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Bank deregulation and corporate risk☆

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ABSTRACT

Although research shows that competitive banks spur corporate growth, less is known about the impact of bank competition on corporate risk. Using a sample of more than 70,000 firm-year observations covering the period from 1975 through 1994, we find that deregulation that intensified competition among banks materially reduced corporate risk, especially among firms that rely heavily on bank finance. We find that competition-enhancing bank deregulation reduced corporate volatility by easing credit constraints when firms experience adverse shocks and reducing the procyclicality of borrowing.

1. Introduction

An extensive body of research examines the impact of lowering regulatory barriers to bank competition on the functioning of banks and the overall economy. Focusing on the United States, researchers show that deregulating geographic impediments to banking have influenced economic growth (Jayaratne and Strahan, 1996; Huang, 2008), the distribution of income (Beck et al., 2010), business cycles (Morgan et al., 2004), entrepreneurship and new business starts (Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009), firm borrowing, investment, and growth (Zarutskie, 2006; Rice and Strahan, 2010; Krishnan et al., 2014; Berger et al., 2017; Berger et al., 2019), technological innovation (Amore et al., 2013; Chava et al., 2013; Cornaggia et al., 2015; Hombert and Matray, 2017), bank efficiency (Jayaratne and Strahan, 1998; Dick (2006), bank governance, liquidity creation and risk-taking (Goetz et al., 2013, 2016; Jiang et al., 2016, 2018, 2019), as well as gender and racial discrimination (Black and Strahan, 2001; Levine et al., 2014) and trade (Michalski and Ors, 2012). Berger and Roman (2018) provide a comprehensive and insightful review.[1]

What has received less attention, however, is the connection between regulatory reforms that lower barriers to competition and

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[1] Research also examines the impact of finance on economic growth in an international setting. See, for example, King and Levine (1993a, 1993b), Demirgüç-Kunt and Maksimovic (1998), Levine and Zervos (1998), Rajan and Zingales (1998) and the literature reviews by Levine (1997, 2005) and Popov (2018).

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corporate risk. This is surprising. Corporate volatility can influence capital costs, capital structure, and corporate investment decisions (e.g., Myers, 1977, 2003; Harris and Raviv, 1991; Hart, 1995; Campello et al., 2011). Furthermore, depending on the covariance of cross-firm performance, changes in the risk of individual firms can shape the fragility of the aggregate economy. Thus, from either the perspective of the firm or the macroeconomy, it is valuable to understand the impact of regulatory reforms that enhance bank competition on corporate risk. While Larrain (2006) and Raddatz (2006) examine the relation between overall financial development and industry-level volatility in cross-country contexts, we are unaware of research that examines the impact of regulatory reforms that trigger greater competition among banks on corporate risk-taking.

Theory offers conflicting predictions about the influence of bank competition on corporate risk. On the one hand, theory highlights three channels through which bank competition can reduce corporate risk. The first two channels emphasize that a relaxation of financing constraints makes it easier for firms to borrow when they experience short-run, adverse shocks—including recessions—that would otherwise trigger inefficient and potentially risk-augmenting fluctuations in investment and employment (e.g., Levine, 1991; Froot et al., 1993). These two channels differ in terms of how bank competition can ease financing constraints. The first channel stresses that bank competition reduces lending rates, as found by Jayaratne and Strahan (1998) and Dick (2006), and these lower rates can ease firm financing constraints. The second channel focuses on a particular trigger of intensified bank competition: regulatory reforms that permit banks to enter and compete in new locales. The resultant geographic expansion of banks can diversify away idiosyncratic local risks, as stressed by Goetz et al. (2016). This particular type of competition-enhancing reform can reduce the sensitivity of bank lending to local economic fluctuations, easing firms' financing constraints with respect to temporary local shocks and thereby lowering firm risk.[2] Third, the models by Boyd and De Nicolo (2005) and Martinez-Miera and Repullo (2010) show that by lowering lending rates, bank competition can ease the moral hazard and adverse selection problems that plague credit markets and thereby induce firms to undertake less risky investments.

In contrast, theory also explains how bank competition can increase corporate risk. First, competition tends to reduce the net worth of banks, which can intensify moral hazard incentives and encourage banks to increase risk. Banks may increase risk in several ways, including by lending to riskier firms and by inducing their client firms to take-on riskier projects (e.g., Keeley, 1990; Hellmann et al., 2000; and Stiroh, 2004). Second, competition can curtail the ability of banks to earn information rents from relationship lending (Petersen and Rajan, 1995), reducing their incentives to screen and monitor borrowers with adverse effects on bank and firm stability (e.g., Berger and Udell, 1995; Berger et al., 2005; and Dell'ariccia and Marquez, 2006; Hombert and Matray, 2017). Third, by weakening bank-firm ties, competition can spur banks to lend to new firms, accelerating the entry and exit of firms and intensifying corporate competition more generally (e.g., Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009). In this way, greater competition can squeeze corporate profit margins, potentially increasing corporate risk (e.g., Jensen and Meckling, 1976; Eisdorfer, 2008). Thus, the impact of competition-enhancing regulatory reforms on corporate risk is an empirical question.

In this paper, we evaluate the impact of bank competition on corporate risk. We exploit the cross-state, cross-time removal of regulatory impediments to interstate banking to construct measures of the contestability of state banking markets. For most of U.S. history, states prohibited the entry of banks from other states. These regulatory impediments limited competition and boosted bank profitability. By the mid-1970s, however, exogenous innovations in data processing and telecommunications lowered the costs to banks of competing at a distance and reduced the value to banks of lobbying for the maintenance of interstate banking restrictions. In a process that evolved over two decades, states engaged in a sequence of bilateral and multilateral arrangements that lowered barriers to the entry of out-of-state banks (Kroszner and Strahan, 1999; Johnson and Rice, 2008). When a state permitted out-of-state banks to establish subsidiaries and provide a broader array of banking services in the state, this spurred the contestability of the state's banking market. The resultant intensification of competition lowered lending rates and boosted deposits rates as shown by Jayaratne and Strahan (1998) and Stiroh and Strahan (2003) and increased the riskiness of banks as shown by Jiang et al. (2018). Ultimately, the 1994 Riegle-Neal Act eliminated restrictions on well-capitalized and well-managed bank holding companies from acquiring bank subsidiaries in other states.

We construct three bank contestability measures. First, $Inter_{jt}$ is the traditional binary indicator that equals zero for state j in all years t before state j eliminates interstate banking restrictions with any state and equals one for all years since state j allows banks from at least one other state to establish subsidiaries within state j. This indicator has been used by many researchers, including Jayaratne and Strahan (1998). Second, we incorporate information on the dynamic process of interstate deregulation, rather than only using information on the first time that a state permits banks from another state to enter and establish subsidiaries. Not only did individual states begin interstate deregulation in different years, these reforms progressed in a state-specific process of unilateral and multilateral agreements over two decades. Exploiting these dynamics, we construct $Ln(\#\ of\ States)_{jt}$, which equals the natural logarithm of one plus the number of states whose banks can enter state j in year t. For the third measure, we build on the second by exploiting an additional source of variation in the competitive pressures facing state banking markets: the geographic distance between states. The gravity model of investment posits—and empirical work confirms—that the costs of establishing, governing, and

[2] While these two channels build from the assumption that competition eases firm financing constraints, the evidence is mixed. Jayaratne and Strahan (1998) and Dick (2006) provide evidence consistent with the view that deregulation-induced bank competition eases financing constraints on firms in general. Zarutskie (2006), using a panel of privately held firms, finds that deregulation-induced competition tightened credit constraints on new firms, but had the opposite effect on older firms. Rice and Strahan (2010) show that the relaxation of branching restrictions reduced the interest rates paid by small firms but find no evidence that deregulation increased borrowing. Most recently, Berger et al. (2019) find that deregulation fostered greater access to credit among relatively financially unconstrained firms, but reduced access to credit among financially constrained firms.

operating nonfinancial subsidiaries increase with distance (e.g., Helpman et al., 2008). When applied to banks, Goetz et al. (2013, 2016) show that distance is negatively associated with banks establishing subsidiaries in response to interstate bank deregulation. Thus, our third contestability measure is $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$, which equals the natural logarithm of one plus the number of states whose banks enter state j in year t, where each of these states is weighted by the inverse of its distance to state j.

We use two measures of corporate risk. Using a sample of U.S. firms covering the period from 1975 through 1994, we construct and examine (1) the standard deviation of the return-on-assets (*ROA Volatility*) over a four-year window for each firm in each year and (2) the idiosyncratic stock return volatility (*Idiosyncratic Risk*) of each firm in each year: the natural logarithm of the annualized variance of residuals from a standard CAPM-model. This yields more than 70,000 firm-year observations.

We begin with a difference-in-differences estimation strategy where the dependent variable is one of the two corporate risk measures. The main explanatory variable is one of the three bank contestability measures, which are computed at the state-year level. We show that the results are robust to controlling for (1) firm and year fixed effects, (2) state-year fixed effects, (3) state and industry time trends, and (4) an assortment of time-varying firm traits, including firm size, leverage, ROA, the market-to-book ratio, and the ratio of firm capital expenditures to total assets.

We discover that the bank contestability measures are associated with a significant reduction in corporate risk. That is, an intensification of bank competition, as measured by the three indicators of interstate bank deregulation, reduced corporate risk. Moreover, the estimated impact is economically large. For example, consider the estimates when using the simple binary indicator of interstate bank deregulation and the ROA volatility measure of firm risk. The results indicate that deregulation, as measured by *Inter*, reduced *ROA Volatility* by 13% (24%) of the mean (median) of *ROA Volatility* for the full sample.

We next evaluate two potential mechanisms through which bank competition might reduce corporate risk. First, as mentioned above, bank competition might reduce corporate risk by easing credit constraints when firms experience temporary, adverse shocks. Put differently, by easing credit constraints, bank competition might reduce the sensitivity of firm investment to cash flows. Thus, we test whether the sensitivity of investment to cash flow falls when states remove barriers to the entry of banks from other states. We find evidence consistent with this first mechanism: there is a material drop in the sensitivity of investment to cash flow when state regulators permit greater competition from banks in other states.

A second mechanism through which interstate bank deregulation could reduce corporate risk is that it allows banks to expand geographically and diversify away idiosyncratic state-specific risk (e.g., Goetz et al., 2016). By diversifying away local economy risks, banks might be better positioned to finance firms when state-specific shocks temporarily affect firms. According to this mechanism, interstate bank deregulation will tend to increase the degree to which banks operating in a state are more geographically diversified, which will in turn make the financial constraints facing a state's firms less sensitive to state-specific business cycles (Morgan et al., 2004). Consistent with this second mechanism, we find that firms' long-term borrowing is less procyclical after bank deregulation. Furthermore, we find evidence consistent with the view that the mechanism linking bank deregulation and corporate risk is bank lending to those firms. In particular, we find that deregulation is associated with an increase in firm borrowing, but not an increase in firms issuing bonds or equity.

We address potential identification concerns in five ways. First, as emphasized above, we control for firm and year fixed effects, state and industry time trends, and an assortment of time-varying firm traits to reduce concerns about omitted variables.

Second, we use the gravity-augmented measure of interstate bank deregulation that accounts for the distance between each state pair. Since distance is exogenous and almost all interstate bank deregulations were reciprocal agreements, this reduces concerns that the results are driven by states with different corporate risk levels choosing particular dynamic sequences of states with which to deregulate.

Third, we directly test for the dynamic effects of interstate bank deregulation by adding leads and lags around the first year that a state deregulated with any other state. There is no evidence that pre-deregulation trends influence the results.[3]

Fourth, we employ a triple difference-in-differences estimation strategy to reduce concerns that we are not identifying a link between bank deregulation and firm risk. In particular, we further differentiate firms by industry. The theories discussed above stress that exposing banks to greater competition would affect the riskiness of the firms to which the banks lend. From this perspective, if some firms do not use banks, an intensification of bank competition will have less an effect on those firms than on other firms that depend heavily on banks. Thus, using the Rajan and Zingales (1998) measures of bank dependence, we differentiate between firms in industries that rely heavily on bank loans from firms in industries that are not naturally dependent on banks for external finance. We then evaluate whether the impact of bank competition on firm risk is bigger among bank-dependent firms. This is what we find. Across all specifications, we discover that the bank contestability measures are associated with a greater reduction in corporate risk among firms in financially dependent industries. For example, the results indicate that deregulation reduced *ROA Volatility* among firms in financially dependent industries by 20% (37%) of the mean (median) of *ROA Volatility* for the full sample.

Finally, we examine specific mechanisms proposed by theory through which bank competition might reduce corporate risk: the sensitivity of corporate investment to cash flows and the sensitivity of bank borrowing to local economic conditions. As noted above, we find evidence for both mechanisms, providing greater confidence in our conclusions regarding the impact of competition-enhancing deregulation on corporate risk.

Our paper contributes to research on the determinants of firm risk. Researchers examine the impact of CEO compensation

[3] Past research also supports our identification strategy. Several studies show that the timing of deregulation does not reflect bank performance (e.g., Jayaratne and Strahan, 1998; Goetz et al., 2013), bank transparency and risk e.g., (Jiang et al., 2016, 2018), or state economic performance (e.g., Jayaratne and Strahan, 1996; Morgan et al., 2004; Demyanyk et al., 2007; Beck et al., 2010).

structure (e.g., Coles et al., 2006; Low, 2009; Hayes et al., 2012; Armstrong and Vashishtha, 2012), board accountability (e.g., Bargeron et al., 2010), investor protection laws (e.g., John et al., 2008; Acharya et al., 2011), and ownership structure on corporate risk-taking (e.g., Paligorova, 2010; Kim and Lu, 2011; Faccio et al., 2011; Boubakri et al., 2013). We contribute to this line of research by examining the impact of regulatory reforms that fostered greater competition among banks on corporate risk-taking.

Our findings also relate to recent research on how individual banks respond to competition. This work discovers that when an *individual* bank experiences greater competition, the bank tends to become more risky, contribute more to systemic risk, create less liquidity as measured bank balance sheets, and disclose more information to the public (Jiang et al., 2016, 2018, 2019). One might view these results as conflicting with this paper's findings that corporate risk falls when its state deregulates. But, these bank- and firm-level results combine to provide consistent, albeit nuanced, perspectives on bank deregulation. While individual banks boost the overall systemic riskiness of their portfolios, even as they reduce the duration gap between their assets and liabilities and become more transparent, interstate bank deregulation gives firms access to banks that are less exposed to idiosyncratic local economic conditions, which reduces both investment-cash sensitivity and the procyclicality of credit availability in a state. Thus, the evidence suggests that interstate bank deregulation makes access to credit both less sensitive to temporary shocks and less procyclical. In this way, interstate bank deregulation reduces corporate risk, even as individual banks become riskier.

The remainder of the paper is structured as follows. In Section 2, we briefly discuss our identification strategy, sample and data. In Section 3, we present our main regression results concerning the relation between bank deregulation and firm risk. In Section 4, we investigate the possible underlying channels linking bank competition and firm risk. Section 5 concludes.

2. Data

In this section, we (1) define the sample of firms, measures of firm risk, and the degree to which firms depend on banking financing, (2) describe the process of interstate bank deregulation and our measures of regulatory-induced changes in the competitive pressures facing banks, and (3) detail our econometric strategy for assessing the impact of interstate bank deregulation on firm risk. Table 1 provides summary statistics on the key firm-level variables and the measures of interstate bank deregulation. Appendix 1 gives definitions of each variable.

2.1. Sample of firms, measures of firm risk, and firm dependence on Bank finance

We begin with all U.S firms in the Compustat database from 1975 to 1994. We use the period from 1975 through 1994 since this covers the years of interstate bank deregulation that we describe below. We exclude firms in the financial and utility industries. Following the literature on interstate bank deregulation, we drop Delaware and South Dakota because the two states were subject to

Table 1
Summary statistics: banking competition and firm risk.

Variable	Mean	p25	p50	p75	Std.dev	N
Panel A: Risk measures						
ROA volatility	0.0839	0.0247	0.0448	0.0862	0.1279	74,613
Idiosyncratic Risk	3.0344	2.2360	3.0070	3.7875	1.1330	74,900
Panel B: Deregulation measures						
Inter	0.5170	0	1	1	0.4997	74,613
Ln(# of State)	1.4390	0	1.0986	2.9957	1.5447	74,613
Ln(# of State-distance weighted)	0.9414	0	0.3355	1.9619	1.0347	74,613
Panel C: Control variables						
Size	4.0350	2.5932	3.9127	5.3297	2.0322	74,613
Bklev	0.2601	0.0842	0.2277	0.3773	0.2265	74,613
ROA	0.0328	0.0058	0.0809	0.1396	0.2361	74,613
MB	1.7622	0.9544	1.2286	1.8418	1.6754	74,613
CapEx	0.0792	0.0278	0.0550	0.1005	0.0800	74,613
Panel D: Other variables in channel tests						
CashFlow	0.1133	0.0511	0.1382	0.2160	0.2034	66,465
Q	1.4272	0.9240	1.1518	1.5990	0.8478	66,465
Debt issuance	0.0286	−0.0195	0	0.0399	0.1541	68,733
GSP growth	0.0794	0.0532	0.0779	0.1025	0.0381	68,733
Tangibility	0.3281	0.1614	0.2829	0.4531	0.2173	68,733
Panel E: Bond and equity issuance						
Bond issue dummy	0.0463	0	0	0	0.2101	78,396
Ln(bond issue amt)	0.2113	0	0	0	1.0176	78,396
Equity issue dummy	0.0450	0	0	0	0.2073	78,396
Ln(equity issue amt)	0.1398	0	0	0	0.6886	78,396

This table reports the summary statistics of the variables used in the main regressions. The variables are categorized into five groups, namely firm risk measures (Panel A), measures of interstate banking deregulations (Panel B), control variables in the baseline analysis (Panel C), other variables used in the channel tests (Panel D), and debt and equity issuance variables (Panel D). Detailed definitions are provided in Appendix 1.

special tax incentives for credit cards (Black and Strahan, 2002; Dick and Lehnert, 2010). In the end, the regressions include at most 78,396 firm year observations. The Compustat database provides data on corporate assets, leverage, return on assets, market and book valuations, cash flows, capital expenditures, etc. We use these in our analyses and define them below.

We examine two key measures of each firm's level of risk in each year. The first is based on accounting data and the second on stock prices.

ROA Volatility equals the standard deviation of the return on assets. As in Acharya et al. (2011), Faccio et al. (2011), and Boubakri et al. (2013), we construct *ROA Volatility* as the standard deviation of the 2-digit SIC industry-adjusted ROA over four consecutive years. Thus, we drop firms with less than four consecutive years of ROA data.

Specifically, we first calculate industry-adjusted ROA by taking the ROA of firm i in year t and subtract its corresponding SIC 2-digit industry median ROA in year t. We then construct the standard deviation of this industry-adjusted ROA for firm i in t as the standard deviation of its industry-adjusted ROA during years t through $t + 3$, so that

$$AdjROA_{i,t} = ROA_{i,t} - SIC\ 2\ Digit\ Industry\ Median\ ROA_{k,t},$$

(and)

$$ROA\ Volatility_{i,t} = SD(AdjROA_{i,t}, AdjROA_{i,t+1}, AdjROA_{i,t+2}, AdjROA_{i,t+3}),$$

where k represents firm i's corresponding SIC 2-digit industry classification in year t.

Idiosyncratic Risk equals the natural logarithm of the variance of the residuals from a standard CAPM model, which is a commonly used measure of corporate risk (e.g., Coles et al., 2006; Low, 2009). We use the CRSP value-weighted market portfolio to proxy for the market portfolio and adjust for nonsynchronous trading by adding five leads and five lags of market returns (e.g., Dimson, 1979; Low, 2009).

Specifically, we first estimate the following market model with five leads and five lags for each firm-year:

$$Daily\ Stock\ Return_{i,d} = \alpha_i + \sum_{d=-5}^{d=5} \beta_{i,d} M_d + \varepsilon_{i,d}.$$

We then construct *Idiosyncratic risk* for firm i in year t as:

$$Idiosyncratic\ Risk_{i,t} = Ln[252 * VAR(\varepsilon_{i,t}) * 100].$$

As a market-based measure, *Idiosyncratic Risk* is forward looking. Thus, when regulatory reforms affect the competitiveness of the banking system, the market-based measure will tend to respond to the expected impact of these regulator changes on firm risk.

External Financial Dependence is an industry-level indicator measuring the degree to which firms in that industry depend on external funds. Following the spirit of Rajan and Zingales (1998), Cetorelli and Strahan (2006) and Cornaggia et al. (2015), a 3-digit SIC industry is classified as having high (low) external financial dependence if the average external financial dependence of all firms in that industry falls above (below) the sample median. For each firm in its corresponding 3-digit SIC industry, its external financial dependence in a year is measured as (Capital expenditures – Cash flows from operations) / Capital expenditures. In our analyses, we provide results on the full sample, along with the subsamples of firms in high- and low-external financial dependence industries.

2.2. Interstate Bank deregulation and regulatory-induced measures of Bank competition

As discussed in the Introduction, U.S. states prohibited the entry of banks from other states for most of the 20th century. In particular, state regulators prohibited banks headquartered in one state from acquiring or establishing subsidiary banks in another state. By protecting state banking systems from out-of-state banks, these regulatory restrictions reduced the competitiveness of state banking markets.

By the mid-1970s, however, technological innovations in telecommunications and data processing made it easier for banks headquartered in one state to provide banking services to clients in different states without establishing subsidiaries in those states. That is, technology started to facilitate limited bank competition across state borders. As demonstrated by Kroszner and Strahan (1999), these exogenous technological innovations diminished the value to banks of lobbying to maintain interstate banking restrictions. Moreover, although the technological innovations were common across all states, the interaction between these technological changes and differences in the geography and density of economic activity across states had differential effects on the incentives of banks in different states to lobby to maintain regulatory prohibitions on interstate banking. As shown by Kroszner and Strahan (1999), the interaction between common technological changes and preexisting differences in states created heterogeneity in the timing of interstate bank deregulation.

Starting with Jayaratne and Strahan (1996), an extensive body of research uses the removal of regulatory impediments to interstate banking as exogenous sources of variation in the competitiveness of each state's banking market. From 1978 through 1995, states engaged in a process of interstate bank deregulation, in which a state allowed banks from other states to acquire or establish subsidiary banks in its borders. Over this period, states removed restrictions on interstate banking in a dynamic, state-specific process, either by unilaterally opening their state borders and allowing out-of-state banks to enter or by signing reciprocal bilateral and multilateral agreements with other states. Thus, states initiated interstate bank deregulation in different years and then followed different paths as they signed agreements with other states. The process of interstate bank deregulation ended with the passage of the Riegle-Neal Act of 1994 that eliminated restrictions on BHCs establishing subsidiary bank networks across state boundaries. These

policy changes increased the contestability of banking markets by allowing banks to more easily provide banking services to clients in different state. Reflecting this regulatory-induced competition, interstate bank deregulation reduced interest rates on loans and increased interest rates on deposits (e.g., Jayaratne and Strahan, 1998; and Stiroh and Strahan, 2003).

We measure the regulatory-induced competition pressures triggered by interstate bank deregulation in three ways. First, we follow a long literature that simply defines a state as "deregulated" after it first lowers barriers to interstate banking with at least one other state. In particular, we set $Inter_{jt}$ equal to one for all years t since state j first allows banks from any other state to establish subsidiaries within state j and zero otherwise. $Inter_{jt}$ differs across states because states started the process of interstate bank deregulation in different years. $Inter_{jt}$ does not, however, account for the cross-state heterogeneity in the evolution of interstate banking reforms that occurred over almost two decades.

Second, following Goetz et al. (2013), we examine the evolution of interstate banking reforms. We calculate the number of states whose banks can enter a state in each year. Specifically, $Ln(\#\ of\ States)_{jt}$ equals the natural logarithm of one plus the number of states whose banks can enter state j in year t. This measure accounts for cross-state differences in the dynamic process of removing impediments to out-of-state banks. However, $Ln(\#\ of\ States)_{jt}$ does not differentiate states by the impact that their banks have on the competitive environment in state j; it just provides the number of other states whose banks can enter state j.

Third, building on Jiang et al. (2016), we construct a measure of regulatory-induced competition that differentiates by the impact that each state has on the competitive environment in other states. Specifically, we exploit the gravity model of investment, which holds that the costs to a firm of establishing and operating a subsidiary in a different location are positively associated with the distance to that location. Applied to banking, the gravity model predicts that if state j deregulates interstate banking restrictions with two states, the closer state will generate more competitive pressures because the costs of establishing a subsidiary are lower. Thus, our third regulatory-induced competition measure is $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$, which equals the natural logarithm of one plus the number of other states whose banks enter state j in year t, where each of these other states is weighted by the inverse of their distance from the state.

2.3. Econometric strategy

To assess the relationship between firm risk and the regulatory-induced competition pressures generated from interstate bank deregulation, we start with the following regression framework.

$$Firm\ Risk_{ijt} = \beta D_{jt} + \gamma' X_{ijt} + \delta_i + \delta_t + \delta_T^{IND} + \delta_T^{STATE} + \varepsilon_{ijt} \quad (1)$$

where $Firm\ Risk_{ijt}$ represents one of the two measures of the riskiness of firm i in state j in year t (*ROA Volatility* or *Idiosyncratic Risk*), D_{jt} represents one of the three measures of regulatory-induced competition from interstate bank deregulation (*Inter*, *Ln(# of states)*, or *Ln(# of states-distance weighted)*), X_{ijt} represents a vector of time-varying firm-level characteristics, δ_i and δ_t are firm and year fixed effects respectively, δ_T^{IND} and δ_T^{STATE} represent separate linear time trends for each industry and state respectively, and ε_{ijt} is the error term. In selecting the firm-level control variables, X_{ijt}, we follow work by Faccio et al. (2011), Coles et al. (2006), and Low (2009) on firm-risk and control for firm size (*Size*), which equals the natural logarithm of firms' total asset, book leverage (*Bklev*), which equals total book debt divided by total asset, return on assets (*ROA*), which equals earnings before income and taxes divided by total asset, the market-to-book ratio (*MB*), which equals the ratio of the market value of assets divided by the book value of assets, and capital expenditures (*CapEx*). Throughout the analyses, we report heteroskedasticity-consistent standard errors clustered at the state level.

To link our analyses to the theories discussed in the Introduction, we estimate Eq. (1) for three samples of firms: the complete sample of firms, firms with high external financial dependence, and firms with low external financial dependence. If regulatory reforms affect firm risk by changing the banking system, then the effect of the regulatory reforms on firm risk should be especially pronounced among firms that rely heavily on bank finance. We examine this prediction by examining the three samples of firms and report these results below.

Below, we further modify this regression framework to explore two theoretically-motivated mechanisms through which bank competition can influence firm risk. In particular, we examine whether interstate bank deregulation (1) reduces the sensitivity of investment to cash flows, sensitivity of corporate borrowing to adverse bank supply shocks and (2) reduces the sensitivity of corporate borrowing to state-specific recessions and booms. We detail the specific regressions when we examine these mechanisms.

3. Results on firm risk

3.1. Core results

Table 2 provides the results from estimating Eq. (1). The dependent variable is *ROA Volatility* in Panel A and *Idiosyncratic Risk* in Panel B. In each Panel, we present the results of nine regressions. For each of the three measures of regulatory-induced bank competition – *Inter*, *Ln(# of states)*, or *Ln(# of states-distance weighted)*, we provide estimates for the full sample of firms (ALL), firms in industries that rely heavily on bank financing (High), and firms in industries that have low dependence on bank financing (Low). In Table 2, we do not include linear time trends by state and industry. We provide and discuss these results below.

We discover that regulatory-induced bank competition reduces corporate risk, especially among firms in industries that rely heavily on external finance. Each of the three measures of regulatory-induced bank competition enters negatively and significantly in both the *ROA Volatility* and *Idiosyncratic Risk* regressions when examining firms in the full sample, and in industries that rely heavily

Table 2
banking competition and firm risk: baseline regression.

	External financial dependence								
	ALL	High	Low	ALL	High	Low	ALL	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A - Dependent variable: ROA volatility									
Inter	−0.0106***	−0.0164***	−0.0016						
	(−3.95)	(−3.71)	(−0.76)						
Ln(# of states)				−0.0037***	−0.0060***	−0.0013			
				(−3.53)	(−2.99)	(−1.53)			
Ln(# of states-distance weighted)							−0.0046***	−0.0078***	−0.0017
							(−2.95)	(−2.84)	(−1.60)
Size	−0.0049***	−0.0051**	−0.0047***	−0.0050***	−0.0052**	−0.0047***	−0.0050***	−0.0053**	−0.0047***
	(−2.85)	(−2.29)	(−2.92)	(−2.90)	(−2.34)	(−2.94)	(−2.90)	(−2.35)	(−2.95)
Bklev	0.0006	−0.0028	0.0063	0.0007	−0.0026	0.0063	0.0007	−0.0027	0.0063
	(0.09)	(−0.27)	(1.48)	(0.10)	(−0.25)	(1.48)	(0.10)	(−0.26)	(1.48)
ROA	−0.1276***	−0.1273***	−0.1337***	−0.1277***	−0.1273***	−0.1337***	−0.1277***	−0.1273***	−0.1337***
	(−14.73)	(−15.29)	(−9.44)	(−14.73)	(−15.34)	(−9.44)	(−14.78)	(−15.46)	(−9.42)
MB	0.0021**	0.0007	0.0054***	0.0021**	0.0007	0.0054***	0.0021**	0.0007	0.0054***
	(2.59)	(0.81)	(3.85)	(2.56)	(0.77)	(3.85)	(2.57)	(0.77)	(3.85)
CapEx	−0.0132*	−0.0186*	−0.0005	−0.0138*	−0.0188*	−0.0007	−0.0138*	−0.0189*	−0.0007
	(−1.79)	(−1.74)	(−0.05)	(−1.83)	(−1.72)	(−0.07)	(−1.83)	(−1.72)	(−0.07)
Constant	0.1106***	0.1295***	0.0869***	0.1109***	0.1300***	0.0882***	0.1100***	0.1289***	0.0880***
	(18.88)	(16.80)	(12.33)	(17.65)	(15.26)	(12.24)	(17.75)	(15.90)	(12.72)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	74,613	36,912	37,698	74,613	36,912	37,698	74,613	36,912	37,698
Adjusted R2	0.668	0.664	0.709	0.668	0.664	0.709	0.668	0.664	0.709
High - Low		−0.0148***			−0.0047**			−0.0061**	
(p-value)		(0.002)			(0.041)			(0.032)	
Panel B - Dependent variable: idiosyncratic risk									
Inter	−0.0536**	−0.0743**	−0.0099						
	(−2.52)	(−2.56)	(−0.50)						
Ln(# of states)				−0.0253**	−0.0419***	−0.0068			
				(−2.32)	(−3.53)	(−0.67)			
Ln(# of states-distance weighted)							−0.0269*	−0.0479***	0.0001
							(−1.79)	(−3.47)	(0.01)
Size	−0.2038***	−0.2026***	−0.2297***	−0.2045***	−0.2036***	−0.2299***	−0.2045***	−0.2039***	−0.2297***
	(−20.74)	(−13.00)	(−16.99)	(−21.14)	(−13.34)	(−16.95)	(−21.19)	(−13.45)	(−16.95)
Bklev	0.0503***	0.0298***	0.6883***	0.0503***	0.0298***	0.6884***	0.0504***	0.0299***	0.6884***
	(3.43)	(3.37)	(14.15)	(3.44)	(3.37)	(14.18)	(3.46)	(3.39)	(14.15)
ROA	−0.2028***	−0.2039***	−0.1742***	−0.2030***	−0.2042***	−0.1742***	−0.2030***	−0.2042***	−0.1743***
	(−6.18)	(−5.44)	(−2.79)	(−6.17)	(−5.46)	(−2.79)	(−6.17)	(−5.49)	(−2.79)
MB	−0.0220***	−0.0178***	−0.0350***	−0.0220***	−0.0178***	−0.0350***	−0.0220***	−0.0178***	−0.0350***
	(−5.11)	(−4.73)	(−3.03)	(−5.12)	(−4.73)	(−3.03)	(−5.12)	(−4.74)	(−3.03)
CapEx	−0.6309***	−0.5383***	−0.9605***	−0.6326***	−0.5403***	−0.9611***	−0.6325***	−0.5404***	−0.9607***
	(−5.19)	(−5.06)	(−7.17)	(−5.17)	(−5.05)	(−7.16)	(−5.17)	(−5.06)	(−7.16)
Constant	3.9635***	4.0533***	3.8377***	3.9751***	4.0799***	3.8432***	3.9640***	4.0647***	3.8323***
	(90.48)	(67.44)	(47.42)	(86.81)	(66.00)	(45.94)	(94.57)	(73.13)	(46.34)
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	74,900	36,524	38,370	74,900	36,524	38,370	74,900	36,524	38,370
Adjusted R^2	0.645	0.646	0.664	0.645	0.647	0.664	0.645	0.646	0.664
High - Low		−0.0644**			−0.0351***			−0.0479***	
(p-value)		(0.025)			(0.001)			(0.000)	

This table presents the effect of interstate banking deregulations on firms' risks. The sample period covers from 1975 to 1994. In panel A, the dependent variable is *ROA Volatility* while in panel B, the dependent variable is *Idiosyncratic Risk*. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. $Ln\ (\#\ of\ states)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. In both panels, results are shown by the full sample as well as subsamples based on external financial dependence (EFD), respectively. A high (low) EFD subsample has industry EFD above (below) the sample median. Firm and year fixed effects are included in all of the regressions and not tabulated in the table. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics for the regression coefficients are in parentheses. The difference between the coefficients of interstate banking deregulation measures in High vs. Low group is tested using SUR with *p*-value shown in the last row. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

on external finance. In contrast, none of the deregulation measures enters significantly in either of the firm risk when using the subsample of firms in low financial dependence industries. We further test the difference of the coefficients associated with each of the three measures of regulatory-induced bank competition in the *High* and *Low* external finance groups using the Seemingly Unrelated Regression (SUR) model. As the *p*-values of the test statistics in the last row of the table show, the effect of interstate banking deregulation is significantly larger among firms in *High* external financial dependence industries. These results are consistent with the view that increases in bank competition reduce risk taking by firms that rely heavily on bank funding.

The estimated coefficients suggest an economically large effect. First, consider the ROA volatility regression for the full sample of firms when using the simple binary indicator before and after a state first allowed the entry of banks from any other state (*Inter*). As shown in Panel A, *Inter* enters with a coefficient of −0.0106 indicating that *ROA Volatility* decreases by about 0.0106, holding other factors constant. This is large relative to the mean and median values of *ROA Volatility*, which are 0.0839 and 0.0448 respectively, as shown in Panel A of Table 1. Thus, the estimates in Table 2 indicate that interstate bank deregulation, on average (at the median), induced a 13% (24%) reduction in firm risk.

Second, consider the regression results on the sample of firms with high external financial dependence. For this subsample, the estimated coefficient on *Inter* is 60% larger in absolute value terms (−0.0164). Thus, interstate bank deregulation induced a 20% (37%) reduction in firm risk relative to average (median) firm in the full sample.[4] While considering the regression results on the sample of firms with low external financial dependence, the estimated coefficient (−0.0016) is neither statistically significant nor economically relevant (given that the mean value of *ROA Volatility* for Low group is 0.067). Furthermore, the differences between the estimated coefficients on the regulatory-induced competition measures in the *High* and *Low* groups are large. Using *Inter* and comparing firms with *High* and *Low* lower external financial dependence, the estimate indicate that deregulation led to 1.5% greater reduction in risk, on average, among firms that depend heavily on external finance. Thus, interstate bank deregulation has a much bigger impact on firm risk among firms in industries that depend heavily on external finance.

Third, consider the *Idiosyncratic Risk* results in Panel B. Since idiosyncratic risk is measured as the natural logarithm of the firm risk, i.e., the variance of the residuals from the CAPM, the coefficient estimate provides the percentage change in firm risk. Thus, the estimated coefficient on *Inter* of −0.0743 for firms that depend heavily on external finance implies that an intensification of bank competition (as measured by *Inter* switching from zero to one) decreases firms' idiosyncratic risk by 7.4% among these heavily-dependent (*High* group) firms. Again, we apply the SUR model to test the differences of the estimated coefficients associated with each of the three interstate banking deregulation measures in the *High* versus *Low* external financial dependence groups. We find that the differences are statistically significant and economically large.

The control variables enter with coefficient estimates that are similar in magnitude to those in existing studies of firm risk. As shown in Panel A of Table 2, on average smaller firms are riskier than large firms, while more profitable firms are less risky. The estimated coefficients on Market-to-Book are positive and significant, indicating that firms that grow faster are riskier. In panel B, we find that the estimated coefficient on book leverage is positive and significant, which is consistent with the capital structure theory that higher leverage induces higher default risk, and the estimated coefficient on capital expenditure is negative, which is consistent with the view that physical capital could be used as collateral, lowering the probability of default.

3.2. Controlling for state and industry linear time trends

We were concerned that trends in corporate risk within a state could influence both the start and the dynamic process of interstate bank deregulation, confounding the ability to draw causal inferences about the relation between bank competition and firm risk from these bank deregulation measures. One of the ways in which we address this concern is by including linear time trends for each state as depicted in Eq. (1). We also include linear time trends for each industry since this too could differentially affect the evolution of firm risk within states.

We find that the results hold and the coefficients change little when including these linear time trends. We report these results in Panel A and B of Table 3. We obtain similar results to those presented in Table 2 for both *ROA Volatility* and *Idiosyncratic Risk*, and for all of the three interstate bank deregulation measures.

We further control for state-year fixed effects to condition out potentially confounding factors differing by state and year. To conduct this examination, we first define an indicator variable *EFD Dummy* that equals one if the industry measure of external financial dependence is greater than the sample median and zero otherwise. Then, we augment the Eq. (1) regression specification used above by interacting the *EFD Dummy* with all of the regressors in the baseline regression. As the value of each of the three measures of regulatory-induced bank competition remains the same for all the firms in a single state-year, the standalone terms of these deregulation measures are absorbed by the state-year fixed effects. We also control for firm fixed effects and industry linear trends. State-level linear trends will also be subsumed by state-year fixed effects. Again, we report heteroskedasticity-consistent standard errors and cluster at the state level. As shown in Table 4, each of three interaction terms – *EFD Dummy* separately interacted with each of the regulatory-induced bank competition measures – enters negatively and significantly. The estimated difference between the *High* versus *Low* external financial groups is similar to the estimated differences reported in Table 3 above, when splitting the sample.

[4] This can also be evaluated relative to the sample of bank dependent firms. Given that the mean value of *ROA Volatility* for the *High* group is 0.1012, interstate bank deregulation induced a 16% reduction in firm risk, on average, relative to the high bank dependent group of firms.

Table 3
Banking competition and firm risk: baseline regressions with state and industry linear time trends.

	External financial dependence								
	ALL	High	Low	ALL	High	Low	ALL	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A - Dependent variable: ROA volatility									
Inter	−0.0103***	−0.0164***	−0.0012						
	(−3.77)	(−3.57)	(−0.57)						
Ln(# of states)				−0.0038***	−0.0072***	−0.0005			
				(−3.51)	(−3.83)	(−0.56)			
Ln(# of states-distance weighted)							−0.0050***	−0.0098***	−0.0011
							(−2.97)	(−3.67)	(−0.86)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	74,613	36,912	37,698	74,613	36,912	37,698	74,613	36,912	37,698
Adjusted R2	0.670	0.666	0.710	0.669	0.666	0.710	0.669	0.666	0.710
High - Low		−0.0152***			−0.0067***			−0.0087***	
(p-value)		(0.003)			(0.002)			(0.002)	
Panel B - Dependent variable: idiosyncratic risk									
Inter	−0.0583***	−0.0877***	−0.0081						
	(−2.71)	(−3.01)	(−0.41)						
Ln(# of states)				−0.0264**	−0.0420***	−0.0036			
				(−2.65)	(−3.80)	(−0.40)			
Ln(# of states-distance weighted)							−0.0336**	−0.0550***	−0.0035
							(−2.23)	(−3.29)	(−0.24)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	74,900	36,524	38,370	74,900	36,524	38,370	74,900	36,524	38,370
Adjusted R2	0.649	0.650	0.669	0.649	0.650	0.669	0.648	0.650	0.669
High - Low		−0.0796***			−0.0383***			−0.0515***	
(p-value)		(0.005)			(0.000)			(0.000)	

This table reports the baseline results controlling for the linear time trends of states and industries. State (Industry) linear time trend is constructed as the interaction terms of state (industry) dummy and year. The results are shown by the full sample as well as subsamples based on external financial dependence (EFD), respectively. A high (low) EFD subsample has industry EFD above (below) the sample median. The dependent variable is *ROA Volatility* in Panel A and *Idiosyncratic Risk* in Panel B. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. $Ln\ (\#\ of\ states)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. t statistics for the regression coefficients are in parentheses. The difference between the coefficients of interstate banking deregulation measures in High vs. Low group is tested using SUR with *p*-value shown in the last row. Heteroskedasticity-consistent standard errors are clustered at the state level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

3.3. Other potential confounding effects

In Appendix 2, we summarize the results of five additional robustness checks. First, since firms headquartered in California and New York account for 25% of our sample, we conduct the analyses while omitting firms from these two states. As shown in column (1)–(3) of Panel A and B, the results hold for *ROA Volatility* and *Idiosyncratic Risk*, both in terms of statistical significance in terms of the size of the estimated coefficients. Second, we were concerned that the results might be sensitive to when we end the sample. For example, we end the sample in 1994 with the passage of the Riegle-Neal Act, but it might take some time for bank competition to materialize and affect firms. Thus, we extend the estimation period through 1997. The results hold and are shown in column (4)–(6) of both Panels of Appendix 2. Third, choosing a start date is also a bit arbitrary. We start our sample in 1975, but it was not until 1978 that a state (Maine passed a reciprocal interstate banking law), and it was not reciprocated until 1982. Thus, as a robustness check, we conduct the analyses starting in 1982 as well. As shown in column (7)–(9) of Appendix 2, the results hold. Fourth, since this is a period when states were also removing impediments to the branching of banks within their states, i.e., intrastate bank deregulation, we also control for the date when each state permitted intrastate branching. Again, as shown in columns (10)–(12) in Appendix 2, the results hold. Fifth, we were concerned that changes in hostile takeover laws during this period could affect the estimates. In

Table 4
Banking competition and firm risk: robustness to state-year fixed effects.

Dependent variable:	ROA volatility			Idiosyncratic risk		
	(1)	(2)	(3)	(4)	(5)	(6)
EFD Dummy*Inter	−0.0136***			−0.0756***		
	(−2.93)			(−3.14)		
EFD Dummy*Ln(# of states)		−0.0058**			−0.0340***	
		(−2.68)			(−3.14)	
EFD Dummy*Ln(# of states-distance weighted)			−0.0069**			−0.0427***
			(−2.38)			(−2.71)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
State-Year FE	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	74,610	74,610	74,610	74,894	74,894	74,894
Adjusted R^2	0.687	0.687	0.687	0.668	0.668	0.668

This table reports the effect of interstate banking deregulations on the risks of firms in industries with High versus Low external financial dependence (EFD), controlling for state-year fixed effects. We define EFD dummy as equal to one if the industry EFD of a firm is above the sample median and zero otherwise. We interact the EFD dummy with all the variables in the baseline regressions in Table 2 and present the key interactions. The dependent variable is *ROA Volatility* in column (1)–(3) and *Idiosyncratic Risk* in column (4)–(6). All regressions include firm and state-year fixed effects, plus industry linear time trends. Standalone measures of interstate banking deregulation, year fixed effects and state linear trends are subsumed by state-year fixed effects. t statistics for the regression coefficients are in parentheses. Heteroskedasticity-consistent standard errors are clustered at the state level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

particular, over our sample period, 30 states passed business combination (BC) laws that reduced the threat of hostile takeovers, weakening the role of the market for corporate control (Bertrand and Mullainathan, 2003). Some theories suggest that impeding takeovers allows managers to enjoy a more "quiet life" by having their firms take less risk. If these legal changes occurred when states were removing impediments to interstate bank deregulation, their influence could confound the ability to draw inferences about the impact of bank competition on firm risk. In order to mitigate this concern, we control for changes in these BC laws. As shown in columns (13)–(15) of Appendix 2, all of the results hold.[5]

3.4. The dynamics of firm risk and regulatory-induced competition

Although we demonstrated above that the results hold even when controlling for individual state trends and state-year fixed effects, concerns might remain about the possibility that the evolution of corporate risk in a state shapes the state's approach to bank deregulation. Thus, we examine the dynamics of firm risk before and after interstate bank deregulation. If these reverse causality influences are important, then we should find that firm risk predicts interstate bank deregulation.

In particular, following Kerr and Nanda (2009) and Beck et al. (2010), we construct a dynamic difference-in-differences model including a set of dummies for the years surrounding the year a state first lowers its barriers to interstate banking, using the previous three years or earlier as the reference group. In particular, the dummy variables are set equal to zero, except *BeforeX* equals one for the X year(s) before the state first deregulates with another state; *AfterX* equals one for X year(s) after deregulation; *After0* equals one for the year of deregulation. *After6+* equals one for all years starting with year six onward following the state's first interstate bank deregulation. Table 5 provides regression results for both *ROA Volatility* and *Idiosyncratic Risk* and also includes all of the standard controls from Table 3, including firm and year fixed effects, as well as state and industry linear trends.

As shown in Table 5, there are two key findings. First, there is no evidence that pre-deregulation trends are distorting our interpretation of the regression results. That is, *BeforeX* dummies all enter insignificantly. Second, the impact of deregulation on firm risk is persistent over time. That is, the estimated coefficients on the post-deregulation dummies are all negative and significant. This suggests that the effects of competition-enhancing regulatory reforms on firm risk are non-transitory.

3.5. Robustness tests: Sampling concerns

We were concerned about several sampling issues, including the selection of firms into and out of the sample during the estimation period, the sensitivity of the results to excluding large firms, and the robustness of the results to focusing on highly-competitive industries. In this subsection, we evaluate each of these sampling concerns.

First, firms might differentially select into and out of the estimation sample in a manner that affects the results. Thus far, our estimation sample includes all U.S firms in the Compustat database from 1975 to 1994 with the requisite data. Since states started the process of interstate bank deregulation only after 1978, our estimate sample includes firms stopped operations before their states

[5] We also separately examine *High* and *Low* external financial dependence groups. In unreported results, we find that the estimated coefficient of each deregulation measure is more negative in the *High* group.

Table 5
Dynamic effects of banking deregulation.

Dependent variable:	ROA volatility (1)	Idiosyncratic risk (2)
Before3	−0.0006	−0.0196
	(−0.25)	(−0.57)
Before2	−0.0038	−0.0442
	(−0.86)	(−1.19)
Before1	−0.0083	−0.0647
	(−1.63)	(−1.61)
After0	−0.0161***	−0.0999**
	(−2.76)	(−2.02)
After1	−0.0173**	−0.1283**
	(−2.65)	(−2.11)
After2	−0.0172**	−0.1503**
	(−2.57)	(−2.50)
After3	−0.0181***	−0.1964**
	(−2.84)	(−2.64)
After4	−0.0178***	−0.1798**
	(−2.92)	(−2.23)
After5	−0.0192***	−0.1954**
	(−3.14)	(−2.26)
After6 +	−0.0197***	−0.1975*
	(−3.38)	(−2.00)
Controls	YES	YES
Firm FE	YES	YES
Year FE	YES	YES
State trend	YES	YES
Industry trend	YES	YES
Observations	74,613	74,900
Adjusted R^2	0.670	0.649

This table reports the dynamic effect of interstate banking deregulations on firms' risks. The dependent variable is *ROA Volatility* and *Idiosyncratic Risk* respectively in column (1) and (2). The response to interstate banking deregulation is modeled by adding dummy variables from three years before to six or more years after the deregulation. All regression control for year and firm fixed effects, and state and industry linear time trends, and the same set of controls in Table 2. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

started to deregulate interstate banking restrictions. Similarly, since some states completed interstate bank deregulation prior to 1994, our sample includes firms that began operations after their state had fully liberalized interstate banking restrictions. To (1) isolate whether firms that remain active throughout a state's the deregulation period experience a reduction in risk and (2) to address potential concerns with survivorship bias, we exclude both firms that stopped operation before their states started interstate bank deregulation and firms that only started after the state had completed the deregulation. That is, we focus on intensive margin and present these results in Appendix 3. As shown, all of the results discussed above hold for this subsample of "intensive" firms. Moreover, the economic sizes of the estimated coefficient in Appendix 3 are very similar to those that emerged from the full sample of firms.[6]

Second, we were concerned that larger firms might access banks in other states, reducing the connection between a state's banking system and its firms. To address this concern, we re-do the analyses for only small firms, which are less likely to use banks in other states. Specifically, we focus on the firms where the *Size* measure is below the sample median and use the same regression specification employed above. The results are provided in Panel A of Appendix 4. We find that deregulation-induced bank competition leads to a large decrease in firm risk, as gauged by both *ROA Volatility* and *Idiosyncratic Risk*. The effect is statistically significant across the specifications with each of the three measures of banking deregulation. This provides further evidence that when a state lowers barriers to interstate banking, this influences risk taking by client firms.

Third, we were concerned that the results might be driven only by uncompetitive industries. For example, firms with longstanding relationships with a bank might reduce their risk profiles if deregulation reduces the value of relationship lending (Petersen and Rajan, 1995). If firms facing greater competitive pressures are more focused on growth opportunities, they will tend to be less likely to tradeoff expected returns for lower risk. Under these conditions, uncompetitive firms will be more likely to reduce risk if deregulation impedes relationship lending. To address this concern, we focus only on firms operating in competitive industries. We

[6] In unreported results, we find that firms that dropped out of the sample prior to when its state started the process of interstate bank deregulation are not riskier than the "intensive" firms, i.e., those firms operating during the deregulation period. Furthermore, the firms that enter the sample after a state has completely removed banking restrictions are not less risky than those "intensive" firms.

measure industry competition using the Herfindahl-Hirschman Index (HHI) of the asset-based market shares of firms in the same industry and restrict the sample to firms in industries with below the sample median of industry HHI. We report the results in Panel B of Appendix 4. We find that the estimated impact of regulatory-induced banking competition on firm risk remains significantly negative across all specifications. These results further mitigate identification concerns and provide greater support for the view that an intensification of bank competition reduces corporate risk-taking.

3.6. Robustness tests: Alternative measures for risk and Bank financing dependence

In this subsection, we use alternative measures of firm risk and the degree to which firms depend on banks for external finance to address additional concerns. With respect to firm risk, we examine two alternative measures. First, there might be concerns that the degree to which firms smooth earnings (e.g., by manipulating depreciation costs) is positively associated with bank competition, so that the negative relation between bank deregulation and firm risk could reflect greater earnings smoothing, rather than an actual reduction in risk. To address this concern, we measure firm risk using the volatility of earnings before interests, taxes, depreciation and amortization (EBITDA) instead of using the measure employed above, *ROA Volatility*, which is based on earnings before interests and taxes. The EBITDA-based volatility measure is subject to less manipulation, as it also excludes depreciation and amortization. Second, we reconstruct the *Idiosyncratic Risk* measure by estimating the market model without the five leads and five lags. While using leads and lags helps address the non-synchronous trading issues of stock returns, they are less of a concern in our study given that we focus on firms listed in the same market. Therefore, we reassess our findings using these alternative risk measures. We present the results in Appendix 5. We find that all the results hold with these two alternative risk measures.

With respect to the degree that firms depend on banks for external finance, we were concerned that our measure of external financial dependence might capture reliance on other forms of finance. To address this concern, we follow Chava and Purnanandam (2011) and define firms as bank dependent if they are not covered by S&P credit ratings. The reasoning is that such firms will have less access to public bond markets and will therefore be more dependent on bank credit. We divide the sample into two groups (*High* versus *Low* bank credit dependence) based on the credit rating coverage and estimate the effect of interstate bank deregulation within each subgroup. The results are shown in Appendix 6. Consistent with our baseline results, we find that bank competition significantly lowers bank risk, especially among bank-dependent firms. As shown, the estimated impact is much larger for firms in the *High* versus *Low* bank dependence group. These robustness tests are consistent with the view that greater bank competition reduces firm risks by increasing firms' access to bank credit.

4. Mechanisms

In this section, we examine two predictions from theory for how bank competition shapes firm risk. We first test whether the capital expenditures become less sensitive to cash-flows among firms in states that implemented competition-enhancing regulatory reforms. Second, we evaluate whether the borrowing of firms in a state becomes less sensitive to fluctuations in the state's economy when the state lowers barriers to interstate banking.

4.1. Improved access to finance

As emphasized in the Introduction, one view argues that when banks face greater competition, they ease financing constraints (e.g., Froot et al., 1993). In turn, the easing of financing constraints, allows firms to borrow more easily when temporary, adverse conditions affect those firms. In the absence of bank credit, these short-run shocks would force firms to make inefficient investment and employment decisions that boost firm risk. Thus, following Fazzari et al. (1988) and many other studies (e.g., Biddle and Hilary, 2006; Almeida and Campello, 2007), we first examine whether the investment-cash flow sensitivity of firms falls when states implement regulatory-reforms that increased competition among banks.

In particular, we examine the following regression equation:

$$CapEx_{ijt} = \gamma CashFlow_{ijt} + \beta CashFlow_{ijt} * D_{jt} + \alpha D_{jt} + \phi Q_{i,k,t} + \delta_i + \delta_t + \delta_T^{IND} + \delta_T^{STATE} + \varepsilon_{ijt} \quad (2)$$

where $CapEx_{ijt}$ retains the same definition as above, and is equal to capital expenditures over total assets, D_{jt} represents one of the three measures of regulatory-induced competition from interstate bank deregulation (*Inter*, *Ln(# of states)*, or *Ln(# of states-distance weighted)*), $Cash\ Flow_{i,\ k,\ t}$ equals the firm's internal cash flow ratio, which is defined as operating cash flow over total assets, $CashFlow_{ijt} * D_{jt}$ is the interaction between one of the interstate bank deregulation indicators and corporate cash flow, which is our explanatory variable of focus, and $Q_{i,\ k,\ t}$ is the firms' Tobin's *q*. Finally, the regression also conditions on firm and year fixed effects, as indicated by δ_i and δ_t respectively, and state and industry linear trends (δ_T^{IND} and δ_T^{STATE}).

As shown in Table 6, corporate investment-cash flow sensitivities fall when states implement regulatory-reforms that increase competition among banks. This finding emerges from each of the measures of interstate bank deregulation. For example, consider the results on *Ln(# of states)* in column (2). The interaction term, $CashFlow_{ijt} * Ln(\#of\ states)_{jt}$ enters negatively and significantly indicating that a firm' capital expenditures become less sensitive to its cash flows when regulatory reforms intensify bank competition in the state. The estimated impact is also economically large. The general results show that after interstate bank deregulation (i.e.,

Table 6
Banking competition and firm risk: underlying channels through investment-cash flow sensitivity.

Dependent variable:	CapEx		
	(1)	(2)	(3)
Cash flow	0.1424***	0.1356***	0.1320***
	(6.81)	(7.25)	(7.34)
Cash flow*inter	−0.0646***		
	(−3.91)		
Inter	0.0129**		
	(2.08)		
Cash flow*ln(# of states)		−0.0192***	
		(−4.72)	
Ln(# of states)		0.0025*	
		(1.75)	
Cash flow*ln(# of states-distance weighted)			−0.0267***
			(−4.69)
Ln(# of states-distance weighted)			0.0041**
			(2.12)
Q	0.0216***	0.0217***	0.0217***
	(8.95)	(8.83)	(8.87)
Constant	0.0413***	0.0445***	0.0444***
	(5.25)	(7.39)	(7.68)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
State trend	YES	YES	YES
Industry trend	YES	YES	YES
Observations	66,465	66,465	66,465
Adjusted R^2	0.445	0.444	0.444

This table reports the effect of interstate banking deregulations on the investment-cash flow sensitivity. The dependent variable is *CapEx*, defined as capital expenditure scaled by total assets. *Cash Flow* is operating cash flow scaled by total assets. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. *Q* is Tobin's q. All regressions control for firm and year fixed effects, and state and industry linear time trends. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

#of state increases from 0 to 50), firms' investment-cash flow sensitivity drops by 0.0755 (−0.0192*ln(1 + 50)), indicating that firms are significantly less financially constrained. In the sense of economic significance, the decline represents about a 56% of the investment-cash flow sensitivity before deregulation (which is 0.1356).

4.2. Borrowing cyclicality

A second view regarding the mechanisms through which competition-enhancing bank regulatory reforms reduce firm risk focuses on borrowing cyclicality. We just showed that firms become less financially constrained after bank deregulations and this decline is more pronounced in distressed industries. In this section, we explore whether bank deregulation eased credit constraints in manner that allowed corporate operations to be less sensitive to the state-level economic cycles.

In particular, interstate bank deregulation not only intensified competition among banks, it also allowed banks to become more geographically diversified (e.g., Goetz et al., 2013). For example, as state *j* allowed banks from other states to enter state *j*, those other states typically allowed banks headquartered in state *j* to establish subsidiaries within their borders as well. As state *j* deregulated with other states, therefore, a larger proportion of the banking system in state *j* will have operations in multiple states. This will allow those banks to diversify state-specific risks (Goetz et al., 2016). From this perspective, interstate bank deregulation allows banks to better diversify state-specific risks, so that lending to firms is less sensitive to state-specific business cycles. Thus, we test whether the borrowing of firms in a state becomes less sensitive to the state's business cycle fluctuations as the state lowers barriers to interstate banking.

To evaluate whether removing restrictions on interstate banking makes corporate borrowing less sensitive to state-specific economic fluctuations, we estimate the following equation:

$$Debt\ Issuance_{ijt} = \gamma GSPGrowth_{jt} + \beta GSPGrowth_{jt} * D_{jt} + \alpha D_{jt} + \phi' \boldsymbol{X}_{i,j,t} + +\delta_i + \delta_t + \delta_T^{IND} + \delta_T^{STATE} + \varepsilon_{ijt} \quad (3)$$

where *Debt Issuance*$_{ijt}$ is the change in the ratio of long-term debt, define as long-term debt over total assets, for firm *i* in state *j* in year *t*, D_{jt} represents one of the three measures of regulatory-induced competition from interstate bank deregulation (*Inter*, *Ln(# of states)*, or *Ln(# of states-distance weighted)*), *GSPGrowth*$_{jt}$ is the growth rate of gross state product (GSP) of state *j* in year *t*, *GSPGrowth*$_{jt} * D_{jt}$ is the interaction between one of the interstate bank deregulation indicators and the growth rate of GSP, $\boldsymbol{X}_{i,\ j,\ t}$ is a vector of control

Table 7
Banking competition and firm risk: underlying channels through borrowing cyclicality.

	Dependent variable: debt issuance		
	(1)	(2)	(3)
GSP growth	0.2361***	0.2293***	0.2264***
	(6.13)	(5.93)	(6.02)
GSP growth*inter	−0.3259***		
	(−5.46)		
Inter	0.0351***		
	(4.68)		
GSP growth*ln(# of states)		−0.0739***	
		(−3.33)	
Ln(# of states)		0.0084***	
		(3.67)	
GSP growth*ln(# of states-distance weighted)			−0.1116***
			(−3.41)
Ln(# of states-distance weighted)			0.0126***
			(3.67)
Size	0.0524***	0.0524***	0.0524***
	(23.68)	(23.45)	(23.36)
ROA	0.0046	0.0050	0.0051
	(0.55)	(0.58)	(0.59)
Tangibility	0.0757***	0.0756***	0.0755***
	(9.50)	(9.47)	(9.45)
MB	0.0030***	0.0030***	0.0030***
	(4.01)	(4.03)	(4.03)
Constant	−0.2438***	−0.2417***	−0.2412***
	(−19.81)	(−19.51)	(−19.56)
Firm FE	YES	YES	YES
Year FE	YES	YES	YES
State trend	YES	YES	YES
Industry trend	YES	YES	YES
Observations	68,733	68,733	68,733
Adjusted R^2	0.071	0.070	0.070

This table reports the effect of interstate banking deregulations on firms' borrowing cyclicality. The dependent variable is *Debt Issuance* at firm level, which is measured with annual changes in long-term debt scaled by total assets. We use the state-level GSP growth rate to proxy for economic cyclicality. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. *Tangibility* is net plant, property and equipment scaled by total assets. All regressions control for year and firm fixed effects, and state and industry linear trends. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

variables for firm *i* in state *j* in year *t*, which, following Heider and Ljungqvist (2015), includes *ROA*, *Size*, *MB* and *Tangibility*, where *Tangibility* is the ratio of tangible to total assets. The regression also controls for firm and year fixed effects (δ_i and δ_t) and state and industry linear trends ($\delta_T^{IND}$and δ_T^{STATE}).

The results reported in Table 7 indicate that when a state removes restrictions on interstate banking, the borrowing by firms in the state become less cyclical. The estimated coefficient on the interaction between each interstate bank deregulation measure and *GSP Growth* enters negatively and significantly. With respect to economic size of the coefficient, the cyclicality of firm financing will be reduced by 0.2906 (= − 0.0739*ln(1 + 50)) after interstate bank deregulation. The reduction almost fully offsets the pre-deregulation borrowing cyclicality (i.e., 0.2293). These findings are consistent with the view that interstate bank deregulation allows banks to diversify away state-specific risks, and this greater diversification facilitates lending to firms during temporary, state-specific economic downturns.[7]

We push these analyses a bit further to focus on diversification. If firms borrowing in a state becomes less cyclical when banks operating in that state expand across different states and diversify away state-specific risks due to interstate bank deregulation, then the decrease in borrowing cyclicality should be larger in states where banks are more geographically diversified. Thus, we split our sample by states according to the level of banks' geographic diversification in each state. Following Amore et al. (2013), we define *Geographic Diversification* as the weighted average of diversification of all banking institutions operating in the state. For each banking institution, we calculate its diversification by estimating its HHI according to its asset distribution across states. We then weight each banking institution by the percentage of its asset in the state over the total banking assets in the state. Then, we run the same

[7] We also conduct the same analyses as in Tables 6 and 7 while splitting the full sample into *High* versus *Low* external financial dependence groups. As shown in Appendix 7, the effect is more pronounced among firms in High external financial dependence industries.

Table 8
Diversification benefits of interstate banking deregulation.

	Geographic diversification					
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: debt issuance						
GSP growth	0.2221***	0.2620**	0.2353***	0.2213**	0.2270***	0.2045**
	(7.16)	(2.39)	(5.67)	(2.35)	(6.03)	(2.17)
GSP growth*inter	−0.3471***	−0.3090**				
	(−4.47)	(−2.31)				
Inter	0.0414***	0.0326**				
	(4.07)	(2.54)				
GSP growth*ln(# of states)			−0.1110***	−0.0244		
			(−5.54)	(−0.83)		
Ln(# of states)			0.0116***	0.0047		
			(4.79)	(1.61)		
GSP growth*ln(# of states-distance weighted)					−0.1573***	−0.0169
					(−5.60)	(−0.39)
Ln(# of states-distance weighted)					0.0188***	0.0024
					(6.58)	(0.63)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	36,528	32,205	36,528	32,205	32,205	36,528
Adjusted R^2	0.065	0.064	0.065	0.064	0.064	0.065
High - Low	−0.0381		−0.0866**		−0.1404**	
(p-value)	(0.808)		(0.023)		(0.011)	

This table reports regression results on the diversification benefits of interstate banking deregulation. We use the change of long-term debt as dependent variable (*Debt Issuance*). We split the sample by the geographic diversification of all banking institutions in a state. Following Amore et al. (2013), we construct geographic diversification as the weighted average of diversification of all banking institutions operating in the state. For each banking institution, we calculate its diversification level by estimating its HHI index according to its asset distribution across states. We then weight each banking institution by the percentage of its asset in the state over total banking assets in the state. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions control for year and firm fixed effects, and state and industry linear trends. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics for the regression coefficients are in parentheses. The difference between the coefficients of interaction terms between GSP Growth and interstate banking deregulation measures in High vs. Low group is tested using SUR with p-value shown in the last row. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

regressions as above except that we split the full sample between states with banking systems that have either high or low geographic diversification across other states.

As shown in Table 8, we find that interstate bank deregulation is associated with a larger decrease in borrowing cyclicality in states where banks have diversified their activities into other states to a greater extent. In states with banking systems that have low geographic diversification, we find that interstate bank deregulation did not reduce the borrowing cyclicality of firms. We also test the difference between the coefficient on the interaction term between each of the deregulation measures and *GSP Growth*. The SUR estimate suggests that the more diversified group did experienced a significantly larger reduction in borrowing cyclicality than the less diversified group. Thus, the results are consistent with the view that (1) interstate bank deregulation allows banks to expand across state borders and diversify away state-specific risks and (2) this diversification reduces the tightening of a firm's financing constraints when there are local, adverse shocks that trigger inefficient corporate investment and employment decisions.

4.3. Non-bank financing

Finally, to further assess the independent link between interstate bank deregulation and bank financing, we examine whether a deregulation-induced intensification of bank competition changes firms' non-bank financing, such as the issuance of public bonds or equity. To conduct this examination, we obtain debt and seasoned equity issuance data from Thomson Reuters's SDC database. We

Table 9
Banking competition and other financing.

Dependent variable:	Bond issue dummy			Ln(bond issue amt)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Bond issuance						
Inter	0.0068			0.0269		
	(1.52)			(1.27)		
Ln(# of states)		0.0006			0.0076	
		(0.31)			(0.84)	
Ln(# of states-distance weighted)			0.0020			0.0154
			(0.67)			(1.10)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	78,396	78,396	78,396	78,396	78,396	78,396
Adjusted R2	0.236	0.236	0.236	0.291	0.291	0.291

Dependent variable:	Equity issue dummy			Ln(equity issue amt)		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B - Equity issuance						
Inter	0.0048			0.0123		
	(1.21)			(0.92)		
Ln(# of states)		0.0020			0.0045	
		(1.05)			(0.68)	
Ln(# of states-distance weighted)			0.0032			0.0089
			(1.14)			(0.96)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES
Observations	78,396	78,396	78,396	78,396	78,396	78,396
Adjusted R2	0.076	0.076	0.076	0.094	0.094	0.094

This table presents the results on the effect of interstate banking deregulation on bond issuance (Panel A) and seasoned equity issuance (Panel B). *Bond Issue Dummy* and *Equity Issue Dummy* is an indicator variable that equals one when the firm issues debt and equity respectively in a year and zero otherwise. *Ln(Bond Issue Amt)* and *Ln(Equity Issue Amt)* is the natural logarithm of one plus the total issue value of debt and equity in a firm-year respectively. $Ln\ (\#\ of\ states)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions control for year and firm fixed effects, state and industry linear trends, and the same set of controls in Table 2. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

construct four measures of securities issuances by each firm in each year, where two measure are for bond financing and two for equity financing: *Bond Issuance Dummy* (*Equity Issuance Dummy*) is an indicator variable that equals one if the firm issues bonds and notes (equity) in a year and zero otherwise; and, *Ln(Bond Issue Amt)* (*Ln(Equity Issue Amt)*) is the natural logarithm of one plus the principle amount of the bond (equity) issuance in a firm year. We apply the same regression specification in Eq. (1) to estimate the effect.

As shown in Table 9, none of these measures of non-bank financing changes significantly following interstate bank deregulation.[8] These results provide further evidence consistent with the view that interstate bank deregulation lowers corporate risk by increasing access to bank credit, not by altering their issuance of bond or equity securities.

5. Conclusions

In this paper, we find that regulatory reforms that intensified competition among banks materially reduced firm risk, especially among firms that rely heavily on bank finance. In particular, when states allowed banks from other states to enter their borders, establish subsidiaries, and compete with local banks, this has a big impact on firm risk. For example, the estimates indicate that

[8] In additional analysis shown in Appendix 8, we also find insignificant patterns when splitting the sample into *High* versus *Low* external financial dependence groups.

interstate bank deregulation reduced the standard deviation of the ROA of firms in industries that rely heavily on external finance by 13% (24%) of the mean (median) standard deviation of ROA in the full sample of firms.

Furthermore, with respect to the mechanism, we find that competition-enhancing bank regulatory reforms reduced both the sensitivity of investment to cash flows and firms' borrowing cyclicality. These results are consistent with the following view of how deregulation lowered corporate risk. Interstate bank deregulation reduced the severity with which firms experienced a tightening of credit constraints when they experience adverse shocks. By making credit more available to firms during difficult times than firms would have had before deregulation, competition-enhancing deregulation reduces the degree to which firms are forced to make inefficient investment and employment decisions that boost firm risk.

Appendix 1. Variable definitions

Variable	Definition	Source
Interstate banking deregulation measures and other law changes		
Inter	A dummy indicator that equals to one since the year of the first passage of interstate bank deregulation in a firm's headquarter state, and zero otherwise.	
Ln(# of states)	The natural logarithm of one plus the number of states whose BHCs can enter into home state in year t	
Ln(# of states-distance weighted)	The natural logarithm of one plus the number of states whose BHCs can enter into home state in year t, where each of the states are weighted by the inverse of distance to the home state in year t.	
Intra	A dummy indicator that equals one since the year of the first passage of intrastate bank deregulation in a firm's headquarter state, and zero otherwise.	
BC	A dummy indicator that equals one since the year of the first passage of business combination law in a firm's headquarter state, and zero otherwise.	
Firm risk measures		
ROA volatility	Standard deviation of the industry-adjusted ROA over a four-year window, where ROA is defined as earnings before interests and taxes over total assets, adjusted by the median ROA of the firms' in the industry. In the robustness test, we use earnings before interests, taxes, depreciation, and amortization.	Compustat
Idiosyncratic risk	The natural logarithm of the annualized variance of the residuals from the market model based on daily stock returns and returns on CRSP value-weighted market portfolio, where the model is estimated for each firm-year and adjusts for non-synchronous trading by adding five-day leads and five-day five lags. In the robustness test, we remove the leads and lags.	CRSP
Firm characteristics		
Size	The natural logarithm of total assets.	Compustat
Bklev	Book leverage defined as total debt over total assets.	Compustat
ROA	The ratio of earnings before interests and taxes to total assets.	Compustat
CapEX	The ratio of capital expenditures to total assets.	Compustat
MB	Market value of assets over book value of assets, where market value of assets is obtained using book value of assets plus the appreciation of market equity over book equity.	Compustat
CashFlow	Operating cashflows deflated by total assets.	Compustat
Q	Tobin's q, constructed as book value of assets plus the difference between market and book value of equity, net of deferred taxes, and further divided by book value of assets.	Compustat
Debt issuance	The change of long-term debt scaled by total assets.	Compustat
Tangibility	Net property, plant and equipment over total assets.	Compustat
Bond issue dummy	An indicator variable equals one if a firm issues bonds and notes in a year.	SDC
Ln(bond issue amt)	The natural logarithm of one plus the total principle amount of bonds and notes issued by a firm in a year.	SDC
Equity issue dummy	An indicator variable equals one if a firm issues new equity in a year.	SDC
Ln(equity issue amt)	The natural logarithm of one plus the total principle amount of equity issued by a firm in a year.	SDC
Bank credit dependence	Whether a firm is covered by the S&P credit rating.	Compustat
Industry characteristics		
External financial dependence	Average external financial dependence of firms in an industry. External financial dependence at firm level is measured as the difference between capital expenditures and cash flow from operations over capital expenditures.	Compustat
Industry competition	Average HHI of asset-based market shares of firms in an industry.	Compustat
State characteristics		
Geographic diversification	The weighted average of diversification of all banking institutions operating in the state. We use the ratio of assets it has in the state to the total banking assets in the state as the weight for each institution. As a measure of each banking institutions' diversification, we estimate the HHI based on the distribution of the assets of its subsidiaries across states.	Bank regulatory

Appendix 2. Banking Competition and Firm Risk: Robustness Checks.

	Excl. CA&NY			End at 1997			Start at 1982
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A - dependent variable: ROA volatility							
Inter	−0.0122***			−0.0109***			−0.0105***
	(−3.59)			(−4.23)			(−3.57)
Ln(# of states)		−0.0038***			−0.0041***		
		(−3.35)			(−3.22)		
Ln(# of states-distance weighted)			−0.0059***			−0.0056***	
			(−3.42)			(−2.83)	
Controls	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES
Observations	56,987	56,987	56,987	90,773	90,773	90,773	68,840
Adjusted R2	0.678	0.678	0.678	0.683	0.683	0.683	0.694
Panel B - Dependent Variable: idiosyncratic risk							
Inter	−0.0585*			−0.0604**			−0.0122
	(−1.99)			(−2.61)			(−0.49)
Ln(# of states)		−0.0265**			−0.0222**		
		(−2.45)			(−2.57)		
Ln(# of states-distance weighted)			−0.0474***			−0.0273**	
			(−3.20)			(−2.03)	
Controls	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES	YES
Observations	56,899	56,899	56,899	90,745	90,745	90,745	69,400
Adjusted R2	0.653	0.654	0.654	0.657	0.657	0.657	0.658

	Start at 1982		Intrastate			BC		
	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Panel A - dependent variable: ROA volatility								
Inter			−0.0097***			−0.0101***		
			(−3.95)			(−3.80)		
Ln(# of states)	−0.0038***			−0.0036***			−0.0038***	
	(−2.95)			(−3.67)			(−3.54)	
Ln(# of states-distance weighted)		−0.0053**			−0.0046***			−0.0048***
		(−2.62)			(−3.07)			(−2.96)
Controls	YES	YES	YES	YES	YES	YES	YES	YES

Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES
Observations	68,840	68,840	74,613	74,613	74,613	74,613	74,613	74,613
Adjusted R2	0.694	0.694	0.670	0.670	0.670	0.670	0.669	0.669
Panel B - Dependent Variable: idiosyncratic risk								
Inter			−0.0575***			−0.0586***		
			(−2.76)			(−2.73)		
Ln(# of states)	−0.0146**			−0.0260**			−0.0265**	
	(−2.08)			(−2.52)				−0.0350**
Ln(# of states-distance weighted)		−0.0169			−0.0330**			(−2.43)
		(−1.42)			(−2.03)			
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES	YES	YES
Observations	69,400	69,400	74,900	74,900	74,900	74,900	74,900	74,900
Adjusted R2	0.658	0.658	0.649	0.649	0.648	0.649	0.649	0.648

This table shows the robustness tests on the effect of interstate banking deregulations on firms' risks in alternative samples and periods, or with additional controls for state-level legal changes. Specifically, we (a) exclude firms headquartered in California and New York (column 1–3), (b) prolonged our sample period to 1997 (column 4–6) and then (3) restrict our starting year from 1982 (column 7–9); (4) include the intrastate banking deregulations (column 10–12); and (5) control for the BC law passage (column 13–15). The dependent variable is *ROA Volatility* in Panel A and *Idiosyncratic Risk* in Panel B. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. t statistics for the regression coefficients are in parentheses. Heteroskedasticity-consistent standard errors are clustered at the state level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 3. Banking competition and firm risk: intensive margin.

	ALL	High	Low	ALL	High	Low	ALL	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
External financial dependence									
Panel A - dependent variable: ROA volatility									
Inter	−0.0096***	−0.0149***	−0.0011						
	(−3.84)	(−3.33)	(−0.54)						
Ln(# of states)				−0.0037***	−0.0068***	−0.0005			
				(−3.38)	(−3.55)	(−0.54)			
Ln(# of states-distance weighted)							−0.0047***	−0.0088***	−0.0010
							(−2.70)	(−3.27)	(−0.77)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	65,046	31,869	33,175	65,046	31,869	33,175	65,046	31,869	33,175
Adjusted R2	0.674	0.670	0.708	0.673	0.670	0.708	0.673	0.670	0.708
Panel B - dependent variable: idiosyncratic risk									
Inter	−0.0462**	−0.0786***	−0.0051						
	(−2.26)	(−2.90)	(−0.24)						
Ln(# of states)				−0.0190*	−0.0350***	−0.0010			
				(−1.93)	(−3.12)	(−0.11)			
Ln(# of states-distance weighted)							−0.0219	−0.0447**	0.0019
							(−1.38)	(−2.43)	(0.12)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	62,455	29,941	32,508	62,455	29,941	32,508	62,455	29,941	32,508
Adjusted R2	0.650	0.655	0.671	0.650	0.655	0.671	0.650	0.655	0.671

This table reports the regression results at the intensive margin. We exclude the firms that have dropped out of the sample prior to the deregulation of its state and the firms that entered into the sample after a state had completed the deregulation. The results are shown by the full intensive sample as well as subsamples based on external financial dependence (EFD), respectively. A high (low) EFD subsample has industry EFD above (below) the sample median. The dependent variable is *ROA Volatility* in Panel A and *Idiosyncratic Risk* in Panel B. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. $Ln\ (\#\ of\ states)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics for the regression coefficients are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 4. Banking competition and firm risk: evidence from small firms and firms in competitive industries.

Dependent variable:	ROA Volatility			Idiosyncratic risk		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Small firms						
Inter	−0.0262***			−0.0716***		
	(−6.67)			(−2.69)		
Ln(# of states)		−0.0084***			−0.0346***	
		(−4.70)			(−2.74)	
Ln(# of states-distance weighted)			−0.0106***			−0.0352
			(−4.47)			(−1.64)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	32,114	32,114	32,114	36,205	36,205	36,205
Adjusted R2	0.633	0.633	0.632	0.534	0.534	0.533
Panel B - Firms in competitive industries						
Inter	−0.0147***			−0.0648*		
	(−3.24)			(−1.71)		

Ln(# of states)		−0.0053***			−0.0393***	
		(−3.33)			(−2.86)	
Ln(# of states-distance weighted)			−0.0075***			−0.0571***
			(−2.89)			(−2.76)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES
Observations	37,791	37,791	37,791	37,717	37,717	37,717
Adjusted R2	0.676	0.676	0.676	0.653	0.653	0.653

This table shows the results of interstate banking deregulations on the risks of small firms, which have relatively little multi-state presence and the firms operating in high competition industries. The small-firm sample (Panel A) consists of the firms with *Size* below sample median. The competitive sample consists of the firms operating in industries, where the HHI of the market shares of the firms in these industries is below sample median. The dependent variable is *ROA Volatility* in column (1)–(3) and *Idiosyncratic Risk* in column (4)–(6). *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics for the regression coefficients are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 5. Banking competition and firm risk: alternative risk measures.

	ALL	High	Low	ALL	High	Low	ALL	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
External financial dependence									
Panel A - Dependent variable: ROA volatility based on EBITDA									
Inter	−0.0049**	−0.0075*	−0.0006						
	(−2.18)	(−1.76)	(−0.26)						
Ln(# of states)				−0.0024**	−0.0049**	−0.0007			
				(−2.30)	(−2.49)	(−0.82)			
Ln(# of states-distance weighted)							−0.0026	−0.0054**	−0.0014
							(−1.62)	(−2.03)	(−1.27)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	74,514	36,863	37,648	74,514	36,863	37,648	74,514	36,863	37,648
Adjusted R2	0.698	0.695	0.733	0.698	0.695	0.733	0.698	0.695	0.733
Panel B - Dependent variable: idiosyncratic risk without non-synchronicity adjustment									
Inter	−0.0507**	−0.0711**	−0.0096						
	(−2.08)	(−2.33)	(−0.43)						
Ln(# of states)				−0.0293***	−0.0346***	−0.0135			
				(−2.75)	(−2.78)	(−1.47)			
Ln(# of states-distance weighted)							−0.0359**	−0.0424**	−0.0135
							(−2.15)	(−2.61)	(−0.81)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	63,562	30,667	32,891	63,562	30,667	32,891	63,562	30,667	32,891
Adjusted R2	0.685	0.693	0.698	0.686	0.693	0.698	0.685	0.692	0.698

This table reports the baseline results using alternative risk measures. The results are shown by the full sample as well as subsamples based on external financial dependence (EFD), respectively. A high (low) EFD subsample has industry EFD above (below) the sample median. The dependent variable is *ROA Volatility* defined on EBITDA in Panel A and *Idiosyncratic Risk* without non-synchronicity adjustment in Panel B. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. t statistics for the regression coefficients are in parentheses. Heteroskedasticity-consistent standard errors are clustered at the state level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 6. Banking deregulation and firm risks: subsample by bank credit dependence.

	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Credit Dependence						
Panel A - dependent variable: ROA volatility						
Inter	−0.0181***	−0.0017				
	(−4.26)	(−1.17)				
Ln(# of states)			−0.0080***	−0.0004		
			(−4.50)	(−0.65)		
Ln(# of states-distance weighted)					−0.0107***	−0.0006
					(−4.19)	(−0.65)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	48,486	26,127	48,486	26,127	48,486	26,127
Adjusted R^2	0.680	0.772	0.680	0.772	0.680	0.772
Panel B - Dependent variable: idiosyncratic risk						
Inter	−0.0666***	−0.0247				
	(−3.11)	(−1.11)				
Ln(# of states)			−0.0345***	−0.0132*		
			(−2.87)	(−1.80)		
Ln(# of states-distance weighted)					−0.0525***	−0.0096
					(−2.78)	(−0.79)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	48,674	26,226	48,674	26,226	48,674	26,226
Adjusted R^2	0.628	0.821	0.628	0.821	0.628	0.821

This table reports the effect of interstate banking deregulations on the risks of firms with High versus Low bank credit dependence. We define firms as bank-dependent if they are not covered by S&P credit ratings. The dependent variable is *ROA Volatility* Panel A and *Idiosyncratic Risk* in Panel B. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. t statistics for the regression coefficients are in parentheses. Heteroskedasticity-consistent standard errors are clustered at the state level. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 7. Channel tests by external financial dependence.

Dependent variable: CapEx	External financial dependence					
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Investment-Cash flow sensitivity						
Cash flow	0.1442***	0.1443***	0.1323***	0.1426***	0.1282***	0.1387***
	(6.28)	(8.07)	(6.52)	(8.76)	(6.54)	(8.70)
Cash Flow*Inter	−0.0823***	−0.0412**				
	(−4.87)	(−2.46)				
Inter	0.0151*	0.0075*				
	(1.95)	(1.69)				
Cash Flow*Ln(# of states)			−0.0225***	−0.0140***		
			(−5.28)	(−2.97)		
Ln(# of states)			0.0019	0.0022		
			(1.02)	(1.43)		
Cash Flow*Ln(# of states-distance weighted)					−0.0319***	−0.0178***
					(−5.15)	(−2.73)
Ln(# of states-distance weighted)					0.0041	0.0036
					(1.47)	(1.59)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES

Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	32,463	33,996	32,463	33,996	32,463	33,996
Adjusted R^2	0.440	0.498	0.439	0.498	0.439	0.498
Panel B - Borrowing cyclicality						
GSP growth	0.3386***	0.1318***	0.3245***	0.1258***	0.3255***	0.1208***
	(6.92)	(3.54)	(6.34)	(3.59)	(6.20)	(3.65)
GSP Growth*Inter	−0.3820***	−0.2876***				
	(−4.58)	(−3.52)				
Inter	0.0369***	0.0315***				
	(4.61)	(2.69)				
GSP Growth*Ln(# of states)			−0.0806**	−0.0730***		
			(−2.26)	(−4.01)		
Ln(# of states)			0.0062*	0.0108***		
			(2.00)	(3.62)		
GSP Growth*Ln(# of states-distance weighted)					−0.1245**	−0.1088***
					(−2.34)	(−4.23)
Ln(# of states-distance weighted)					0.0082*	0.0172***
					(1.68)	(4.26)
Controls	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Observations	33,461	35,260	33,461	35,260	33,461	35,260
Adjusted R^2	0.067	0.112	0.066	0.112	0.066	0.112

This table reports the effect of interstate banking deregulations on investment-cash flow sensitivity (Panel A) and borrowing cyclicality (Panel B) of firms in High versus Low external financial dependence (EFD) industries. A high (low) EFD subsample has industry EFD above (below) the sample median. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. $Ln\ (\#\ of\ states)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. $Ln(\#\ of\ states\text{-}distance\ weighted)_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. *Q* is Tobin's q. All regressions control for firm and year fixed effects, and state and industry linear time trends. Heteroskedasticity-consistent standard errors are clustered at the state level. t statistics are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

Appendix 8. Banking Deregulation and Other Financing: Subsample by External Financial Dependence.

Dependent variable:	Bond issue dummy						Ln(Bond Issue Amt)					
	External financial dependence						External financial dependence					
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Bond issuance												
Inter	0.0141***	0.0015					0.0593**	0.0035				
	(2.83)	(0.28)					(2.61)	(0.13)				
Ln(# of states)			0.0023	−0.0013					0.0110	0.0039		
			(0.91)	(−0.59)					(0.97)	(0.37)		
Ln(# of states-distance weighted)					0.0029	−0.0012					0.0131	0.0065
					(0.71)	(−0.35)					(0.72)	(0.38)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	38,736	39,656	38,736	39,656	38,736	38,736	38,736	39,656	38,736	39,656	38,736	39,656
Adjusted R^2	0.198	0.247	0.198	0.247	0.198	0.198	0.236	0.312	0.236	0.312	0.236	0.312

Dependent variable:	Equity Issue Dummy						Ln(Equity Issue Amt)					
	External Financial Dependence						External Financial Dependence					
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Panel B - Equity issuance												
Inter	0.0049	0.0090*					0.0059	0.0315*				
	(0.78)	(1.97)					(0.31)	(1.91)				
Ln(# of states)			0.0030	0.0013					0.0040	0.0049		
			(1.13)	(0.53)					(0.49)	(0.51)		
Ln(# of states-distance weighted)					0.0037	0.0040					0.0046	0.0159
					(0.89)	(1.08)					(0.36)	(1.07)
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
State trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	38,736	39,656	38,736	39,656	38,736	39,656	38,736	39,656	38,736	39,656	38,736	39,656
Adjusted R^2	0.065	0.095	0.065	0.095	0.065	0.095	0.088	0.097	0.088	0.097	0.088	0.097

This table reports the effect of interstate banking deregulations on bond issuance (Panel A) and seasoned equity issuance (Panel B) of firms in High versus Low external financial dependence (EFD) industries. A high (low) EFD subsample has industry EFD above (below) the sample median. *Bond Issue Dummy* and *Equity Issue Dummy* is an indicator variable that equals one when the firm issues debt and equity respectively in a year and zero otherwise. *Ln(Bond Issue Amt)* and *Ln(Equity Issue Amt)* is the natural logarithm of one plus the total issue value of debt and equity in a firm-year respectively. *Inter* is a dummy variable that turns from 0 to 1 once a state passed the interstate banking deregulation law. *Ln (# of states)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*. *Ln(# of states-distance weighted)*$_{jt}$ is the natural logarithm of one plus the number of states whose BHCs can enter into home state *j* in year *t*, where each of the states are weighted by the inverse of distance to the home state in year *t*. All regressions include firm and year fixed effects, state and industry linear time trends, as well as the same set of controls in Table 2. t statistics for the regression coefficients are in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% level, respectively.

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