Financial Consolidation, Corporate Finance and Firm Investment in the Business Cycle

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JEL Codes: E32, E44, G21, G32.

Keywords: Financial consolidation; business cycles; corporate finance; investment

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Abstract

We study the influence of financial consolidation on firms' cyclical behavior. We construct a dynamic model in which banks extract rents from non-competitive lending relationships. Calibrating the model to US data, we show that after bank consolidation the weakening in firms' bargaining power vis-à-vis banks enhances precautionary liquidity accumulation and equity issuance following positive shocks, increasing the shock sensitivity of investment. Using matched firm-bank data, we find that the US bank consolidation has raised the procyclicality of equity issuance, liquidity accumulation and investment for small publicly-traded firms. The analysis suggests that bank consolidation especially raises the relevance of productivity shocks.

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1 Introduction

The banking sectors of several countries have undergone a significant process of consolidation in recent decades (Berger et al. (2010); Group of Ten (2001)), and the consolidation process has again picked up momentum in the past few years (Bank for International Settlements (2018); Corbae and D'Erasmo (2020)). The concentration and complexity of financial institutions has been shown to have major consequences for firms' access to finance, financing decisions and, ultimately, for firms' investment and production (Ferguson (2001)). In contrast with this broad consensus, we know surprisingly little about its influence on the dynamics of firms' financing over the business cycle and the consequences to the cyclical behavior of physical investment. And yet, studying the determinants of cyclical financing patterns is critical for understanding firms' response to macroeconomic disturbances and the mechanisms of propagation of real and financial shocks (Covas and Den Haan

(2011); Jermann and Quadrini (2012)). In this paper, we take a step towards addressing these issues theoretically and empirically.

The United States provides a natural setting for our analysis. Since the late 1990s, the US financial sector has seen a dramatic consolidation, with financial institutions becoming larger and more complex (see, e.g., Corbae and D'Erasmo (2020) and Ferguson (2001)).[1] Figure A.1 in the Appendix shows the increase in the concentration of the US banking sector, as measured by the Herfindahl-Hirschman indices of bank loans and assets. During the 1980s and 1990s, the average number of banks equaled 11,000 with a mean Herfindhal on loans of 79. For the post-1999 period, the average number of banks fell under 7,000 with a mean Herfindhal on loans of 426. In recent years, the share of banking assets held by the top 10 bank holding companies has exceeded 60% (Fernholz and Koch (2016)).

The literature has established key facts about the behavior of publicly-traded firms' financing over the business cycle (see, e.g., Covas and Den Haan (2011), Jermann and Quadrini (2012) and Karabarbounis et al. (2014)). First, firms of all sizes borrow procyclically, that is, increase their debt during economic expansions.[2] Second, small and medium-sized firms issue equity and accumulate liquidity (cash and cash equivalents) procyclically, while larger firms issue equity and accumulate liquidity countercyclically. In this paper, we first investigate empirically the influence of financial consolidation on this cyclical behavior of firms' financing. Motivated by the empirical findings, we then study the effects of financial consolidation on firms' financing and investment in a general equilibrium business cycle model with financial frictions and non-competitive lending relationships calibrated to US data. Finally, we empirically validate the influence of financial consolidation on the cyclical behavior of firms' investment through the firm financing channel.

Following prior literature, in the empirical analysis we use financial and physical investment data

[1] As argued by Ferguson (2001), "Financial consolidation has helped to create a significant number of large, and in some cases increasingly complex, financial institutions" and "the pace of consolidation increased over time, including a noticeable acceleration in the last three years of the [1990s]."

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

on US firms from the Compustat North America database matched with granular syndicated loan data from Thomson Reuters LPCs DealScan database and with data on bank mergers and on the bank-holding status of banking institutions. We first document the cyclicality of financing for a sample of 16,675 firms. We confirm the above stylized facts for the period 1981-2017,[3] and at the same time find that the procyclical equity issuance and liquidity accumulation of small and medium-sized firms is especially driven by the latter half of this period, after the late 1990s.[4] In the mid-1990s, banking regulatory reforms, especially the Riegle-Neal Interstate Banking and Branching Efficiency Act, allowed financial institutions to engage in acquisitions and mergers across state lines (Strahan and Weston (1998); Nippani and Green (2002); Chang (2017); Kwan (2004); Holland et al. (1996); Melzer (1995)). Exploiting the staggered implementation of the Riegle-Neal Banking Act by US states during the 1990s, we obtain a first piece of evidence that the financial consolidation that occurred after the mid-1990s banking reforms was one of the forces that contributed to shaping the cyclicality of small and medium-sized firms: the increase in their procyclicality, in fact, was most pronounced in states that adopted Riegle-Neal earlier. These findings are robust to restricting the analysis only to firms that remained in the sample throughout the sample period, thus addressing possible compositional effects.

Next, we provide further evidence on the influence of financial consolidation. By leveraging detailed loan-level data to track the lending activities of banks to the firms in our sample we identify plausibly exogenous shocks to the degree of consolidation of the banks. We find that procyclical equity issuance and liquidity accumulation after the late 1990s is more pronounced for small and medium-sized firms whose lending banks were involved in a merger or were acquired by a multi-bank holding company (increased size, power and complexity of lenders) and firms with a smaller set of available lenders

[3]For firms of all sizes, debt issuance remained procyclical throughout the 1981-2017 period. As detailed in the data description, the choice of the sample period is dictated by various factors. The relevant data are largely unavailable prior to 1981. We conservatively choose not to include the years 2018-2019 due a change in accounting rules, while 2020 marks the beginning of the 2020-23 COVID period during which COVID-related factors influenced firms' financing.

[4]To identify 1999 as the break year, we perform Wald tests and other tests for a significant break year. The firm-level analysis reveals that a one-standard deviation change to cyclical GDP increases equity issuance of the average small or medium-sized firm by as much as 24% following the late 1990s. In the first half of our sample period, instead, equity issuance decreased by a similar magnitude.

(weaker firm bargaining power vis-à-vis lenders). In addition, the effect of bank mergers on firms' cyclicality appears to be more pronounced for mergers that entailed a significant increase in the size and power of lending banks.[5]

Motivated by the evidence, we study the effects of financial consolidation on firm financing and investment in a general equilibrium business cycle model with financial frictions and non-competitive lending relationships calibrated to the US data. In the model, firms cover short-term and long-term financing needs through equity issuance and borrowing, subject to credit constraints (see, e.g., Jermann and Quadrini (2012)). When borrowing from banks, firms bargain over the cost of loans. In addition to tapping external finance, firms accumulate internal liquidity. The threat point of a firm in its negotiations with a bank is increased by holding liquidity, as this allows the firm to cover its short-term financing needs in case the bank withholds credit.[6] Financial consolidation is then simulated by weakening firms' bargaining power vis-à-vis their lending banks and strengthening banks' outside option. This financial consolidation produces cyclical financing patterns in line with those documented empirically for small and medium-sized publicly-traded firms: following consolidation, the increased procyclicality occurs in response to productivity (TFP) shocks, rather than shocks to financial constraints. In turn, the increased procyclicality of equity issuance and liquidity accumulation raises the sensitivity of firms' investment to shocks.

The intuition for the theoretical results revolves around the idea that, after financial consolidation, smaller firms have stronger incentives to issue equity and accumulate precautionary liquidity following positive shocks. In particular, a firm's demand for labor can be met by accessing short-term bank credit or drawing down accumulated liquidity. The firm bargains with the lending bank over the cost of credit. If a firm has low bargaining power and/or the bank has more valuable alternatives to lending

[5]The estimates suggest that shocks to bank consolidation increase small and medium-sized firms' procyclicality throughout the sample period. However, the pace of consolidation (e.g., the frequency of bank mergers, including large mergers) is much more intense in the second half of our period.

[6]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.

to the firm, then the cost of accessing bank credit is high. When a positive TFP shock occurs, firms want to increase their labor. A firm with a low cost of accessing short-term bank credit (a "large" firm) simply increases borrowing and pays out higher profits from the positive shock to equity holders. A firm with a high cost of accessing bank credit (a "small" firm) will also desire to increase its labor; however, the lending bank can extract a high share of the surplus of doing so. In response, the firm will have the incentive to carry more liquidity to offset the bank's bargaining advantage. The firm finances this precautionary liquidity 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 following a positive financial shock, as the loosening of the firm's borrowing constraint allows for a firm to increase its debt issuance rather than its liquidity accumulation and equity issuance.

We next investigate how the influence of financial consolidation on the financing behavior of small and medium-sized firms affects the cyclical behavior of their investment and employment. In the model, pronounced effects of shocks on investment occur post-financial consolidation via the financial channel illustrated above. In fact, firms' liquidity holdings magnify their ability to appropriate surplus when negotiating with banks, as well as increase the value of capital as collateral. The procyclical liquidity accumulation post-financial consolidation, therefore, boosts firms' returns from accumulating capital as a productive input and as collateral, increasing the sensitivity of physical investment to shocks. Leveraging our matched bank-firm US data, we show that this also holds true empirically. In particular, in the data small and medium-sized firms' investment becomes more sensitive to productivity shocks post-financial consolidation, and this increase in sensitivity depends on firms' liquidity holdings, consistent with our model's financial channel.

Before we proceed, it is worth belaboring that other forces plausibly contributed to shaping the cyclicality of firms' financing and investment during the period under scrutiny. The influence of financial consolidation, a mechanism originating on the supply side of credit, is indeed fully consistent with other non-mutually exclusive forces on the demand (borrowers') side of credit. The model, in particular, indicates that financial consolidation could have accounted for approximately one fourth of the increase in the financing procyclicality of smaller firms detected in the empirical estimates.

Related literature. This paper speaks to two main strands of literature. The first related literature investigates the impact of the financial sector on firms' financing and liquidity accumulation over the business cycle and the implications for the cyclical behavior of firms' investment. Covas and Den Haan (2012) introduce a time-varying financing friction into a partial equilibrium model. Jermann and Quadrini (2012) introduce financial frictions in a general equilibrium model to generate a trade-off between debt and equity over the business cycle. Bacchetta et al. (2019) consider a dynamic general equilibrium model in which firms can pay wages using external financing or internal liquidity. These models do not explore the role of financial consolidation in the cyclical behavior of firm financing and investment. Investigating this role uncovers a novel channel of influence of the financial sector on the transmission of shocks to the macroeconomy. We find that financial consolidation raises the sensitivity of smaller firms' equity issuance and liquidity accumulation to productivity (TFP) shocks and that, in turn, this can increase the procyclicality of their investment. On the empirical side, Covas and Den Haan (2011), Jermann and Quadrini (2012) and Karabarbounis et al. (2014) generally find that debt issuance is procyclical in samples that begin in the early 1980s, while the cyclicality of equity issuance depends on firm size. Karabarbounis et al. (2014) show that equity issuance is procyclical for smaller firms and countercyclical for large firms. We uncover an impact of financial consolidation on the financing and investment behavior of smaller firms.

A second strand of related literature examines the effects of financial sector consolidation on non-financial firms. Di Patti and Gobbi (2007) show that Italian bank mergers reduced availability of credit to firms. Karceski et al. (2005) find that bank mergers in Norway lowered the equity value of publicly-traded firms that borrow from the merging banks. Carow et al. (2006) uncover that US bank mergers have negative equity effects for publicly-traded companies by decreasing their bargaining power vis-à-vis banks.[7] A common finding of these studies is that the effects of financial consolidation are generally more pronounced for firms of smaller size (Degryse and Ongena (2008)). We contribute to this literature by exploring the impact of financial consolidation on the dynamics of firms' financing over the business cycle and the consequences to the cyclical behavior of investment.

The paper unfolds as follows. Section 2 details data and measurement. In Section 3, we present the empirical evidence on the effects of financial consolidation on firms' cyclical financing behavior. In Section 4, we lay out the model. Section 5 describes the calibration and simulates financial consolidation. Section 6 empirically validates the predicted influence of financial consolidation on firms' investment through the financing channel. Section 7 investigates the relative importance of productivity shocks and financial shocks in the model and in the data. Section 8 concludes. Additional results and technical proofs are in the online Appendix.

2 Data and Setting

Our empirical evidence uses various data sources. The primary sources are the Compustat North America - Fundamentals Annual files and DealScan. Compustat provides balance sheet data for publicly-traded firms. DealScan contains information on the syndicated lenders for firms in the Compustat sample. We complement these sources with the Call Report data from the Federal Reserve Bank of Chicago on the bank-holding status of financial institutions and the Merger Description data from the Federal Reserve Bank of Chicago on the timing and characteristics of bank mergers.

Firm-Level Data. Compustat firms account for roughly one fourth to one third of total private sector US employment and sales; thus, they represent an economically important sample of businesses (Davis et al. (2006)). Publicly-traded firms may not be as reliant on bank debt as private firms. However, several studies document that bank debt accounts for an important share of total debt for

[7] For structural models of the market structure of the banking sector, see Corbae and D'Erasmo (2021) and Corbae and D'Erasmo (2020).

Compustat firms (see, e.g., Lee (2017) and Crouzet (2021))[8] and plays a key role in the sensitivity of Compustat firms to shocks (e.g., monetary policy shocks; Ippolito et al. (2018)).

Our sample spans the 1981-2017 period. The relevant variables for our empirical analysis of firms' financing behavior are primarily those in the cash flow statement, which are not well-populated prior to 1981. We conservatively choose not to include the years post 2017 in our sample. Several studies document a significant change in the debt and asset values reported by Compustat firms between the end of 2018 and 2019 due to a change in the accounting rules for leases. Including those years could then capture changes in financing variables driven by accounting factors. The year 2020 marks the beginning of the 2020-2023 COVID period, during which COVID-related factors affected firms' financing. We drop firms incorporated outside of the United States. Financial firms (SIC 6000-6999), utility firms (SIC 4900-4999) and quasi-governmental firms (SIC 9000-9999) are also excluded. These groups of firms are heavily regulated, which makes their financing decisions distinct from other firms. Further, we remove any firm that in 1981-2017 engaged in a major merger (merger or acquisition after which sales increased by at least 50 percent).

Creation of the financing variables most closely follows Eisfeldt and Muir (2016) (see also the Appendix). Net debt issuance is long-term debt issuance (DLTIS) minus long-term debt reduction (DLTR) plus changes in current debt (DLCCH) minus (net) interest paid (XINT). 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). The results are fully robust to netting out cash dividends or compensation-based stock options, as we will see. Liquidity accumulation is the change in cash and cash equivalents (CHE_t - CHE_{t-1}). All variables are normalized by the lagged book value of total assets (AT). In robustness tests, we normalize by the lagged (net) capital stock (PPENT).

Consistent with the literature, we treat firm size as a natural proxy for firms' exposure to bank

[8] Lee (2017) proxies for bank debt by subtracting commercial paper (CMP) from long-term debt - other (DLTO). Crouzet (2021) creates a bank debt proxy by summing DLTO and notes payable (NP). Using these alternative proxies results in a share of bank debt in the 22%-40% range.

lending decisions and credit market conditions. Smaller firms are less informationally transparent and less able to access a variety of funding sources available to large firms. This is also the case for smaller publicly traded firms, and, accordingly, several studies partition Compustat firms based on their size (e.g., Covas and Den Haan (2011); Gopalan et al. (2011); Bharath et al. (2008); Ippolito et al. (2018)). In line with these arguments, the literature generally finds that the effects of bank mergers and consolidation are more pronounced for smaller firms (see, e.g., Carow et al. (2006) and references therein).[9] Specifically, we group firms into size bins using acyclical cutoffs of the book value of total assets, as in Covas and Den Haan (2011). 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 (following Eisfeldt and Muir (2016) we exclude the top 10 percent of firms from the large size group; however, our results are fully robust to including them).[10] A (log) linear trend is then fit through the annual cutoff values and used as the new cutoff values for firm size groupings. This prevents the cutoff values themselves from being cyclical. The results using the original cutoff values are very similar to those with the adjusted values. For simplicity, we use two size groups; in unreported tests, we find that the results become stronger as the asset value cutoff is lowered, that is, as the definition of "small" becomes narrower. As we show later on, the results also carry through if we use a continuous measure of firm size rather than a discrete partitioning.

Splitting by size categories, Table A.1 shows summary statistics for the 16,675 firms in the sample. There is a large discrepancy in firm size between the 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. During the period 1981-2017, approximately 90% of firms fall within their modal firm size category. Put differently, firms

[9] Private firms are likely to be even more exposed than small listed firms to bank lending decisions. Thus, our results could tend to underestimate the impact of banking consolidation on cyclical financing and investment patterns.

[10] Eisfeldt and Muir (2016) describe how the top 10 percent of firms present measurement problems and anomalous financing behavior that could make their inclusion in the sample misleading of firm dynamics. For example, the top 10 percent of Compustat firms have measurement issues that make it difficult to separate accumulated liquidity from investment. Also, the largest firms are more global in nature, which presents two reasons to exclude them from the sample: first, liquidity accumulation will partially reflect international tax considerations (e.g., repatriation timing) and second, firm behavior will be impacted to a greater extent by non-US business cycles.

rarely cross size bins. This suggests we can (approximately) treat firm size as a fixed firm characteristic. In unreported computations, we also obtained that small publicly traded firms account for a relevant share of the total employment, sales, and investment of the sample. Around the midpoint of our sample period, for example, this share was nearly one fourth.

Loan-Level 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 firm. A subset of the lenders in a syndicate are the lead arrangers. The lead arrangers agree with the firm on the loan characteristics (loan amount, collateral, interest rate) and are also responsible for inviting other lenders to join. The non-lead members of the syndicate ("participants") provide funds and assist in the administrative tasks (Degryse et al. (2009)).

Using the DealScan database, we create a pool of lenders for each Compustat firm that aligns with DealScan records. Specifically, any lender involved in a syndicated loan relationship with a firm in the current year, the preceding 5 years, or the subsequent 5 years is categorized as part of the "firm's lender pool". Since firms do not necessarily participate in the syndicated loan market every year, using a window of ±5 years allows us to capture those banks that act as key lenders to the firm in the current period.[11] Both the lead lenders and participants interact, and contract, directly with the firm, gaining information about the firm through the loan agreement (Li (2017)).

After creating this lender pool, we construct proxies for (shocks to) the relative power of lenders vis-à-vis borrowers. We use an indicator for a lender recently being acquired by another lender, an indicator for a lender recently joining a multi-bank holding company, the total number of lenders in a firm's pool, and the share of syndicated loans provided by the lead lender(s). The first two indicators represent exogenous changes in the relationship between a firm and a lender triggered by shocks to the

[11] The results are generally robust to using a different window length and to standardizing the 5-years-rolling window based on loan maturity.

degree of consolidation of the lender. We use these proxies to investigate how an increase in the size and complexity of the lending banks affects firms' cyclical behavior.

3 Empirical Evidence

3.1 Firm Financing over the Business Cycle

In this section, we first investigate firms' financing behavior in the 1981-2017 period. Table 1 performs a preliminary exploration showing the correlations of the aggregate financing series with the cyclical component of real corporate GDP.[12] As commonly found in the literature, over the 1981-2017 period debt issuance appears to be procyclical for all firms, while equity issuance and liquidity accumulation appear to be procyclical for smaller firms and countercyclical for large firms. Panels B and C compare cyclical financing behavior in the pre-1999 period and the post-1999 period. We choose 1999 as a break year based on Wald tests and other tests for a significant break year detailed in the Appendix. Small firms' equity issuance and liquidity accumulation appear to be procyclical post-1999 (Panel C) and countercyclical prior to 1999 (Panel B). Large firms behave virtually the same in the two periods.

In Table 2 we study cyclical financing patterns using firm-level panel data. First, the coefficients are estimated by 12 regressions (2 time periods x 3 financing variables x 2 size groups) of the specification

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

$V_{i,t}$ is the financing variable of interest normalized by the lagged book asset value, α_0 is a constant, t and t^2 capture trends, Y_t is the cyclical component of real corporate GDP normalized such that a unit increase indicates moving from its lowest to its highest value in 1981-2017, $Z_{i,t-1}$ are the lagged controls, and $e_{i,t}$ is the error term. Following Covas and Den Haan (2011) we control for cash flow and Tobin's Q, expressed as the difference between the firm's value and the respective size group's mean at

[12] In constructing the aggregate time series, we follow a similar methodology as Eisfeldt and Muir (2016) and Covas and Den Haan (2011). See the note to Table 1. Appendix Table A.2 shows robustness when no filtering is used.

$t-1$.[13] We report the β coefficient, with standard errors clustered along 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:

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

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. 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 that of the large group.

Third, the bold coefficients in the post-1999 period are based on the p-values from 6 regressions (3 financing variables x 2 size groups) where the 2 time periods are pooled:

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

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. We bold the coefficients in the post-1999 period 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 a variable is statistically different in the 1999-2017 period, relative to 1981-1998.

Panel A of Table 2 displays the results. Recall that a positive coefficient indicates procyclicality. As shown by the bold coefficients, the cyclicality of equity issuance and liquidity accumulation for small firms are significantly different in the post-1999 period relative to pre 1999: the sign of the coefficients flips. Dividing the post-1999 equity issuance coefficient for small firms of 11.12 by 4.5 (the standard deviation change from the lowest to the highest realization of the business cycle measure) results in a standardized coefficient of 2.5, which is 13% (=2.5/19.1) of the average equity issuance to assets of small firms. Alternatively, this effect is 24% of the average annual equity issuance (10.3%) for our aggregate

[13] The results hold when we control for a wider set of firm characteristics.

small firm time series data.[14] Repeating the above calculations, the change in the coefficient from -10.74 in the pre-1999 period to 11.12 post 1999 is between 25% and 47% of average equity issuance.

The estimates carry through with firm fixed effects (Appendix Table A.3).[15] In Panel B of Table 2, besides firm fixed effects, we add a continuous measure of size, $(s_{it} - E_i[s_i])$, where s_{it} is firm i's log of asset value in year t and $E_i[s_i]$ is its average in the sub-period. Post 1999 equity and liquidity become less procyclical as the firm grows, i.e. looks more like a "large" firm. This was not true pre 1999.

Measurement. Appendix Table A.4 shows robustness to excluding dividend payouts from net equity issuance. Another possible concern is that sometimes employee stock options are used to finance selected intangible investments, and this could influence the estimates. We proxy for compensation-based issuances as in McKeon (2015); excluding them does not alter the estimates. The results also hold for alternative definitions of liquidity accumulation (Appendix Table A.4): the cash flow statement version of change in cash and cash equivalents; changes in cash only; and retained earnings.

Compositional effects and other tests. To account for any compositional change, we restrict the sample to firms that entered Compustat prior to 1990 and were also in the sample in 2017. Similar to the full sample, more than 90% of the firms remain in the same size class over the whole period. Appendix Tables A.5 and A.6 show that all the results carry through.[16]

In Appendix Table A.8 we exclude firms with a Z-score below 1.8 (high distress probability). We also verify that the estimates hold by normalizing the financing variables by the (net) capital stock or by the first reported asset value. Additionally, we exclude all observations with any merger, rather than with a major merger.[17] Finally, observe that Compustat quarterly data are prone to reporting and measurement issues. Thus, following a broad strand of studies, we work with annual data but we

[14] Analogous calculations for liquidity accumulation result in an effect of approximately 14%.

[15] Since the sample exhibits entry and exit, and we do not want firm fixed effects to be endogenous, we keep only firms with more than 5 years of data within a subperiod.

[16] As an additional method of controlling for compositional effects (which preserves a sample closer to the baseline), we also excluded younger firms ($<$ 5 years), riskier firms (sample sales volatility in the top 25th percentile) and firms whose share of intangible capital is in the top 25th percentile. Our results are essentially unchanged (see Appendix Table A.7).

[17] For space considerations, the latter two robustness checks are unreported (results available upon request).

verified that all the results for financing cyclicality carry through with quarterly data.

3.2 The Influence of Financial Consolidation

Various phenomena occurred during the sample period, possibly affecting the cyclicality of firms' financing. It is nonetheless useful to refer to the words used in April 2001 by the Federal Reserve Vice Chairman Roger Ferguson: "Financial consolidation has helped to create a significant number of large, and in some cases increasingly complex, financial institutions"; "the pace of consolidation increased over time, including a noticeable acceleration in the last three years of the [1990s]" (Ferguson (2001)). In what follows, we study the influence of financial consolidation on firms' cyclical financing patterns. We concentrate on small firms, as these are the businesses that are more exposed to bank lending decisions and credit market conditions and for which we find an increase of procyclicality from the late 1990s.

A frequently held view is that a key contributor to the financial consolidation that occurred from the late 1990s was the Riegle-Neal Banking Act of 1994, which applied to states at different dates between 1994 and 1997 (Strahan and Weston (1998); Nippani and Green (2002); Chang (2017); Kwan (2004); Holland et al. (1996); Melzer (1995)). In the words of Strahan and Weston (1998), for example, "[...] one of the forces driving this increased consolidation is deregulation of restrictions on geographical expansion, which was recently completed with passage of the Riegle–Neal Interstate Banking and Branching Efficiency Act of 1994." As shown in Figure A.1, banking concentration, as measured by the Herfindahl indices of bank loans and assets, noticeably increases between the passage of Riegle-Neal in 1994 and the end of the 1990s. During the 1980s and 1990s, there was an average of over 11,000 banks with a mean HHI on loans of 79. For the post-1999 period, the average number of banks fell under 7,000 with a mean HHI on loans of 426. 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 commercial banking with investment banking. Heiney (2010) documents that the banking sector consolidation of the 1990s slows down after 1999. Exploiting the staggered adoption of the Riegle-Neal Act, we show that the increase in financing procyclicality is most pronounced amongst firms headquartered in states that adopted Riegle-Neal earlier.

While providing important insights, the evidence from the staggered Riegle-Neal adoption cannot rule out that, besides financial consolidation, other aggregate or market structure phenomena induced by the Riegle-Neal passage played a role in influencing firms' cyclical patterns. Next, we then provide more direct evidence on the effects of financial consolidation. We create a pool of lenders with whom Compustat firms have a syndicated loan relationship, as detailed in Section 2. The characteristics of, or shocks to, these firms' key lenders are then used to test whether a change in bank bargaining power and bank complexity was one of the forces contributing to the increase in small firms' financing procyclicality. We construct plausibly exogenous shocks to bank bargaining power and bank complexity by using the timing of bank mergers or the acquisition of banks by a BHC, respectively.

It is worth highlighting that our analysis focuses on the cyclical behavior of firm financing—how financial consolidation shapes the behavior of equity issuance, debt issuance, and liquidity accumulation—rather than on loan pricing. This reflects both our objective of capturing firms' responses to consolidation and the implications of the theoretical model, which, as we shall see, predicts that firms change their financing patterns precisely to avoid possible increases in loan costs following financial consolidation. A test on the effect on loan pricing would require information on pre-bargaining (rather than equilibrium) loan prices—data that are not observed in practice.

3.2.1 Timing of Riegle-Neal Adoption

The Riegle-Neal Act was passed in 1994, but states individually enacted legislation that determined when it went into effect. This led to staggered adoption during the years 1995 (14 states), 1996 (12 states) and 1997 (24 states). As shown in Appendix Figure A.2 the consolidation process of the banking sector appears to have been faster in states that adopted Riegle-Neal earlier.

We test whether the year of adoption is associated with different procyclicality of equity and liquidity for smaller firms using the following specification:

$$V_{i,t} = \alpha_s + \alpha_1 t + \alpha_2 t^2 + I(h)_i \beta_h Y_t + \Gamma' Z_{i,t-1} + e_{i,t} \tag{4}$$

where α_s is a state-level fixed effect, 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 3, 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 issuance and liquidity accumulation 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 (Panel A: 1981-1998). To illustrate the pre-trends and importance of the adoption year, Appendix Figure A.3 displays how our β coefficients vary over time for equity issuance.[18] Specifically, β_h is estimated in 5-year rolling windows for each adoption cohort h. As shown, all cohorts have quite similar pre-adoption behavior, while the coefficient flips from negative to positive around each cohort's specific adoption year.

The results obtained in Table 3 essentially carry through when restricting the focus to only those firms that entered the Compustat sample prior to 1990 and were also in the sample in 2017 (thus, netting out possible compositional effects; see Appendix Table A.9). They also carry through when implementing the tests recommended by Baker et al. (2022) to avoid bias in staggered difference-in-differences specifications. In particular, in the Appendix we show variation in the timing of the treatment (Appendix Figure A.4), show that the results are robust to excluding the control variables (Appendix Table A.10) and to excluding either the 1995 or 1996 adopters (Appendix Table A.11). Quantitatively, the estimates in Table 3 suggest that post 1999, following an increase of the cyclical GDP from its lowest to its highest value during the sample period, a firm headquartered in 1995 adopters would have experienced a 6 percentage point larger increase in its equity issuance and a 4

[18] Coefficients for liquidity acccumulation are qualitatively similar.

percentage point larger increase in its liquidity accumulation relative to a firm headquartered in 1997 adopters.

The results thus indicate that the increase in the procyclicality of smaller firms identified above was most pronounced in states that adopted Riegle-Neal earlier. In what follows, we use matched bank-firm information from the loan-level data to further tease out the contribution of financial consolidation to financing cyclicality.

3.2.2 Measures of Financial Consolidation

Reduction in firms' bargaining power vis-à-vis lenders. In Table 4, we re-estimate the baseline regression with an additional interaction term to test how a reduction in firms' bargaining power vis-à-vis banks influences the cyclicality of smaller firms:

$$V_{i,t} = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \beta_1 Y_t + \beta_2 X_{i,t} + \beta_3 Y_t * X_{i,t} + \Gamma' Z_{i,t-1} + e_{i,t} \tag{5}$$

where $Y_t * X_{i,t}$ is the interaction of our business cycle measure, Y_t, with a characteristic of, or shock to, the firm's lender pool, $X_{i,t}$. The main coefficient of interest is β_3, which captures 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. Since we are interested in only the interaction term, we could replace the trend variables with a year fixed effect to control for omitted aggregate variables. Doing so does not meaningfully change our estimates of β_3. Neither does adding a firm fixed effect.

Sharpe (1990), Rajan (1992) and Ongena and Smith (2001) show that borrowing from multiple banks moderates a bank's informational monopoly on a firm. In Panel A of Table 4, we use the total number of lenders in the created firm's lender pool from the loan-level data as a proxy for a firm's outside options in bargaining with a lender. Here, a higher number of lenders for smaller firms in the post-1999 period is associated with less procyclical equity issuance and liquidity accumulation. This suggests that the cyclicality of smaller firms financing moves in the direction of larger firms cyclicality when smaller firms have a larger set of lenders. Next, we proxy for a firm's outside option with the lead lender(s) average share of the total syndicated loan value for the 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 and the more the firm is reliant on the lead lender for financing. In line with the insights of Panel A, in Panel B of Table 4 we see that in the post-1999 period 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 equity issuance and liquidity accumulation.

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. Table A.1 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 (see again Table A.1).[19] 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 influenced 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" (Degryse and Ongena (2008)).

To probe this point further, we next use a proxy for (shocks to) 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. Relative to the previous two measures, mergers (and, below, BHC acquisitions) have the benefit of being more plausibly exogenous. Here, a firm's lender being acquired by another lender plausibly captures an exogenous change in the market power of that

[19] The Lerner index is the percent markup of the price of bank production over the marginal cost.

lender. Panel A of Table 5 shows evidence for the full period that a firm's lending bank being acquired by another bank matters, i.e. it is associated with increased procyclicality of smaller firms' equity and liquidity. While we do not find that the marginal effect of mergers is significantly stronger in the post-1999 period, it is the case that mergers occur twice as frequently in the DealScan sample during this latter period (Table A.1). This suggests that the overall contribution of mergers to smaller firms' cyclicality has become more important primarily via the increased pace of consolidation and the increased incidence of mergers. Quantitatively, the estimates suggest that, following an increase of the cyclical GDP from its lowest to its highest value during the sample period, a firm whose lending bank was involved in a merger would have experienced a 10 percentage point larger increase in its equity issuance and a 7 percentage point larger increase in its liquidity accumulation.

Additionally, one would expect that larger mergers would have a greater impact on the borrowing firms. Panel B of Table 5 presents a triple interaction between the size of the merger (i.e. the percentage increase in the original lender's asset value due to the merger), the occurrence of a merger and cyclical GDP. Increasing the size of the merger in the All Lender Pool by one standard deviation leads to an additional 23.38 percentage point increase in the procyclicality of equity issuance and an additional 10.56 percentage point increase for liquidity accumulation.[20]

We can further assess the impact of bank mergers by splitting firms into those with few outside options and those with many outside options. One would expect the impact of a bank merger to be greater for firms with fewer lenders in their lender pool (Degryse and Ongena (2008)). In Panel C of Table 5, 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

[20] As noted, we observe that the overall contribution of bank mergers to firms' cyclicality has become more important primarily through the increased incidence of mergers ("extensive margin"). However, the stronger effect of large mergers, together with their significantly higher frequency in the second half of our period (Appendix Table A.1), suggests that, at least along this dimension, the "intensive margin" impact of bank mergers could have complemented the "extensive margin" in affecting firm cyclicality.

equity issuance. In contrast, firms with many lenders see no effect from a lead lender acquisition. Appendix Table A.12 shows similar results for the acquisition of any lender.

Increased complexity in bank-firm relationships. Panel A of Table 6 repeats the same exercise with an interaction term to test whether increased distance between the firm and the lender contribute to shaping financing cyclicality. In particular, 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 (Berger et al. (2005)). Thus, the bank is less interested in (has a looser link with) the local firm. Indeed, Berger et al. (2005) document that larger, more complex banks tend to have shorter, more impersonal lending relationships with firms. Equity issuance is significantly more procyclical for those small firms who have a lender in their pool who has recently joined a MBHC. There is also 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 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.

Finally, in Panel B of Table 6 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.12 shows similar results for any of the firm's lenders joining a MBHC.

4 The Model

The empirical estimates point to financial consolidation as one of the forces shaping small firms' financing cyclicality in recent decades. We study the effects of financial consolidation in a dynamic general equilibrium model where firms can issue equity and borrow, subject to constraints. The model allows us to evaluate the extent of the contribution of financial consolidation to financing cyclicality and to draw implications for the sensitivity of firms' investment and employment to shocks. We will later return to our data to test these implications for the cyclical behavior of firms' investment.

The model builds upon an established class of studies (e.g., Covas and Den Haan (2012); Hennessy and Whited (2005)) and especially shares features with Jermann and Quadrini (2012).[21] Our setup has two distinct dimensions, however. First, we introduce a motive for firms to hold liquidity. This enables us to investigate the comovement of debt issuance, equity issuance and liquidity accumulation. Second, following a broad banking literature (e.g., Sharpe (1990); Rajan (1992); Ongena and Smith (2001); Degryse et al. (2009)), we let firms bargain with banks over the cost of loans, surrendering part of the surplus. This captures the widespread presence of lock-in effects and switching costs in lending relationships between firms and banks, and the imperfect competition among banks (Degryse et al. (2009)). Firms' bargaining over the cost of loans endogenizes their desire for liquidity.

4.1 Time, Agents, and Goods

Time is discrete and infinite (see Figure 1 for the within-period timeline). The economy is populated by firms, households, and banks. There is a final good, which can be produced, invested and consumed, and physical capital. Firms produce the final good using capital and labor. Households supply labor to firms, act as firm shareholders, and finance firms by purchasing bonds and equity. Banks intermediate short-term funds between households and firms.

[21] For more broadly related studies, see also Kiyotaki and Moore (1997), Perri and Quadrini (2018) and Crouzet (2018). Following Jermann and Quadrini (2012), we consider one type of firms in the model. In our setting, allowing for firm heterogeneity (e.g., introducing firms without stock market access, or distinguishing between relatively smaller and relatively larger publicly listed firms), would not give additional insights into the key model mechanisms, which are all based on the relationships between banks and firms, rather than on the market interactions between different firm types. In addition, it would make the analysis significantly more complicated. We leave the construction of this more complex heterogenous-firm setting to future research.

4.2 Firms

Setup. 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 capital, and n_t is labor. Capital evolves according to $k_{t+1} = (1-\delta)k_t + i_t$, where i_t is investment and δ is the depreciation rate.

A firm has access to three forms of external financing: equity issuance, intertemporal debt (bonds) and an intraperiod loan, obtained from a bank. Due to enforcement problems, the amount of intraperiod borrowing from a bank is subject to constraints, as we discuss below. 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 (steady-state) equity payout target $\bar{d}$ 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 debt with equity financing. 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. Specifically, firms face an effective gross interest rate of $R_t = 1 + r_t(1-\tau)$ on their intertemporal debt, where r_t is the interest rate and τ is a tax subsidy.

Firms can carry liquidity (store final good), a_t, between periods. In Jermann and Quadrini (2012), firms need intraperiod bank loans to finance labor expenses at the beginning of a period, subject to borrowing constraints. In our setting, besides intraperiod loans, firms can use accumulated liquidity to cover labor expenses. Carrying liquidity between periods is costly, however, as firms could alternatively reduce their intertemporal debt, b_t, and associated interest payments.

Firms' problem. At the beginning of a period firms must hire labor to produce. If a firm enters the period holding less liquidity than necessary to cover desired labor expenses, it can pay for labor expenses by borrowing via an intraperiod bank loan, l_t. The firm and the lending bank bargain over the net cost e_t per unit of loan.[22] This reveals two benefits to a firm from carrying liquidity. First,

[22]We can think that a firm is locked into a bank at the beginning of the period. Alternatively, one could think that, at

holding liquidity reduces the size of the bank loan that a firm needs, all else equal. Second, as detailed below, it increases the value of the firm's threat point when it bargains with the bank.

To make the bargaining 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.[23] Thus, labor expenses can be written as

$$w_t n_t = l_t + \nu a_t + (1-\nu) a_t \tag{6}$$

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

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

where η is the bargaining power of the firm and γ is the return on the bank's outside option in case of breakdown of the negotiation.[24] 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. Thus, all else equal, the cost of the intraperiod loan will be lower for firms carrying more liquidity. Solving the bargaining problem, the per unit cost of the intraperiod loan is

$$e_t = \frac{(1-\eta)\left[z_t k_t^{\theta} \left(\left(\frac{l_t + a_t}{w_t} \right)^{1-\theta} - \left(\frac{a_t}{w_t} \right)^{1-\theta} \right) - l_t \right] + \eta \gamma l_t}{l_t}. \tag{7}$$

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

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

After cancelling l_t, which is repaid within the same period as it is contracted, substituting from equation

the beginning of the period, banks compete, but once a loan is granted, the firm is locked into the lending bank and the loan contract can be forced into renegotiation. These alternatives would be effectively equivalent in our setting.

[23] See the end of this subsection for further discussion of the ν parameter.

[24] See the end of this subsection for further discussion of the γ parameter.

(7) for $e_t l_t$, substituting in $n_t = \frac{l_t + a_t}{w_t}$ and $l_t = w_t n_t - a_t$, this becomes:

$$\varphi(d) = (1-\delta)k + \eta z k^{\theta} n^{1-\theta} + \frac{b'}{R} + \eta(1+\gamma)a + (1-\eta) z k^{\theta} (\frac{a}{w})^{1-\theta} - b - k' - a' - \eta(1+\gamma)wn. \quad (8)$$

Finally, since the enforceability of loan obligations is imperfect, a firm's ability to borrow is limited. Specifically, at the end of the period, the firm can choose to default on the intraperiod loan l_t. After producing and paying costs, 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 lending bank can 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, $l_t + a_{t+1} + (1-\nu)a_t$. Then, the lender's enforcement constraint is:[25]

$$\xi_t (k_{t+1} - \frac{b_{t+1}}{1+r_t}) \geq w_t n_t - \nu a_t. \quad (9)$$

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 whose changes are referred to as a "financial shock".

Discussion*.* Two parameters of our setup deserve additional 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 lending bank can

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

verify, i.e. that the firm cannot walk away with, in the event of default. Since the lender can recoup this fraction of liquidity, it functionally acts as collateral.

The γ parameter governs the value of the lender's outside option in case the firm and the lender do not agree to an intraperiod loan. Thus, it is assumed a bank can invest the funds, l_t, in the event of a negotiation breakdown, but at a lower net benefit. For example, we could think that banks have access to a superior storage technology that yields a non-zero net benefit.

Firms' decisions. Let V(**s**;k,b,a) be the cum-dividend value of a firm, where **s** is the aggregate states. A firm's optimization problem is given by

$$V(\mathbf{s}; k, b, a) = \max_{d,n,k',b',a'} \{d + Em'V(\mathbf{s}'; k', b', a')\} \tag{10}$$

subject to the firm's budget constraint (BC) in (8) and the enforcement (borrowing) constraint (EC) in (9). Let λ and μ denote 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 and using the envelope conditions for k, b and a gives the FOCs:

$$\mathbf{a}': \; Em' \cdot \Bigg(\underbrace{\mu'\nu}_{\text{EC loosening}} + \frac{1}{\varphi_d(d')} \Bigg(\underbrace{\eta(1+\gamma) + (1-\eta)(1-\theta) z' k'^{\theta} (\frac{a'}{w'})^{-\theta} \cdot \frac{1}{w'}}_{\text{Negotiation Benefit}} \Bigg) \Bigg) = \frac{1}{\varphi_d(d)}. \tag{11}$$

Accumulating liquidity 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 absconded from the lender (and thus acts as collateral). It 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. Accumulating liquidity, however, reduces dividend payments, tightening the BC this period by $\frac{1}{\varphi_d(d)} = \lambda$.

$$\mathbf{b}': \quad \frac{1}{\varphi_d(d)} \cdot \frac{1}{R} = \frac{\mu\xi}{1+r} + Em' \cdot \left(\frac{1}{\varphi_d(d')} \right) \tag{12}$$

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

$$\mathbf{k}': \; Em' \cdot \left\{ \left(\frac{1}{\varphi_d(d')} \right) \cdot (1 - \delta + \eta\theta z' k'^{\theta-1} n'^{1-\theta} + (1-\eta)\theta z' k'^{\theta-1} (\frac{a'}{w'})^{1-\theta}) \right\} + \xi\mu = \frac{1}{\varphi_d(d)}. \tag{13}$$

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

$$\mathbf{n}: \quad (1-\theta) z k^{\theta} n^{-\theta} = \frac{\varphi_d(d)\mu + \eta(1+\gamma)}{\eta} \cdot w. \tag{14}$$

Hiring labor increases production. However, it tightens the EC through requiring a larger bank loan l and tightens the BC through the wage payment and increasing the loan cost.

4.3 Households, Banks, and General Equilibrium

There is a continuum of identical households that consume (c_t) and supply labor (n_t) to firms. Households also act as firm shareholders and hold firm bonds (b_t). Thus, they solve the problem:

$$\max_{n_t, b_{t+1}, s_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t U(c_t, n_t) \tag{15}$$

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

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 on bonds, 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 households' FOCs for labor n_t, bond holdings b_{t+1}, and equity holdings s_{t+1} read respectively:

$$w_t U_c(c_t, n_t) + U_n(c_t, n_t) = 0, \tag{16}$$

$$U_c(c_t, n_t) - \beta(1+r_t) E U_c(c_{t+1}, n_{t+1}) = 0, \tag{17}$$

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

The aggregate states $\mathbf{s}$ comprise 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.

As in Jermann and Quadrini (2012), banks are simply intermediaries of short-term funds: they borrow funds from households, lend them to firms and, within the same period, collect their intraperiod loans and pay funds back to households.[26] A general equilibrium is defined as follows:

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 24-26; (ii) firms' policies are optimal and* $V(\mathbf{s},k,b)$ *satisfies the Bellman equation 10; (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.

5 Model Analysis

The empirical evidence reveals a change in the cyclical financing behavior of small firms in the post-financial consolidation period relative to the pre-consolidation period. It suggests that firms with low bargaining power vis-à-vis lending banks and a high value for the banks' outside option (i.e. a weaker relationship between firm and bank) play a role in the post-consolidation 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 firms' bargaining power vis-à-vis their lending banks (high η) and a low value for the banks' outside option (low γ). We are going to see that in this "pre financial

[26] Banks immediately consume the net profits, $e_t l_t$, stemming from their bargaining with firms. Alternatively, we could assume that banks are owned by households and distribute profits to households as a lump-sum payment. We show in the Appendix that this does not have a meaningful impact on the results.

consolidation" world, the impulse response functions (IRFs) for equity issuance and liquidity accumulation are consistent with the countercyclical patterns of large firms and small firms detected for the period before the financial consolidation of the late 1990s. However, when η and γ are varied to reflect a state of the world with financial consolidation and widespread interstate banking (i.e. low firms' bargaining power and a high value for the banks' outside option), then equity issuance and liquidity accumulation increase in response to a positive shock, consistent with the procyclical behavior of smaller firms detected for the period post financial consolidation. 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 7, we show evidence that TFP shocks are in fact what drive the empirical results. Finally, the response of debt issuance remains procyclical across all parameter values, in line with the empirical findings.

5.1 Calibration

The model is calibrated to US data at the quarterly frequency and solved numerically by local approximation around the non-stochastic steady state. Table 7 displays the calibrated values of the parameters. In total, there are 17 parameters to be chosen. Two parameters refer to households' preferences: the discount factor, β, and the disutility of work parameter, α, which is found in the household's utility function of the form $U(c, n) = \ln(c) + \alpha \cdot \ln(1 - n)$. Five parameters refer to the business sector. Two of them govern firms' production technology: the share of capital in the Cobb Douglas production technology, θ, and the capital depreciation rate, δ. Two refer instead to the tax advantage of debt, τ, and to the issuance cost of equity, κ. A fifth parameter, ν, pins down the value of firm liquidity as collateral. Eight parameters refer to the aggregate shock processes: the mean value of the productivity shock, $\bar{z}$, the mean value of the financial shock, $\bar{\xi}$, the standard deviation of the productivity shock, σ_z, the standard deviation of the financial shock, σ_ξ, and the four elements of the

A matrix that govern the process of the shocks. Finally, two parameters refer to the banking sector: the bargaining power of firms vis-à-vis banks, η, and the banks' outside option value, γ. We detail the choice of the two bank parameters in the following section.

As described below, several of the 17 parameters are standard in the related literature and we choose them based on conventional estimates of prior literature or standard business sector observations. We choose the remaining parameters to match targets in the data. The disutility of work parameter α is set such that hours worked, n, equals 0.3 in steady state to be consistent with time-use surveys that show a typical person devotes approximately 30% of their time endowment to work. The Cobb-Douglas production function of the firm has a capital share parameter θ equal to 0.36, in line with conventional macro models. 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 nearly all of our sample period. This value of τ (in conjunction with the other calibrated parameters) guarantees that the enforcement constraint is always binding in our simulated responses. The product of the discount parameter, β, and the parameter for the value of firm liquidity as collateral, ν, contributes to shaping firms' desire to hold liquidity. If the desire to carry liquidity between periods is very high, then firms will cover all wage costs with accumulated liquidity. Our choice of these parameters implies that, in conjunction with the bank parameters, the fraction of wage bill financed with internal liquidity is consistent with the fraction implied by aggregate business sector data (i.e. Federal Reserve Flow of Funds and NIPA data).[27] A higher β and a lower ν (for example increasing β from 0.9 to 0.97 and simultaneously decreasing ν from 0.25 to 0.1) would imply a similar fraction of liquidity to wage bill. The productivity shock, z, is normalized to a mean of 1. We set the mean value of the financial shocks, $\bar{\xi}$, to target a steady state debt to GDP ratio close to 3.4, which is the average quarterly debt to GDP ratio of the non-financial business sector (see Jermann and

[27]Compustat data do not provide information on wages.

Quadrini (2012)). The equity issuance cost, κ, does not affect the steady state values, but influences the responsiveness of equity payouts to shocks. We choose κ to generate a variance in equity payouts that matches the variance observed in our data.

Besides the mean values of the shocks $\bar{z}$ and $\bar{\xi}$, there are 6 other parameters that govern the properties of the TFP shock and the financial shock. These parameters are derived from our empirical estimates of the shocks and the corresponding autoregressive system. To create the baseline measures of the shocks, we replicate the methodology of Jermann and Quadrini (2012) and extend their series through 2017. In particular, as detailed in the Appendix, we extract the level of productivity (z) as a Solow residual of the production function and the financial tightness (ξ) from the binding enforcement constraint. This series of estimated shocks provides the standard deviations, σ_z and σ_ξ, for the model. The values of the 2x2 $\mathbf{A}$ matrix estimated in the autoregressive system are used to govern the shock processes in the model.

5.2 Simulated Responses and Financial Consolidation Regimes

We subject two different steady states to productivity (TFP) and financial shocks. The two steady states are characterized by different values of the bank parameters η and γ. Table 7 (bottom panel) shows selected steady state moments (targeted or untargeted).

The first steady state mimics the pre-financial consolidation state, and we refer to it as the "stronger borrowers" state. In our preferred calibration, we set the firm bargaining power parameter, η, to 0.99 and the bank outside option parameter, γ, to 0.01 (see below for a sensitivity analysis). The bargaining power parameter value of 0.99 approximates the case of full firm bargaining power, as found, e.g., in Jermann and Quadrini (2012) and Diamond and Rajan (2001). While a mapping between indicators of bank concentration and bargaining power is hard to establish, the Herfindahl-Hirschman (HHI) indices of bank loans and assets point to a highly fragmented and very competitive US banking sector prior to the consolidation process: for example, the mean Herfindahl for bank loans was only 75 before 1994 (see Figure A.1 in the Appendix). Using US data for the pre-consolidation period, Rocheteau et al. (2018) estimate a slightly lower bargaining power of firms vis-à-vis banks in loan negotiations (0.85); however, their focus is on micro and small privately-held firms, which tend to be in a weaker position vis-à-vis banks (in sensitivity analysis, we will nonetheless consider a 0.85 bargaining power in the pre-consolidation state). The bank outside option parameter, γ, is chosen such that (in conjunction with the other calibrated parameters above) the model can match the equity issuance to output ratio observed in our data in the pre-consolidation period. The chosen value of γ (0.01) approximates the case where the bank simply stores funds at zero net benefit within the period in the event of no agreement with the firm. This is akin to what is found in Diamond and Rajan (2001), for example, where a lender's only outside option is liquidation.

Panel (a) of Figure 2 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. Note that debt issuance and liquidity accumulation are zero in steady state, as shown in Table 7. Thus, the IRFs show the absolute (percentage point) deviation for each financing variable. Consistent with Jermann and Quadrini (2012), the financing variables are scaled by output. 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-financial consolidation period. Liquidity accumulation essentially does not respond to a shock. Since liquidity acts as a buffer to increased bargaining costs, when firms have a high value of η they do not need to respond to shocks by adjusting liquidity holdings, as banks are anyway unable to extract a meaningful amount of surplus in the bargaining process.

In the second steady state, which mimics the post-financial consolidation state, we reduce the firm bargaining power parameter from 0.99 to 0.7 and increase the bank outside option parameter to

0.04. We pick a value for the bargaining power (0.7) in between those estimated with US data for the post-consolidation period by Petrosky-Nadeau and Wasmer (2011) (0.73) and Liberati (2018) (0.78) on one side and, on the other side, by Petrosky-Nadeau and Wasmer (2013) (upper bound of 0.63) and Bethune et al. (2022) (0.58, focusing on micro and small privately-held firms). In this second steady state, we increase the bank outside option parameter, γ, to 0.04 so that (in conjunction with the above calibrated parameters) the model can match the equity issuance to output ratio observed in our data in the post-consolidation period. The change in the bargaining power parameter and in the bank outside option parameter acts to illustrate the effects of financial consolidation on smaller firms, i.e. those in which we see empirical evidence that the bank's bargaining power and outside option matter following the financial consolidation of the 1990s.

In Panel (b) of Figure 2, 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 is smaller; however, the direction of the response remains the same as in the pre-financial consolidation steady state. In contrast, equity issuance and liquidity accumulation now respond positively to a positive TFP shock, i.e. they display a procyclical pattern.

The difference in the responses in the post-consolidation steady state, relative to the pre-consolidation state, can be interpreted as an enhanced incentive for firms to accumulate precautionary liquidity and, thus, to issue equity. Anticipating a relevant surplus extraction by banks, firms have an increased appetite for liquidity when productivity rises. To finance this liquidity accumulation, they issue more equity when a TFP shock hits. A positive financial shock, by contrast, relaxes firms' access to financing, reducing the need for precautionary liquidity.

In the Appendix, we perform a comprehensive sensitivity analysis, altering the parameter η for firms' bargaining power vis-à-vis banks in a reasonably ample neighborhood of our preferred calibration. The results appear to be robust to such alternative calibrations of the pre- and post-consolidation bargaining power. In Figure 3, for example, we display the IRFs under two alternative calibrations. In one, we set firms' bargaining power in the pre-consolidation steady state to 0.93, while retaining the 0.7 value for firms' bargaining power in the post-consolidation steady state. In a second alternative, we further reduce firms' bargaining power in the pre-consolidation steady state to a more conservative value of 0.85, while raising it in the post-consolidation steady state to 0.75. The insights we draw are essentially unchanged relative to our preferred calibration.

6 Investment and Employment: From Model to Data

We investigate the implications of financial consolidation for the cyclical investment and employment behavior of smaller firms.

As seen in equation 13, the first order condition for capital, there are three main mechanisms by which a TFP shock impacts a firm's demand for capital: a "Surplus Appropriation Channel", $\eta\theta z' k'^{\theta-1} n'^{1-\theta}$; a "Financial Channel", $(1-\eta)\theta z' k'^{\theta-1}(\frac{a'}{w'})^{1-\theta}$; and a "Collateral Channel", $\xi\mu$. First, increased productivity leads to higher output. The lending bank will want to extract this surplus during the bargaining phase; the firm's bargaining power, η, determines how much of the surplus the firm can keep. The less surplus the firm can keep, the lower its demand for capital ("Surplus Appropriation Channel"). Second, as noted, the liquidity holdings of the firm are used as the threat point in bargaining with the bank, as they can be used to hire labor. This benefit of liquidity is stronger when the capital stock is larger. Thus, capital provides a stronger benefit through this financial channel for firms with more accumulated liquidity ("Financial Channel"). Third, capital benefits the firm for its role as collateral in the enforcement constraint ("Collateral Channel").

Figure 4 shows the IRFs for each of these three components (Surplus Appropriation, Financial, Collateral) in response to a positive TFP shock to the "stronger borrowers" (pre-financial consolidation) steady state and the "weaker borrowers" (post-financial consolidation) steady state.[28]

[28] Appendix Figure 5 shows the same IRFs for a positive financial shock.

Capital increases more in the "stronger borrowers" state than in the "weaker borrowers" state via the Surplus Appropriation mechanism. This reflects the fact that the higher bargaining power of stronger borrowers limits banks' 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, the channel most closely related to financial consolidation increases the sensitivity of the weaker borrowers. That is, the increased procyclicality in corporate financing results in higher investment sensitivity. Interestingly, the Collateral Channel shows minimal difference between the "stronger borrowers" and the "weaker borrowers" state. We now turn to investigate empirically whether financial consolidation indeed resulted in higher investment sensitivity for smaller firms.

Observe first that, given the above evidence on the cyclicality of firm financing, we would expect smaller firms to reduce equity issuance and liquidity accumulation in response to a negative shock, but only during the post-financial consolidation period. Appendix Table A.14 shows the change in the financing variables of interest in 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). As expected, small firms see a large decline in equity issuance and liquidity accumulation in those years (relative to positive growth years) and, as seen in Panel B, this holds true post-1999 only.

Next, in Appendix Table A.15 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 revealed 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

Table 8, it is again only small firms that experience a significant difference from pre-1999 to post-1999. This suggests that the increased procyclicality of financing for smaller firms may also have resulted in increased sensitivity of investment and employment (as shown in Appendix Table A.16, the conclusion carries through when restricting the focus to those firms that entered the Compustat sample prior to 1990 and were also in the sample in 2017).

To further isolate the Financial Channel, we also split small firms by their liquidity position leading into the post-1999 period. Specifically, "low liquidity position" ("high liquidity position") firms are small firms with a cash-to-asset ratio in 1996-1998 at or below (respectively, above) the median. In the terminology of our model, firms with a low liquidity position should have a lower threat point and be in a weaker position to counter the effects of financial consolidation; thus, they should be more sensitive in the post-financial consolidation period. Panel B of Table 8 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 investment sensitivity for those firms most affected.

7 Financial and TFP Shocks

In the model, following financial consolidation, the increase in the procyclicality of equity issuance and liquidity accumulation occurs only in response to TFP shocks. A further way to verify whether the financial consolidation mechanism can help explain the empirical patterns is then to test whether in the data the procyclicality of equity issuance and liquidity accumulation of small firms is due to TFP shocks during the post-1999 period.

Using the TFP and financial shock series constructed above, in the baseline empirical panel specification we replace the cyclical component of real corporate GDP with the one-year lagged value of these shocks. Since the firm financing data are 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 in Table 9 for smaller firms and in Appendix Table A.13 for both smaller and larger firms, split by the pre-1999 and post-1999 periods. In the pre-1999 period, the results of small and large firms are similar: a positive financial shock (i.e. a loosening of the financial constraint) is associated with an increase in debt issuance and a decrease in equity issuance and 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 pre-1999.

In the post-1999 period (i.e. following financial consolidation), the financing behavior of large firms remains qualitatively unchanged; however, smaller firms see a 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. This matches the increase in the procyclicality of equity issuance and liquidity accumulation in the latter period. The importance of TFP shocks is also consistent with the above IRFs: in the model the increase in the procyclicality of equity issuance and liquidity accumulation occurs for TFP shocks.

Finally, we can compare the magnitude of the equity issuance response in our model to the empirical estimates. In the model, equity issuance for weak borrowers increases by 2% over the first four quarters following a positive TFP shock (an increase of 0.35 percentage points from the steady state value of 17.3%). In Table 9, we estimate that small firms' annual equity issuance increases by 2.43 percentage points in response to a positive TFP shock. This is an increase of 9% relative to the post-1999 average of 26% for small firms' equity issuance. Thus, the model explains approximately two-ninths, or 22%, of the equity issuance response to TFP shocks.

8 Conclusion

The consequences of financial consolidation for the non-financial sector have generated an intense debate in recent decades. This paper studies the effect of financial consolidation on the behavior of firms' financing and investment over the business cycle. We find that a weakening of their bargaining power vis-à-vis banks and a fraying of the relationships with banks leads small and medium-sized publicly-traded firms to more intensely issue equity and accumulate precautionary liquidity during expansions. This behavior contrasts with the countercyclical equity and liquidity behavior of larger publicly-traded firms and appears to reflect at least in part the attempt of small and medium-sized firms to offset their weakened position vis-à-vis larger and more complex financial institutions. This effect on cyclical financing behavior turns out to have far-reaching consequences for firms' investment: small and medium-sized firms' investment become significantly more sensitive to shocks as a result of the change in the cyclicality of financing.

The paper leaves open relevant questions. Equity issuance and liquidity hoarding can entail relevant costs. Thus, it is important to evaluate the welfare implications of 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 for issuing equity. The results of this analysis may then constitute a lower bound of the actual effects of financial consolidation through cyclical financing and investment patterns. We leave these and other issues to future research.

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Figure 1: Within-Period Model Timeline

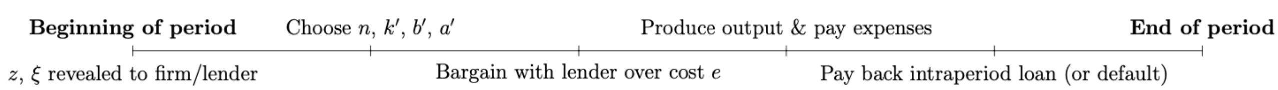
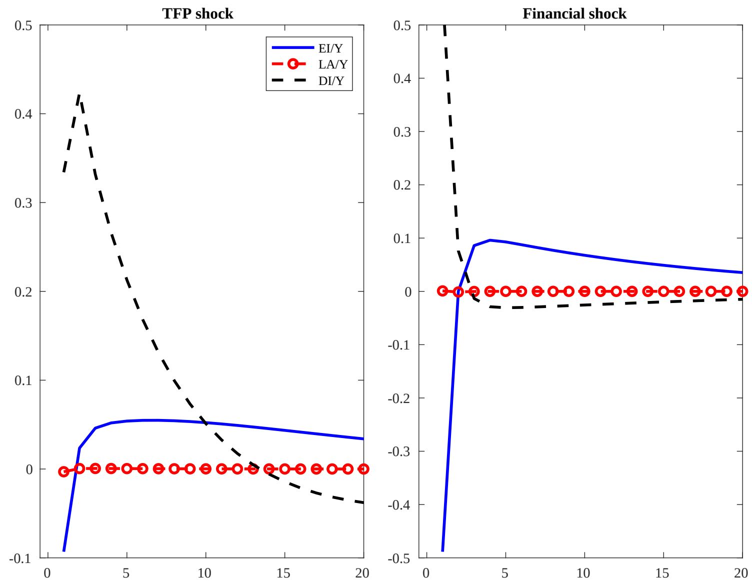
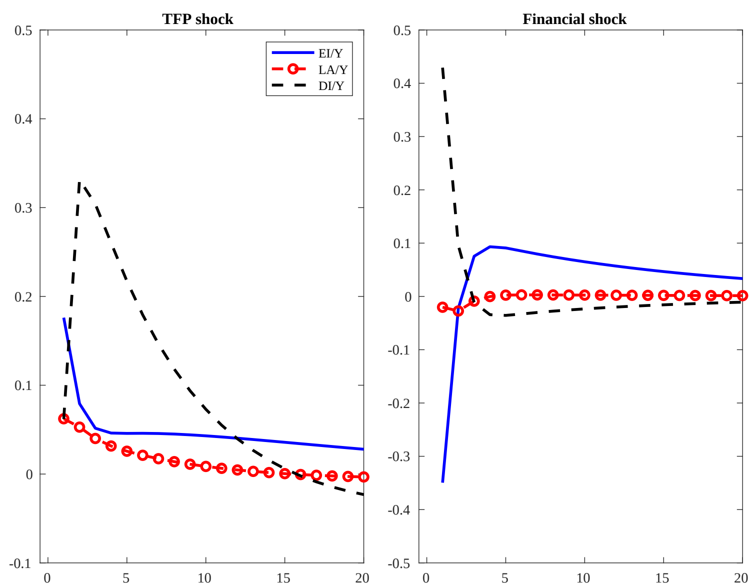


Figure 2: IRFs of Financial Variables to Positive TFP & Financial Shocks

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



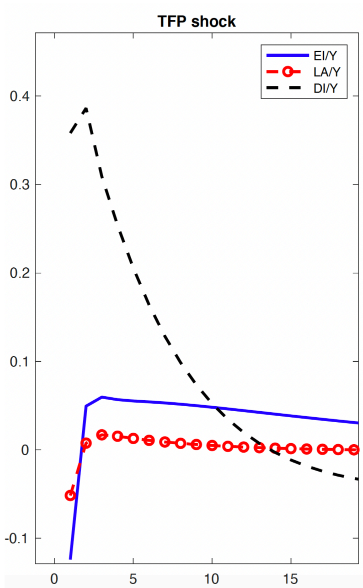
(b) Weaker Borrowers: Low Bargaining Power / High Bank Outside Option



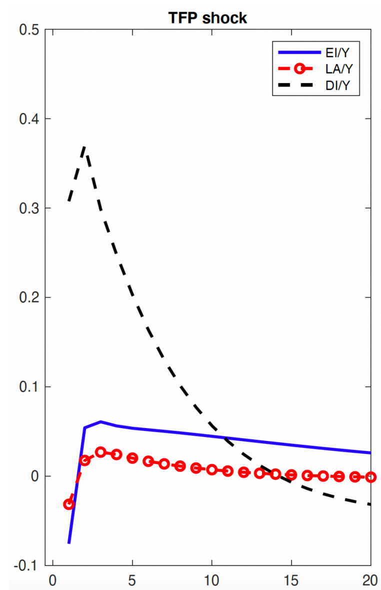
This figure plots the impulse responses of equity issuance (EI), liquidity accumulation (LA) and debt issuance (DI) for a one standard deviation positive TFP shock (left column) and financial shock (right column). Panel (a) shows the impulse response when the firm bargaining power parameter is set high and bank outside option is set low. Panel (b) shows the opposite. See Section 5.2 for details. The y-axis is percent deviation from the steady state value for the ratio of the financing variable to output.

Figure 3: IRFs of Financial Variables: Robustness to Bargaining Power Parameter

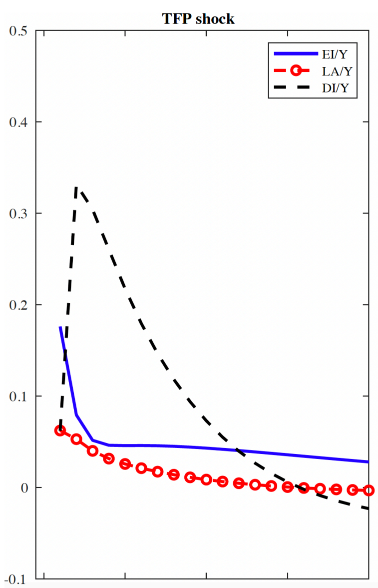
(a) Stronger Borrowers w/ $\eta = 0.93$



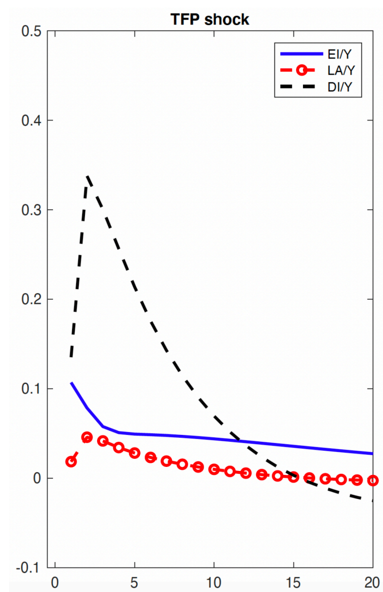
(b) Stronger Borrowers w/ $\eta = 0.85$



(c) Weaker Borrowers w/ $\eta = 0.7$

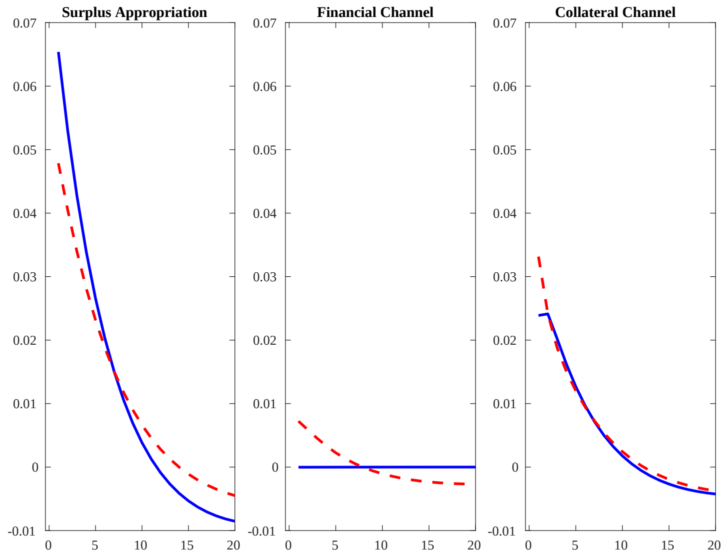


(d) Weaker Borrowers w/ $\eta = 0.75$



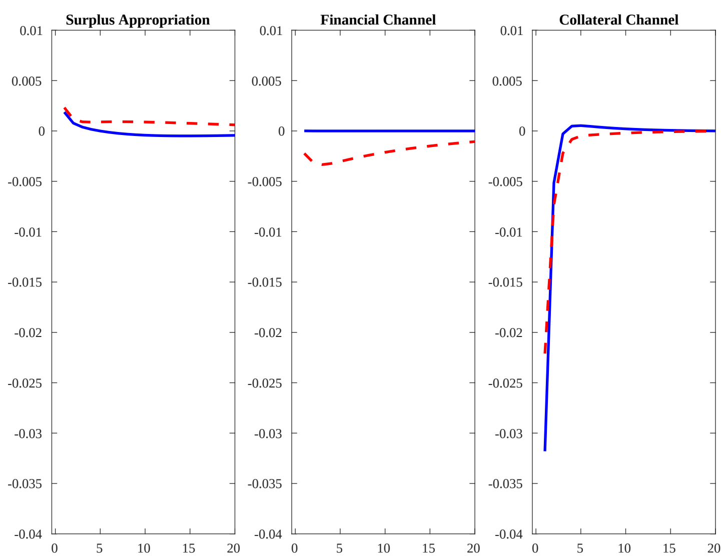
This figure plots the impulse responses of equity issuance (EI), liquidity accumulation (LA) and debt issuance (DI) for a one standard deviation positive TFP shock. As in the baseline, the bank's outside option (γ) equals 0.01 in the Stronger Borrowers state and 0.04 in the Weaker Borrowers state. See Section 5.2 for further details. The y-axis is percent deviation from the steady state value for the ratio of the financing variable to output.

Figure 4: IRFs of 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.

Figure 5: IRFs of 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 1: Cyclicality of Aggregate Financing Variables, by Size

	Panel A: 1981-2017			Panel B: 1981-1998			Panel C: 1999-2017		
	DI	EI	LA	DI	EI	LA	DI	EI	LA
Small Firms	0.495***	0.276*	0.180	0.556**	-0.487**	-0.367	0.575**	0.509**	0.336
	(0.147)	(0.162)	(0.166)	(0.208)	(0.218)	(0.233)	(0.198)	(0.209)	(0.228)
Large Firms	0.622***	-0.430***	-0.276*	0.691***	-0.557**	-0.262	0.653***	-0.414*	-0.307
	(0.132)	(0.153)	(0.162)	(0.181)	(0.208)	(0.241)	(0.184)	(0.221)	(0.231)
All Firms	0.588***	-0.086	-0.038	0.648***	-0.484**	-0.323	0.647***	0.110	0.061
	(0.137)	(0.168)	(0.169)	(0.19)	(0.219)	(0.237)	(0.185)	(0.241)	(0.242)

This table displays the correlations between the cyclical component of HP-filtered annual real corporate GDP and the aggregate series of debt issuance, equity issuance and liquidity accumulation. 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. We follow a similar methodology as Eisfeldt and Muir (2016) and Covas and Den Haan (2011) in constructing them. 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, with a smoothing parameter set to 100. 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. In Appendix Table A.2 we show that the results also hold with the non-filtered financing series and annual GDP growth or filtering the financing series and GDP as in Hamilton (2018). Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2: Firm-Level Cyclicality of Financing Variables

Panel A: Baseline Specification

	1981-1998			1999-2017		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	6.41***	-10.74***	-8.61***	4.04***	**11.12****	**3.56**
	(1.631)	(3.569)	(2.964)	(0.898)	**(3.942)**	**(3.464)**
Large Firms	8.80***	-2.92**	-2.51**	6.08***	-1.42**	-1.12
	(1.436)	(1.195)	(1.158)	(1.323)	(0.592)	(1.081)
SF Observations	36,981	40,616	40,616	33,899	39,363	39,363
LF Observations	18,891	20,874	20,874	17,375	19,698	19,698
		p-values			p-values	
$H_0 : small = large$	0.040	0.006	0.009	0.179	0.003	0.108

Panel B: With-In Firm Variance in Continuous Size Measure

	1981-1998			1999-2017		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Cyclical GDP	6.59***	-6.52**	-3.47	4.61***	6.95***	2.95
	(1.430)	(2.312)	(2.257)	(0.629)	(2.377)	(2.392)
Cyclical GDP x Size	0.35	8.32***	6.29***	1.51*	-8.62***	-4.20**
	(0.919)	(2.435)	(1.659)	(0.847)	(2.288)	(1.501)
Observations	44,680	49,118	49,118	41,634	47,965	47,965
					p-values	
$H_0 : Interaction\ in\ Pre_{1999} = Post_{1999}$				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. 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. Post-1999 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. In Panel B, the 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. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 3: State-Level Timing of Riegle-Neal Adoption

	1981-1998			1999-2009			1999-2019		
	DI	EI	LA	DI	EI	LA	DI	EI	LA
GDP	5.35***	-11.63***	-9.62**	5.09***	11.83*	6.43	4.88***	12.31***	5.12
	(1.632)	(3.553)	(3.332)	(0.565)	(5.475)	(5.382)	(0.822)	(4.256)	(3.927)
$adopt_{1996}$ x GDP	2.45	-1.53	-0.29	-1.56*	0.35	-2.18*	-1.14	-1.12	-1.14
	(1.788)	(2.517)	(1.754)	(0.770)	(3.491)	(1.113)	(0.955)	(2.263)	(1.323)
$adopt_{1997}$ x GDP	0.95	4.09	4.30***	-0.84	-8.26***	-6.82**	-1.65	-6.35**	-4.38*
	(1.108)	(2.719)	(1.303)	(0.986)	(2.486)	(2.486)	(1.155)	(2.976)	(2.293)
Observations	36,537	40,117	40,117	21,913	25,763	25,763	32,697	38,005	38,005

This table displays the estimates of regressing the financing variable of interest on the cyclical component of HP-filtered real corporate GDP. This GDP measure is interacted with an indicator for the year of state-level Riegle-Neal adoption. State-level fixed effects are included and controls for 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 4: Reduction in Small Firm's Bargaining Power, Syndicate Structure

Panel A: Number of Lenders

	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 Share

	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 on the cyclical component of HP-filtered real corporate GDP and an interaction with the number of lenders in the "All Lender Pool" or the percentage of a firm's total syndicated loans contributed by the lead lender(s) during the 1985-1998 and 1999-2012 periods. 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: Reduction in Small Firm's Bargaining Power, Lender Market Power

Panel A: Bank Merger, 1985-2012

	All Lender Pool			Lead Lender Pool		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	6.76***	7.28**	0.04	6.66***	7.00*	-0.01
	(2.238)	(3.419)	(1.500)	(2.145)	(3.443)	(1.485)
Acquired x GDP	0.26	9.60**	7.00**	0.24	7.36**	6.44*
	(2.724)	(3.821)	(3.354)	(3.451)	(3.559)	(3.234)
Observations	18,572	21,181	21,181	18,349	20,928	20,928
R^2	0.007	0.020	0.004	0.007	0.020	0.004

Panel B: Size of Merger, 1999-2012

	All Lender Pool			Lead Lender Pool		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	8.99***	13.66	1.24	8.93***	13.16	1.12
	(1.242)	(8.311)	(3.279)	(1.274)	(8.326)	(3.267)
Acquired x GDP	1.25	5.06	6.53	0.88	3.50	5.36
	(2.506)	(3.551)	(3.982)	(2.034)	(3.667)	(3.699)
Size x Acquired x GDP	-3.23	23.38***	10.56***	-11.07	20.65**	11.41**
	(5.799)	(4.974)	(3.372)	(10.322)	(9.529)	(3.984)
Observations	9,091	10,654	10,654	8,892	10,435	10,435
R^2	0.017	0.024	0.004	0.016	0.024	0.004

Panel C: By Size of Lender Pool, 1999-2012

	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)
Acquired 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

This table displays the estimates of regressing the financing variable of interest on cyclical GDP and an interaction with a flag for a lender in a firm's "All Lender Pool" or "Lead Lender Pool" being acquired by another lender during the previous five years. Firms with few (many) lenders are those with a below-average (above-average) number of lenders in their "All Lender Pool". *Size* is the percentage increase in the bank due to the merger, standardized to unit variance. 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: Increase in Small Firms' Lender Relationship Complexity, MBHC Status

Panel A: Baseline Specification

	All Lender Pool			Lead Lender Pool		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	9.63***	12.13	0.64	9.55***	12.07	0.71
	(1.144)	(7.925)	(3.089)	(1.233)	(7.999)	(3.093)
JoinMBHC x GDP	-4.32*	16.85**	9.31	-5.26**	12.67*	8.03
	(2.196)	(7.124)	(5.471)	(1.788)	(6.039)	(5.123)
Observations	9,186	10,761	10,761	9,015	10,572	10,572
R^2	0.016	0.025	0.005	0.017	0.025	0.005

Panel B: By Size of Lender Pool

	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 on cyclical GDP and an interaction with an indicator for a lender in the "All Lender Pool" or the "Lead Lender Pool" that joined a multi-bank holding company in the previous 5 years during the 1999-2012 period. 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 7: Calibration

Households' preferences		*Aggregate shock processes*	
Discount factor	$\beta = 0.9$	Mean of productivity shock	$\bar{z} = 1$
Disutility of work	$\alpha = 1.53$	Mean of financial shock	$\bar{\xi} = 0.4826$
Business sector		Standard deviation: productivity shock	$\sigma_z = 0.006$
Production technology	$\theta = 0.36$	Standard deviation: financial shock	$\sigma_\xi = 0.0087$
Depreciation rate	$\delta = 0.025$	Matrix for the shocks process	$\begin{pmatrix} 0.9736, -0.0287 \\ 0.1509, 0.9363 \end{pmatrix}$
Tax advantage of debt	$\tau = 0.35$		
Payout cost parameter	$\kappa = 0.05$		
Value of liquidity as collateral	$\nu = 0.25$		

Bank Parameters and Selected Steady State Values

	Stronger Borrowers ($\eta = 0.99$, $\gamma = 0.01$)	Weaker Borrowers ($\eta = 0.7$, $\gamma = 0.04$)
Selected targeted		
Equity Issuance to output, ei/y	-0.121	-0.173
Labor, n	0.300	0.300
Selected untargeted		
Equity payout, d	0.076	0.108
Debt issuance to output, di/y	0.000	0.000
Liquidity accumulation to output, la/y	0.000	0.000

This table displays the baseline parameter values and steady state values of the general equilibrium business cycle model. Note that Equity Issuance to Output and Labor are targeted moments in the model.

Table 8: Firm-Level Cyclicality of Real Variables

	Panel A: Baseline Specification					Panel B: By Liquidity Position, Small Firms			
	1981-1998		1999-2017			Low Liquidity Position		High Liquidity Position	
	Inv.	Emp.	Inv.	Emp.		Inv.	Emp.	Inv.	Emp.
Small Firms	-1.35	-1.86	2.53***	12.49***	GDP	-2.55***	-7.32*	-1.02	2.83
	(0.886)	(3.692)	(0.753)	(3.344)		(0.831)	(3.849)	(0.969)	(3.720)
Large Firms	0.94	9.53**	2.26**	10.34***	D_t^{post}	5.05***	16.83***	3.26***	8.72
	(1.006)	(4.42)	(0.943)	(3.273)		(1.005)	(4.844)	(1.145)	(5.454)
SF Obs.	39,893	38,235	39,129	37,331	SF Obs.	25,918	24,973	24,700	23,988
LF Obs.	20,473	20,272	19,579	19,211	R^2	0.007	0.014	0.011	0.029
		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. D_t^{post} is an indicator for the years 1999-2017. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. In Panel B, Liquidity Position is determined by the median cash-to-assets ratio for the years 1996-1998. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Response of Financing Behavior to Positive TFP and Financial Shocks

	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

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. Small firms are those with book value of assets below the 60th percentile in a given year. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Online Appendix

This online Appendix contains, for the empirical analysis, details on the construction of the financing variables (A.1) and evidence that the change in smaller firm behavior occurred around 1999 (A.2); and, for the model, the derivation of the enforcement constraint (A.3), details on households' FOCs (A.4), robustness for the alternative apportioning of bank profits (A.5) and details on the computation of TFP and financial shocks (A.6).

A.1 Details on the Construction of Financing Variables

We describe below some additional technical details on the construction of the financing variables and on the filtering of the aggregate financing series. This complements the discussion in Sections 2 and 3.

As in Covas and Den Haan (2011), two additional specific restrictions are made. First, we remove General Electric, General Motors, Ford and Chrysler, which were strongly affected by the FASB94 accounting rule instituted in 1988. Second, 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.

When calculating net debt issuance, DLCCH is subtracted for firms with an scf code of 1. 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.[1] For firms with a data code of 4, DLCCH was assumed to be included in DLTIS, so DLCCH was set to zero.

When calculating net equity issuance, missing values of DV are set to zero in order to avoid too many missing values for net equity issuance. We also show in the Robustness section that using net

[1] Chang, X., Dasgupta, S., Wong, G., and Yao, J. (2014). Cash-flow sensitivities and the allocation of internal cash flow. *The Review of Financial Studies*, 27(12):3628-3657.

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.

When calculating liquidity accumulation, we use the balance sheet version of cash, rather than the cash flow statement version (CHECH), as CHECH is unavailable prior to 1984. We show in the Robustness section that the results hold using either version, as well as using change in cash only (CH_t - CH_{t-1}), i.e. excluding cash equivalents.

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

A.2 Identifying the Structural Break

In the empirical analysis, we use 1999 as the year in which small firms experienced a structural break in their financing behavior. To provide evidence of the suitability of this choice, we regress the aggregate financing 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. Appendix Figure A.5 plots 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.

Similarly, we also re-estimated the baseline panel results using different break years. 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. The results for liquidity accumulation are similar, with the p-value falling below 0.1 in 1999. Thus, 1999 is the strongest candidate for a structural break in the cyclicality estimates. The literature discussed above shows an increase in financial consolidation beginning in the mid-1980s.

[2] Diallo, I. (2018). HAMILTONFILTER: Stata module to calculate the Hamilton filter for a single time series or for a panel dataset. Boston College Department of Economics.

This could explain why the p-values of our Wald tests decrease throughout much of the 1990s.

A.3 Proof of the Enforcement Constraint

The following proof of equation 9 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 towards creditors (bank and bondholders) equal to $l_t + \frac{b_{t+1}}{1+r_t}$. 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 by the defaulting firm; 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 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 9) is unaffected by this assumption. Note also that it is effectively immaterial the assumption one makes about the degree of priority of workers relative to the bank in case of firm default. It could be that in the event of default the workers have absolute priority, so that the deferred labor expenses effectively reduce the net resources appropriated by the bank. It could alternatively be that workers are junior to the bank (or intermediate cases between these two polar ones). We now consider the two cases of ξ_t.

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

In renegotiation, the firm must pay the 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 above, 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:

$$Em_{t+1}V_{t+1} - k_{t+1} + \frac{b_{t+1}}{1+r_t}. + l_t + (1-\nu)a_t \tag{19}$$

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

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:

$$Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t \tag{20}$$

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

$$Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t - \xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \tag{21}$$

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:

$$Em_{t+1}V_{t+1} \geq .Em_{t+1}V_{t+1}. + l_t + (1-\nu)a_t - \xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \tag{22}$$

Thus, we get our enforcement constraint:

$$\xi_t(k_{t+1} + \frac{b_{t+1}}{1+r_t}) \geq l_t + (1-\nu)a_t = w_t n_t - \nu a_t \tag{23}$$

A.4 Households' FOCs

The households' FOCs for labor n_t, bond holdings b_{t+1}, and equity holdings s_{t+1} read respectively:

$$w_t U_c(c_t, n_t) + U_n(c_t, n_t) = 0, \tag{24}$$

$$U_c(c_t, n_t) - \beta(1 + r_t) E U_c(c_{t+1}, n_{t+1}) = 0, \tag{25}$$

$$U_c(c_t, n_t) p_t - \beta E(d_{t+1} + p_{t+1}) U_c(c_{t+1}, n_{t+1}) = 0. \tag{26}$$

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.

A.5 Alternative Apportioning of Bank Profits

As mentioned in Section 6.3, we assume in the baseline model that the bank's profits, $e_t l_t$, are immediately consumed by the bank. Here, we distribute these profits to the households as a lump-sum payment and show that the results still hold.

The household budget constraint now becomes

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

where the bank's profits, $e_t l_t$, have been added to the constraint. The rest of the budget constraint remains the same.

As is standard, we assume that the household supplies labor to a different firm than the one in the bargaining problem, i.e. the household's labor decision will not internalize the bank's surplus from the bargaining problem. Thus, the first order conditions remain the same as in the baseline model. The corresponding impulse response functions for our two steady states are indistinguishable from the baseline model (see Appendix Figure A.6).

A.6 Computation of TFP and Financial Shocks

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:

$$\hat{z}_t = \hat{y}_t - \theta\hat{k}_t - (1-\theta)\hat{n}_t \tag{27}$$

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):[3]

$$\xi_t\left(k_{t+1} - \frac{b_{t+1}}{1+r_t}\right) = y_t. \tag{28}$$

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:

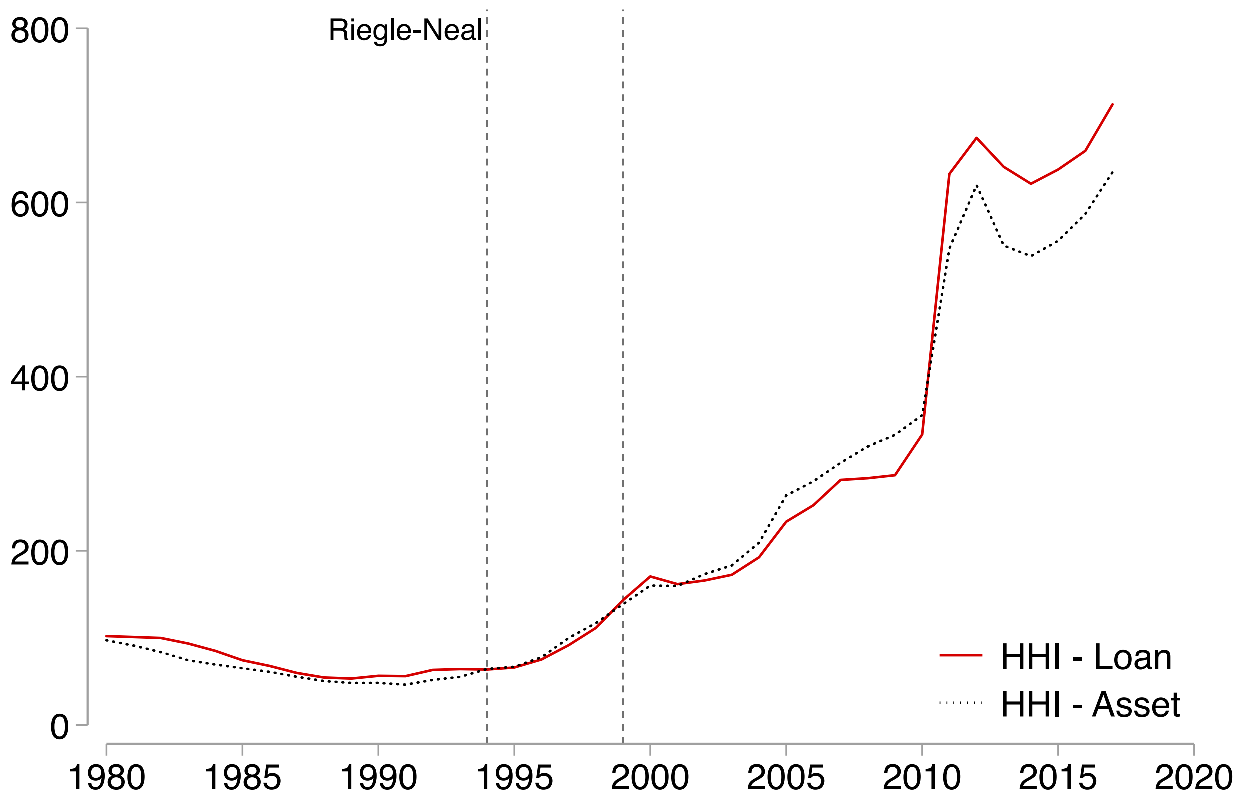
$$\begin{pmatrix} \hat{z}_{t+1} \\ \hat{\xi}_{t+1} \end{pmatrix} = \mathbf{A}\begin{pmatrix} \hat{z}_t \\ \hat{\xi}_t \end{pmatrix} + \begin{pmatrix} \epsilon_{z,t+1} \\ \epsilon_{\xi,t+1} \end{pmatrix}. \tag{29}$$

Appendix Figure A.7 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.

[3] We recognize that this enforcement constraint differs from the one used in our model. To generate financial shocks comparable to the literature, we used this more common enforcement constraint.

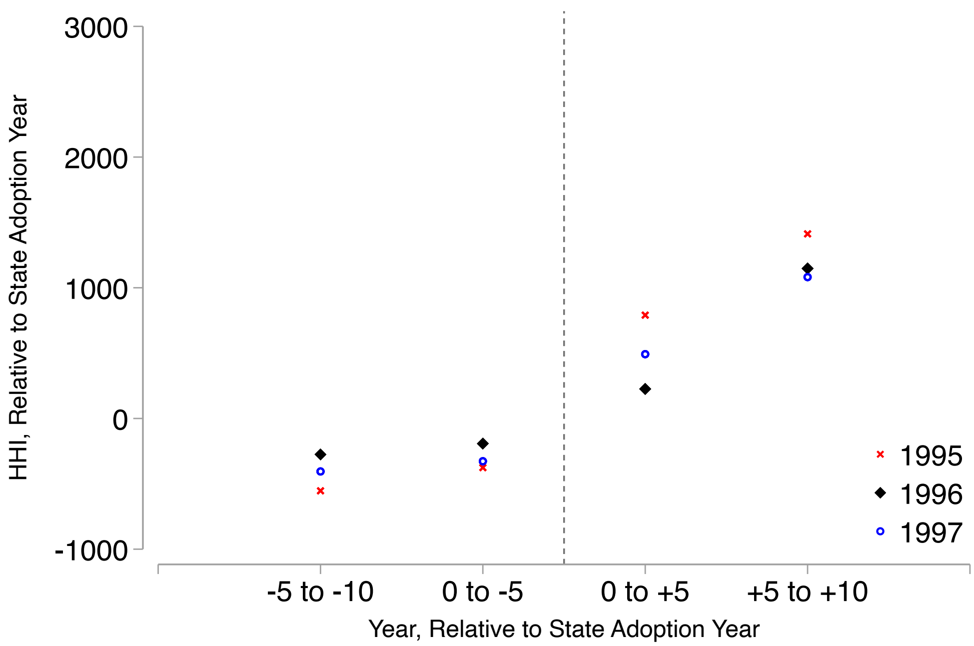
Online Appendix Figures & Tables

Figure A.1: Concentration of US Banking Industry



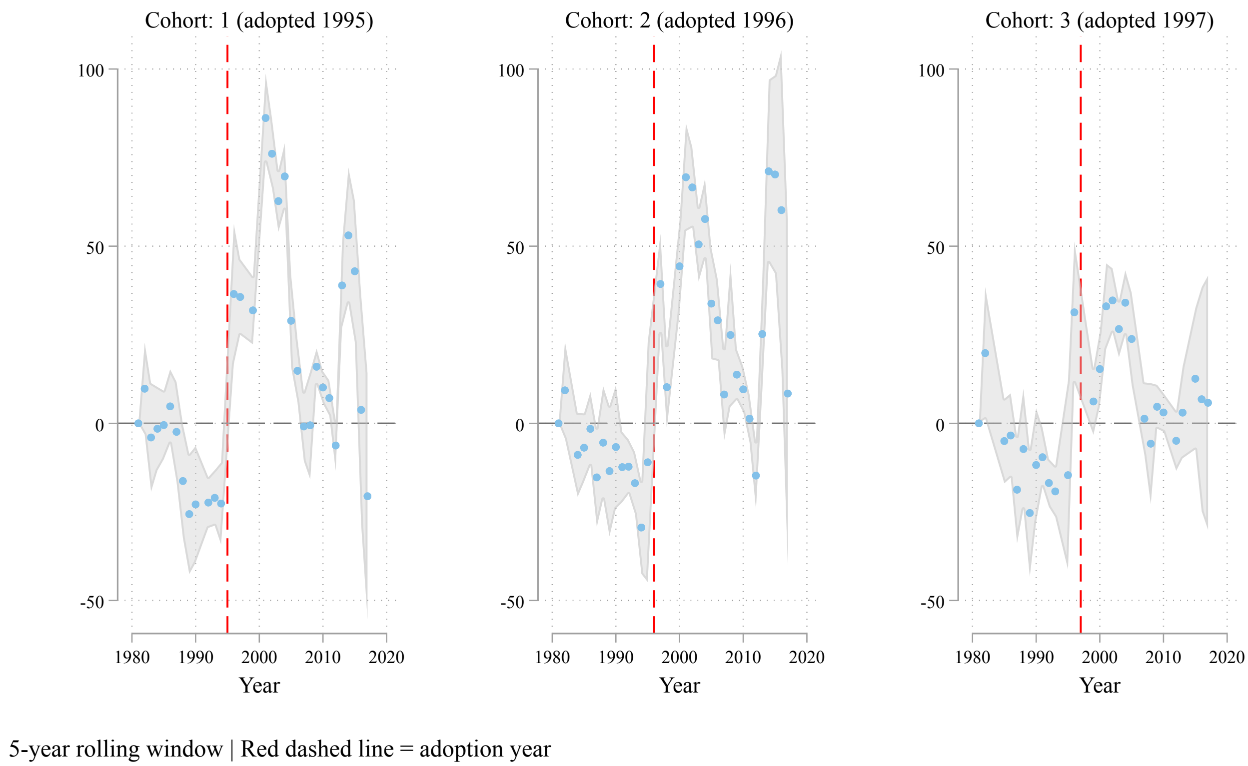
This figure plots the national Herfindahl-Hirschman index for total loans and total assets in the commercial banking sector during the period 1980-2017. Authors' calculations using FR Y-9C data.

Figure A.2: HHI By Timing of Riegle-Neal Adoption



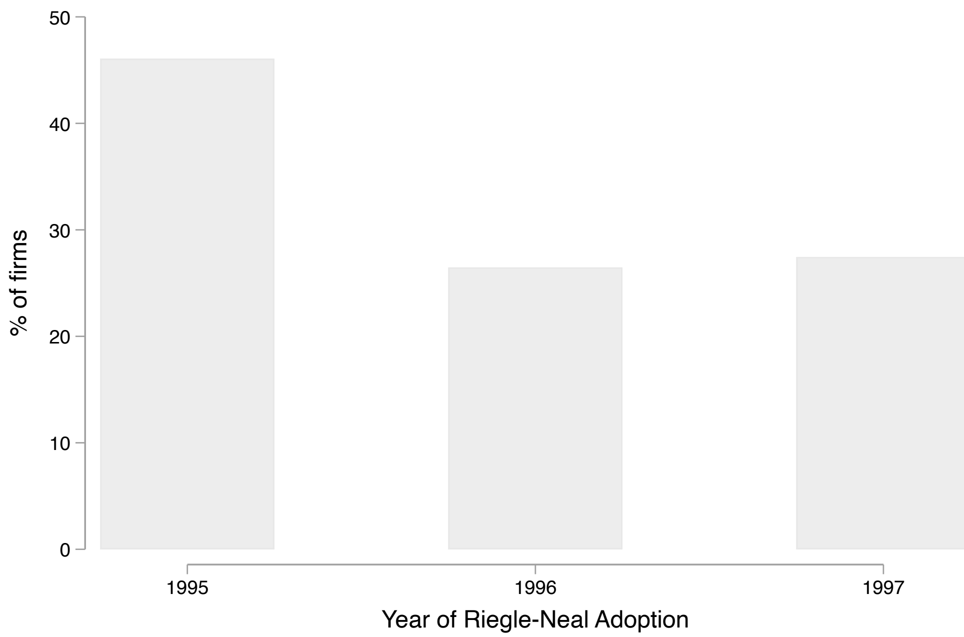
This plot shows the average state-level HHI for bank loans grouped by states' year of adopting the Riegle-Neal Act.

Figure A.3: Rolling Equity Issuance Cyclicality by Adoption Cohort



These plots show the cyclicality of equity issuance estimated in rolling 5-year windows for firms that are headquartered in a state that adopted Riegle-Neal in 1995 (first panel), 1996 (second panel) or 1997 (third panel).

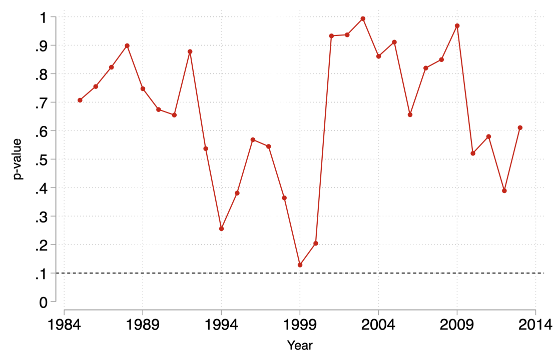
Figure A.4: Distribution of the Timing of Riegle-Neal Adoption



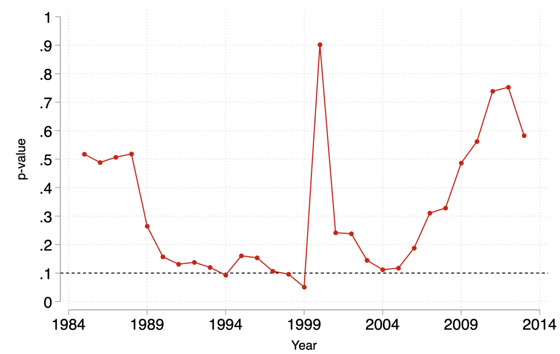
This histogram shows the percentage of firms that are headquartered in a state that adopted Riegle-Neal in 1995, 1996 or 1997.

Figure A.5: Wald Test for Structural Break in Cyclicality of Small Firm Financing

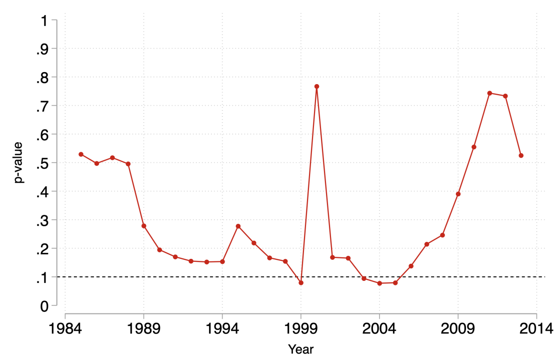
(a) Debt Issuance



(b) Equity Issuance



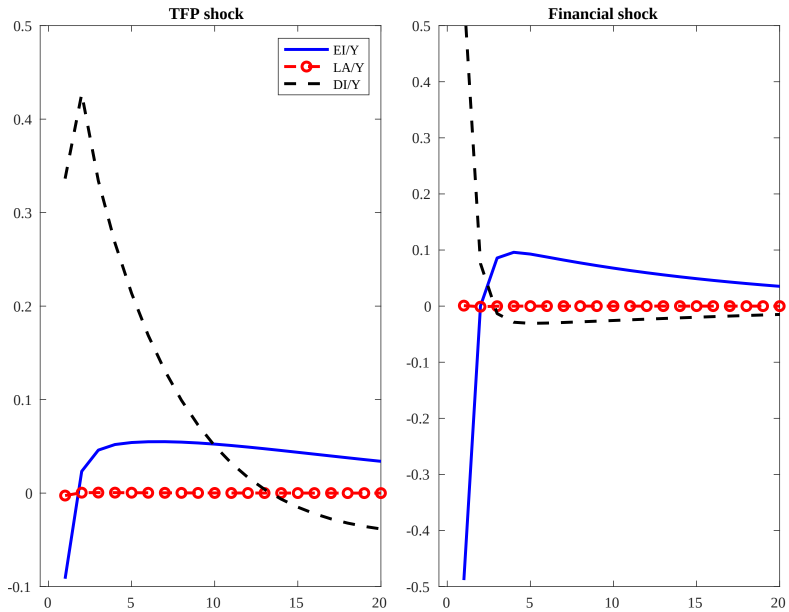
(c) Liquidity Accumulation



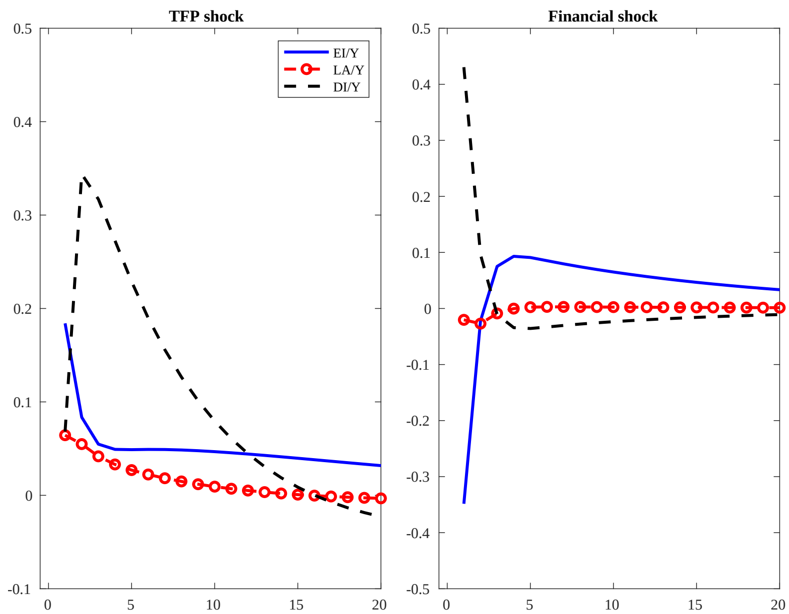
This figure plots the p-values of a Wald test to check for a structural break in the corresponding year reported on the x-axis. Variables for debt issuance (Panel a), equity issuance (Panel b) and liquidity accumulation (Panel c) are the aggregate series for small firms. Small firms are those with book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

Figure A.6: IRFs of Financial Variables: Alternative Household Budget Constraint

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



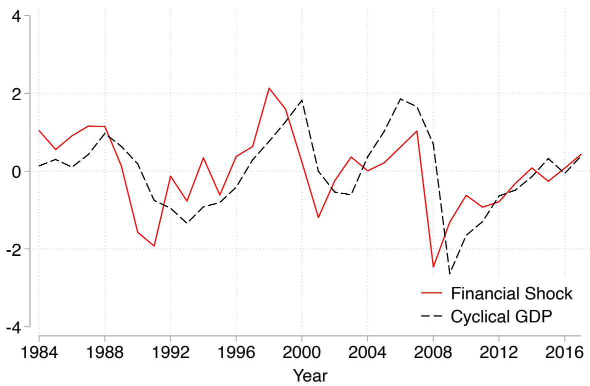
(b) Weaker Borrowers: Low Bargaining Power / High Bank Outside Option



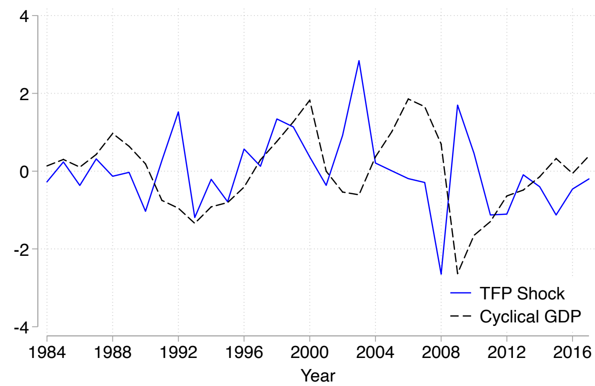
This figure plots the impulse responses of equity issuance (EI), liquidity accumulation (LA) and debt issuance (DI) for a one standard deviation positive TFP shock (left column) and financial shock (right column). Panel (a) shows the impulse response when the firm bargaining power parameter is set high 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 A.7: Time Series of Financial & TFP Shocks

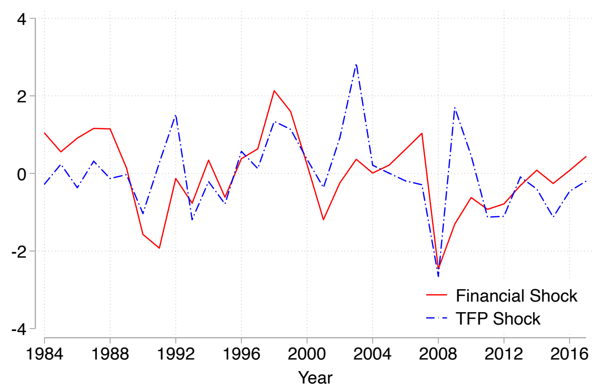
(a) Financial Shock & Cyclical GDP



(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.

Table A.1: Summary statistics

Panel A: Compustat	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
Debt-to-Assets Ratio	31.4	50.3	33.9	31.5
# of Firms	13,158		3,517	

Panel B: DealScan & Call Report	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
Recently Acquired (Merger)	0.040	0.080	0.041	0.080
Size of Merger	0.556	1.047	0.551	1.080
Recently Joined MBHC	0.181	0.122	0.185	0.119
Number of Lenders	2.425	3.374		
Lead Year Share			0.892	0.792

Panel A 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. Panel B displays means for characteristics of the lenders in the All Lender Pool and Lead Lender Pool. The sample period is 1985-2012.

Table A.2: Aggregate Financing Variables: No Filtering

	No Filtering 1981-2017			Hamilton Filtering 1981-2017		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	0.537***	0.332**	0.260	0.625***	0.404**	0.328*
	(0.143)	(0.159)	(0.163)	(0.132)	(0.155)	(0.16)
Large Firms	0.431***	0.098	-0.161	0.602***	-0.233	-0.160
	(0.153)	(0.168)	(0.167)	(0.135)	(0.164)	(0.167)
All Firms	0.578***	0.279*	0.191	0.636***	0.140	0.141
	(0.138)	(0.162)	(0.166)	(0.13)	(0.167)	(0.167)

	1981-1998			1981-1998		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	0.575**	0.210	0.020	0.840***	-0.008	0.022
	(0.205)	(0.244)	(0.25)	(0.136)	(0.25)	(0.25)
Large Firms	0.503**	-0.004	-0.199	0.820***	-0.476*	-0.128
	(0.216)	(0.25)	(0.245)	(0.143)	(0.22)	(0.248)
All Firms	0.652***	0.320	0.069	0.838***	-0.226	0.008
	(0.19)	(0.237)	(0.249)	(0.136)	(0.244)	(0.25)

	1999-2017			1999-2017		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	0.638***	0.461**	0.461**	0.639***	0.529**	0.454*
	(0.187)	(0.215)	(0.215)	(0.187)	(0.206)	(0.216)
Large Firms	0.554**	-0.075	-0.091	0.664***	-0.299	-0.147
	(0.202)	(0.242)	(0.242)	(0.181)	(0.231)	(0.24)
All Firms	0.641***	0.174	0.260	0.690***	0.194	0.199
	(0.186)	(0.239)	(0.234)	(0.176)	(0.238)	(0.238)

The left column of this table displays the correlations between the annual growth rate in real corporate GDP and the three (non-HP-filtered) financing variables. The right column displays the correlations between the cyclical component of Hamilton (2018)-filtered annual real corporate GDP and the three 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. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.3: Robustness Test: Firm Fixed Effect

	1981-1998			1999-2017		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	5.36***	-11.37***	-6.56**	4.10***	**6.13**	**2.40**
	(1.398)	(3.413)	(2.981)	(0.692)	**(3.649)**	**(3.270)**
Large Firms	7.40***	-4.61***	-2.59**	6.43***	-1.57**	-1.35
	(1.264)	(0.957)	(1.052)	(1.079)	(0.550)	(1.063)
SF Observations	29,709	32,516	32,516	27,873	32,488	32,488
LF Observations	16,195	17,932	17,932	15,590	17,698	17,698

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. 1999-2017 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: 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.5: Cyclicality of Aggregate Financing Variables (Consistent Sample)

	1981-1998					
	Debt Issuance		Equity Issuance		Liquidity Accum.	
Size categories	HP	H	HP	H	HP	H
Small Firms	0.478**	0.347	-0.292	-0.509**	-0.150	-0.396
	(0.22)	(0.234)	(0.239)	(0.215)	(0.247)	(0.23)
Large Firms	0.427*	0.570**	-0.572**	-0.667***	-0.354	-0.252
	(0.226)	(0.205)	(0.205)	(0.186)	(0.234)	(0.242)
All Firms	0.435*	0.513**	-0.554**	-0.630***	-0.421*	-0.308
	(0.225)	(0.215)	(0.208)	(0.194)	(0.227)	(0.238)

	1999-2017					
	Debt Issuance		Equity Issuance		Liquidity Accum.	
Size categories	HP	H	HP	H	HP	H
Small Firms	0.476**	0.513**	0.299	0.432*	0.031	0.166
	(0.213)	(0.208)	(0.231)	(0.219)	(0.242)	(0.239)
Large Firms	0.663***	0.418*	-0.721***	-0.586***	-0.468**	-0.449*
	(0.182)	(0.22)	(0.168)	(0.197)	(0.214)	(0.217)
All Firms	0.633***	0.525**	-0.659***	-0.546**	-0.422*	-0.345
	(0.188)	(0.206)	(0.182)	(0.203)	(0.22)	(0.228)

The left column displays the correlations between the cyclical component of HP-filtered annual real corporate GDP and the three HP-filtered financing variables. The right column uses the Hamilton (2018)-filtered versions of annual real corporate GDP and the three financing variables. The sample includes only those firms that entered Compustat prior to 1990 and also appeared in Compustat in 2017. 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. Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.6: Firm-Level Cyclicality of Financing Variables (Consistent Sample)

Panel A:	1981-1998			1999-2017		
Baseline Sample	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	4.04*	-3.65	-8.56**	4.17**	**17.51****	**7.04**
	(2.134)	(3.397)	(3.106)	(1.550)	**(7.879)**	**(4.989)**
Large Firms	4.90***	-3.09***	-2.01	5.30***	-2.78***	-2.66**
	(1.631)	(0.980)	(1.310)	(0.871)	(0.570)	(1.122)
SF Observations	3,364	3,677	3,677	4,051	4,627	4,627
LF Observations	2,943	3,227	3,227	3,603	4,042	4,042

Panel B:	1981-1998			1999-2017		
W/in Firm	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.79***	-3.76	-5.27**	3.90***	6.41**	3.14
	(1.615)	(2.858)	(2.373)	(1.217)	(2.622)	(3.269)
GDP x Size	0.90	2.40	8.13***	1.01	-4.55**	-3.40
	(2.598)	(5.020)	(2.761)	(0.854)	(1.768)	(2.198)
Observations	6,058	6,641	6,641	7,247	8,210	8,210

Panel C:	1981-1998			1999-2017		
Alt. Financing	NSS	Liquidity	Cash	NSS	Liquidity	Cash
Small Firms	-3.82	-4.84	-0.47	**17.71****	**4.29**	4.25
	(3.458)	(2.854)	(2.352)	**(7.892)**	**(3.584)**	(3.585)
Large Firms	-3.43***	-0.75	1.64	-2.34***	-1.44	**-1.79***
	(0.986)	(1.402)	(1.258)	(0.550)	(0.860)	**(0.945)**
SF Observations	3,677	3,319	3,243	4,627	4,626	4,617
LF Observations	3,227	2,798	2,668	4,042	4,042	3,993

This table displays the estimates of regressing the financing variable of interest 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. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. Post-1999 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. The sample includes only those firms that entered Compustat prior to 1990 and also appeared in Compustat in 2017. In Panel B, the GDP measure is interacted with a continuous measure of a firm's book value of assets (Size), where a firm-specific fixed effect is included and all variables are demeaned by firm. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.7: Additional Compositional Effect Tests for Small Firms

	1981-1998			1999-2017		
	DI	EI	LA	DI	EI	LA
Baseline	6.41***	-10.74***	-8.61***	4.04***	**11.12****	**3.56**
	(1.631)	(3.569)	(2.964)	(0.898)	**(3.942)**	**(3.464)**
Exclude Young Firms	4.13***	-7.74**	-5.59**	3.81***	**9.24*****	**1.97**
	(1.230)	(2.839)	(2.203)	(0.612)	**(3.127)**	**(2.657)**
Exclude Volatile Firms	5.65***	-9.26**	-7.90**	4.45***	**10.33****	**2.43**
	(1.422)	(3.720)	(3.192)	(0.849)	**(3.922)**	**(3.630)**
Exclude High Intangible Firms	5.13***	-10.65***	-8.78***	2.94***	**12.88*****	**4.04**
	(1.460)	(3.462)	(3.016)	(0.817)	**(4.334)**	**(4.054)**

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 subperiod sample. Post-1999 estimates in bold indicate the hypothesis $H_0 : \beta_j^{pre} = \beta_j^{post}$, where $j \in \{small\}$, is rejected at the 5% level. Young firms are firms listed in Compustat for fewer than 5 years. Volatile firms are firms whose full-sample standard deviation of sales growth is in the top 25th percentile. High intangible firms are firms whose ratio of intangible assets to total assets is in the top 25th percentile. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.8: Cyclicality Results without Financially Distressed Firms

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	5.01***	-12.63***	-7.92**
	(1.652)	(4.063)	(3.157)
Large Firms	6.24***	-3.83***	-2.74*
	(1.563)	(1.131)	(1.327)
SF Observations	27,997	30,879	30,879
LF Observations	16,028	17,788	17,788
		p-values	
$H_0 : small = large$	0.241	0.011	0.029

Panel B: 1999-2017

	Debt Iss.	Equity Iss.	Liq. Accum.
Small Firms	3.80***	**9.79***	**3.69**
	(0.646)	**(4.675)**	**(3.230)**
Large Firms	4.99***	-2.17***	-1.77*
	(1.203)	(0.590)	(1.007)
SF Observations	20,032	23,673	23,673
LF Observations	13,436	15,464	15,464
		p-values	
$H_0 : small = large$	0.328	0.014	0.043

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. Firms with an Altman Z-score below 1.8 (i.e. high probability of financial distress) are excluded. 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. 1999-2017 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.9: State-Level Timing of Riegle-Neal Adoption (Consistent Sample)

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	3.51	-6.43	-8.81*
	(2.650)	(5.246)	(4.418)
$adopt_{1996}$ x GDP	-1.68	5.76	-3.03
	(3.334)	(9.809)	(5.795)
$adopt_{1997}$ x GDP	2.14	2.19	3.11
	(3.273)	(7.427)	(5.288)
Observations	3,342	3,654	3,654

Panel B: 1999-2009

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	7.32***	13.82	4.24
	(1.852)	(9.756)	(6.727)
$adopt_{1996}$ x GDP	-3.37*	4.90	6.89
	(1.528)	(3.591)	(5.054)
$adopt_{1997}$ x GDP	-2.47	-5.06**	-0.32
	(1.819)	(1.994)	(3.018)
Observations	2,245	2,593	2,593

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 of state-level Riegle-Neal adoption. The sample includes only those firms that entered Compustat prior to 1990 and also appeared in Compustat in 2017. 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.10: State-Level Timing of Riegle-Neal Adoption (w/o Controls)

Panel A: 1981-1998

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	5.55***	-2.51	-4.88
	(1.808)	(4.680)	(3.486)
adopt_{1996} x GDP	3.54*	-2.41	-0.70
	(1.727)	(5.075)	(1.743)
adopt_{1997} x GDP	0.30	1.09	2.83
	(1.410)	(4.120)	(2.128)
Observations	42,277	46,318	46,318

Panel B: 1999-2009

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.85***	28.31**	15.51*
	(0.509)	(10.174)	(7.727)
adopt_{1996} x GDP	-1.44*	-5.57	-4.95
	(0.682)	(5.313)	(3.095)
adopt_{1997} x GDP	-0.88	-18.72**	-13.36**
	(1.110)	(5.978)	(4.874)
Observations	23,420	27,560	27,560

Panel C: 1999-2019

	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.47***	24.05***	11.52*
	(0.864)	(8.149)	(5.872)
adopt_{1996} x GDP	-0.83	-5.96	-3.22
	(0.990)	(4.663)	(3.049)
adopt_{1997} x GDP	-1.31	-13.91**	-8.84*
	(1.188)	(5.904)	(4.361)
Observations	35,255	40,995	40,995

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 of state-level Riegle-Neal adoption. There are no controls included. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.11: State-Level Timing of Riegle-Neal Adoption (Exclude 1995 or 1996 adopters)

Panel A: 1981-1998	Excluding 1996 adopters			Excluding 1995 adopters		
	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	5.21***	-11.91***	-9.54***	7.72***	-13.62***	-10.10***
	(1.575)	(3.609)	(3.279)	(2.032)	(3.868)	(3.307)
$adopt_{1997}$ x GDP	1.03	4.32	4.27***	-1.17	6.64*	4.99**
	(1.124)	(2.844)	(1.293)	(1.812)	(3.795)	(2.034)
Observations	26,389	28,967	28,967	21,170	23,066	23,066

Panel B: 1999-2009	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	5.03***	11.75*	6.51	3.47***	13.79*	4.52
	(0.601)	(5.492)	(5.284)	(0.889)	(7.411)	(5.158)
$adopt_{1997}$ x GDP	-0.69	-8.01***	-6.75**	0.76	-8.26**	-4.57*
	(0.946)	(2.370)	(2.492)	(1.470)	(3.031)	(2.267)
Observations	16,072	18,937	18,937	11,995	13,919	13,919

Panel C: 1999-2019	Debt Iss.	Equity Iss.	Liq. Accum.	Debt Iss.	Equity Iss.	Liq. Accum.
GDP	4.95***	11.56**	5.06	3.88***	12.96**	4.33
	(0.882)	(4.077)	(3.840)	(0.993)	(5.071)	(3.508)
$adopt_{1997}$ x GDP	-1.55	-6.05*	-4.32*	-0.47	-5.13*	-3.22*
	(1.153)	(3.018)	(2.307)	(1.746)	(2.770)	(1.636)
Observations	23,937	27,827	27,827	17,822	20,491	20,491

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 of state-level Riegle-Neal adoption. 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.12: 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)
Acquired 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.13: 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 A.14: 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.15: 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, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.16: Firm-Level Cyclicality of Real Variables (Consistent Sample)

	Panel A: Baseline Specification					Panel B: By Liquidity Position, Small Firms			
	1981-1998		1999-2017			Low Liquidity Position		High Liquidity Position	
	Inv.	Emp.	Inv.	Emp.		Inv.	Emp.	Inv.	Emp.
Small Firms	-0.38	7.81	1.93***	7.66**	GDP	-0.88	6.02	-0.39	12.41**
	(1.260)	(5.136)	(0.667)	(2.854)		0.521	0.338	0.786	0.021
Large Firms	1.01*	9.19**	1.52	5.23	D_t^{post}	3.10*	2.91	1.95	-6.20
	(0.501)	(3.410)	(0.952)	(3.653)		0.071	0.667	0.234	0.271
SF Obs.	3,606	3,510	4,605	4,485	SF Obs.	4,300	4,216	3,717	3,582
LF Obs.	3,188	3,145	4,024	3,981	R^2	0.019	0.013	0.006	0.016

	p-values	
$H_0 : small_{pre} = small_{post}$	0.112	0.979
$H_0 : large_{pre} = large_{post}$	0.637	0.423

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. D_t^{post} is an indicator for the years 1999-2017. The sample includes only those firms that entered Compustat prior to 1990 and also appeared in Compustat in 2017. Each coefficient is the estimate from a separate regression for each firm size x subperiod sample. In Panel B, Liquidity Position is determined by the median cash-to-assets ratio for the years 1996-1998. Two-way clustered standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$