Financial Consolidation and the Cyclicality of Corporate Financing*

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Abstract

This paper finds that the financing behavior of US firms along the business cycle changed following the late 1990s. While debt issuance remained procyclical for firms of all sizes, equity issuance and liquidity accumulation switched from countercyclical to procyclical for small and medium-sized publicly-traded firms. Using matched firm-bank data, we provide evidence that consolidation in the US financial sector contributed to this change. We then verify this mechanism by building a general equilibrium business cycle model and simulating financial consolidation: decreasing firms' bargaining power vis-à-vis lenders and diluting lenders' ties to customary borrowers. The change in corporate financing behavior induced by financial consolidation significantly increased the sensitivity of firms' investment and employment to aggregate shocks.

JEL Codes: E22, E32, E44, G32.

Keywords: Financial frictions; business cycles; financial structure; credit shocks

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1 Introduction

The structure of the financial sector can have important consequences for firms' access to finance and, ultimately, for investment and production decisions. An aspect that thus far has received limited attention is the way the structure of the financial sector influences the behavior of firms' financing over the business cycle. And yet, studying the drivers of cyclical financing patterns is critical for understanding firms' resilience to macroeconomic disturbances and the mechanisms of propagation of real and financial shocks. This paper takes a step toward addressing these issues by investigating how changes in the financial sector structure shape the financing behavior of corporate firms over the business cycle. The United States provides a natural setting for our analysis. Since the passing of banking regulatory reforms during the 1990s, the US financial sector has seen a dramatic consolidation. Well over 60% of banking assets are now held by just the top 10 bank-holding companies (Fernholz and Koch (2016)). Specifically, the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 allowed for financial institutions to engage in acquisitions and mergers across state lines. This led to larger and more complex institutions.[1]

The literature has established three key stylized facts about the cyclical behavior of publicly-traded firms' financing.[2] First, firms of all sizes borrow procyclically, i.e. firms increase the amount of debt they hold during periods of economic expansion.[3] Second, small and medium-sized firms issue equity procyclically, while larger firms issue equity countercyclically. Third, liquidity accumulation follows the same pattern as equity issuance, with small and medium-sized firms increasing cash holdings during economic expansions and large firms increasing cash holdings during downturns. In this paper, we confirm these stylized facts for the period 1981-2017; however, we show that the procyclical equity issuance and liquidity accumulation of small and medium-sized firms is entirely driven by the latter half of this period. From the early 1980s to the late 1990s, in fact, equity financing and liquidity accumulation for firms of all sizes was countercyclical. Following the regulatory reforms, the cyclicality of equity issuance and liquidity accumulation has changed dramatically for the firms most likely to have been impacted by the reforms: small and medium-sized firms with lower bargaining power vis-à-vis lenders and that experienced an increase in the complexity of the relationship with their lenders.

Following prior literature, we use data on US firms from the Compustat North America database to construct two types of data sets: aggregate time series and firm-level panel.

[1] See Berger et al. (1999) for further discussion on the implications of financial consolidation.

[2] Covas and Den Haan (2011), Jermann and Quadrini (2012), Karabarbounis et al. (2014) and Begenau and Salomao (2019) are primary examples.

[3] Unless otherwise stated, a "firm" refers to a publicly-traded US firm.

We then document the cyclicality of financing during the 1981-2017 period for a sample of 16,675 firms and uncover a structural break in financing behavior for small and medium-sized firms in the late 1990s.[4] Next, we match Compustat firms to syndicated loan data from Thomson Reuters LPCs DealScan database for the years 1987-2012. We provide evidence using the characteristics of lenders and loans that the US financial consolidation contributed to the change in cyclicality for small and medium-sized firms. Specifically, procyclical equity issuance and liquidity accumulation post-1999 is most prevalent among firms with a weaker relationship to their lenders, i.e. firms with a smaller set of available lenders (weaker firm bargaining power vis-à-vis lenders) and firms whose lenders were acquired by a multi-bank holding company (increased size and complexity of lenders).

After providing evidence consistent with US financial consolidation as a driver of the changed cyclicality, we interpret the evidence though a general equilibrium business cycle model with financially-constrained firms. As in Jermann and Quadrini (2012), firms can borrow and issue equity to cover short-term and long-term financing needs. Access to bank debt is constrained by the lender's imperfect enforcement of the debt contract. Access to equity markets entails equity issuance costs. We additionally allow firms to endogenously accumulate liquidity and directly bargain with their lender over the cost of short-term borrowing. The threat point of the firm in these negotiations is increased by holding liquidity, as this allows the firm to cover its short-term financing needs in the absence of bank financing.[5] Financial consolidation is then simulated in the model by weakening firm bargaining power vis-à-vis the lender and strengthening the lender's outside option. This financial consolidation produces cyclical financing patterns in line with those documented for small and medium-sized publicly-traded firms in the 1999-2017 period. Specifically, the documented flip in cyclicality occurs in response to TFP shocks in the model, rather than shocks to the firms' financial constraints. We show that this also holds true empirically.

The intuition for the theoretical results is the following. A firm has demand for labor that can be met by accessing short-term bank financing or drawing down accumulated liquidity.[6] The firm bargains with the lender over the cost of bank financing. If a firm has high bargaining power vis-à-vis the lender and/or the lender has less valuable alternatives to lending to the firm, then the cost of accessing bank financing is low. When a positive TFP shock occurs, firms want to increase their labor. A firm with a low cost of accessing short-term bank financing (a "large" firm) simply increases borrowing and pays out higher profits from the positive shock

[4] In Section 4, we perform a Wald test to identify 1999 as the break year.

[5] As it realistically takes time for a firm to issue equity, by assumption the firm cannot access equity at the time of bargaining with the lender; thus, the firm wants to be holding accumulated liquidity.

[6] See Lins et al. (2010) for evidence that firms substitute between cash and credit lines.

to equity holders. A firm with a high cost of accessing bank financing (a "small" firm) will also desire to increase its labor; however, the lender can extract a high share of the surplus of doing so. In response, the firm will need to carry more liquidity to offset the bank's bargaining advantage. The firm finances this extra liquidity holding by issuing equity. As a result, both liquidity accumulation and equity issuance increase following a positive TFP shock, i.e. they behave in a procyclical manner. This pattern does not hold for a positive financial shock, as the loosening of the firm's borrowing constraint allows for a firm (regardless of bargaining power or the lender's outside option) to simply increase its debt issuance rather than its liquidity accumulation and equity issuance.

We next investigate how the changes in cyclical financing behavior prompted by financial sector consolidation affect the cyclical behavior of real variables, both empirically and in the model. Empirically, the investment and employment of small and medium-sized firms show an increased sensitivity to economic shocks in the post-financial sector consolidation period. By contrast, large firms' investment and employment sensitivity does not change following consolidation. In the general equilibrium model, pronounced effects on investment occur in the post-financial sector consolidation period via a financial channel. Specifically, firms' liquidity holdings magnify firms' ability to appropriate surplus when negotiating with lenders, as well as increase the value of capital as collateral. The procyclical liquidity accumulation post-financial consolidation, therefore, boosts firms' returns from accumulating capital both as a productive input and as collateral. Pre-financial sector consolidation firms have high bargaining power vis-à-vis the lender; thus, this financial channel is weaker.

This paper contributes to three bodies of literature. The first investigates empirically and theoretically the behavior of firm financing and liquidity accumulation over the business cycle. Using different data sets and definitions of key financing variables, Covas and Den Haan (2011), Jermann and Quadrini (2012), Karabarbounis et al. (2014) and Begenau and Salomao (2019) generally find that debt issuance is procyclical in samples that begin in the early 1980s, while the cyclicality of equity issuance depends on the size of the firm. Karabarbounis et al. (2014) show that equity issuance is procyclical for smaller firms and countercyclical for large firms. We confirm these prior studies for the baseline period of 1981-2017; however, we show that the finding of procyclical equity issuance for smaller firms is driven by the post-financial consolidation period. Covas and Den Haan (2012) and Jermann and Quadrini (2012) introduce financial frictions to generate a tradeoff between debt and equity financing over the business cycle. Unlike Covas and Den Haan (2012), this paper develops a general equilibrium model, which allows for the incorporation of employment. Further, neither of these models have a role for firm liquidity. Bacchetta et al. (2019) introduce firm liquidity holdings into a general

equilibrium model. Similar to this paper, firms pay wages using either external financing or internal liquidity. Our model differs from Bacchetta et al. (2019) by allowing for bargaining between a firm and its lender. This allows for an analysis of the effects of financial consolidation on the cyclicality of financing.

The second strand of related literature investigates the effects of financial sector consolidation on non-financial firms.[7] Di Patti and Gobbi (2007) show that Italian bank mergers reduced availability of credit to corporate borrowers. Karceski et al. (2005) find that bank mergers in Norway lowered the equity value of publicly-traded firms that borrow from the merging banks. These impacts are more pronounced amongst those firms that have the highest cost of switching to another lender. Carow et al. (2003) show that US bank mergers have negative equity effects for publicly-traded companies by decreasing their bargaining power vis-à-vis the merging lenders. We contribute to this literature by exploring the impact of financial consolidation on the cyclicality of firms' financing, as well as the consequences to the cyclical behavior of investment and employment.

Finally, we contribute to the literature on the relative contribution of TFP shocks versus financial shocks to the business cycle. Jermann and Quadrini (2012) find that financial shocks are an important driver of the US business cycle. In contrast, Zetlin-Jones and Shourideh (2017) and Guo (2019) suggest that financial shocks have small impacts on real GDP. This paper contributes to this literature by providing evidence as to the drivers of firm financing decisions. In particular, we find that large firms' debt issuance, equity issuance and liquidity accumulation decisions respond to financial shocks. This was true of smaller firms as well, prior to financial consolidation, while equity issuance and liquidity accumulation are mostly driven by TFP shocks in the post-consolidation period. To the extent that this firm financing behavior influences aggregate output, TFP shocks appear to have gained relative importance over the past two decades.

The remainder of this paper is organized as follows. Section 2 details the data sample and variable definitions. Section 3 presents the empirical results using aggregate time series and firm-level panel data. Section 4 shows that the empirical results are robust to alternate specifications and assumptions. Section 5 utilizes syndicated loan data to provide empirical evidence that financial consolidation can help explain the empirical findings. Section 6 describes the business cycle model. Section 7 simulates financial consolidation in the model. Section 8 provides empirical evidence on the relative importance of TFP shocks and financial shocks to the cyclicality of financing behavior. Section 9 presents evidence that smaller firms' investment and employment have become more sensitive to negative shocks in the

[7] Relatedly, Beck et al. (2003) finds that increased financial sector consolidation is associated with fewer systemic banking crises.

post-financial consolidation period. Finally, Section 10 concludes.

2 Empirical Evidence

This section describes the data sources we use to explain how and why firm financing behavior has changed over time. This paper uses two primary data sources: Compustat and DealScan. Compustat provides balance sheet data for publicly-traded firms. The DealScan database contains information describing the syndicated lenders for firms in the Compustat sample.

2.1 Firm-Level Compustat Data

The 1981-2017 Compustat North America - Fundamentals Annual files include publicly-traded firms. Compustat firms account for approximately one fourth of total private sector U.S. employment; thus, publicly-traded firms represent an economically important sample of businesses.[8] This paper is interested in the effects of consolidation among financial institutions (banks), and publicly-traded firms may not be as reliant on bank debt as private firms. However, Table 1 shows that bank debt accounts for an important share of total debt amongst Compustat firms: over 20% of total debt for the average firm in Compustat.[9] Bank debt has also been shown to play a key role in the sensitivity of Compustat firms to shocks. For example, Ippolito et al. (2018) find that Compustat firms with a higher ratio of bank debt to assets are more sensitive to monetary policy shocks.

The relevant variables for this paper are primarily those reported in the cash flow statement, which are not well-populated prior to 1981.[10] Firms incorporated outside of the United States are dropped from the sample. Financial firms (SIC 6000-6999), utility firms (SIC 4900-4999) and quasi-governmental firms (SIC 9000-9999) are also excluded. The latter two groups are heavily regulated, which makes their financing decisions distinct from other corporate firms. Similarly, financial firms are subject to regulations, such as capital requirements, that uniquely affect their financing behavior. As in Covas and Den Haan (2011), three additional restrictions are made. First, we remove any firms that engaged in a

[8] See Davis et al. (2006) for comparisons between Compustat firms and private firms.

[9] We proxy for bank debt by subtracting commercial paper (CMP) from long-term debt - other (DLTO), as in Lee (2017). Alternatively, Crouzet (2020) creates a bank debt proxy by summing DLTO and notes payable (NP). Using this alternative measure would result in an even higher bank debt share for Compustat firms.

[10] Other papers in this literature also tend to begin their samples in the early 1980s, due to changes in U.S. financial markets and the general behavior of numerous economic variables described elsewhere, e.g. the Great Moderation. In the Online Appendix, we show that the results are virtually unchanged if we start the sample in 1984, rather than 1981.

major merger during the 1981-2017 time period.[11] Second, we remove General Electric, General Motors, Ford and Chrysler, as these firms were heavily affected by the FASB94 accounting rule instituted in 1988. Third, we drop any firm-year observations where the accounting identity (assets = liabilities + equity) is violated by more than 10% of the firm's book value of assets. Finally, any firm-year observations with missing values for assets, liabilities, equity, debt, cash or (net) capital stock are dropped.

Creation of the primary financing variables most closely follows Eisfeldt and Muir (2016). Net debt issuance is calculated as long-term debt issuance (DLTIS) minus long-term debt reduction (DLTR) plus changes in current debt (DLCCH) minus (net) interest paid (XINT).[12] Net equity issuance is the sale of common and preferred stock (SSTK) minus the purchase of common and preferred stock (PRSTKC) minus cash dividends (DV).[13] External financing is the sum of net debt issuance and net equity issuance. Liquidity accumulation is defined as the change in cash and cash equivalents (CHE_t - CHE_{t-1}).[14] All variables are normalized by the lagged book value of total assets (AT). We show in the Robustness section that the results hold if we instead normalize by the lagged (net) capital stock (PPENT).

As in Covas and Den Haan (2011), firms are grouped into size bins using acyclical cutoffs of the book value of total assets. Specifically, firms are first split into size groups by the previous year's asset value. We define small firms as those with a book value of assets below the 60th percentile and large firms as those above the 60th percentile (excluding the top 10 percent of firms).[15] A (log) linear trend is then fit through these annual cutoff values and used as the new cutoff values for firm size groupings. This prevents the cutoff values themselves from being cyclical; however, the results using the original cutoff values are very similar to those with the adjusted values.

For the aggregate time series results, we follow a similar methodology as Eisfeldt and Muir

[11] A "major merger" is defined as any merger or acquisition where sales increased by at least 50 percent afterwards (Compustat sales footnote code AB).

[12] For firms with an scf code of 1, DLCCH is subtracted. As described in Chang et al. (2014), prior to the adoption of uniform reporting rules in 1988, DLCCH that was reported on a firm's working capital statement (scf = 1) has the opposite sign as when reported on other financial statements. For firms with a data code of 4, DLCCH was assumed to be included in DLTIS, so DLCCH was set to zero

[13] Missing values of DV are set to zero in order to avoid too many missing values for net equity issuance. We show in the Robustness section that using net sale of stock (i.e. SSTK minus PRSTKC) produces results very similar to the equity issuance measure. Thus, the results are not driven by the behavior of dividends.

[14] Unlike Eisfeldt and Muir (2016), we use the balance sheet version of cash, rather than the cash flow statement version (CHECH). This is due to CHECH being unavailable prior to 1984. We show in the Robustness section that the results hold using either version of liquidity accumulation, as well as using change in cash only (CH_t - CH_{t-1}), i.e. excluding cash equivalents.

[15] See Eisfeldt and Muir (2016) for a description of how the top 10 percent of firms present measurement problems and anomalous financing behavior that makes their inclusion in the sample misleading of firm dynamics.

(2016) and Covas and Den Haan (2011). Specifically, we sum the financing variable of interest for all firms of a size classification within a year. Then, we divide each series by the sum of the asset value for all firms of a size classification within a year to create the aggregate series by size. Finally, we HP filter the aggregate financing series to produce a stationary series.[16] The cyclical component of this HP-filtered series is then used in all correlations to remove the longer-run trends in the variables. While it has been standard to use HP filtering in this literature, Hamilton (2018) warns that HP filtering can cause spurious correlations. We show in the Robustness section that the results hold if we use either the non-HP-filtered financing series or if we filter based on the Hamilton (2018) methodology.[17] Further, the firm-level panel regressions do not use filtering and still produce results similar to those found with the HP-filtered aggregate series; thus, the results are not driven by the choice to use HP filtering.

Splitting by firm size categories, Table 1 shows summary statistics of asset value, firm age and key financing variables for the 16,675 firms in the sample. Since all firms are publicly-traded, even "small firms" are quite large relative to the typical private firm. Still, there is a sizable discrepancy between the firm categories: the average small firm has an asset value of $71.5 million, while the average large firm has an asset value of $931 million. As expected, larger firms tend to be older. Smaller firms rely more on equity financing than larger firms and also tend to accumulate more liquidity. During the sample period 1981-2017, approximately 90% of firms fall within their modal firm size category. In other words, firms rarely cross size bins. This suggests we can (approximately) treat firm size as a fixed firm characteristic.

2.2 DealScan Syndicated Lender Data

We use information on syndicated loans from the Thomson Reuters LPC's DealScan database for the years 1987-2012. This database allows us to link syndicated lenders to their borrowing firms in Compustat. The syndicated loan market consists of groups of lenders that jointly loan funds to a single borrowing firm. A subset of the lenders in a syndicate are the lead arrangers. These lead arrangers agree with the firm on the key characteristics of the loan, including the loan amount, collateral, interest rate, etc. The lead arrangers are also responsible for inviting the other syndicate lenders to join. The non-lead members of the syndicate provide funds, assist in the administrative tasks and screen/monitor the borrowing firm. These non-lead

[16] For the baseline results, we use annual data; thus, the smoothing parameter is set to 100. For quarterly data, the smoothing parameter is set to 1600.

[17] To perform the Hamilton (2018) filtering, we use the Diallo (2018) HAMILTONFILTER Stata command. For annual data, this amounts to using the residual from regressing the variable of interest at year t on its values at year $t-2$ and $t-3$.

members are referred to as "participants".[18]

Using the DealScan database, we create a pool of lenders for each Compustat firm that matches to DealScan. Specifically, any lender that was engaged in a syndicated loan relationship with a firm in the current year, the previous 5 years or the next 5 years are classified as belonging to a firm's lender pool. Since firms do not necessarily engage in the syndicated loan market every year, using a window of 5 years allows us to capture a higher percentage of the lenders with which a firm does business.[19] The lenders included in a firm's lender pool are plausibly those banks that act as key lenders to the firm. Both the lead lenders and participants interact, and contract, directly with the firm (see Mugasha (1998)). This allows the lenders, including the participant lenders, to gain important information about the borrowing firm through the syndicated loan agreement (see Li (2017)).

After creating this lender pool, we are interested in measures of the relative power of the relationship lenders vis-à-vis the borrowing firms. In order to capture this, we use three proxies: the total number of lenders in a firm's pool, the share of syndicated loans provided by the lead lender(s) and an indicator for a lender recently joining a multi-bank holding company. This last proxy represents an exogenous change in the relationship between a firm and lender. In addition, we also consider a proxy for lender market power: an indicator for a lender recently being acquired by another lender. In Section 5, we use these proxies to present evidence that an increase in the size and complexity of the relationship lenders is a key driver in changing the cyclicality of small and medium-sized firms' financing behavior.

3 The Cyclicality of Firm Financing Over Time

In this section, we present evidence of a structural break in the financing behavior of small and medium-sized publicly-traded firms around the year 1999. In an April 2001 speech, Federal Reserve Vice Chairman Roger Ferguson noted that "Financial consolidation has helped to create a significant number of large, and in some cases increasingly complex, financial institutions" and that "the pace of consolidation increased over time, including a noticeable acceleration in the last three years of the [1990s]" (Ferguson (2001)). A key contributor to this consolidation was the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, which applied to states at different dates between 1994 and 1997.[20] Heiney (2010) presents evidence that the banking sector consolidation of the 1990s begins to slow after 1999. As shown in Figure 2, the concentration of the banking sector, as measured by Herfindahl-Hirschman

[18] See Delis et al. (2017) for additional detail on the syndicated loan market.
[19] The results are generally robust to using a different window length.
[20] See Dick (2006) for a list of state-specific dates of adoption.

indices, noticeably increases between the passage of Riegle-Neal in 1994 and the end of the 1990s. The other major financial reform of the 1990s, the Gramm-Leach-Bliley Act, was passed in 1999 and allowed for bank holding companies to integrate their commercial banking activities with investment banking. For the above reasons, the year 1999 serves as a logical partition for our analysis.[21]

We show that, prior to 1999, the cyclicality of debt issuance, equity issuance and liquidity accumulation behaves similarly for both smaller and larger firms. But, after 1999, the financing behavior of small and medium-sized firms becomes significantly different than larger firms. Specifically, these firms begin to issue equity and accumulate liquidity in a procyclical fashion. These results hold using both the correlations of aggregated time series data and panel regression estimates of disaggregated firm-level data. The following sections explore the potential causes of this change in cyclicality and find that the mechanisms are consistent with financial consolidation: a weakening of smaller firms' bargaining power vis-à-vis their lenders and an increase in the complexity of their relationship with lenders.

3.1 Aggregate Time Series Results

To visually illustrate the main stylized facts documented in this paper, Figure 3 plots the aggregate time series of debt issuance (panel a) and equity issuance (panel b) separately for "small" (asset value below the 60th percentile) and "large" firms (asset value between the 60th and 90th percentiles), as well as the cyclical component of real corporate GDP. All series are standardized to have a mean of zero and unit variance. In panel (a), the debt issuance series for small and large firms essentially overlap each other for the entire 1980-2017 period. They also clearly comove positively with cyclical GDP, i.e. debt issuance is procyclical for both small and large firms. In panel (b), the equity issuance series for both small and large firms positively comove throughout the first half of the sample period; however, these series negatively comove during the 2000s. In terms of cyclicality, both small and large firms negatively comove with cyclical GDP in the first half of the time period, while the equity issuance of small firms positively comoves in the latter half. The remainder of this paper more rigorously demonstrates that the cyclicality of small firms' equity issuance and liquidity accumulation changed from the early 1980s to the late 1990s and uncovers a role for financial consolidation in this phenomenon.[22]

Using the aggregate series displayed in Figure 3, Table 2 presents the correlation between

[21] Additional empirical evidence for using the year 1999 is presented below in the Robustness section.

[22] For space consideration, the liquidity accumulation version of this figure is in the Online Appendix. The behavior of the series is quite similar to that of equity issuance.

each of the main financing variables and the cyclical component of real corporate GDP.[23] Panel A shows the correlations for the entire 1981-2017 period.[24] As commonly found in this literature, debt issuance is strongly procyclical for firms of all sizes (i.e. the correlation is positive), while equity issuance and liquidity accumulation are procyclical for smaller firms and countercyclical for large firms. One of the insights of this paper is evident by comparing Panel B to Panel C: the commonly found procyclicality of small firms' equity issuance and liquidity accumulation is driven by the post-1999 time period (Panel C). You can see from Panel B that equity issuance and liquidity accumulation are countercyclical for smaller firms prior to 1999. In contrast, large firms behave virtually the same in both periods.

3.2 Firm-Level Panel Results

Next, we reproduce these cyclical financing patterns using firm-level panel data, which allows for the addition of firm characteristics beyond size. Table 3 displays results from estimating a total of 24 regressions with the following 3 specifications. First, the reported coefficients are estimated by 12 regressions (2 time periods x 3 financing variables x 2 size groups) of the following specification:

$$V_{i,t} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \beta Y_t + \Gamma' Z_{i,t-1} + e_{i,t} \tag{1}$$

where $V_{i,t}$ is the financing variable of interest normalized by the lagged book value of assets, α_0 is a constant [25], t and t^2 capture trends in the financing variable, Y_t is the cyclical component of real corporate GDP normalized such that a unit increase in Y_t indicates moving from the lowest value of the cyclical component to the highest value during the sample period 1981-2017, $Z_{i,t-1}$ includes the lagged values of the controls and $e_{i,t}$ is the error term. For the baseline specification, we follow Covas and Den Haan (2011) and include the following controls: firm's cash flow and Tobin's Q, where each control variable is the difference between the firm's value at $t-1$ and the respective size group's mean value at $t-1$. This normalization prevents the controls from picking up variations in aggregate economic conditions.[26] We report the β

[23] Following most of the literature, we use the cyclical component of HP-filtered real corporate GDP to measure the business cycle. In the Robustness section, we show that the results are robust to alternative measures.

[24] Since we HP filter the variables for the baseline results, there is potential for end-point bias. In the Online Appendix, we drop the first and last three years from the baseline sample and show the results are nearly identical.

[25] Next we show that including a firm fixed effect produces similar results.

[26] Using a small number of controls allows for a parsimonious model; however, it does not rule out the possibility that the estimated cyclicality by firm size is driven by omitted non-size variables. On the one hand, firm size is intended to broadly capture characteristics shared by firms of similar size. Still, in the Robustness section we show that the firm size results hold when we allow a wider set of firm characteristics to explain

coefficient in the tables, with standard errors in parentheses clustered along both the time and firm dimensions.

Second, the reported p-values are the result of 6 regressions (2 time periods x 3 financing variables) where the 2 firm size groups are pooled:

$$V_{i,t} = \alpha_j + I(j)_{i,t}(\alpha_{1,j}t + \alpha_{2,j}t^2 + \beta_j Y_t + \Gamma_j' Z_{i,t-1}) + e_{i,t} \tag{2}$$

where α_j is a size group j fixed effect and $I(j)_{i,t}$ is an indicator for the size group to which firm i belongs to in year t. This indicator is interacted with all of the explanatory variables. We report the p-values of β_{large}, where *small* is the base group. These p-values indicate whether the cyclicality of the *small* group statistically differs from the large group.

The bold coefficients in Panel B are based on the p-values from 6 regressions (3 financing variables x 2 size groups) where the 2 time periods are pooled:

$$V_{i,t} = \alpha_k + I(k)_{i,t}(\alpha_{1,k}t + \alpha_{2,k}t^2 + \beta_k Y_t + \Gamma_k' Z_{i,t-1}) + e_{i,t} \tag{3}$$

where α_k is a time period k fixed effect and $I(k)_{i,t}$ is an indicator for the time period to which firm i belongs to in year t. This indicator is interacted with all of the explanatory variables. We bold the coefficients in Panel B of the tables to indicate a p-value below 0.05 for the coefficient $\beta_{post1999}$, where $pre1999$ is the base group. These p-values indicate whether the cyclicality of the variable of interest is statistically different in the 1999-2017 period, relative to the 1981-1998 period.

Table 3 reports the baseline panel results. The coefficients in Table 3 can be interpreted as the effect on the financing variable (as a percentage of the firm's asset value) of moving from the lowest realization of the business cycle measure in the full sample period 1981-2017 to the highest realization, i.e. a positive coefficient indicates a procyclical relationship. First, note that the strength and direction of the cyclicality implied by the coefficients in Panel A and Panel B qualitatively match quite closely with the aggregate correlations in Panel B and Panel C, respectively, of Table 2. Thus, while the panel regressions treat each firm observation equally, the results are quite similar to the aggregate data, where firms are weighted by their asset value. Second, the p-values in Panel B for equity issuance and liquidity accumulation are at or below 0.10, indicating statistically significant differences in cyclicality of equity issuance between small firms and large firms. Third, as indicated by the bold coefficients in Panel B, the cyclicality of equity issuance and liquidity accumulation for small firms are significantly different in Panel B than the cyclicality of small firms in Panel A. For small firms, the sign of

cyclicality in financing variables.

the coefficient flips, with the magnitude of the coefficients in the post-1999 period being quite similar to the pre-1999 coefficients in absolute value. In sum, we detect large and statistically significant changes in the financing behavior of only small firms for the post-1999 period.

We can get a sense of the magnitude of changes in GDP on equity issuance by converting to a one-standard deviation change in cyclical GDP. Moving from the lowest realization of the business cycle measure in the full sample period 1981-2017 to the highest realization is approximately a 4.5 standard deviation change. Thus, dividing the post-1999 equity issuance coefficient for small firms of 11.12 by 4.5 results in a standardized coefficient of 2.5. Comparing to the simple average equity issuance for small firms of 19.1% of assets (see Table 1), this amounts to an effect equivalent to 13% of average equity issuance. Alternatively, we could compare to the average annual aggregate equity issuance for small firms of 9.85%. This amounts to an effect equivalent to 25% of average equity issuance. Changes in GDP appear to have an economically significant effect on firm equity issuance.

To this point, the regressions have not included a firm fixed effect; however, it could be the case that an idiosyncratic firm component is responsible for the results. We next include a firm fixed effect to control for permanent heterogeneity. Since the Compustat sample contains a substantial amount of firm entry and exit, we do not want the firm fixed effect to be endogenous. As a result, we keep only firms that have greater than 5 years of data within a subperiod. In Appendix Table A.1, we report the results of estimating the baseline specification while including this firm-specific constant term. As with the baseline specification, equity issuance and liquidity accumulation are countercyclical in the pre-1999 period and significantly more procyclical in the post-1999 period.

However, since firms rarely move between the two firm size categories, the inclusion of a firm fixed effect does not exploit within-firm size variance over time. As an alternative, we next use a continuous firm size measure. Specifically, we want to answer the question, "During the post-1999 period, does equity issuance and liquidity accumulation for a firm become less procyclical as that individual firm grows?" We re-estimate the baseline panel specification with the following changes: the addition of a firm fixed effect, the use of a continuous measure of size (i.e. log of asset value) and the demeaning of the continuous size measure at the firm level. The specification is the following:[27]

$$V_{i,t} = \alpha_i + \alpha_1 t + \alpha_2 t^2 + \beta_1 (s_{it} - E_i[s_i]) Y_t + \Gamma' Z_{i,t-1} + e_{i,t} \tag{4}$$

where α_i is a firm i fixed effect. The variable s_{it} measures firm i's size (i.e. log of asset value)

[27] We again drop firms that appear in fewer than 6 sample years to prevent the firm fixed effect from being endogenous.

in year t and $E_i[s_i]$ is the average size of firm i in the sub-period. With this specification, the cyclicality of a firm's financing variables is identified by the variation in a firm's current size relative to that firm's average size.

In the post-1999 period, one would anticipate that a firm's equity issuance and liquidity accumulation becomes significantly less procyclical as it grows, i.e. looks more like a "large" firm. The results in Table 4 show that this is true.[28] As well, this was clearly not true of the pre-1999 period. Given these empirical results, Section 5 will use information about firms' lenders to investigate what caused smaller firms' financing behavior to change post-1999.

4 Robustness

This section first presents evidence that the change in smaller firm behavior occurred around 1999, consistent with the importance of financial consolidation. Then, we show that the empirical results are robust to alternative specifications and assumptions. Specifically, we test the robustness of the main finding: equity issuance and liquidity accumulation became procyclical in the 1999-2017 period for smaller firms only.

4.1 Identifying the structural break

Thus far, we have used 1999 as the year where small firms experienced a structural break in their equity issuance and liquidity accumulation. Intuitively, 1999 is a natural break year, as a substantial portion of the post-reform financial consolidation had occurred by 1999. To provide evidence of the suitability of this assumption, we regress the aggregate financing variable series for small firms on the cyclical component of real corporate GDP. We then perform a Wald test for a structural break in the estimated cyclicality coefficient. In Figure A.1, we plot the p-values of these Wald tests for each year from 1984-2014. Unsurprisingly, the p-values for debt issuance are never below 0.1, as there is not strong evidence for a change in the cyclicality of debt issuance. Conversely, the p-value for a structural break in equity issuance is at its lowest, below 0.1, in 1999.[29] The results for liquidity accumulation are similar, with the p-value falling below 0.1 in 1999. We conclude that 1999 is the strongest candidate for a structural break in the cyclicality estimates.[30]

[28] The Online Appendix presents the results of using continuous size without a firm fixed effect or isolating within-firm variance. The results are consistent with the baseline categorical size findings.

[29] Similarly, we also rerun the baseline panel results using different break years. This method produces similar results as the Wald test, which is that the pre-1999 vs post-1999 break is the break year with the highest significance and the results weaken as the break year moves away from 1999.

[30] Given the literature discussed above that shows an increase in financial consolidation beginning in the mid-1980s, it is not surprising that there is a decreasing trend in the p-values of our Wald tests throughout

4.2 Other Robustness Tests

One potential concern with the empirical results is that, rather than capturing the cyclicality of smaller firms, they could be capturing the cyclicality of firm entry. In other words, during an expansion, many young firms choose to go public and disproportionately issue equity. To account for this, we restrict the sample to only those firms that entered the Compustat sample prior to 1990 and were also in the sample in 2017. Despite severely restricting the sample, Appendix Table A.2 shows that the results hold. Thus, the findings are not driven by firm entry or a change in the composition of the sample over time.

Next, one may prefer alternative definitions of the financing variables. Appendix Table A.3 displays the results of alternative definitions for equity issuance and liquidity accumulation. We split the net equity issuance variable into its two components: net sale of stock and dividend payouts. Recall that net equity issuance is the sale of common and preferred stock (SSTK) minus the purchase of common and preferred stock (PRSTKC) minus cash dividends (DV). Appendix Table A.3 shows that the net sale of stock (i.e. excluding cash dividends) results closely match the equity issuance results. Thus, the behavior of dividend payouts does not drive the findings. The main results also qualitatively hold for three alternative definitions of liquidity accumulation. The first alternative definition uses the cash flow statement version of change in cash and cash equivalents, rather than the balance sheet version used in the baseline estimates.[31] The second alternative definition uses changes in cash only, rather than cash and cash equivalents. The third definition uses retained earnings.

While it is standard to use HP-filtering in this literature, it could be the case that the filtering of the GDP measure and/or financing variables (aggregate results only) are non-trivially impacting the results. In Appendix Table A.4 we reproduce the baseline correlation results with the non-filtered financing series and the annual growth rate in real corporate GDP. The main findings are less strong, but the general pattern clearly holds. Next, we additionally show that filtering the financing series and/or GDP using the Hamilton (2018) methodology produces qualitatively similar results to the baseline estimations. Appendix Table A.5 shows this for the aggregate correlation results. Overall, the results are not dependent on the decision to HP-filter the data.

Finally, we include a few additional robustness checks in the Online Appendix. First, we verify that the findings are not driven by the cyclicality or potential endogeneity of asset value. We do so with two robustness checks: normalizing the financing variables by the (net) capital stock value or by the firm's first reported asset value. Both normalizations produce results

much of the 1990s.

[31] The cash flow statement version is not available until 1984.

quite similar to our baseline findings. Second, we exclude all observations with any merger, rather than just firms that experienced a major merger. The results are largely unchanged to this exclusion; thus, the findings are not due to, for example, the issuance of equity during the merging process. Third, one might be concerned that small firms are more likely to be on the verge of bankruptcy, i.e. financially distressed, and that our results might then be picking up the impact of financial distress. We have already confirmed that the results are not driven by firm entry or exit. But, in the Online Appendix, we exclude firms that are considered "financially distressed" according to the Altman Z-Score. Such firms are disproportionately smaller firms. Despite losing nearly half of the sample of small firms with this exclusion, the results remain largely unchanged.

5 The Role of Financial Consolidation

In this section, we first exploit the staggered adoption of the Riegle-Neal Interstate Banking and Branching Efficiency Act and show that the change in financing cyclicality is most pronounced amongst firms headquartered in states that adopted Riegle-Neal earlier. Next, we create a pool of lenders with whom Compustat firms have a syndicated loan relationship, as described in Section 2. The characteristics of these firms' key lenders are then used to test whether a change in bargaining power and bank complexity contributed to the flip in financing cyclicality for smaller firms beginning in the late 1990s.

5.1 State-Level Timing of Riegle-Neal Adoption

While the Riegle-Neal Interstate Banking and Branching Efficiency Act was passed in 1994, states individually passed legislation that determined when Riegle-Neal went into effect. This led to staggered adoption during the years 1995 (14 states), 1996 (12 states) and 1997 (24 states). We next test whether the year of adoption is associated with higher procyclicality of equity and liquidity for smaller firms using the following specification:

$$V_{i,t} = \alpha_h + \alpha_1 t + \alpha_2 t^2 + I(h)_i \beta_h Y_t + \Gamma' Z_{i,t-1} + e_{i,t} \tag{5}$$

where h is the year of Riegle-Neal adoption for the state in which a firm is headquartered and $I(h)_i$ is an indicator for this year. In Table 5, we display the estimates of β_{1995}, β_{1996} and β_{1997} for smaller firms in the periods 1981-1998, 1999-2009 and 1999-2019. Panel C (1999-2019) shows that equity and liquidity are significantly less procyclical for firms headquartered in 1997 adopters. This is especially true for the first decade after reform, as seen in Panel

B (1999-2009). These same trends were not apparent prior to Riegle-Neal (see Panel A: 1981-1998). These results suggest that the state-specific adoption of Riegle-Neal noticeably contributed to the change in cyclicality patterns identified above. We next use matched bank-firm information to further test the effects of financial consolidation on financing cyclicality.

5.2 Measures of Financial Consolidation

a. Reduction in Firms' Bargaining Power vis-à-vis Lenders

In Table 6, we re-estimate the baseline panel regression with an additional interaction term to test whether a reduction in firms' bargaining power vis-à-vis lenders is associated with the documented change in cyclicality for smaller firms post-1999:

$$V_{i,t} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \beta_1 Y_t + \beta_2 X_{i,t} + \beta_3 Y_t * X_{i,t} + \Gamma' Z_{i,t-1} + e_{i,t} \tag{6}$$

where $Y_t * X_{i,t}$ is the interaction of our business cycle measure, Y_t, with a characteristic of the firm's lender pool, $X_{i,t}$. The main coefficent of interest is β_3, which shows the effect on the cyclicality measure, Y_t, of moving from the 25th percentile value for the characteristic of the firm's lender pool to the 75th percentile value.

Sharpe (1990), Rajan (1992), Boot (2000) and Ongena and Smith (2001) show that a single bank can extract monopoly rents through future loans to the firm. Borrowing from multiple banks moderated such "hold-up" issues. In Panel A of Table 6, we use the total number of lenders in the created firm's lender pool as the proxy for a firm's outside options in bargaining with a lender. Here, an increase in the number of lenders for smaller firms in the post-1999 period is associated with a *less* procyclical equity issuance and liquidity accumulation, as well as a more procyclical debt issuance. This suggests that the cyclicality of smaller firms financing behavior moves in the direction of larger firms cyclicality when smaller firms have a larger set of lenders. By contrast, no such evidence emerges for the pre-1999 period.

Next, we proxy for the firm's outside option with the lead lender(s) average share of the total syndicated loan value for a firm. As demonstrated by Rajan (1992), the larger the share of the lead lender, the stronger the informational monopoly power of the lender vis-à-vis the firm. Thus, a high lead lender share suggests that the firm is more reliant on the lead lender for financing. As expected, in Panel B, we see that the more concentrated the syndicated loans amongst the lead lender(s), the less that small firms behave like large firms, in terms of the cyclicality of debt issuance, equity issuance and liquidity accumulation.

Importantly, the interaction coefficients for the pre-1999 period are generally insignificant and opposite of the post-1999 sign. For example, decreasing the number of lenders in post-

1999 is significantly related with a more procyclical equity issuance for smaller firms; however, there is no relationship pre-1999. Appendix Table A.7 shows means for key characteristics of the syndicated lenders. Our proxies have not seen substantial change from the pre to post periods. But the size/strength of the lenders in the lender pools has seen a noticeable increase, as illustrated by the average lender's share of state assets and the average lender's Lerner index.[32] Thus, for a given reduction in the number of available lenders for a firm, the effect is stronger in the post-1999 period. This suggests that financial consolidation affected the impact of firm-bank relationships on financing behavior by increasing the intensity of the effect, i.e. a change in available lenders matters more because the lenders themselves are "stronger".

As mentioned, the measures in both Panel A and Panel B are proxies for limited outside options for the firm when seeking a loan. These results are consistent with less firm bargaining power (i.e. fewer lender options and more reliance on a small set of lenders) being significantly related to the increased procyclicality of smaller firms' equity issuance and liquidity accumulation. As an alternative to the measures based on the pool of lenders available to a firm, we next use a proxy for the lender's market power. We re-estimate similar regressions as above; however, the interaction term now flags when a firm's lender has recently been acquired by another lender. This plausibly captures an exogenous change in the market power of a firm's lender. While the frequency of lender mergers is relatively low (less than 10% of the sample includes a recent merger), Table 7 shows that the post-1999 interaction coefficients are at least qualitatively consistent with lender's market power increasing the procyclicality of equity issuance and liquidity accumulation.

We can further assess the impact of a bank merger by splitting firms into those with few outside options and those with many outside options. One would expect the impact of a bank acquisition to be greater for those firms with fewer lenders in their lender pool. In Table 9, we split our sample into firms with a below average number of lenders ("Few Lenders") and firms with an average or above number of lenders ("Many Lenders"). As expected, firms with few lenders whose lead lender was recently acquired by another lender have significantly more procyclical equity issuance. In contrast, firms with many lenders see no effect from a lead lender acquisition. Appendix Table A.6 shows qualitatively similar results for the acquisition of any lender.

b. Increased Complexity in Bank-Firm Relationships

Table 8 repeats the same exercise with an interaction term to test whether increased distance

[32]The Lerner index is the difference between the price of bank production and the marginal cost, divided by the marginal cost.

between the firm and the lender can explain the documented changes in cyclicality. Here, the term "distance" refers both to physical distance as well as the level of complexity in the relationship between a firm and lender. In Panel A, we interact the business cycle measure with whether any of the firm's lenders has joined a multi-bank holding company (MBHC) within the past 5 years. Joining a MBHC is evidence that more of the lender's decisions are moved away from the local loan officers to far-away headquarters. Thus, the financial institution is less interested in (has a looser link with) the local firm.[33] This measure has the added benefit of being an exogenous change in the relationship between a firm and its lender. Equity issuance is significantly more procyclical for those small firms who have a lender in their pool who has recently joined a MBHC. In Panel B, there is a similar effect from a lead lender joining a MBHC.

Note that the base group, i.e. those firms without a lender who has recently joined a MBHC, still includes many lenders who had previously joined a MBHC more than five years ago. Thus, this would be expected to attenuate our estimate of β_3. Still, we find a significant effect consistent with a weakening in the relationship between a firm and a lender leading to a more procyclical equity issuance.

As discussed above, we see that the interaction coefficients for the pre-1999 period are generally insignificant and opposite of the post-1999 sign. Since the size/strength of the lenders in the lender pools has experienced a noticeable increase, while our proxies have not, this suggests that the acquisition of a lender by a MBHC matters more in the post-1999 period because the lenders themselves are "stronger".

Finally, we can again assess the impact of increased complexity by splitting firms into those with few outside options and those with many outside options. In Table 9, we split our sample into firms with a below average number of lenders ("Few Lenders") and firms with an average or above number of lenders ("Many Lenders"). Firms with few lenders whose lead lender recently joined a MBHC have significantly more procyclical equity issuance. In contrast, firms with many lenders see no effect. Appendix Table A.6 shows qualitatively similar results for any of the firm's lenders joining a MBHC.

6 The Model

We interpret the empirical findings through a general equilibrium business cycle model with financially constrained firms. In line with the empirical setting, firms can finance short-term and long-term financing needs via borrowing or equity issuance. The model environment builds

[33] Berger et al. (2005) show that larger banks tend to have shorter, more impersonal lending relationships with firms.

upon Jermann and Quadrini (2012); however, we depart in at least two key ways. First, we allow for firms to hold liquidity. This is important to investigating the comovement of debt issuance, equity issuance and liquidity accumulation. Second, we posit that firms bargain with lenders over the cost of loans. As discussed below, this endogenizes the desire for firms to hold liquidity. We now describe the model environment in greater detail.

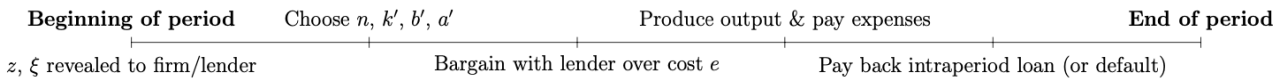
6.1 Environment

Time is discrete and infinite (see Figure 1 for the within-period timeline of the economy). There is a $[0, 1]$ continuum of firms with a production function $F(z_t, k_t, n_t) = z_t k_t^{\theta} n_t^{1-\theta}$, where z_t is stochastic aggregate productivity, k_t is the firm's capital stock used in production and n_t is the firm's labor used in production. Capital evolves according to $k_{t+1} = (1 - \delta)k_t + i_t$, where i_t is investment and δ is the depreciation rate. The firm chooses the capital stock, k_t, in the previous period. Labor, n_t, is chosen at the beginning of period t.

Firms have access to three forms of external financing: equity issuance, intertemporal debt (bonds) and an intraperiod loan, obtained from a lender (bank). The amount of intraperiod borrowing is subject to constraints, due to enforcement problems. Firms can issue equity by decreasing their equity payout, d_t, where a negative value indicates net equity issuance. Firms that deviate from the long-run equity payout target are subject to a quadratic cost that makes the total cost of equity payouts $\varphi(d_t) = d_t + \kappa \cdot (d_t - \bar{d})^2$, where $\kappa \geq 0$ represents the friction of substituting from debt financing to equity financing and $\bar{d}$ is the long-run (steady-state) equity payout target. Intertemporal debt, b_t, has a tax advantage that makes it preferable to issuing equity. This preference of debt to equity follows the standard pecking order assumption found in models such as Jermann and Quadrini (2012) and Hennessy and Whited (2005). Specifically, firms face an effective gross interest rate of $R_t = 1 + r_t(1 - \tau)$, where r_t is the interest rate and τ is a tax subsidy. The intraperiod loan will be discussed in further detail below.

To this point, the environment has followed the setup of a standard business cycle model augmented with a firm financing decision, such as in Jermann and Quadrini (2012). We now make the first major departure: firms are given the option to accumulate liquidity, a_t, and carry it between periods. Holding liquidity allows firms to cover current period operating costs and reduces the amount of external financing required. With the standard assumption of $\beta R < 1$, this extension is not trivial. Liquidity must provide some additional benefit that justifies the firm holding liquidity between periods rather than reducing its intertemporal debt, b_t, and associated interest payments. Firms choose to hold liquidity in this economy for two reasons: to increase their threat point in bargaining over the cost of the intraperiod loan and to pay for labor expenses.

Figure 1: Within-Period Model Timeline



Specifically, firms enter the period holding capital for use in production; however, in order to produce, firms must also hire labor at the beginning of the period. If firms enter the period holding less liquidity than necessary to cover desired labor expenses, then they can pay for these labor expenses by borrowing via an intraperiod loan, l_t. The firm and lender bargain over repayment on the intraperiod loan, i.e. the net cost e_t per unit of loan. This reveals two benefits to a firm from carrying liquidity. First, holding liquidity reduces the size of the intraperiod loan that a firm desires, all else equal. Second, as detailed below, holding liquidity increases the value of the firm's threat point in the process of bargaining over loan repayment e_t. The effect of both is to decrease the total cost of financing labor expenses.

To make the solution of the bargaining problem tractable, the cost e_t is paid by the firm after production. Additionally, the firm has the choice to defer until the end of the period payment on a fraction $1-\nu$ of its labor expenses that are paid out of accumulated liquidity.[34] Thus, labor expenses can be written as

$$w_t n_t = l_t + \nu a_t + (1-\nu) a_t \tag{7}$$

where w_t is the wage rate paid to labor. The firm and lender bargain over the cost of the intraperiod loan. Instead of reaching an agreement with the lender, the firm can threaten to walk away and produce using only the labor it can afford to hire with its accumulated liquidity. This leads to the following bargaining problem:

$$\max_{e_t} \left\{ \left[F\left(z_t, k_t, \frac{l_t + a_t}{w_t}\right) - (1+e_t) l_t - F\left(z_t, k_t, \frac{a_t}{w_t}\right) \right]^{\eta} \left[(e_t - \gamma) l_t \right]^{1-\eta} \right\}$$

where η is the bargaining power of the firm and γ is the return on the lender's outside option.[35] Since the returns of the production function are diminishing in labor, a firm with higher liquidity, a_t, will produce less additional surplus from agreeing to an intraperiod loan. This means, all else equal, that the cost of the intraperiod loan will be lower for firms holding more liquidity. Solving this bargaining problem, the cost of the intraperiod loan is

[34] See the end of this subsection for further discussion of the ν parameter.
[35] See the end of this subsection for further discussion of the γ parameter.

$$e_t = \frac{(1-\eta)\left[z_t k_t^{\theta}\left(\left(\frac{l_t+a_t}{w_t}\right)^{1-\theta} - \left(\frac{a_t}{w_t}\right)^{1-\theta}\right) - l_t\right] + \eta\gamma l_t}{l_t} \tag{8}$$

The firm's intertemporal budget constraint can be written as follows:

$$(1+e_t)l_t + w_t n_t + b_t + k_{t+1} + \varphi(d_t) + a_{t+1} = (1-\delta)k_t + F(z_t, k_t, n_t) + \frac{b_{t+1}}{R_t} + a_t + l_t$$

Then, cancelling l_t, which is paid back within the same period as it is contracted, substituting in Equation (8) for $e_t l_t$, substituting in $n_t = \frac{l_t+a_t}{w_t}$ and $l_t = w_t n_t - a_t$ gives the following budget constraint:

$$\begin{aligned}\eta(1+\gamma)w_t n_t + b_t + k_{t+1} + \varphi(d_t) + a_{t+1} \\ = (1-\delta)k_t + \eta F(z_t, k_t, n_t) + \frac{b_{t+1}}{R_t} + \eta(1+\gamma)a_t + (1-\eta)F(z_t, k_t, \frac{a_t}{w_t})\end{aligned} \tag{9}$$

Finally, since firms are able to default on their loans (i.e. the enforceability of loan obligations is imperfect), the ability for a firm to borrow is limited. Specifically, at the end of the period, the firm can choose to default on the intraperiod loan l_t. After production and paying costs $e_t l_t$, $w_t n_t - (1-\nu)a_t$, b_t, k_{t+1} and $\varphi(d_t)$, the firm is holding liquid resources equal to $l_t + a_{t+1} + (1-\nu)a_t$. By assumption, the firm can defer a portion, $(1-\nu)a_t$, of its labor costs to the end of the period. If the firm defaults, then the lender is able to recover the full value of the firm's non-liquid physical capital, k_{t+1}, with probability ξ_t and recover nothing with probability $1-\xi_t$. However, the firm is able to hide its liquid resources, $l_t + a_{t+1} + (1-\nu)a_t$. It follows that the lender's enforcement constraint is:[36]

$$\xi_t(k_{t+1} - \frac{b_{t+1}}{1+r_t}) \geq w_t n_t - \nu a_t \tag{10}$$

Increasing the amount of intertemporal debt, b_{t+1}, or intraperiod debt, $l_t = w_t n_t - a_t$, will tighten the enforcement constraint. Capital, k_{t+1}, serves as collateral and loosens the enforcement constraint. Note that, all else equal, holding more liquidity loosens the enforcement constraint through reducing the desired intraperiod loan amount. As in Jermann and Quadrini (2012), ξ_t, is an aggregate stochastic innovation where changes are referred to as a "financial shock".

Before describing the firm's optimization problem, two parameters deserve additional

[36]See Appendix for a complete proof of the derivation of the enforcement constraint.

discussion. The ν parameter governs the fraction of a_t that functionally acts as collateral. This parameter can be rationalized in at least two ways. First, it could be thought of as the lender having an enforcement mechanism that makes the firm commit to paying a portion of wages in a timely manner. The portion of the labor costs that are not reliant on the lender can be deferred. This shares similarities with the block-bargaining assumption of Petrosky-Nadeau and Wasmer (2013) in which the firm and banker form a block to negotiate wages with workers. Alternatively, ν can be interpreted as the portion of liquidity that the lender can verify, i.e. that the firm cannot escape with in the event of default. Since the lender can recoup this fraction of liquidity in the event of default, it functionally acts as collateral.

The γ parameter governs the value of the lender's outside option in the event that the firm and lender do not agree to an intraperiod loan. Thus, it is assumed the lender can still re-invest the funds, l_t, in the event of a negotiation breakdown, but at a lower net benefit. Alternatively, it could be assumed the lender has some superior storage technology that returns a non-zero net benefit.

6.2 Firm Optimization Problem

Since the two shocks, productivity and financial, are aggregate shocks, we can work with a representative firm model. Let V($\mathbf{s}$;k,b,a) be the cum-dividend value of the firm, where $\mathbf{s}$ is the aggregate states. The representative firm's optimization problem then reads:

$$V(\mathbf{s}; k, b, a) = \max_{d,n,k',b',a'} \{d + Em'V(\mathbf{s}'; k', b', a')\} \tag{11}$$

subject to

$$\xi(k' - \frac{b'}{1+r}) \geq wn - \nu a$$

and

$$\varphi(d) = (1-\delta)k + \eta z k^{\theta} n^{1-\theta} + \frac{b'}{R} + \eta(1+\gamma)a + (1-\eta)zk^{\theta}(\frac{a}{w})^{1-\theta} - b - k' - a' - \eta(1+\gamma)wn.$$

The first constraint is the enforcement constraint (EC) and the second constraint is the budget constraint (BC). Let λ and μ be the Lagrange multipliers on the budget constraint and enforcement constraint, respectively, and m' be a stochastic discount factor. The FOC for d gives $\lambda = \frac{1}{\varphi_d(d)}$. Substituting this in for λ, using the envelope conditions for k, b and a and rearranging terms gives the FOCs:

$\mathbf{a}'$:

$$Em' \cdot \left(\underbrace{\mu'\nu}_{\text{EC loosening}} + \frac{1}{\varphi_d(d')} \left(\underbrace{\eta(1+\gamma) + (1-\eta)(1-\theta)z'k'^{\theta}(\frac{a'}{w'})^{-\theta} \cdot \frac{1}{w'}}_{\text{Negotiation Benefit}} \right) \right) = \frac{1}{\varphi_d(d)} \tag{12}$$

Accumulating liquidity yields two benefits. First, it loosens the EC in the next period by $\mu'\nu$: the multiplier on the next-period EC times the fraction of liquidity that cannot be hidden from the lender (and thus acts as collateral). Second, accumulating liquidity also loosens the next-period BC by the next-period BC multiplier times the "negotiation benefit" terms, i.e. accumulating liquidity lowers the cost of the intraperiod loan. The cost of accumulating liquidity is a reduction in dividend payments, tightening the BC this period by $\frac{1}{\varphi_d(d)} = \lambda$.

$\mathbf{b}'$:

$$\frac{1}{\varphi_d(d)} \cdot \frac{1}{R} = \frac{\mu\xi}{1+r} + Em' \cdot \left(\frac{1}{\varphi_d(d')} \right) \tag{13}$$

Intertemporal borrowing loosens the BC this period, but tightens the EC this period and tightens the BC next period.

$\mathbf{k}'$:

$$Em' \cdot \left\{ \left(\frac{1}{\varphi_d(d')} \right) \cdot (1 - \delta + \eta\theta z'k'^{\theta-1}n'^{1-\theta} + (1-\eta)\theta z'k'^{\theta-1}(\frac{a'}{w'})^{1-\theta}) \right\} + \xi\mu = \frac{1}{\varphi_d(d)} \tag{14}$$

Purchasing capital loosens the BC next period through liquidation, increased production and lowered cost e (through DRTS of production function) and loosens the EC this period as collateral. But, it tightens the BC this period.

$\mathbf{n}$:

$$(1-\theta)zk^{\theta}n^{-\theta} = \frac{\varphi_d(d)\mu + \eta(1+\gamma)}{\eta} \cdot w \tag{15}$$

Increasing labor increases production by the marginal product of labor, but tightens the EC through requiring more l and tightens the BC through the wage payment and increasing the intraperiod loan cost.

6.3 Household Optimization Problem and General Equilibrium

There is a continuum of identical households, all of whom maximize expected lifetime utility. Households consume c_t and provide labor n_t to firms. Households also act as the firms'

shareholders, i.e. households own the firms, and households lend to the firms by purchasing bonds b_t. Thus, households solve the following optimization problem:

$$\max_{n_t, b_{t+1}, s_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t U(c_t, n_t) \tag{16}$$

subject to

$$w_t n_t + b_t + s_t(d_t + p_t) = \frac{b_{t+1}}{1 + r_t} + s_{t+1} p_t + c_t + T_t,$$

where w_t is the wage rate, s_t are the equity shares, d_t are the equity payouts received from owning equity shares, p_t is the market price of shares, r_t is the interest rate, and $T_t = \frac{B_{t+1}}{1+r_t(1-\tau)} - \frac{B_{t+1}}{1+r_t}$ is the lump-sum tax that funds the tax subsidy, τ, of firms' debt.

The household's FOCs for n_t, b_{t+1}, and s_{t+1}, respectively, are:

$$w_t U_c(c_t, n_t) + U_n(c_t, n_t) = 0 \tag{17}$$

$$U_c(c_t, n_t) - \beta(1 + r_t) E U_c(c_{t+1}, n_{t+1}) = 0 \tag{18}$$

$$U_c(c_t, n_t) p_t - \beta E(d_{t+1} + p_{t+1}) U_c(c_{t+1}, n_{t+1}) = 0 \tag{19}$$

The aggregate states $\mathbf{s}$ are productivity z, the liquidation technology ξ (capturing the tightness of the borrowing constraint), the aggregate capital K, the aggregate bonds B and the aggregate liquidity A. The definition of a general equilibrium is the following:

DEFINITION 1: *A recursive competitive equilibrium is defined as a set of functions for (i) households' policies $c^h(\mathbf{s})$, $n^h(\mathbf{s})$, and $b^h(\mathbf{s})$; (ii) firms' policies $d(\mathbf{s}; k, b)$, $n(\mathbf{s}; k, b)$, $k(\mathbf{s}; k, b)$, $b(\mathbf{s}; k, b)$, and $a(\mathbf{s}; k, b)$; (iii) firms' value $V(\mathbf{s}, k, b)$; (iv) aggregate prices $w(\mathbf{s})$, $r(\mathbf{s})$, and $m(\mathbf{s}, \mathbf{s}')$; (v) law of motion for the aggregate states $\boldsymbol{s}'$=$\Psi(\boldsymbol{s})$. Such that: households' policies satisfy conditions 17-18; (ii) firms' policies are optimal and $V(\mathbf{s}, k, b)$ satisfies the Bellman equation 11; (iii) the wage and interest rates clear the labor and bond markets and $m(\mathbf{s}, \mathbf{s}\hat{a}') = \beta U_c(c\hat{a}', n\hat{a}')/U_c(c, n)$; (iv) the law of motion $\Psi(\boldsymbol{s})$ is consistent with individual decisions and the stochastic processes for z and ξ.*

7 Model Calibration and Simulated Responses

As discussed above, the empirical evidence shows a stark contrast in the cyclical financing behavior of small firms in the post-1999 period relative to the pre-1999 period. The empirical evidence suggests that firms with low bargaining power vis-à-vis their lenders and a high value for the bank's outside option (i.e. a weaker relationship between the firm and lender)

are responsible for the post-1999 behavior. Thus, in this section, we calibrate the model and then vary the corresponding parameters, η and γ.

We first set these parameters to reflect a state of the world prior to financial consolidation and widespread interstate banking: high firm bargaining power vis-à-vis their lenders and a low value for the bank's outside option. We are going to see that in this "pre financial deregulation" world, the impulse response functions for equity issuance and liquidity accumulation are consistent with the cyclicality patterns of large firms and small firms in the pre-1999 period. However, when η and γ are varied to reflect a state of the world with financial consolidation and widespread interstate banking (i.e. low firm bargaining power and a high value for the bank's outside option), then the impulse response functions for equity issuance and liquidity accumulation are consistent with smaller firms in the post-1999 period. The response of debt issuance remains procyclical for all parameter values, in line with the empirical findings.

Specifically, when η and γ are set to reflect the post-1999 period with low firm bargaining power vis-à-vis their lenders and a high value for the bank's outside option, then equity issuance and liquidity accumulation increase in response to a positive shock (i.e. are procyclical). Importantly, this result depends on the type of shock. For financial shocks (i.e. shocks to ξ), equity issuance and liquidity accumulation remain countercyclical. Instead, it is the response to TFP shocks that are consistent with the empirical cyclicality results. In Section 8, we show evidence that TFP shocks are in fact what drive the main cyclicality findings.

7.1 Parameterization

Table 10 displays the calibrated values of our main parameters. The household utility function is $U(c, n) = ln(c) + \alpha \cdot ln(1 - n)$. The disutility of work parameter α is set such that hours worked, n, equals 0.3 in steady state. The Cobb-Douglas production function of the firm has a capital share parameter θ equal to 0.36. Capital depreciates at the standard rate of δ equal to 0.025. Debt has a tax advantage over equity of τ equal to 0.35 to match the 35 percent marginal corporate income tax rate that was in place for most of our sample period. As noted in Jermann and Quadrini (2012), the nonfinancial business sector has an average quarterly debt to GDP ratio of 3.4. Thus, we set the mean value of $\bar{\xi}$ to target this steady state debt to GDP ratio. Finally, the parameters that govern the properties of the TFP shock, σ_z, and the financial shock, σ_ξ, are derived from our empirical estimates of these shocks. See Section 8 for details on the construction of these series.

The calibrated value of the discount parameter β requires further attention. In order to prevent firms from carrying too much liquidity between periods, we set this value at 0.9, which

is lower than standard. If the desire to carry liquidity between periods is too high, then the bargaining between firms and banks over the intraperiod loan becomes unnecessary as firms can cover all wage costs with accumulated liquidity. Alternatively, we can lower the value of ν, which governs the value of liquidity as collateral, and increase β to 0.97. The results are qualitatively similar under this alternative calibration. We detail the firm bargaining power parameter, η, and the bank outside option parameter, γ, below.

7.2 Quantitative Analysis

To evaluate the cyclical properties of the financing variables, we subject two different steady states to two types of shocks. The first steady state is the pre-financial consolidation state, which we refer to as the "stronger borrowers" state. We set the firm bargaining power parameter, η, to 0.99 and the bank outside option parameter, γ, to 0.01. The bargaining power parameter value of 0.99 approximates the case of full firm bargaining power, as found in Jermann and Quadrini (2012), Diamond and Rajan (2001) and others. The bank outside option parameter of 0.01 approximates the case where the bank simply stores the intraperiod loan funds at zero net benefit in the case of no agreement. This is similar to the assumption of Diamond and Rajan (2001), where the lender's only outside option is liquidation.

Appendix Table A.8 shows the steady state values for select variables. Note that debt issuance and liquidity accumulation are zero in steady state. Thus, the following IRFs will show the absolute (i.e. the percentage point) deviation for each financing variable. Consistent with Jermann and Quadrini (2012), the financing variables are scaled by output. Panel (a) of Figure 4 shows the impulse responses of debt issuance, equity issuance and liquidity accumulation to a one-time positive productivity (TFP) shock (ϵ_z) and a one-time positive financial shock (ϵ_ξ) from this pre-financial consolidation steady state. Debt issuance rises upon impact and equity issuance falls for both positive shocks. This is consistent with the empirical results of debt issuance being procyclical and equity issuance countercyclical in the pre-1999 period. Liquidity accumulation essentially does not respond to a shock. Given that liquidity acts as a buffer to increased bargaining costs, a firm with such a high value of η does not need to respond to shocks by adjusting liquidity, as the lender is unable to extract a meaningful amount of surplus in the bargaining process.

In the second steady state, we reduce the firm bargaining power parameter from 0.99 to 0.7 and increase the bank outside option parameter to 0.04. Petrosky-Nadeau and Wasmer (2013) estimates the bargaining power parameter for banks in the US economy as 0.68, but with a range from 0.37 to 0.98. This change acts to illustrate the effects of financial consolidation on smaller firms, i.e. those in which we see empirical evidence that bargaining power and

the bank's outside option matter following the financial consolidation of the 1990s. In Panel (b), the "weaker borrowers" state shows the impulse responses for positive shocks to this new steady state. For the financial shock, the magnitude of the impact on equity issuance and debt issuance has decreased; however, the direction of the response remains the same as in the original steady state. In contrast, equity issuance now responds positively to a positive TFP shock, i.e. equity issuance displays a procyclical pattern upon impact. Liquidity accumulation similarly now responds positively.

The intuition for the impulse responses in the post-financial consolidation steady state is the following. Faced with the prospect of a relevant surplus extraction by their banks, firms have an increased appetite for liquidity when productivity rises. To finance this precautionary accumulation of liquidity, they choose to issue more equity when the TFP shock hits. A positive financial shock, by contrast, relaxes the access to external financing. This reduces the need for precautionary liquidity. We now discuss empirical evidence for the importance of small firms' response to TFP shocks in explaining the flip in the cyclicality of equity issuance and liquidity accumulation.

8 Financial and TFP Shocks

As shown in the previous section, the flip in the cyclicality of equity issuance and liquidity accumulation holds only in response to TFP shocks in the general equilibrium model. This leads to a testable implication: we can re-estimate the baseline panel regressions, replacing the cyclical component of real corporate GDP with a measure of TFP and financial shocks. To be consistent with the model, we would expect that the procyclicality of equity issuance and liquidity accumulation for small firms is due to shocks to TFP, rather than financial shocks, during the post-1999 period.

To create the baseline measures of TFP and financial shocks, we follow the methodology of Jermann and Quadrini (2012) and extend their series through 2017. First, to create a time series of productivity shocks, we compute the Solow residuals of the production function:

$$\hat{z}_t = \hat{y}_t - \theta \hat{k}_t - (1-\theta)\hat{n}_t \tag{20}$$

where the hat represents the log-deviation from the deterministic trend. The output variable, y_t, is real GDP from the National Income and Product Accounts. The capital variable, k_t, is from the Flow of Funds Accounts. The labor variable, n_t is the total private aggregate weekly hours from the Current Employment Statistics survey.

Next, we create the financial shock series using the (binding) enforcement constraint from

Jermann and Quadrini (2012):

$$\xi_t \left(k_{t+1} - \frac{b_{t+1}}{1 + r_t} \right) = y_t \tag{21}$$

The financial variable ξ_t is then computed as the residual. The debt variable is from the Flow of Funds Accounts.

Finally, as in Jermann and Quadrini (2012), we compute the shocks to z and ξ using the following autoregressive system:

$$\begin{pmatrix} \hat{z}_{t+1} \\ \hat{\xi}_{t+1} \end{pmatrix} = \mathbf{A} \begin{pmatrix} \hat{z}_t \\ \hat{\xi}_t \end{pmatrix} + \begin{pmatrix} \epsilon_{z,t+1} \\ \epsilon_{\xi,t+1} \end{pmatrix} \tag{22}$$

Figure 5 plots the estimated series of TFP shocks ($\epsilon_{z,t+1}$) and financial shocks ($\epsilon_{\xi,t+1}$), as well as the cyclical GDP measure. All series have been standardized to have a mean of zero and unit variance to more easily evaluate the comovement of each measure.

After having computed TFP and financial shocks, we replace the cyclical component of real corporate GDP in the baseline empirical panel specification with the one-year lagged value of these shocks. Since the firm financing data is reported at the annual level, the contemporaneous shock value contains information for a shock that occurs (at least partially) after the financing decision. Using the lagged shock avoids this issue. The results are reported in Table 11 for both large firms and smaller firms, split by the pre-1999 and post-1999 periods. In the pre-1999 period, the results across firm size are quite similar: a positive financial shock (i.e. a loosening of the financial constraint) is associated with an increase in debt issuance, a decrease in equity issuance and a decrease in liquidity accumulation. As it becomes easier to borrow, both large and small firms shift toward issuing debt and away from issuing equity and accumulating liquidity. This aligns with the earlier cyclicality results and the standard pecking order theory. Interestingly, TFP shocks are insignificant for both firm sizes and all financing variables in the pre-1999 period.

In the post-1999 period (i.e. following the increase in financial consolidation), the financing behavior of large firms remains qualitatively unchanged; however, smaller firms see a dramatic change. While debt issuance remains closely related to positive financial shocks, the relationship between financial shocks and equity issuance/liquidity accumulation becomes statistically insignificant. Positive TFP shocks are now significantly associated with an increase in both equity issuance and liquidity accumulation. Thus, both the type of shock and the sign of the relationship with the relevant shock have changed for smaller firms in the post-1999 period. This matches the change observed for the cyclicality of equity issuance and liquidity accumulation in the latter period. The importance of TFP shocks is also

consistent with the impulse response functions above, in which a flip in cyclicality for equity issuance and liquidity accumulation held true for TFP shocks and not for financial shocks.

9 Investment and Employment

To this point, we have documented a significant change in the cyclicality of equity issuance and liquidity accumulation for smaller firms. We have additionally provided both empirical and theoretical evidence that consolidation among lenders contribute to explaining these changes. In this section, we investigate the implications for the investment and employment behavior of smaller publicly-traded firms over the business cycle.

As seen in equation 14, the first order condition for capital, there are three main mechanisms by which a TFP shock impacts the firm's demand for capital:

Surplus Appropriation: $\eta\theta z' k'^{\theta-1} n'^{1-\theta}$

Financial Channel: $(1-\eta)\theta z' k'^{\theta-1} (\frac{a'}{w'})^{1-\theta}$

Collateral Channel: $\xi\mu$

First, increased productivity leads to higher output. The lender will want to extract this surplus during the bargaining phase; however, the firm's bargaining power, η, determines how much of the surplus the firm can keep. The more surplus the firm can keep, the higher its demand for capital. Second, as discussed above, the liquidity holdings of the firm are used as the threat point in bargaining with the lender, as they can be used to hire labor. This benefit of liquidity has a complementary effect with the capital stock. Thus, capital provides a higher benefit through this financial channel for firms with more accumulated liquidity, i.e. weak borrowers. Third, capital benefits the firm as collateral in the enforcement constraint.

Figure 6 shows the IRFs for capital and each of these three components (Surplus Appropriation, Financial, Collateral) in response to a positive TFP shock.[37] Capital increases more for the stronger borrowers than for the weaker borrowers; however, this is completely driven by the Surplus Appropriation mechanism. This reflects the fact that the higher bargaining power of stronger borrowers limits the lender's ability to appropriate the surplus of additional capital. The main difference between stronger and weaker borrowers is the Financial Channel response. For stronger borrowers, their bargaining power is so high that they do not have an incentive to increase their threat point. The opposite is true for weaker borrowers. Thus, while the overall investment of stronger borrowers responds more sensitively to a positive TFP shock, the channel most closely related to financial consolidation increases the sensitivity of the weaker borrowers. That is, the changing

[37] Figure A.3 shows the same IRFs for a positive financial shock.

cyclicality in corporate financing results in higher sensitivity. Interestingly, the Collateral Channel shows minimal difference between the two types of borrowers. Next, we investigate empirically whether financial consolidation indeed resulted in higher sensitivity for smaller firms.

Given the evidence presented above on the cyclicality of firm financing, we would expect smaller firms to reduce equity issuance and liquidity accumulation in response to a negative economic shock, but only during the post-1999 period. Appendix Table A.9 shows the change in the financing variables of interest in the face of a negative shock, i.e. the years with negative growth in the cyclical component of HP-filtered real corporate GDP (1982, 1986, 1989-1993, 2001-2003, 2007-2009, and 2016).[38] As expected, small firms see a large decline in equity issuance and liquidity accumulation during years with negative growth (relative to positive growth years) and, as seen in Panel B, this holds true during the post-1999 period only.

Next, in Table 12 we repeat the above exercise with change in investment and log change in employment replacing the financing variables. For both firm sizes, investment and employment fall in years with negative economic growth for each subperiod. However, as shown by the p-values, it is only the small firms that see a significant increase in responsiveness from the pre-1999 to the post-1999 period. Alternatively, we can substitute in investment and employment measures for our financing variables in the baseline panel specification to estimate the overall cyclicality. As seen in Appendix Table A.10, it is again only small firms that see a significant difference from pre-1999 to post-1999. This suggests that the change in the cyclicality of financing for smaller firms may also have resulted in increased sensitivity of investment and employment.

As an additional test, we also split small firms by their liquidity position leading into the post-1999 period. Specifically, "low liquidity position" firms are those small firms with a cash-to-asset ratio in 1996-1998 that was at or below the median. "High liquidity position" are those small firms with a cash-to-asset ratio in 1996-1998 above the median. In the terminology of our model, firms with high liquidity position should have a higher threat point. Small firms with a low liquidity position are in a weaker position to counter the effects of financial consolidation; thus, they should be more sensitive in the post-1999 period. Appendix Table A.11 provides evidence that this was the case. Firms with a low liquidity position prior to 1999 showed a greater increase in the sensitivity of investment and employment after 1999. This again points to financial consolidation resulting in higher sensitivity for those firms most affected.

[38] In the Online Appendix, we try three alternative definitions of a negative shock. First, we use an indicator that is instead set to 1 in years with negative real corporate GDP growth. Second, we use an indicator that is set to 1 in years that overlap with the NBER dating of a recession. Third, we use a discrete variable that measures the number of quarters in a year that overlap with the NBER dating of a recession. All three of these definitions of a negative shock produce similar results to Table A.9.

10 Conclusion

In recent decades, an intense debate has developed on the consequences of financial sector consolidation. This paper contributes by identifying an important effect of financial consolidation on the corporate sector, in the form of a structural change in firms' financing behavior over the business cycle. We find, in particular, that due to the weakened bargaining power vis-à-vis their lenders and a fraying of the relationships between firms and lenders, small and medium-sized publicly-traded firms began to issue equity and accumulate precautionary liquidity during expansions. This behavior starkly contrasts with the countercyclical equity and liquidity behavior of larger publicly-traded firms and reflects the attempt of small and medium-sized firms to offset their weakened position vis-à-vis larger and more complex financial institutions. The change in cyclical financing behavior appears to also have far-reaching consequences for firms' investment and labor hiring decisions. The empirical evidence presented in the paper shows that small and medium-sized firms' investment and employment became significantly more sensitive to negative shocks.

The paper leaves relevant questions open for future research. For example, equity issuance and hoarding of precautionary liquidity can entail relevant costs for firms. Thus, it becomes important to evaluate the welfare implications of the altered financing patterns. Further, as noted, private firms are likely to be even more exposed than small publicly listed firms to financial consolidation, as they lack access to stock markets as a form of financing alternative to bank lending. In this sense, the results of this analysis may constitute a lower bound of the actual effects of financial consolidation through cyclical financing patterns. We leave these and other relevant issues to further research.

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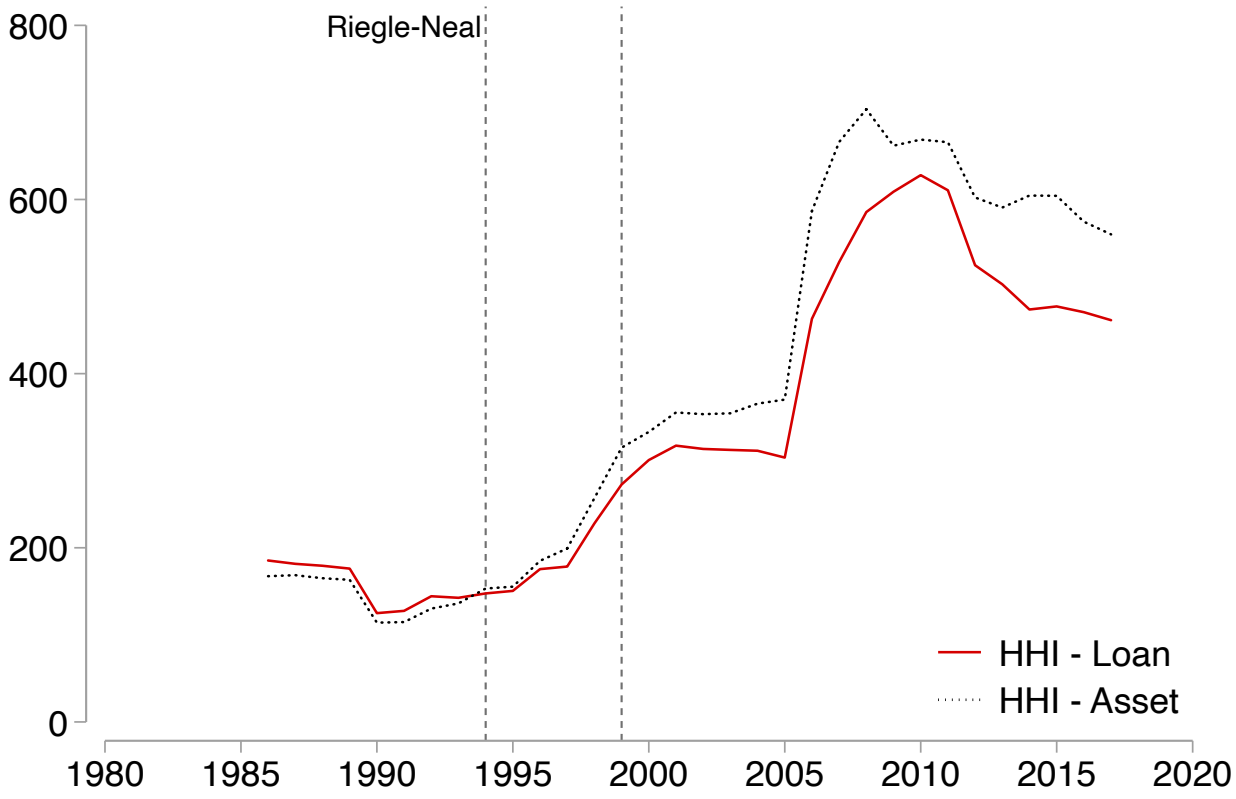
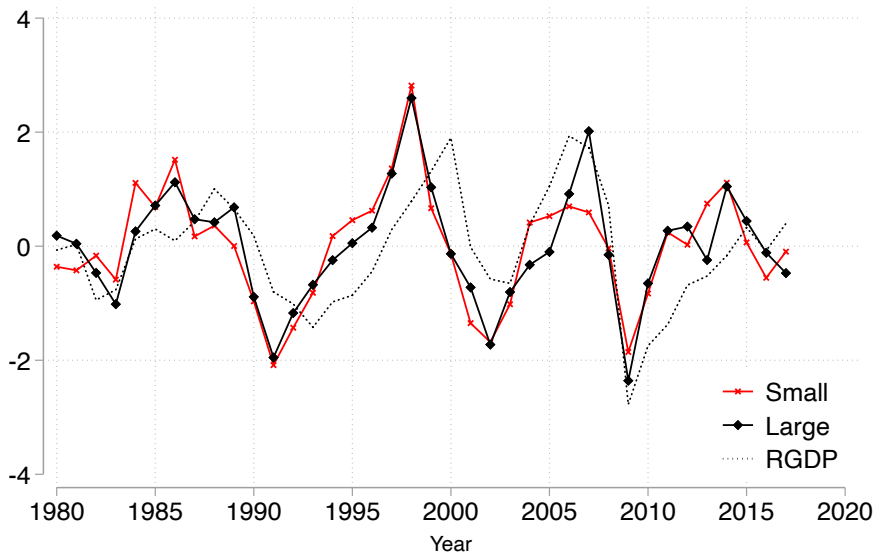
Figure 2: Concentration of US Banking Industry



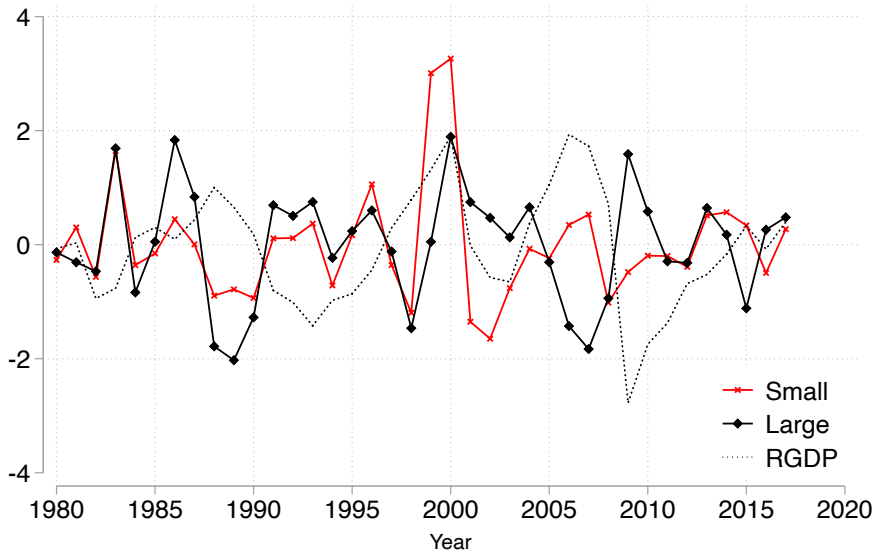
This figure plots the national Herfindahl-Hirschman index for total loans and total assets in the banking sector during the period 1986-2017. Authors' calculations using FR Y-9C data.

Figure 3: Time Series of Financial Variables, by Firm Size

(a) Debt Issuance and Cyclical GDP



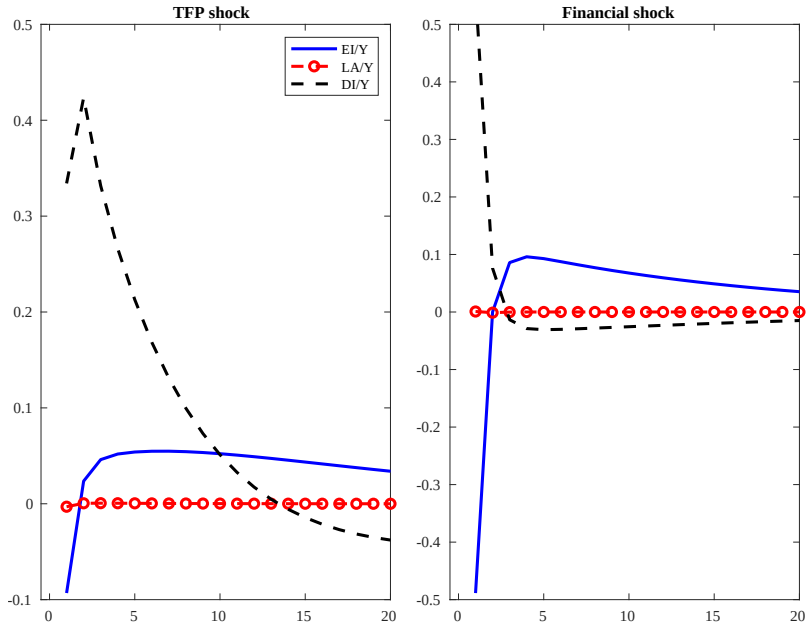
(b) Equity Issuance and Cyclical GDP



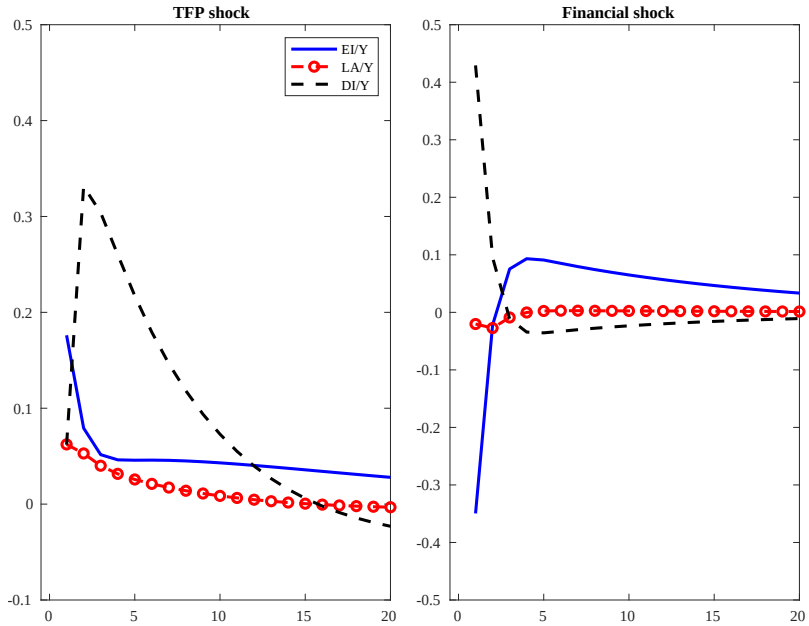
This figure plots the aggregate annual series of debt issuance (Panel a) and equity issuance (Panel b) for small firms and large firms during the period 1980-2017. RGDP (dotted line) is the cyclical component of HP-filtered annual real corporate GDP. Small firms are those with a book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. All series are standardized to have a mean of zero and unit variance.

Figure 4: IRFs of Financial Variables to Positive TFP & Financial Shocks

(a) Stronger Borrowers
High Bargaining Power / Low Bank Outside Option



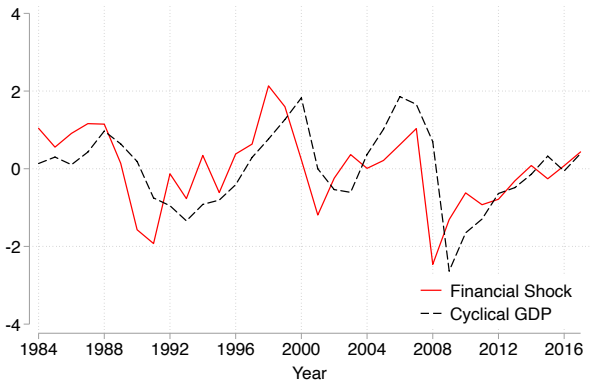
(b) Weaker Borrowers
Low Bargaining Power / High Bank Outside Option



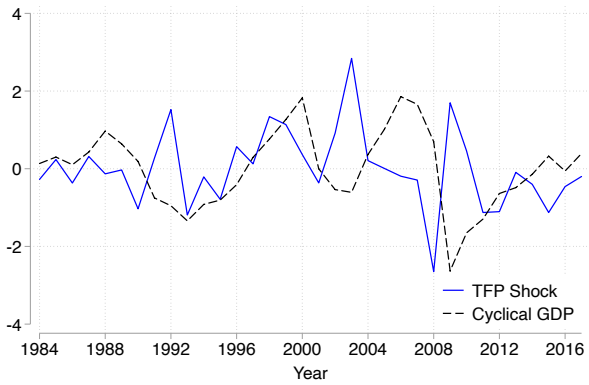
This figure plots the impulse responses of equity issuance (EI), liquidity accumulation (LA) and debt issuance (DI) for a one standard deviation positive TFP shock (left column) and financial shock (right column). Panel (a) shows the impulse response when the firm bargaining power parameter is set high and bank outside option is set low. Panel (b) shows the opposite. The y-axis is percent deviation from the steady state value for the ratio of the financing variable to output.

Figure 5: Time Series of Financial & TFP Shocks

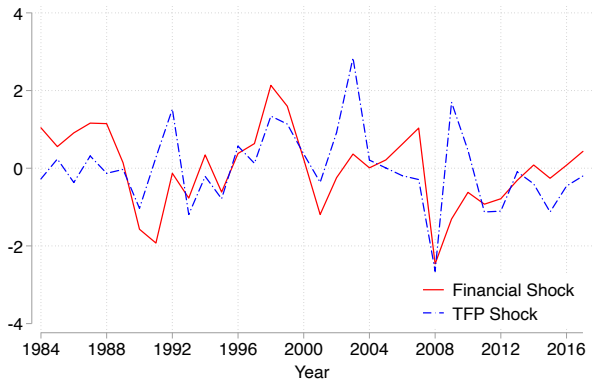
(a) Financial Shock & Cyclical GDP



(b) TFP Shock & Cyclical GDP

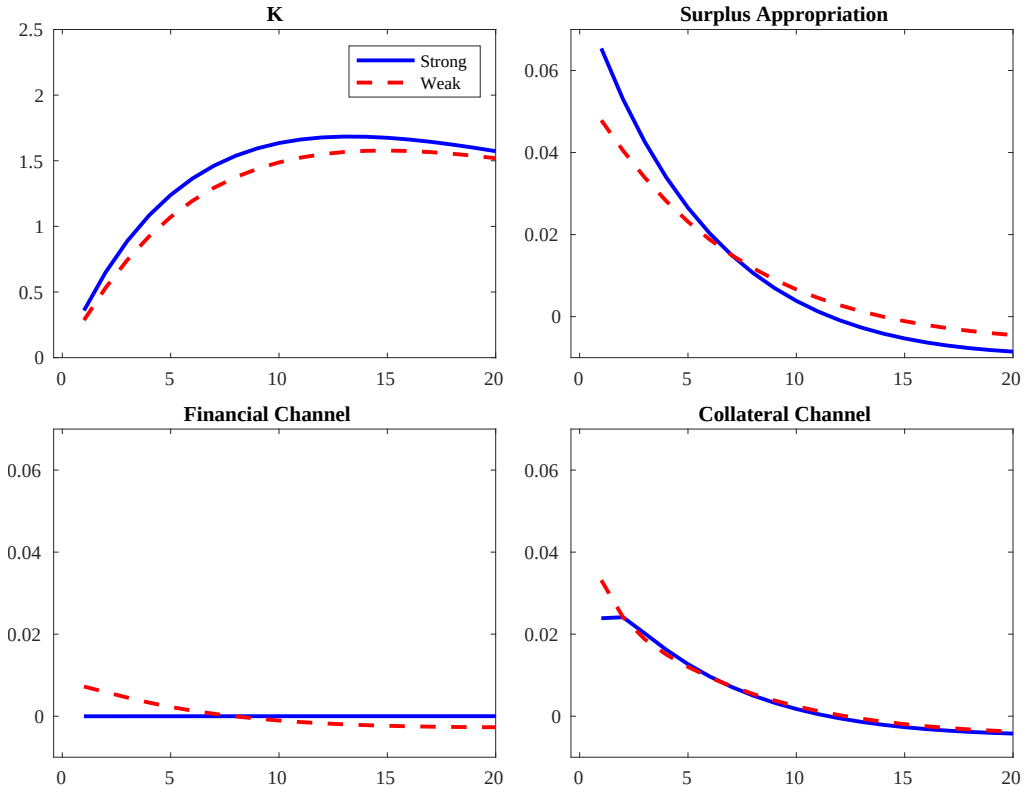


(c) Financial Shock & TFP Shock



This figure plots the model-implied annual series of the financial shocks and TFP shocks during the period 1984-2017. The dotted line in Panel (a) and Panel (b) is the cyclical component of HP-filtered annual real corporate GDP. Small firms are those with a book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. All series are standardized to have a mean of zero and unit variance.

Figure 6: IRFs of Capital and Capital FOC Components to Positive TFP Shock



This figure plots the responses of strong borrowers (blue) and weak borrowers (red, dashed) to a one standard deviation positive TFP shock. The y-axis is absolute deviation from the steady state value.

Table 1: Summary statistics by firm size, 1981-2017

	Small Firms		Large Firms	
	mean	std. dev.	mean	std. dev.
Assets (2012 $'s, millions)	71.5	112.1	931.0	961.0
Age (years)	10.8	9.4	17.2	13.1
Debt Issuance (% of assets)	0.7	21.9	0.4	15.8
Equity Issuance (% of assets)	19.1	59.8	-0.2	11.3
Liquidity Accumulation (% of assets)	5.9	37.0	1.1	11.7
External Financing (% of assets)	20.5	67.6	0.2	21.3
Debt-to-Assets Ratio	31.4	50.3	33.9	31.5
Bank Debt (% of total debt)	18.6	32.0	27.6	33.6
# of Firms	13,158		3,517	

This table displays summary statistics for the book value of assets, firm age and the key financing variables. The sample period is 1981-2017. Small firms are those with a book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile.

Table 2: Cyclicality of Aggregate Financing Variables, by Size

Panel A: 1981-2017

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.495***	0.276*	0.180
Large Firms	0.622***	-0.430***	-0.276*
All Firms	0.588***	-0.086	-0.038

Panel B: 1981-1998

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.556**	-0.487**	-0.367
Large Firms	0.691***	-0.557**	-0.262
All Firms	0.648***	-0.484**	-0.323

Panel C: 1999-2017

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.575**	0.509**	0.336
Large Firms	0.653***	-0.414*	-0.307
All Firms	0.647***	0.110	0.061

This table displays the correlations between the cyclical component of HP-filtered annual real corporate GDP and the three financing variables. The financing variables are the cyclical component of the respective HP-filtered series, aggregated by the indicated firm size categories and normalized by the lagged book value of assets. Small firms are those with book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. "All firms" are the pooled sample of small and large firms. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: Panel Regression: Cyclicality of Financing Variables

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	6.41***	-10.74***	-8.61***
	(1.631)	(3.569)	(2.964)
Large Firms	8.80***	-2.92**	-2.51**
	(1.436)	(1.195)	(1.158)
SF Observations	36,981	40,616	40,616
LF Observations	18,891	20,874	20,874
		p-values	
$H_0 : small = large$	0.040	0.006	0.009

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	4.04***	**11.12****	**3.56**
	(0.898)	**(3.942)**	**(3.464)**
Large Firms	6.08***	-1.42**	-1.12
	(1.323)	(0.592)	(1.081)
SF Observations	33,899	39,363	39,363
LF Observations	17,375	19,698	19,698
		p-values	
$H_0 : small = large$	0.179	0.003	0.108

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. Controls include the firm's cash flow and Tobin's Q. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Panel B estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small, large\}$, is rejected at the 5% level. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4: Panel Regression: With-In Firm Variance in Continuous Size Measure

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	6.59***	-6.52**	-3.47
	(1.430)	(2.312)	(2.257)
GDP x Size	0.35	8.32***	6.29***
	(0.919)	(2.435)	(1.659)
Observations	44,680	49,118	49,118

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.61***	6.95***	2.95
	(0.629)	(2.377)	(2.392)
GDP x Size	1.51*	-8.62***	-4.20**
	(0.847)	(2.288)	(1.501)
Observations	41,634	47,965	47,965
		p-values	
$H_0 : Interaction\ in\ PanelA = PanelB$	0.927	0.000	0.000

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. This GDP measure is interacted with a continuous measure of a firm's book value of assets (Size). A firm-specific fixed effect is included and all variables are demeaned by firm. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Panel Regression: State-Level Timing of Riegle-Neal Adoption

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	5.30***	-11.75***	-9.63**
	(1.648)	(3.563)	(3.324)
adopt_{1996} x GDP	2.50	-1.23	-0.24
	(1.776)	(2.497)	(1.750)
adopt_{1997} x GDP	1.01	4.25	4.34***
	(1.122)	(2.871)	(1.274)
Observations	36,537	40,117	40,117

Panel B: 1999-2009

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	5.08***	11.89*	6.46
	(0.554)	(5.502)	(5.377)
adopt_{1996} x GDP	-1.54*	0.48	-2.16*
	(0.722)	(3.359)	(1.101)
adopt_{1997} x GDP	-0.76	-7.91***	-6.75**
	(0.974)	(2.458)	(2.498)
Observations	21,913	25,763	25,763

Panel C: 1999-2019

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.86***	12.44***	5.17
	(0.829)	(4.230)	(3.907)
adopt_{1996} x GDP	-1.11	-0.93	-1.12
	(0.949)	(2.274)	(1.328)
adopt_{1997} x GDP	-1.56	-6.02*	-4.33*
	(1.156)	(2.996)	(2.301)
Observations	32,697	38,005	38,005

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. This GDP measure is interacted with an indicator for the year state-level Riegle-Neal adoption. A firm-specific fixed effect is included and all variables are demeaned by firm. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Reduction in Firm's Bargaining Power
Number of Lenders, Small Firms

Panel A: All Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	0.99	-8.41	0.85	6.35***	16.35*	3.25
	(8.228)	(8.204)	(7.076)	(1.204)	(9.169)	(3.680)
NumLenders x GDP	2.57**	-0.09	0.96	2.62***	-2.16*	-1.38**
	(0.858)	(1.245)	(0.650)	(0.530)	(1.028)	(0.582)
Observations	9,386	10,420	10,420	9,186	10,761	10,761
R^2	0.047	0.064	0.014	0.031	0.026	0.005

Panel B: Lead Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.40	-8.38	4.64	10.95***	10.59	0.47
	(8.145)	(8.011)	(7.051)	(1.242)	(7.454)	(3.028)
LeadShare x GDP	-3.64*	-0.61	-5.48	-4.96***	7.27**	2.91*
	(1.973)	(4.017)	(3.279)	(1.083)	(2.505)	(1.565)
Observations	9,334	10,356	10,356	9,015	10,572	10,572
R^2	0.039	0.062	0.015	0.025	0.029	0.005

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on GDP (i.e. the cyclical component of HP-filtered real corporate GDP) and an interaction with the number of lenders in the "All Lender Pool" (Panel A) or the percentage of a firm's total syndicated loans contributed by the lead lender(s) (Panel B) during the 1985-1998 and 1999-2012 period. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Reduction in Firm's Bargaining Power
Lender Market Power, Small Firms

Panel A: All Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	2.35	-8.79	1.48	9.09***	13.60	1.22
	(8.078)	(8.284)	(7.074)	(1.194)	(8.382)	(3.274)
BankAcquired x GDP	-6.79	9.99	3.28	0.52	4.76	5.82
	(7.057)	(9.057)	(4.978)	(2.573)	(3.853)	(3.810)
Observations	9,386	10,420	10,420	9,186	10,761	10,761
R^2	0.028	0.064	0.015	0.016	0.024	0.004

Panel B: Lead Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	1.98	-9.12	0.82	9.01***	13.19	1.18
	(7.906)	(8.221)	(6.952)	(1.238)	(8.394)	(3.264)
BankAcquired x GDP	-2.88	10.07	4.37	-0.15	2.72	5.11
	(8.660)	(8.038)	(5.006)	(3.120)	(3.679)	(3.561)
Observations	9,334	10,356	10,356	9,015	10,572	10,572
R^2	0.028	0.063	0.015	0.016	0.024	0.004

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on GDP (i.e. the cyclical component of HP-filtered real corporate GDP) and an interaction with a flag for a lender in a firm's "All Lender Pool" (Panel A) or "Lead Lender Pool" (Panel B) acquired by another lender during the previous five years in the 1985-1998 and 1999-2012 period. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Increased Complexity in Relationship
MBHC Status, Small Firms

Panel A: All Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	2.11	-8.27	2.05	9.63***	12.13	0.64
	(8.202)	(8.012)	(6.947)	(1.144)	(7.925)	(3.089)
JoinMBHC x GDP	-0.35	-4.05	-6.69**	-4.32*	16.85**	9.31
	(1.752)	(4.266)	(2.187)	(2.196)	(7.124)	(5.471)
Observations	9,386	10,420	10,420	9,186	10,761	10,761
R^2	0.028	0.064	0.015	0.016	0.025	0.005

Panel B: Lead Lender Pool

	1985-1998			1999-2012		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	1.86	-8.53	1.37	9.55***	12.07	0.71
	(7.938)	(7.970)	(6.833)	(1.233)	(7.999)	(3.093)
JoinMBHC x GDP	0.30	-2.90	-4.48**	-5.26**	12.67*	8.03
	(1.944)	(3.916)	(1.534)	(1.788)	(6.039)	(5.123)
Observations	9,334	10,356	10,356	9,015	10,572	10,572
R^2	0.028	0.062	0.014	0.017	0.025	0.005

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on GDP (i.e. the cyclical component of HP-filtered real corporate GDP) and an interaction with an indicator for a lender in the "All Lender Pool" (Panel A) or the "Lead Lender Pool" (Panel B) that joined a multi-bank holding company in the previous 5 years during the 1985-1998 and 1999-2012 period. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Effects of Consolidation by Size of Lender Pool,1999-2012
Lead Lender Pool

	Few Lenders			Many Lenders		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	6.53***	18.29	3.39	12.89***	4.15	-2.00
	(1.233)	(11.464)	(4.565)	(2.893)	(2.839)	(1.834)
BankAcquired x GDP	1.75	8.13**	6.59	-5.34	-10.40	0.44
	(3.222)	(3.676)	(4.223)	(4.886)	(7.914)	(3.750)
Observations	5,641	6,631	6,631	3,374	3,941	3,941
R^2	0.010	0.033	0.006	0.033	0.007	0.004

	Few Lenders			Many Lenders		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	7.11***	16.93	2.79	13.26***	3.96	-2.10
	(1.299)	(10.929)	(4.266)	(2.834)	(2.875)	(1.957)
JoinMBHC x GDP	-4.09*	17.58**	9.64	-7.57	-5.99	1.44
	(1.895)	(6.745)	(5.923)	(5.211)	(6.152)	(4.725)
Observations	5,641	6,631	6,631	3,374	3,941	3,941
R^2	0.010	0.034	0.007	0.033	0.007	0.005

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on GDP (i.e. the cyclical component of HP-filtered real corporate GDP) and an interaction with an indicator for a lender in the "Lead Lender Pool" that was acquired by another lender during the previous five years (Panel A) or that joined a multi-bank holding company in the previous 5 years (Panel B). Firms with few lenders are those with a below-average number of lenders in their "All Lender Pool" and firms with many lenders are those with an average or above number of lenders. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Parameterization

Discount Factor	$\beta = 0.9$
Disutility of Work	$\alpha = 1.53$
Tax Advantage	$\tau = 0.35$
Production Technology	$\theta = 0.36$
Depreciation Rate	$\delta = 0.025$
Payout cost parameter	$\kappa = 0.05$
Standard deviation productivity shock	$\sigma_z = 0.006$
Standard deviation financial shock	$\sigma_\xi = 0.0087$
Wage delay parameter	$\nu = 0.25$
Matrix for the shocks process	$\begin{pmatrix} 0.9736, -0.0287 \\ 0.1509, 0.9363 \end{pmatrix}$

This table displays the baseline parameter values for our general equilibrium business cycle model.

Table 11: Response of Financing Behavior to Positive TFP and Financial Shocks

Panel (a): Small Firms

	Debt Iss.		Equity Iss.		Liq. Accum.	
	Pre-1999	Post-1999	Pre-1999	Post-1999	Pre-1999	Post-1999
TFP Shock$_{t-1}$	-0.45	0.07	0.42	2.43**	0.20	1.85**
	(0.305)	(0.197)	(1.021)	(1.057)	(0.928)	(0.737)
Financial Shock$_{t-1}$	1.05***	1.14***	-2.08***	0.93	-1.50**	-0.21
	(0.289)	(0.264)	(0.629)	(1.919)	(0.649)	(1.549)
Observations	30,520	33,899	33,780	39,363	33,780	39,363
R^2	0.012	0.005	0.081	0.010	0.021	0.008

Panel (b): Large Firms

	Debt Iss.		Equity Iss.		Liq. Accum.	
	Pre-1999	Post-1999	Pre-1999	Post-1999	Pre-1999	Post-1999
TFP Shock$_{t-1}$	-0.10	0.02	0.12	0.11	0.37	0.03
	(0.294)	(0.314)	(0.314)	(0.103)	(0.233)	(0.203)
Financial Shock$_{t-1}$	1.20***	1.83***	-0.60**	-0.50**	-0.59**	-0.35
	(0.339)	(0.526)	(0.275)	(0.183)	(0.270)	(0.357)
Observations	14,406	17,375	15,994	19,698	15,994	19,698
R^2	0.026	0.015	0.003	0.022	0.031	0.008

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the lagged annual value of the TFP shock and financial shock. The shocks are standardized to mean zero and unit variance. Controls include the firm's cash flow and Tobin's Q. Panel (a) is the sample of small firms and Panel (b) the sample of large firms. Small firms are those with book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12: Panel Regression: Real Response to Negative Shock

Panel A: 1981-1998

	Investment	Employment
Small Firms	-0.38	-4.10***
	(0.422)	(1.197)
Large Firms	-0.86**	-5.67***
	(0.359)	(1.325)
SF Observations	39,893	38,235
LF Observations	20,473	20,272

Panel B: 1999-2017

	Investment	Employment
Small Firms	-1.48***	-7.95***
	(0.330)	(1.711)
Large Firms	-1.25***	-6.75***
	(0.349)	(1.448)
SF Observations	39,129	37,331
LF Observations	19,579	19,211
	p-values	
$H_0 : small_{pre} = small_{post}$	0.045	0.070
$H_0 : large_{pre} = large_{post}$	0.437	0.580

This table displays the estimates of regressing change in investment (as a % of assets) and percentage change in employment on an indicator for a "negative shock", i.e. a year with negative growth in the cyclical component of HP-filtered real corporate GDP during the sample period 1981-2017. Years with a "negative shock" are 1982, 1986, 1989-1993, 2001-2003, 2007-2009, and 2016. Controls include the firm's cash flow and Tobin's Q. Each coefficient estimate comes from running a separate regression on the firm size x subperiod sample. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Appendix

Proof of the Enforcement Constraint

The following proof of equation 10 follows the logic of Jermann and Quadrini (2012). After they produce, sell output $F(z_t, k_t, n_t)$ and pay expenses, firms can then opt to default on their intraperiod loan and renegotiate it. Thus, at the time of the default decision, firms are holding liabilities equal to $l_t + \frac{b_{t+1}}{1+r_t}$. Since all other expenses have been paid at this point, firms are holding liquidity exactly equal to $l_t + a_{t+1} + (1-\nu)a_t$, i.e. enough liquidity to pay the intraperiod loan, carry accumulated liquidity to the next period and the amount of deferred labor expenses. Firms are also holding non-liquid assets equal to k_{t+1}, i.e. the physical capital. As in Jermann and Quadrini (2012), liquid assets can be hidden from the lender; thus, the lender can only recoup physical capital.

In the event of default, the lender seizes the firm's non-liquid assets and can liquidate them for $\xi_t * k_{t+1}$. After the firm has decided to default, ξ_t is then revealed as either 0 or 1. Thus, the lender will be able to either recoup the entire value of the physical capital or nothing.

If the firm decides to default, then the firm and lender enter a renegotiation process. For simplicity, we assume that the firm has full bargaining power in the renegotiation. As shown in Jermann and Quadrini (2009), changing the bargaining power assumption for the renegotiation is equivalent to changing the value of ξ_t. Thus, the formulation of the enforcement constraint (equation 10) is unaffected by this assumption. We now consider the two extreme cases of ξ_t.

Case I: Lender recoups entire value of physical capital ($\xi_t = 1$)

In renegotiation, the firm must pay lender the amount $k_{t+1} - \frac{b_{t+1}}{1+r_t}$ and promise to repay $\frac{b_{t+1}}{1+r_t}$ next period. This is the amount that makes the lender indifferent between liquidating the firm and keeping the firm in operation. As discussed in the main text, in the event of default, the firm does not have to pay back the intraperiod loan or its deferred labor costs. Thus, the ex-post value of defaulting for the firm is:

$$Em_{t+1}V_{t+1} - k_{t+1} + \frac{b_{t+1}}{1+r_t}. + l_t + (1-\nu)a_t \tag{23}$$

Case II: Lender recoups nothing ($\xi_t = 0$)

In the event of $\xi_t = 0$, the lender will not want to liquidate the firm, as it cannot recoup anything of value. The lender will simply choose to wait until next period when the firm will repay $\frac{b_{t+1}}{1+r_t}$. Thus, the ex-post value of defaulting for the firm is:

$$Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t \tag{24}$$

Since ξ_t is not revealed at the time l_t is contracted, the expected value of default for the firm is:

$$Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t - \xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \tag{25}$$

In order for the lender to agree to intraperiod loan l_t, the firm's value of not defaulting ($Em_{t+1}V_{t+1}$) must be at least as high as the value of default:

$$Em_{t+1}V_{t+1} \geq .Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t - \xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \tag{26}$$

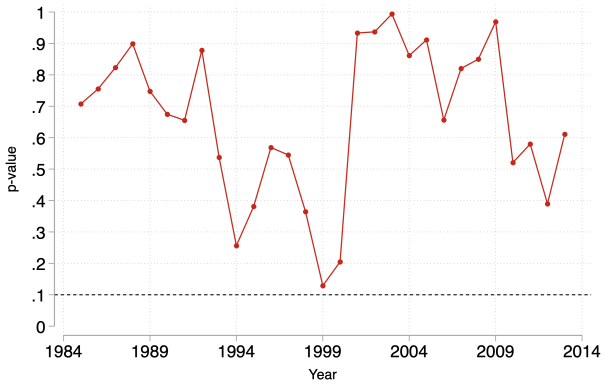
Thus, we get our enforcement constraint:

$$\xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \geq l_t + (1-\nu)a_t = w_t n_t - \nu a_t \tag{27}$$

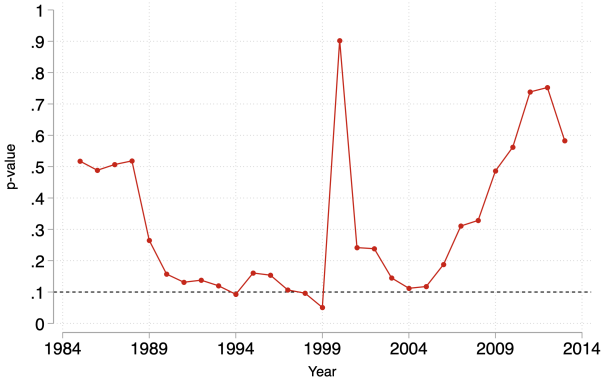
Figures & Tables

Figure A.1: Wald Test for Structural Break in Cyclicality of Small Firm Financing

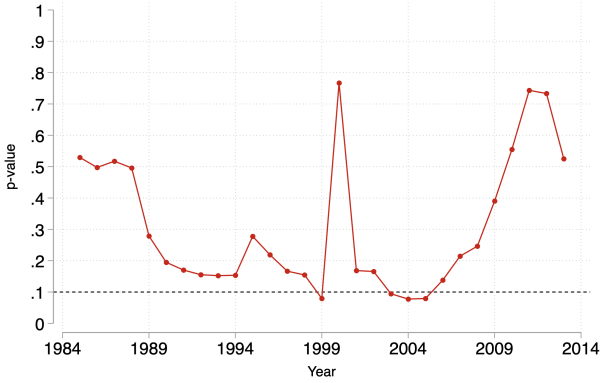
(a) Debt Issuance



(b) Equity Issuance



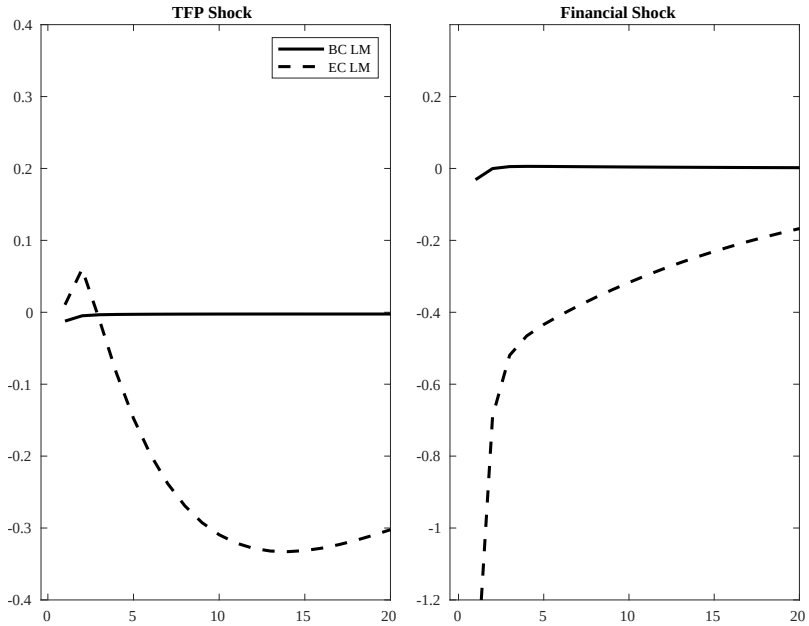
(c) Liquidity Accumulation



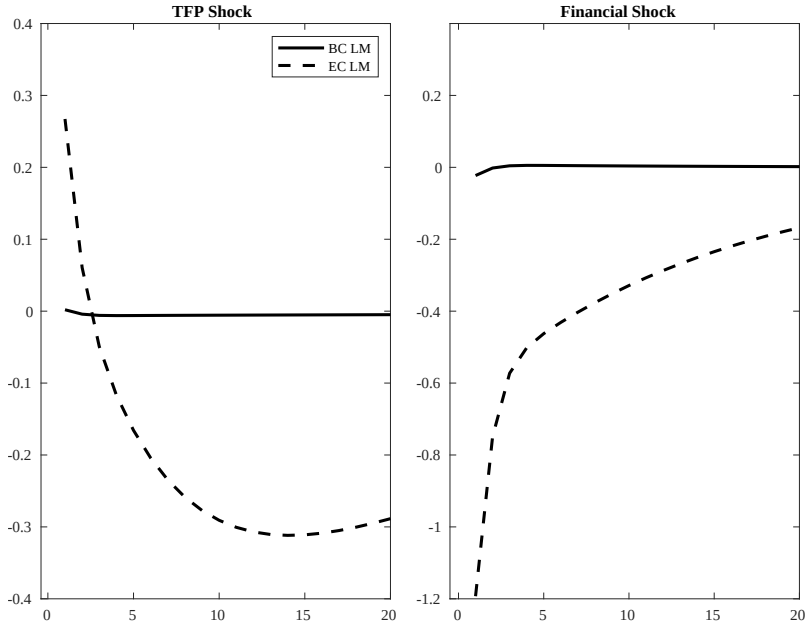
This figure plots the p-values of a Wald test to check for a structural break in the corresponding year reported on the x-axis. Variables for debt issuance (Panel a), equity issuance (Panel b) and liquidity accumulation (Panel c) are the aggregate series for small firms. Small firms are those with book value of assets below the 60th percentile in a given year. The black horizontal line indicates a p-value of 0.1.

Figure A.2: IRFs of Lagrangian Multipliers to Positive TFP & Financial Shocks

(a) Stronger Borrowers
High Bargaining Power / Low Bank Outside Option

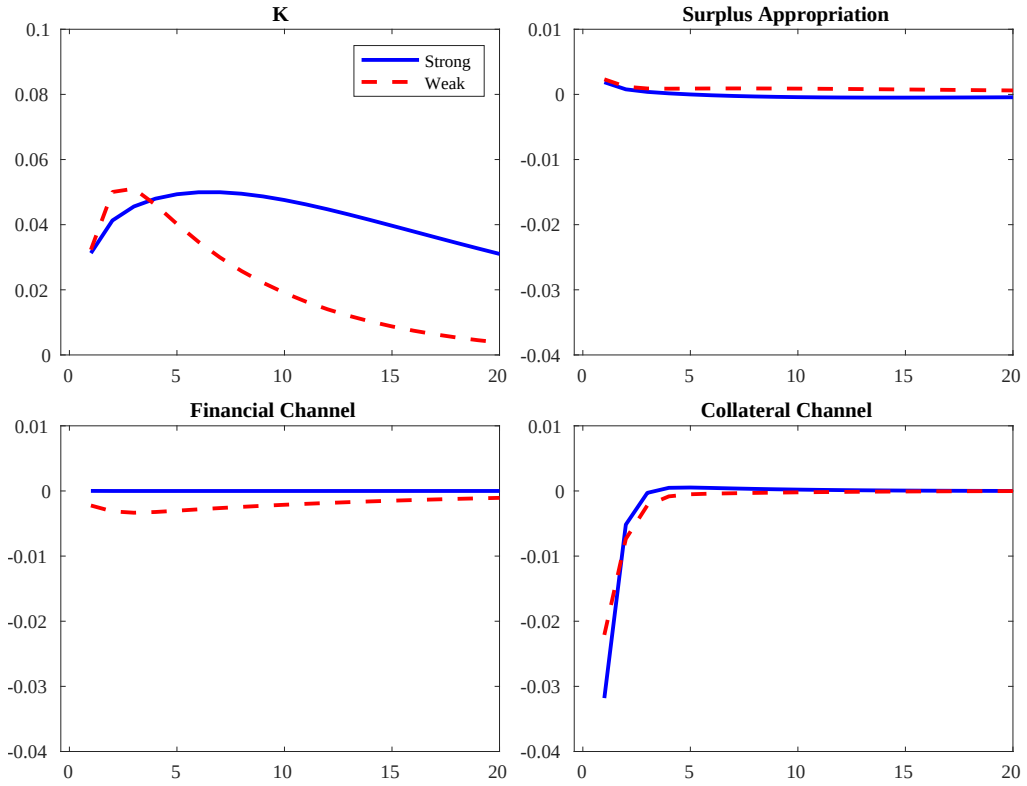


(b) Weaker Borrowers
Low Bargaining Power / High Bank Outside Option



This figure plots the impulse responses of the Lagrangian multiplier on the budget constraint (BC) and enforcement constraint (EC) for a one standard deviation positive TFP shock (left column) and financial shock (right column). Panel (a) shows the impulse response when the firm bargaining power parameter is set high and bank outside option is set low. Panel (b) shows the opposite. The y-axis is percent deviation from the steady state value.

Figure A.3: IRFs of Capital and Capital FOC Components to Positive Financial Shock



This figure plots the responses of strong borrowers (blue) and weak borrowers (red, dashed) to a one standard deviation positive financial shock. The y-axis is absolute deviation from the steady state value.

Table A.1: Panel Regression: Firm Fixed Effect

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	5.36***	-11.37***	-6.56**
	(1.398)	(3.413)	(2.981)
Large Firms	7.40***	-4.61***	-2.59**
	(1.264)	(0.957)	(1.052)
SF Observations	29,709	32,516	32,516
LF Observations	16,195	17,932	17,932
		p-values	
$H_0 : small = large$	0.105	0.022	0.073

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	4.10***	**6.13**	**2.40**
	(0.692)	**(3.649)**	**(3.270)**
Large Firms	6.43***	-1.57**	-1.35
	(1.079)	(0.550)	(1.063)
SF Observations	27,873	32,488	32,488
LF Observations	15,590	17,698	17,698
		p-values	
$H_0 : small = large$	0.118	0.034	0.178

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. A firm-specific fixed effect is included. Controls include the firm's cash flow and Tobin's Q. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Panel B estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small, large\}$, is rejected at the 5% level. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.2: Panel Regression: Consistent Sample of Firms

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	4.04*	-3.65	-8.56**
	(2.134)	(3.397)	(3.106)
Large Firms	4.90***	-3.09***	-2.01
	(1.631)	(0.980)	(1.310)
SF Observations	3,364	3,677	3,677
LF Observations	2,943	3,227	3,227
		p-values	
$H_0 : small = large$	0.696	0.851	0.012

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	4.17**	**17.51****	**7.04**
	(1.550)	**(7.879)**	**(4.989)**
Large Firms	5.30***	-2.78***	-2.66**
	(0.871)	(0.570)	(1.122)
SF Observations	4,051	4,627	4,627
LF Observations	3,603	4,042	4,042
		p-values	
$H_0 : small = large$	0.437	0.015	0.035

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. Controls include the firm's cash flow and Tobin's Q. The sample includes only those firms that entered the Compustat sample prior to 1990 and also appeared in the sample in 2017. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Panel B estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small, large\}$, is rejected at the 5% level. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.3: Panel Regression: Alternative Financing Variables

Panel A: 1981-1998

	Net Sale of Stock	Alt. Liq. Accum.	Cash	Ret. Earnings
Small Firms	-10.82***	-4.63*	-1.74	-9.37***
	(3.564)	(2.575)	(2.278)	(1.737)
Large Firms	-2.96**	-1.40	0.95	-0.89
	(1.147)	(1.227)	(1.304)	(1.535)
SF Observations	40,616	35,736	35,818	40,616
LF Observations	20,874	17,153	17,246	20,874
		p-values		
$H_0 : small = large$	0.006	0.083	0.087	0.001

Panel B: 1999-2017

	Net Sale of Stock	Alt. Liq. Accum.	Cash	Ret. Earnings
Small Firms	**11.23****	**2.94**	2.29	-3.10
	(3.968)	**(2.331)**	(2.268)	(3.291)
Large Firms	-0.96	0.15	-0.15	1.62
	(0.600)	(0.567)	(0.664)	(2.063)
SF Observations	39,363	39,350	39,237	39,363
LF Observations	19,698	19,696	19,510	19,698
		p-values		
$H_0 : small = large$	0.004	0.190	0.235	0.192

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. Controls include the firm's cash flow and Tobin's Q. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Panel B estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small, large\}$, is rejected at the 5% level. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.4: Aggregate Financing Variables: No Filtering

Panel A: 1981-2017

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.537***	0.332**	0.260
Large Firms	0.431***	0.098	-0.161
All Firms	0.578***	0.279*	0.191

Panel B: 1981-1998

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.575**	0.210	0.020
Large Firms	0.503**	-0.004	-0.199
All Firms	0.652***	0.320	0.069

Panel C: 1999-2017

Size categories	Debt Iss	Equity Iss	Liq. Accum.
Small Firms	0.638***	0.461**	0.461**
Large Firms	0.554**	-0.075	-0.091
All Firms	0.641***	0.174	0.260

This table displays the correlations between the annual growth rate in real corporate GDP and the three (non-HP-filtered) financing variables. The financing variables are aggregated by the indicated firm size categories and normalized by the lagged book value of assets. Small firms are those with book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. "All firms" are the pooled sample of small and large firms. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.5: Aggregate Financing Variables: Hamilton Filtering

Panel A: 1981-2017

Size categories	Debt Issuance	Equity Issuance	Liquidity Accum.
Small Firms	0.625***	0.404**	0.328*
Large Firms	0.602***	-0.233	-0.160
All Firms	0.636***	0.140	0.141

Panel B: 1981-1998

Size categories	Debt Issuance	Equity Issuance	Liquidity Accum.
Small Firms	0.840***	-0.008	0.022
Large Firms	0.820***	-0.476*	-0.128
All Firms	0.838***	-0.226	0.008

Panel C: 1999-2017

Size categories	Debt Issuance	Equity Issuance	Liquidity Accum.
Small Firms	0.639***	0.529**	0.454*
Large Firms	0.664***	-0.299	-0.147
All Firms	0.690***	0.194	0.199

This table displays the correlations between the cyclical component of Hamilton (2018)-filtered annual real corporate GDP and the three financing variables. The financing variables are the cyclical component of the respective Hamilton (2018)-filtered series, aggregated by the indicated firm size categories and normalized by the lagged book value of assets. Small firms are those with book value of assets below the 60th percentile in a given year. Large firms are those between the 60th percentile and 90th percentile. "All firms" are the pooled sample of small and large firms. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.6: Effects of Consolidation by Size of Lender Pool, 1999-2012
All Lender Pool

	Few Lenders			Many Lenders		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	7.00***	19.39	3.69	12.50***	3.60	-2.31
	(1.203)	(11.488)	(4.587)	(3.308)	(2.718)	(1.843)
BankAcquired x GDP	1.52	6.15	6.05	-5.06	-7.19	0.93
	(3.294)	(3.664)	(4.104)	(8.910)	(8.455)	(4.120)
Observations	5,761	6,763	6,763	3,425	3,998	3,998
R^2	0.010	0.033	0.006	0.037	0.007	0.006

	Few Lenders			Many Lenders		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	7.52***	17.96	3.03	12.94***	2.62	-2.39
	(1.276)	(10.944)	(4.281)	(2.893)	(2.745)	(2.096)
JoinMBHC x GDP	-3.59	17.25**	10.12	-6.34	5.23	1.62
	(2.053)	(7.267)	(6.023)	(8.459)	(7.559)	(7.917)
Observations	5,761	6,763	6,763	3,425	3,998	3,998
R^2	0.011	0.034	0.007	0.032	0.006	0.006

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on GDP (i.e. the cyclical component of HP-filtered real corporate GDP) and an interaction with an indicator for a lender in the "All Lender Pool" that was acquired by another lender during the previous five years (Panel A) or that joined a multi-bank holding company in the previous 5 years (Panel B). Firms with few lenders are those with a below-average number of lenders in their "All Lender Pool" and firms with many lenders are those with an average or above number of lenders. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.7: Mean of DealScan Lender Characteristics

	All Lender Pool		Lead Lender Pool	
	Pre-1999	Post-1999	Pre-1999	Post-1999
Lerner Index	0.476	0.535	0.476	0.536
Share of State Banking Assets	0.129	0.230	0.129	0.252
Number of Lenders	2.425	3.374		
Recently Joined MBHC	0.181	0.122	0.185	0.119
Recently Acquired	0.040	0.080	0.041	0.080
Lead Year Share			0.892	0.792

This table displays means for characteristics of the lenders in the All Lender Pool and Lead Lender Pool. The sample period is 1985-2012. Small firms are those with a book value of assets below the 60th percentile (in Compustat) for the respective year. Large firms are those between the 60th percentile and 90th percentile.

Table A.8: Steady State Values

Variable		Strong Relationship	Weak Relationship
Equity payout	d	0.076	0.108
Liquidity	a	0.001	0.308
Cost of intraperiod loan	e	0.017	0.080
Debt	b	1.745	1.739
Equity Issuance to output	ei/y	-0.121	-0.173
Debt issuance to output	di/y	0.000	0.000
Liquidity accumulation to output	la/y	0.000	0.000
Labor	n	0.300	0.300
Capital	k	2.337	2.316

This table displays select variables for the corresponding steady states.

Table A.9: Panel Regression: Financing Response to Negative Shock

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	-2.56***	-0.58	0.89
	(0.634)	(1.505)	(1.150)
Large Firms	-1.59*	-0.12	0.55
	(0.822)	(0.484)	(0.481)
SF Observations	36,981	40,616	40,616
LF Observations	18,891	20,874	20,874
		p-values	
$H_0 : small = large$	0.007	0.678	0.659

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	-1.74***	**-7.02*** **	**-4.92** **
	(0.487)	**(2.236)**	**(1.800)**
Large Firms	-1.63*	0.14	-0.39
	(0.937)	(0.340)	(0.475)
SF Observations	33,899	39,363	39,363
LF Observations	17,375	19,698	19,698
		p-values	
$H_0 : small = large$	0.864	0.004	0.008

This table displays the estimates of regressing the financing variable of interest (as a percentage of firm asset value) on an indicator for a "negative shock", i.e. a year with negative growth in the cyclical component of HP-filtered real corporate GDP during the sample period 1981-2017. Years with a "negative shock" are 1982, 1986, 1989-1993, 2001-2003, 2007-2009, and 2016. Controls include the firm's cash flow and Tobin's Q. Each coefficient estimate comes from running a separate regression on the firm size x subperiod sample. Panel B estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small, large\}$, is rejected at the 5% level. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.10: Panel Regression: Cyclicality of Real Variables

Panel A: 1981-1998

	Investment	Employment
Small Firms	-1.35	-1.86
	(0.886)	(3.692)
Large Firms	0.94	9.53**
	(1.006)	(4.420)
SF Observations	39,893	38,235
LF Observations	20,473	20,272

Panel B: 1999-2017

	Investment	Employment
Small Firms	2.53***	12.49***
	(0.753)	(3.344)
Large Firms	2.26**	10.34***
	(0.943)	(3.273)
SF Observations	39,129	37,331
LF Observations	19,579	19,211
	p-values	
$H_0 : small_{pre} = small_{post}$	0.002	0.006
$H_0 : large_{pre} = large_{post}$	0.338	0.883

This table displays the estimates of regressing change in investment (as a % of assets) and percentage change in employment on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. Controls include the firm's cash flow and Tobin's Q. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.11: Panel Regression: Cyclicality of Real Variables
Small Firms, 1981-2017

	Low Liquidity Position		High Liquidity Position	
	Investment	Employment	Investment	Employment
GDP	-2.55***	-7.32*	-1.02	2.83
	0.004	0.065	0.301	0.452
D_t^{post} x GDP	5.05***	16.83***	3.26***	8.72
	0.000	0.001	0.007	0.119
SF Observations	25,918	24,973	24,700	23,988
LF Observations	0.007	0.014	0.011	0.029

This table displays the estimates of regressing change in investment (as a % of assets) and percentage change in employment on the cyclical component of HP-filtered annual real corporate GDP, normalized so that a unit increase in GDP indicates moving from the lowest realization to the highest realization during the sample period 1981-2017. D_t^{post} is an indicator for the years 1999-2017. Liquidity Position is determined by the median cash-to-assets ratio for the years 1996-1998. Controls include the firm's cash flow and Tobin's Q. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$