Bank Deposits and the Stock Market *

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Abstract

I propose and test a new channel for the transmission of stock market fluctuations into the real economy. When the deposit and equity markets are not completely segmented, households chasing hot stock markets drain bank deposit funding. In the aggregate, quarterly deposit growth is significantly negatively correlated with recent stock returns. The negative relationship between deposit growth and stock returns is stronger in counties or zip codes with high stock market participation. My point estimate shows that a 10 percentage point higher stock return leads to a slower deposit growth by 0.4 percentage points, which is more than 10% of the annual deposit growth rate during the sample period. The negative shocks to bank deposit funding during stock market booms translate to a reduction in lending, which has a negative effect on local economic activities. Overall, the findings have important implications for the discussions of the real effect of stock market fluctuations, the segmentation of capital markets, and the objectives of monetary policy.

JEL Classification: G21,G11

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I Introduction

Historically, Germany and Japan have had more bank-oriented financial systems, while in the U.S. and the U.K. both banks and the stock market are important sources of external business financing. The relative merits of intermediaries versus markets in facilitating risk-sharing and resource allocation remain of great interests to economists (Allen and Gale (1997)). In this literature, banks and the stock markets compete with and also complement each other in promoting resource allocation and economic development (Levine and Zervos (1998)). The last few decades have witnessed boom and bust cycles in both the stock markets and the banking sectors around the world. While there is a large literature examining how disruptions to the banking system or the stock market could be transmitted to the real economy, there is little empirical evidence on the potential spillover effects across financial sectors implied by the financial system architecture theories (Allen and Gale (1997), Boot and Thakor (1997), and Song and Thakor (2010)). This paper studies such spillover effects of the stock market onto the banking sector and the real economy.

There has been considerable debate on the extent to which stock market fluctuations affect real activities over and above fundamentals. A common view of the stock market's influence says that the stock market affects investment through its impact on the cost of external financing (Morck, Shleifer, and Vishny (1990)). When stock prices are high relative to fundamentals, firms could issue equity to invest in projects, even those that would have a negative net present value (NPV) in rational markets (Fischer and Merton (1984)). However, as Blanchard, Rhee, and Summers (1993) point out, firms may issue overvalued equity and invest the proceeds in financial securities instead of negative NPV projects, in which case stock mispricing does not affect investment, only the way it is financed. Morck et al. (1990) and Baker, Stein, and Wurgler (2003), on the other hand, suggest that for equity-dependent firms the marginal investment could have a positive NPV even at the rational costs of funds, and thus the effect of equity valuation on investment would be especially strong for smaller firms. The empirical evidence is somewhat mixed. While Barro (1990), Baker et al. (2003), and Chirinko and Schaller (2001) attribute an important independent role to the stock market, Morck et al. (1990) and Blanchard et al. (1993) find that the effect of the stock market is limited, given fundamentals.

In this paper I contend that the tests of the real effects of the stock market fluctuations may have ignored an important spillover effect. When firms issue stocks in hot markets to benefit existing shareholders, the money comes from new shareholders who are chasing the hot markets (Blanchard et al. (1993)). I argue that a major source of this money is bank deposits and that investors pouring money into the stock market drain deposits from the banking sector, which could negatively affect bank lending and the investment activities of bank dependent companies. The reduced economic activities of bank dependent firms could offset any increase in investments by publicly traded companies whose stocks are overpriced, potentially resulting in a lack of response in aggregate investments shown in the literature. However, this does not mean that stock market fluctuations do not matter for resource reallocation or the welfare of the economy.

The idea that the stock market could absorb bank funds during the boom goes back to Machlup (1940), who—due to lack of data—tackles the issue "by means of a logical analysis" (P. 1). This problem was also recognized by bankers and bank regulators during the late 1990s stock market boom.[1] Moreover, capital flowing between the banking sector and the equity market is a crucial feature in models that analyze bank capital structure, the size of the banking sector, and asset prices (Parlour, Stanton, and Walden (2012) and Allen, Carletti, and Marquez (2015)). However, this potential channel through which stock market booms and busts influence the real economy has not been empirically tested. To the extent that this channel exists and the investment of small bank-dependent firms is more sensitive to funding opportunities, the externalities of stock market fluctuation through its effect on small private companies could be large.[2]

Figure I plots quarterly deposit growth against the stock returns measured over the most recent two quarters from 1984 to 2014. It clearly shows a negative relationship between

[1] "John Franklin, president of First United Bank: 'The next crisis in community banking, without a correction in the stock market, will be the lack of funds necessary for community banks to lend to Main Street and to farmers'" (Fettig and Feldman (1998)). "Bank deposit growth is declining...Assets of mutual fund companies increased more than ten fold to reach over $6 trillion at the end of June 2000. Raising equity values undoubtedly played a large role..."(Genay (2000)).

[2] Stock market participation in the U.S. is relatively high compared to that in the rest of the world, which suggests that the substitution effect could be larger in the U.S.. For example, an important assumption in the model of Allen et al. (2015) is that the market for deposits is segmented from that for equity, and their justification for this assumption is "with the exception of the U.S. and a few other countries, the household finance literature finds that relatively few people own stocks, bonds, or other types of financial assets either directly or indirectly" (P. 602).

the two. Deposit growth tends to be smaller or even negative when the stock market is booming. This negative relationship is a little surprising if one expects both to be procyclical. But this relationship is consistent with there being substitution between deposits and stock market investment by investors. I show that this effect persists after controlling for other macroeconomic variables such as GDP growth, interest rates, and house price appreciation.

The negative correlation shown in Figure I is also consistent with other explanations. For example, during stock market booms, public firms issue overvalued stocks to fund investments or simply to increase cash holdings and reduce their demand for bank loans. In response to the drop in credit demand, banks cut their supply of deposits, generating such a negative relationship.

To provide support for the existence of the deposit channel, I examine how the effect of stock market fluctuations on deposit growth varies with the degree of segmentation between the deposit and the equity markets. In particular, the substitution should exist only in households that have nontrivial investment in the stock market (other than retirement plans). In the U.S., there is substantial regional variation in stock market participation (Hong, Kubik, and Stein (2004)), and the substitution effect should be stronger in areas with high stock market participation.

I use a unique dataset from the IRS to measure local stock market participation. Since 1989, the IRS has published county-level taxable income data, which includes adjusted gross income, wages and salaries, dividend income, etc.[3] I use the ratio of taxable dividend income to total adjusted taxable income to measure a county's stock market participation. Relative to the popular household survey data such as PSID or the American Community Survey,[4] the IRS data use the population of tax filers, which largely overlaps with the population of households in the U.S. and, thus, allows for an accurate measure of stock market participation at the granular county or even zip-code level. Figure III shows the dividend-income ratio at the county level in 1995 and 2014. What is notable is the variation in stock market participation across counties and the relative persistence in county participation over time.

I show that the negative relationship between stock returns and deposit growth is indeed

[3]In addition, since 1998, zip-code level income data are also available, and dividend income starts to be reported in 2004.

[4]The popular Survey of Consumer Finances does not disclose households' geographic information, not even the state where households reside.

stronger in counties with greater stock market participation. When the value of the stock market increases by 10%, compared to counties with a dividend-income ratio of 1%, counties with a dividend-income ratio of 5% witness a slower growth of deposits by 0.5%, which is about 14% of the sample mean. A rough calculation of the aggregate effect indicates that a 10-percentage-point higher stock return leads to a slower deposit growth by 0.4 percentage points. The effect is robust to allowing the deposit-stock return sensitivity to vary with other county characteristics, such as income per capita or population, and to the inclusion of county fixed effects. In addition, to address the concerns about the endogenous nature of local stock market participation and to rule out alternative explanations, I show that the effect is robust to various estimation methods such as IV estimation, within-bank estimation, and within-county estimation.

The use of returns in the tests of the deposit channel is motivated by both the fact that it is a popular explanatory variable in the literature examining the stock market and the real economy (e.g., Morck et al. (1990)) and the fact that studies have shown a positive correlation between stock returns and money flow into the stock market (e.g., Warther (1995) and Greenwood and Shleifer (2014)). Clearly, stock returns could be affected by news in fundamentals as well as investor sentiment. The paper does not take a stand on the extent to which stock returns are driven by irrationality (Adam, Marcet, and Beutel (2017)), which is obviously relevant for the welfare implications of the paper, but shows that the spillover effects of the stock market performance could be very important insofar as researchers and policy makers care about how asset prices affect the real economy. To show the robustness of the results and to rule out alternative explanations, I also show that deposits growth is slower in high stock participation counties when investor sentiment is high or when there is greater net flow of money into the stock market.

I next examine whether the shocks to deposits translate to bank lending. If banks can frictionlessly substitute for deposit funding with other sources, such as federal funds or bonds, then there will not be any shocks to lending, and the substitution between deposits and stock investment will be inconsequential in the discussion of the real effect of stock market booms and busts. Using quarterly data of a large number of commercial banks, I show that both bank deposit and loan growth are slower in areas with high stock market participation when the stock market has performed well recently.

To provide further evidence for the deposit channel, I next examine how deposit rates change in response to the stock market in areas with different stock market participation. In addition to cutting lending or obtaining funds from other sources, banks can also choose to pay higher deposit rates to counteract the deposit outflow. A rise in deposit rates in areas with high stock market participation during stock market booms will further show that the slower deposit and loan growth is a result of the deposit channel as opposed to shocks to loan demand by businesses. For this test, I use a unique dataset of weekly branch level deposit rates on various depository products for a large number of banks. The results show that there is some evidence of banks responding to deposit outflow by raising deposit rates—the rates on 25K money market accounts increase significantly in high participation counties during stock market booms relative to low participation counties.

Lastly, I examine the impact of deposits flows induced by the stock market on local economic activities. I find that counties whose banks raise deposits in high stock participation counties experience a slower growth in employment relative to other counties during stock market booms. The results hold when I control for a county's own stock market participation. The results provide evidence that the contraction in lending induced by the outflow of deposits during stock market booms reduces real economic activities.

Overall, the findings have several important implications for the discussion of the real effect of the stock market, the segmentation of capital markets, bank deposit funding, and monetary policy. The literature has argued that financially constrained public companies are more likely to take advantage of mispricing to invest (Stein (1996) and Baker et al. (2003)), whereas other firms should instead issue shares and hold the proceeds as cash (Blanchard et al. (1993)). Insofar as the investment of bank-dependent private firms is more sensitive to shocks to external financing, the effects of stock market mispricing through the channel uncovered in this paper could potentially be large relative to those through the behavior of publicly traded firms. Moreover, Shleifer and Vishny (2010) state that, although the literature has examined extensively how the mispricing of assets affects the investments of the mispriced firms, it has not studied the spillover effect of investor sentiment through banks. This paper takes a step in that direction by showing that, investor sentiment in the stock market influences bank lending through the deposits channel.

Deposits remain the predominant source of funding for banks, representing over 80%

of total assets for an average bank during the sample period. The demand for deposits by households tends to be local and inelastic, which gives banks power in setting deposit rates (Hannan and Berger (1991), Neumark and Sharpe (1992), and Drechsler, Savov, and Schnabl (2016)). This paper suggests that part of the low elasticity is due to limited stock market participation. Allen et al. (2015) state that "one important ingredient of our model is that depositors are segmented from capital providers in that they do not participate directly in financial markets and, thus, in firm financing" (P. 603). This segmentation is a key assumption in their model's prediction that equity capital is costly relative to deposits. My findings imply that when households more actively invest in the stock market, large swings in stock market valuation could represent a major source of shocks to deposits flows into and out of the banking sector. Thus, the paper provides direct empirical evidence of competition between banks and financial markets (Allen and Gale (1997) and Song and Thakor (2010)). The findings also complement that of Gatev and Strahan (2006) by showing that although banks have a unique advantage in providing liquidity to corporations during periods of market stress because of deposit inflows, their lending capacity in market upturns is constrained by deposit outflows.[5]

Several recent papers study how the availability of bank deposits affects bank lending (Becker (2007), Gilje, Loutskina, and Strahan (2016), Plosser (2014), and Parra (2016)). Most of these studies focus on specific deposit shocks from "fracking" or lottery jackpot winners. The shock to deposit flows due to stock market valuation identified in this paper represents a more common shock to bank funding, compared to these more idiosyncratic shocks, which could potentially be diversified away through bank internal networks (Gilje et al. (2016) and Ben-David, Palvia, and Spatt (2016)).

Monetary policy by central banks appears to react to large movements in the stock market (Rigobon and Sack (2003)). Central bankers expressed concerns over the overheating of the stock market in late 1920s and late 1990s and the crash of the stock market in 1987 (Chirinko and Schaller (2001)).[6] The findings in the paper suggest that the externality of stock market

[5]The focus of Gatev and Strahan (2006) is liquidity shocks in the commercial paper (CP) markets, where liquidity is measured by the paper-bill spread. They show that the shocks in the CP markets tend to be dramatic but brief. The short-lived spikes in the spread do not usually coincide with prolonged stock market downturns.

[6]Federal Reserve Board Chairman Alan Greenspan famously coined the term "irrational exuberance" in his December 1996 speech, which set off widespread debate over whether the central bank should factor

fluctuations through the bank deposit channel should be an important welfare consideration for central bankers.

II Data and Summary Statistics

II.A Time Series Data

Quarterly aggregate bank deposit and loan data are from the FDIC Quarterly Banking Profile (https://www.fdic.gov/bank/analytical/qbp/), available since 1984. In the time series analysis below, I will focus on domestic deposits, which accounts for about 90% of total deposits, as of the last quarter of 2016. Quarterly GDP growth and monthly effective Federal funds rates are from the Federal Reserve Bank of St. Louis. The return of the value-weighted stock index is from CRSP. Panel A of Table I reports the summary statistics of these variables from 1984 to 2014. On average, deposits grow by 1.2% each quarter and the average quarterly stock return is 3.0%. The Federal funds rate has a mean of 4% during this period, but it varies substantially from almost zero in recent years to over 10% in the late 1990s. Quarterly residential house price index data are from the Federal Housing Finance Agency (FHFA). The index is estimated using sales prices and appraisal data.

I obtain the investor sentiment index constructed by Baker and Wurgler (2006) and Baker and Wurgler (2007) and updated by the authors using the first principal component of five variables: dividend premium; closed-end fund discount; first-day returns on IPOs; IPO volume; and equity share in new issues. Each of the variables has first been orthogonalized with respect to a set of macroeconomic variables. The monthly index from 1965 to 2015 is available from Jeffrey Wurgler's webpage http://people.stern.nyu.edu/jwurgler/.

II.B Annual County Level Data

For deposit growth at the county level, I aggregate deposits of branches by county using the Summary of Deposits data from the FDIC. The database reports the amount of branch deposits for FDIC-insured institutions as of June 30 every year since 1994. I obtain annual income per capita and total population data at the county level from the Bureau of

asset values into monetary policy.

Economic Analysis. I obtain median county age in 1990 (AGE050190D) and educational attainment in 1990 (percent of people 25 years or older who have a bachelor's degree or higher, EDU685190D) from the Census Bureau's 1990 Census through the USA Counties database. The 1990 decennial Census data are used because the census was taken prior to the beginning year of the sample period of the county deposits data. Since education will be used as one of the IVs for stock market participation, measuring it prior to the sample period minimizes the possibility that the exclusion condition is violated due to reverse causality. The religious congregations and membership data in 1990 are obtained from the Association of Religion Data Archives (ARDA, http://www.thearda.com/Archive/Files/Descriptions/CMS90CNT.asp). I obtain annual county level employment data from the County Business Patterns (CBP) released by the Census Bureau. The data include the total number of establishments, employment during the week of March 12, as well as the number of establishments by size category. Annual county house prices are also from FHFA.

I measure a county's stock market participation by the ratio of its aggregate dividend income over adjusted gross income. The breakdown of taxable income at the county level is from the IRS (https://www.irs.gov/uac/soi-tax-stats-county-data). The data are available from 1989 through 2014. The IRS data are ideal to measure local stock market participation because they are based on all households that file tax returns with the IRS, which allows for measuring stock market participation accurately even at a granular level. In contrast, household survey data that have been used in the literature usually contain only a few thousand households, which makes it difficult to accurately measure local stock market participation.[7]

One potential disadvantage of using dividend income to measure stock market participation is the potential measurement errors due to the dividend clientele effect. For example, if households in certain areas tend to invest in dividend-paying stocks, the dividend-income ratio will tend to overestimate the stock market participation of these households relative to households in other areas. Another potential cause of measurement errors in using dividend income to proxy for investment in the public stock market is that dividends received by households are not all distributed by publicly traded companies. Dividends could also be

[7] Brown, Ivkovi, Smith, and Weisbenner (2008) use a large number of individual tax return data from the IRS from 1987 to 2006 to study the community's effect on stock market participation.

paid by privately owned C corporations or mutual funds primarily investing in fixed-income assets. To partially address these concerns, I show that the results are robust to using the fraction of tax-payers that file dividend tax returns in a county to proxy for stock market participation.[8]

Panel B of Table I shows that, on average, dividend income accounts for 1.6% of total income. Assuming an average dividend yield of 2%, the dividend-income ratio suggests that the average household's investment in the stock market is slightly smaller than its annual taxable income. There is also substantial variation across counties. After the ratios are winsorized at the 0.5 and 99.5 percentile, the dividend-income ratio ranges from 0.3% to 6.3%. The counties with the lowest average dividend-income ratios include Sioux, ND, Manassas Park, VA, and Starr, TX. Those with the highest average dividend-income ratios include Indian River, FL, Lancaster, VA, and Teton, WY. Figure III shows the dividend-income ratios across U.S. counties in 1995 and 2014. The degree of stock market participation as measured by the dividend-income ratio appears to be highly persistent, which is consistent with the fact that county fixed effects alone can explain almost 80% of the variation in dividend-income ratio.

The IRS also reports taxable income information at the zip-code level. But the amount of dividend income is not available until 2004. The dividend-income ratio at the zip-code level is calculated as the ratio of total dividend income to total adjusted gross income in the zip code. There are a total of 22,565 zip codes in the sample, or about 7 zip codes per county. I use the 2004 dividend-income ratio for the years prior to 2004 in the within-county analysis. However, the results still hold if I use only the post-2004 data. The sample is a panel of 388,968 zip-code-year observations. The summary statistics of dividend-income ratio and deposit growth at the zip-code level are reported in the last two rows of Panel B. Not surprisingly, the variation in both dividend-income ratio and deposit growth is greater at the zip-code level than the county level.

The average income per capita at the county level is $26,597, and the average growth rate of income per capita is 3.8% during this period. The median total population per county is 25,776, and the average growth rate of population is 0.6%. The average median age in 1990

[8]In the Appendix I also show that at the state level the IRS measure is positively correlated with the stock market participation in Hong et al. (2004), using the 1992 household survey data.

is 34.4. Among people 25 or above, 13.4 percent on average have bachelor degree or above in 1990. The average annual growth rate of employment is 0.5%. House prices grow at an average rate of 2.6% per year.

II.C Bank Level Data

The quarterly balance sheet data of commercial banks are taken from the quarterly Consolidated Report of Condition and Income filed by commercial banks, commonly known as "call reports." Call reports contain detailed on- and off-balance sheet information such as assets, liabilities, income, and loan commitments. I obtain domestic deposits (rcon2200), domestic loans (rcon1400), domestic C&I loans (rcon1766), domestic real estate loans (rcon1410), insured deposits (rcon2702 prior to the second quarter of 2006, and rconf045+rconf049 afterwards)[9], total assets (rcfd2170), equity (rcfd3210), and income (riad4340). I focus on the growth of domestic deposits and loans because the demand shocks to deposits should affect deposit growth only domestically. However, the results are almost identical if the total deposits and loans are used (the rcfd series).

I obtain weekly branch-level deposit rates data from Ratewatch for a large number of banks from December 1997 to December 2015. The deposit rates are available for a wide variety of deposit products such as CDs, checking, savings, and money market accounts, for different amounts and different maturities. Ratewatch data are used by a large number of banks and credit unions as well as the FDIC. As in Drechsler et al. (2016), I focus on the rates of the two most popular deposit products, money market accounts with an account size of $25,000 and 12-month certificates of deposit with an account size of $10,000. I take the average weekly deposit rates at the branch level within a bank to obtain average quarterly deposit rates at the bank level. The deposit rates are available for 5,791 banks and for 333,879 bank-quarters.

To map county characteristics, including dividend-income ratio, to the bank level, I use bank deposits in each county as the weight to construct deposit-weighted county characteristics for banks. Bank balance sheet data are quarterly, the deposits at the county level are

[9]From the third quarter of 2009, reporting thresholds on non-retirement deposits increased from $100,000 to $250,000. Therefore, in the analysis of quarterly growth of insured deposits at the bank level, the observations for the third quarter of 2009 are dropped.

available only for the end of June every year, and the dividend-income ratio is measured at the end of calendar year. The timing of the variables is as follows. For deposit and loan growth each quarter, the deposits as of the end of June in the previous year are used as weights, and the dividend-income ratio is measured at the end of the prior year. Because the deposits data at county level starts in June 1994 and the dividend-income ratio at the county level ends in 2014, the deposit and loan growth from 1995 to 2015 are examined, resulting in a total of 651,182 bank-quarter observations. Panel C reports the summary statistics for the bank level data. The mean deposit growth of 1.9% is higher than mean aggregate growth reported in Panel A, but the medians are similar, reflecting the right skewness of bank level data. Loan growth (2.1%) outpaced deposit growth (1.9%), reflecting banks' reliance on non-traditional funding sources such as non-core liabilities and securitization activities during this period, especially in the years leading up to the recent financial crisis. Stock returns are the cumulative returns over two quarters, $t-1$ and t. The summary statistics of bank level controls such as bank size, capitalization, and income are also reported. On average, the deposit to asset ratio is 83.7% for banks in our sample, suggesting that deposits are the predominant source of funding for these banks. The average capitalization rate is 10.6% during this period. The average rate of 12-month 10k CDs is 2.4% and the average rate of a 25k money market account is 1.3%.

III Stock Returns and Deposit Growth

In this section, I first provide some evidence on the substitution between holding deposits and investing in stocks by examining the composition of household financial assets. I then examine how deposit growth is related to stock market returns in the aggregate, how the effect varies with stock market participation at the county level, and how the effect varies across counties within banks, and across zip codes within counties.

III.A Evidence from the Composition of Household Financial Assets

Figure IV plots the quarterly shares of financial assets owned by households and nonprofit organizations from the Federal Reserve Flow of Funds Accounts, of which nonprofit organizations account for a very small fraction. As of the last quarter of 2016, pension entitlements constituted the largest single category of household financial assets (29.5%). The share of deposits was 13.7%, while corporate equities, directly owned and indirectly owned through equity mutual funds, accounted for 27.2%. The figure also shows that the two components tend to move in opposite directions, with the combined share relatively stable over time. In the 1990s, the expansion of the equity assets is associated with a shrinkage of deposits. The opposite occurred in the early 2000s after the Dot-com bubble bursts and during the recent financial crisis. Panel (a) of Figure V confirms this by plotting the share of corporate equities in household financial assets against the share of deposits in total financial assets *excluding corporate equities*, which shows a strikingly tight and negative relation between the two, with a correlation of -0.87. In contrast, Panel (b) shows a relatively loose and nonlinear relationship between the share of corporate equities assets against the share of debt securities and money market mutual funds (MMMF), indicating no obvious substitution between holding stocks and debt securities.

III.B Time Series Analysis

This section examines how deposit growth is related to recent stock market performance, using quarterly aggregate data. The model I estimate here is

$$\Delta Depo_t = \alpha + \beta_1 ret_t + \beta_2 ret_{t-1} + \gamma_1 X_t + \gamma_2 X_{t-1} + \epsilon_t \tag{1}$$

where $\Delta Depo_t$ is the growth of domestic deposits from quarter $t-1$ to quarter t, ret_t and ret_{t-1} are the stock returns in quarter t and $t-1$, and X_t and X_{t-1} are control variables such as GDP growth, change in Federal funds rates, and residential house price growth in quarter t and $t-1$, respectively.

Column (1) of Table II shows that both the current and previous quarterly returns are

negatively correlated with current deposit growth, with the previous return significant at the 5% level. In column (2), I add the time t and $t-1$ control variables, which show no statistically significant effect on deposit growth. The current stock return becomes statistically significant at the 10% level. When the return in $t-1$ increases by 10%, deposit growth drops by 0.38%, which is about a third of the 1.2% average quarterly deposit growth from 1984 to 2014. Figure I shows the scatter plot of deposit growth in quarter t and stock returns over the most recent two quarters. Deposit growth is negatively correlated with contemporaneous change in Federal funds rate, consistent with the finding in Drechsler et al. (2016).

I next examine whether bank loan growth is correlated with recent stock market performance. Column (3) shows that the stock return in quarter $t-1$ is also statistically negatively correlated with loan growth, with the effect slightly smaller than that on deposit growth. GDP growth in both quarters is positively related to quarter t loan growth, suggesting that loan growth is more procyclical than deposit growth. Concurrent house price growth is positively correlated with loan growth, potentially reflecting the growth of real estate loans during the house price boom leading up to the financial crisis.

Next, I confirm the positive correlation between money flow into the stock market and recent stock returns documented in Warther (1995) and Greenwood and Shleifer (2014), among others. As in Greenwood and Shleifer (2014), to proxy for flows into the stock market, I use the net inflows into equity mutual funds from the Investment Company Institute, scaled by the lagged aggregate capitalization of the U.S. stock market. The last column shows that flows are strongly positively correlated with contemporaneous and past returns. A one standard deviation (8.5%) increase in stock returns in the current quarter is associated with a 10 basis points increase in the flow measure, which corresponds to about a third of the standard deviation of the variable. The results here are, thus, consistent with Greenwood and Shleifer (2014)'s finding that many investors' expectations of future returns are driven by past returns, which in turn drives flows into the stock market.

The results in Table II are consistent with the deposit channel, which states that when households pour money into hot stock markets to provide funding for highly valued companies, they reduce their demand for deposits issued by banks. Banks, in turn, cut lending to businesses and households. But they are also consistent with alternative explanations, such as when the stock market is performing well, public firms are more likely to issue stocks to

obtain funding, which could reduce their demand for bank loans. Banks, in turn, respond by taking fewer deposits. The aggregate data cannot be used to differentiate the two possibilities. In what follows, I rely on the variation in local stock market participation to provide evidence on the existence of the deposit channel.

III.C County Level Analysis

Branch level deposit data used to construct county level deposit growth are only available every year on June 30. So the analysis here uses a sample of county-year panels starting in 1994, which is the first year that the branch level data become available. I test whether the effect shown in the previous section is stronger in counties with greater stock market participation. To this end, I first present some visual evidence on how the sensitivity of county deposit growth to stock returns varies with county stock market participation. I first run a time-series regression using annual data for each county i:

$$\Delta Depo_{i,t} = \alpha + \beta_i ret_t + \epsilon_{i,t} \tag{2}$$

where $\Delta Depo_{i,t}$ is the deposit growth in county i from June 30 of calendar year $t-1$ to June 30 of calendar year t, and ret is stock return measured over the same period. I then sort all counties into 10 equal-sized bins according to their stock market participation as measured by their dividend-income ratio, and calculate the average sensitivity, β_i, for each bin. Figure VI shows that the negative relationship between deposit growth and stock returns strengthens almost linearly with stock market participation, indicating that changes in deposits demand by households investing in the stock market in response to stock market performance is an important driver of the pattern we observe in the aggregate data in Section III.B.

To test the idea formally, I generate an interaction term between stock returns and the dividend-income ratio. The model I estimate is

$$\Delta Depo_{i,t} = \alpha + \beta_1 Div\_ratio_{i,t-1} \times ret_t + \beta_2 Div\_ratio_{i,t-1} + \gamma X_{i,t-1} + \mu_t + \epsilon_{i,t} \tag{3}$$

where deposit growth is from June 30 of calendar year $t-1$ to June 30 of calendar year t, and ret_t is not included separately, as it is subsumed by the year fixed effect μ_t. Dividend-income

ratio and county controls X are measured at the end of calendar year $t-2$. Stock return is measured over the same period as deposit growth. Income and population growth are from the end of calendar year $t-2$ to calendar year $t-1$. I cluster the standard errors by county and year (two way clustering) to allow for correlation both across year within a county and across counties within a year.

Table III reports the results. Column (1) shows that the interaction term between return and dividend-income ratio is significantly negative, suggesting that in counties with high stock market participation, deposit growth reacts more negatively to stock market booms. This finding renders support for the deposit channel. Column (2) reports the results with controls. Income per capita, income per capita growth, and population growth are all positively related to deposit growth. To control for other local factors that could also affect the sensitivity of local deposit growth to stock market performance, I also include interactions between stock returns and the logarithm of population and the logarithm of income per capita. The effect of stock market returns on deposit growth does not seem to vary with the size or the wealth of the county. When the value of the stock market increases by 10%, compared to counties with a dividend-income ratio of 1%, counties with a dividend-income ratio of 5% witness a decline of deposits by 0.5%, which is about 14% of the 3.6% annual deposit growth reported in Panel B of Table I. In column (3), the counties are weighted by lagged population. The effect becomes much larger.

Next, the regression further controls for county fixed effects, which estimates whether the within-county variation in the growth rate of deposits over time is a function of stock returns and dividend-income ratio. This is a fairly restrictive specification, because as shown below the vast majority of variation in dividend-income ratio is across counties rather than over time. So controlling for county fixed effects discards a lot of variation in the interaction term coming from across counties. Despite this, column (4) shows that the point estimate of the interaction term is the same as that in column (2) and statistically significant at the 5% level.

So far, the focus has been on whether deposit growth is affected by recent stock returns. As shown in previous literature, companies tend to issue stocks when the stock market is performing well, and the evidence in this paper so far suggests that the issuance is at least partially funded by households' reallocation of deposit savings into the stock market.

Admittedly, recent return is not the only relevant measure for such opportunities. The literature has also shown that firms are more likely to issue stocks when investor sentiment is high. In fact, one of the five variables used to construct the sentiment index by Baker and Wurgler (2006) is the share of equity issuance in total debt and equity issuance. Given that high investor sentiment does not necessarily coincide with high recent returns, it is interesting to see whether deposit growth is affected by investor sentiment above and beyond recent stock returns. Another reason that it could be interesting to look at sentiment is that arguably the sentiment index captures investors' irrational "beliefs about future cash flows and investment risks that is not justified by the facts at hand" (Baker and Wurgler, 2007, P. 1), whereas recent stock returns could be completely driven by fundamentals. To the extent that deposit growth also reacts to investor sentiment, a discussion of the welfare effect of investor sentiment should not overlook its effect on bank financing and lending. Column (5) shows that the interaction between investor sentiment and dividend-income ratio is also significantly negative, suggesting that investor sentiment also affects deposit growth beyond the effect of recent stock returns.

The results in Table III also permit me to conduct a rough calculation of the aggregate effect of stock return on deposit growth. Applying the point estimate from the weighted least squares estimation in column (3), the population weighted average dividend-income ratio of 1.87% implies that a 10-percentage-point higher stock return leads to a slower deposit growth by 0.4 percentage points, which suggests that the deposit channel could account for about 62% (=0.004/(0.0027+0.0038)) of the negative correlation between aggregate deposits growth and stock returns observed in column (2) of Table II.

The negative coefficient on the interaction term between the return and dividend-income ratio suggests that counties with greater stock market participation tend to experience a slower deposit growth during stock market booms and faster deposit growth during stock market busts. The discussion so far centers mostly on the former case. But the same argument would predict larger deposit inflow in counties with high stock market participation when investors pull money out of the stock market during downturns. I explore whether this is indeed the case by examining how deposit growth varies with stock market participation during a 12-month period from July to June with the highest (2010) and lowest (2008) returns in the sample period. Appendix Table A.I shows that the deposit channel seems to

work in both directions.

Lastly, in the Appendix Table A.II, I show that the cross-county evidence on deposit growth and stock returns in the U.S. extends to across countries as well. The table shows that stock market returns and deposits GDP ratio exhibit a stronger negative relationship in countries with a larger stock market relative to GDP.

III.D Determinants of Stock Market Participation and the IV Estimation

Are the results in Table III indeed evidence of the deposit channel, or are they simply a manifestation of other local forces that determine both stock market participation and the sensitivity of deposit growth to stock returns? In other words, one could be concerned about potential omitted variables biasing the results. I next explore the variation in county level stock market participation and some of the determinants of the variation. During this exercise I will also consider some variables that are correlated with stock market participation but do not seem to have an obvious reason to affect deposit growth or the sensitivity of deposit growth to stock returns. These variables will be used as IVs for stock market participation.

To begin with, untabulated results show that county fixed effects alone can explain almost 80% of the variation in dividend-income ratio, which suggests that the stock market participation at the county level is quite stable over time. Adding year effects increases the R^2 by only 3.4%. Figure II shows the time series variation in the ratio of total dividend income over total adjusted gross income from 1994 to 2014. Column (1) of Panel A of Table IV shows that stock market participation tends to decrease with the size of the county (population) and to increase with the wealth of the county (income per capita). However, these variables do not seem to affect how deposit growth reacts to stock returns, as shown by the interaction terms in column (2) of Table III. Existing analysis of household level data such as the Survey of Consumer Finances has revealed several other important determinants of stock market investment such as education, age, and race (See 2013 SCF Chartbook, http://www.federalreserve.gov/econresdata/scf/files/BulletinCharts.pdf). I confirm some of these effects in columns (2) and (3). Counties in which a larger fraction of population has a bachelor's degree or above tend to have a higher dividend-income ratio. Stock market

participation increases with median county age.

Studies have found that religion could also play a role in household stock market investment (Kumar (2009)). Column (4) shows that stock market participation is positively related to the county Lutheran share but negatively related to the Southern Baptist share. These two variables explain an additional 3.1% of the variation in dividend-income ratio. These results change little if state fixed effects are controlled for (not reported).

As a final check, I examine whether local stock market participation is correlated with local deposit market competition, which has been shown in the banking literature to be important in determining the equilibrium amount of deposit and lending in local markets (e.g., Drechsler et al. (2016)). Following the literature, I measure deposit competition using the Herfindahl index of banks' local deposit market share, which is the sum of the squared deposit market shares of all banks with branches in a given county in a given year. Column (5) shows that the dividend-income ratio has a positive but statistically insignificant correlation with the Herfindahl index after controlling for other variables. This finding helps alleviate concerns that the results are driven by confounding macro shocks having differential impacts on local deposit markets due to differences in deposit competition across counties (Drechsler et al. (2016)).

Which of these county characteristics are good instruments for stock market participation? It is possible that these variables are correlated with deposit growth unrelated to their effects on stock market participation. For example, senior people tend to have more savings in banks and, thus, areas with more seniors tend to have a higher level of deposits (Becker (2007)). Similarly, but maybe to a lesser degree, holding income level constant, religion and education could also affect people's bank savings unrelated to their stock market investments. One way to help alleviate the concern about potential alternative channels is to control for the lagged level of deposits at the county level. Because the static county characteristics are measured in 1990, before the sample period starts, their effects on bank deposits unrelated to stock market investments and stock market returns should be captured by the amount of deposits in year $t-1$ when deposit growth from $t-1$ to t is examined.

Panel B of Table IV presents the results where religion (Lutheran share and Southern Baptist share) and education are used as instruments for dividend-income ratio and their interaction with stock returns is used as instruments for the interaction between dividend-

income ratio and stock returns, respectively. The control variables are the same as those in Table III, except that the log lagged deposits is included as an additional control. The coefficients of $Div\_ratio \times ret$ using both IVs are statistically significant and much larger than those in the OLS regression. But the coefficient estimates are quite close in the two IV estimation. Assuming that at least one of these instruments is valid, the results suggest that either the OLS estimates are downward biased or the IV results are estimating the effect for counties whose stock market participation is affected by these instruments ("local average treatment effect"), which is larger than that of an average county.

III.E Within-bank Estimation

In this section, I exploit the fact that more than half of the banks operate in more than one county to conduct a within-bank estimation of stock market and deposit growth. Specifically, I estimate a model similar to Eq. (3) using only multi-county banks and bank×year fixed effects. The inclusion of bank×year fixed effects will wipe out any shocks at the bank level in a given year and compare deposit growth in different counties within the same bank. This estimation will further rule out some alternative explanations of the results such as negative shocks to loan demand during stock market booms, because banks tend to reallocate funds using the internal capital markets in response to loan demand shocks, which should cause a change in deposits homogenously across the counties. The model estimated here is

$$\begin{aligned}\Delta Depo_{i,b,t} = \alpha + \beta_1 Div\_ratio_{i,t-1} \times ret_t + \beta_2 Div\_ratio_{i,t-1} + \beta_3 Div\_ratio_{i,t-1} \times sentiment_t \\ + \gamma X_{i,t-1} + u_{b,t} + \epsilon_{i,b,t} \qquad (4)\end{aligned}$$

where $\Delta Depo_{i,b,t}$ is the growth of bank b's deposits in county i, and $u_{b,t}$ is the bank×year fixed effects. Other variables are measured in the same way as in Eq. (3).

In column (1) of Table V, I first estimate the model above for the sample of multi-county banks without bank×year fixed effects. Both stock returns and investor sentiment show a larger effect on deposit growth than the last column of Table III. As shown in column (2), after controlling for bank-year fixed effects to remove any confounding shocks at the bank level, the effect of stock return on deposit growth becomes smaller while the effect of investor sentiment becomes larger; both remain statistically significant at the 5% level. Overall, the

results suggest that, even within the same bank, deposits grow faster in branches with low stock market participation when investors are upbeat about the stock market.

III.F Within-county Estimation

Analogous to the estimation in the previous section, in this section I estimate a within-county estimation using deposit growth and stock market participation at the zip-code level. For this analysis, I match bank branch zip codes from the Summary of Deposits to the zip codes in the IRS data set. The county×year fixed effects control for any shocks at the county level that affect deposit growth at the county level, and, thus, the estimation compares how deposit growth in different zip codes of the same counties differentially reacts to stock market fluctuations, depending on the zip code level stock market participation. The identification assumption is that while deposits tend to be localized (people tend to put money in nearby branches), any effects of recent stock market performance on local banks through other economic activities such as loan demand shocks should be more spread out across the whole county. For example, one alternative explanation of the results presented so far is that stock market participation is higher in areas where more public companies are headquartered and, therefore, the negative loan demand shocks during stock market booms could be greater. But it is hard to imagine that this alternative explanation could be applied to the zip codes within the same county. The model estimated here is

$$\Delta Depo_{i,j,t} = \alpha + \beta_1 Div\_ratio_{i,j,t-1} \times ret_t + \beta_2 Div\_ratio_{i,j,t-1} + \beta_3 Div\_ratio_{i,j,t-1} \times sentiment_t + u_{i,t} + \epsilon_{i,j,t} \tag{5}$$

where $\Delta Depo_{i,j,t}$ is the deposit growth in zip code j within county i, and $u_{i,t}$ is the county×year fixed effects.

Column (1) of Table VI first presents the results with county control variables and year fixed effects. Both interaction terms are significantly negative, suggesting that the zip-code deposit growth is slower when stock market participation is high, during stock market booms. Column (2) includes county×year fixed effects to control for common county shocks. Both variables remain statistically significant, alleviating concerns that unobserved local shocks are driving the results.

III.G Alternative Explanations and Robustness

One alternative explanation for my findings is that households simply withdraw deposits to consume more out of stock market wealth during stock market booms, and the deposits do not flow into the stock market. While I do not observe the money flow at the household level, numerous studies have found that investors do pour money into the stock market during boom times. In addition, existing studies have shown that the marginal propensity to consume out of stock market wealth is relatively small (Poterba (2000)). In fact, Starr-McCluer (2002) finds that only 3.4 percent of her survey respondents indicated that they were spending more and saving less as a result of the market run-up. On the other hand, 11.6 percent indicated they were spending less and saving more, presumably as a result of expectation of higher returns (Greenwood and Shleifer (2014) and Adam et al. (2017)). The vast majority indicated that the stock prices over the past few years had not affected their spending or saving patterns. There are three pieces of evidence in the paper that cannot be explained by the stock wealth effect. First, as shown above, investor sentiment affects deposit growth above and beyond recent stock returns. Second, as shown below, deposit growth is smaller in high stock participation counties when there is greater aggregate net inflow to equity mutual funds. Finally, the negative real effect of the deposit channel shown below is not consistent with the positive stock wealth effect.

I now conduct several tests to rule out other alternative explanations and also to provide robustness checks of the findings. First, column (1) of Table VII shows that the interaction between the change in Federal fund rate and dividend-income ratio is not statistically significant, suggesting that the effect documented in Drechsler et al. (2016) is not behind my findings. Column (2) shows that the interaction between the standard deviation of returns and dividend-income ratio is also not statistically significant, suggesting that the return does not simply affect capital flow through a risk channel. In both columns, the interaction between stock returns and dividend-income ratio remains quantitatively similar and significant at the 5% level. Moreover, column (3) shows that the results are robust to using the fraction of people who invest in the stock market to proxy for stock market participation in a county. Lastly, column (4) shows that deposit growth is slower in high participation counties when there is large money inflow into the stock market, measured by the net inflows into equity mutual funds (provided by the Investment Company Institute), scaled by the lagged

aggregate capitalization of the U.S. stock market.

IV Stock Returns, Bank Lending, and Deposit Rates

In this section, I use bank level data to examine whether shocks to deposits are transmitted to lending. To the extent that banks can substitute for deposits with other types of funding, the reduced deposit demand by households during stock market booms may not affect lending. However, such substitution is unlikely to be frictionless, because deposits are generally considered to be a stable and cheaper source of funding than other types of bank debt or equity, partly thanks to deposit insurance (Sundaresan and Wang (2017)). It is also important to note that any effect on lending reflects the impacts of both credit demand and credit supply. However, to the extent that stock market booms have a positive effect on loan demand in areas with high stock market participation through the wealth effect, the demand effect could even go the opposite direction than the supply effect caused by deposit shocks. Besides, the within-bank and within-county analysis above and the results on deposit rates below should further alleviate concerns about loan demand shocks driving the results. The model I estimate here is

$$\Delta Y_{i,t} = \alpha + \beta_1 Div\_ratio_{i,t-1} \times ret_{[t-1,t]} + \beta_2 Div\_ratio_{i,t-1} + \beta_3 Z_{i,t-1} + \gamma X_{i,t-1} + \mu_t + \epsilon_{i,t} \quad (6)$$

where the dependent variable is quarterly deposit and loan growth and Div_ratio is the deposit-weighted average dividend-income ratio across counties where a bank has deposits. Motivated by the time series analysis that deposit growth is affected by stock returns in both the current quarter and the previous quarter, the stock returns used here are the cumulative returns in quarters $t-1$ and t. Z is a vector of bank level controls such as assets, equity-asset ratio, and income-asset ratio. X is a vector of deposit-weighted county characteristics such as population and income per capita. μ_t is time (year-quarter) fixed effects.

Table VIII presents the results. Column (1) shows that banks in areas with high stock market participation experience slower growth in deposits during stock market booms, consistent with the findings at the county level. Column (2) shows that the effects are similar

for insured deposits, which are more likely to be owned by households than corporations.[10]

Column (3) shows that the effects on deposit growth are transmitted to bank lending, although the effect is smaller on loan growth compared to deposit growth. Column (4) examines bank C&I lending, which shows a larger effect than total loans. The point estimate suggests that for a 10% quarterly stock return, a one standard deviation increase in the dividend-income ratio in counties where a bank lends to is associated with a 0.67 percentage point slower growth in C&I loans, which is a third of the average quarterly C&I loan growth rate. Column (5) shows a similar effect for real estate loans. Overall the results suggest that the decline in deposits when households chase hot stock markets reduces the amount of credit available to businesses and property buyers, which could have a significant negative impact on real activities.[11]

I next examine whether the sensitivity of deposit rates to stock returns varies with a bank's exposure to stock participation. Columns (6) and (7) report the results. Both the rates on 12-month CDs and 25K money market accounts increase in areas with high stock market participation during stock market booms, and the increase is statistically significant for the 25K money market accounts. The smaller response in CD rates is consistent with that the fact CDs are more competitively priced on a broader geographic basis than money market instruments (Berger and Hannan (1989)). The findings provide further evidence that the results of deposit and loan growth are a result of household asset substitution rather than changes in demand for loans, as the loan demand effect will result in the opposite effect on deposit rates shown here.

V Evidence of Real Effects

The evidence presented so far shows that stock market booms attract deposits away from the banking sector, which causes banks to cut lending. The contraction in bank credit supply will not affect real economic activities if borrowers are able to take advantage of favorable

[10] As explained in the data section, the analysis excludes the third quarter of 2009 because of the change in the reporting threshold from $100,000 to $250,000. In untabulated results, I also show that similar results are found for large-denomination time deposits, but not for the rest of wholesale funding including brokered deposits, foreign deposits, Federal funds purchased, and other borrowing.

[11] In untabulated results, I show that the the results are similar for relatively large banks, those in the top quartile by asset size.

stock market conditions for external financing, in which case the deposit channel would not be important for the discussion of the real effects of stock market fluctuations. However, such substitutions are possible only for public companies. Private firms without access to the public equity market are likely to be the same firms that are bank dependent. Indeed, it is well established in the literature that negative credit supply shocks lead to contraction in borrower investment and employment, especially for small firms that cannot substitute bank funding with financing from alternative sources (e.g., Gertler and Gilchrist (1994) and Chodorow-Reich (2014)). Despite the well documented real effects of bank credit crunch, it is still necessary to consider whether such real effects exist in the particular setting of this paper, because the real effects of credit constraints might be different, depending on the causes and overall macroeconomic conditions.

To test the effect on county economic activities, the relevant dividend-income ratio measure in a county is not the county's own dividend-income ratio, but the average dividend-income ratio exposed to by banks that lend in that county. So the key independent variable is *Bank Div_ratio*, defined as the weighted average of bank dividend-income ratios across all banks in a given county, using their lagged deposits shares as weights, where bank dividend-income ratios are defined the same way as in section IV. I also control for the county's own dividend-income ratio and its interaction with stock returns to ensure that the estimation is using variation in stock market participation coming from counties other than where the lending is taking place. I estimate the following regression:

$$\begin{aligned}\Delta Y_{i,t} =& \alpha_i + \beta_1 Bank\ Div\_ratio_{i,t-1} \times ret_t + \beta_2 Bank\ Div\_ratio_{i,t-1} + \beta_3 Div\_ratio_{i,t-1} \times ret_t \\ &+ \beta_4 Div\_ratio_{i,t-1} + \gamma_1 X_{i,t-1} + \gamma_2 X_{i,t-1} \times Year_{2008} + \mu_t + \epsilon_{i,t} \end{aligned} \tag{7}$$

where $\Delta Y_{i,t}$ is the log growth in employment from March of year t to March of year $t+1$, $Bank\ Div\_ratio_{i,t-1}$ is the deposits-weighted bank dividend-income ratio at the end of year $t-1$, ret is the stock market return during year t, and $Div\_ratio_{i,t-1}$ is the county's own dividend-income ratio. $X_{i,t-1}$ is a vector of deposits-weighted bank characteristics (log assets, income-assets ratio, equity-assets ratio, deposits-assets ratio, and real estate loans-assets ratio) measured at the end of year $t-1$. In light of recent research showing that pre-crisis bank characteristics are correlated with bank credit supply during the financial crisis of 2008

(Ivashina and Scharfstein (2010) and Cornett, McNutt, Strahan, and Tehranian (2011)), I also allow these bank variables to have a potentially differential effect on employment in 2008. Lastly, motivated by the recent literature on the large effect of the recent house price boom and bust on local economies (Mian and Sufi (2011) and Mian and Sufi (2014)), the regression also controls for the county's house price growth in year t, and its interaction with the 2008 year dummy.

Table IX presents the results. Column (1) shows that counties whose banks raise deposits in high stock participation counties see a reduction in employment relative to other counties during stock market booms. When the value of the stock market increases by 10%, a one standard deviation (61 basis points) increase in *Bank Div_ratio* leads slower growth of employment by 5 basis points, which is about 10% of the average growth rate of 50 basis points per year during the sample period. Column (2) shows that the effect is almost identical when county fixed effects are controlled for in the estimation. These results provide evidence that the contraction in lending induced by the outflow of deposits during stock market booms reduces real economic activities.

VI Conclusion

This study presents evidence that the stock market has an important spillover effect on bank deposit funding and lending through household asset allocation. Aggregate deposit growth is slower following high stock returns. The effect is stronger in areas with high stock market participation. Despite some evidence that banks attempt to counteract the negative shock by raising deposit rates, bank lending is reduced when the stock market absorbs funds from household deposits. The reduced credit supply shocks appear to have a negative impact on local economic activities.

The findings highlight the important implications of capital market segmentation (or the lack of it) on both the demand side (firms) and the supply side (households) for the discussion of transmission of stock market fluctuations into the real economy. In countries like the U.S., where household stock market participation is relatively high, the segmentation between the deposit market and the equity market is limited (Allen et al. (2015)), which gives rise to a crowding-out effect of stock market investment upon bank deposit funding, documented in

the paper.

The segmentation on the capital demand side is, however, still very severe. While large public companies can obtain financing from issuing stocks, bonds, and borrowing from banks, small private companies typically depend on bank loans for external financing. So when the stock market is highly valued relative to fundamentals, these bank dependent firms cannot simply substitute equity financing for bank loans like public companies. This, combined with the fact that these firms are more likely to be financially constrained indicates that the transmission of stock market fluctuations into the real economy through the deposit channel could be large relative to the public companies, which may not channel their equity financing into real investment if they are not equity dependent (Blanchard et al. (1993) and Baker et al. (2003)). More broadly, the findings in this paper also have implications for the discussion of the role played by stock markets and banks in fostering resource allocation and economic development (Levine and Zervos (1998) and Allen and Gale (2000)).

References

Adam, K., Marcet, A., Beutel, J., August 2017. Stock price booms and expected capital gains. American Economic Review 107 (8), 2352–2408.

Allen, F., Carletti, E., Marquez, R., 2015. Deposits and bank capital structure. Journal of Financial Economics 118 (3), 601 – 619.

Allen, F., Gale, D., 1997. Financial markets, intermediaries, and intertemporal smoothing. Journal of Political Economy, 523–546.

Allen, F., Gale, D., 2000. Comparing Financial Systems. MIT Press, Cambridge, MA.

Baker, M., Stein, J. C., Wurgler, J., 2003. When does the market matter? stock prices and the investment of equity-dependent firms. The Quarterly Journal of Economics 118 (3), 969–1005.

Baker, M., Wurgler, J., 2006. Investor Sentiment and the Cross-Section of Stock Returns. Journal of Finance 61 (4), 1645–1680.

Baker, M., Wurgler, J., 2007. Investor sentiment in the stock market. The Journal of Economic Perspectives 21 (2), 129–151.

Barro, R. J., 1990. The stock market and investment. The Review of Financial Studies 3 (1), 115–131.

Becker, B., 2007. Geographical segmentation of US capital markets. Journal of Financial Economics 85 (1), 151–178.

Ben-David, I., Palvia, A., Spatt, C., 2016. Banks' internal capital markets and deposit rates. Journal of Financial and Quantitative Analysis, forthcoming.

Berger, A. N., Hannan, T. H., 1989. The price-concentration relationship in banking. The Review of Economics and Statistics 71 (2), 291–299.

Blanchard, O., Rhee, C., Summers, L., 1993. The stock market, profit, and investment. The Quarterly Journal of Economics 108 (1), 115–136.

Boot, A. W. A., Thakor, A. V., 1997. Financial system architecture. The Review of Financial Studies 10 (3), 693–733.

Brown, J. R., Ivkovi, Z., Smith, P. A., Weisbenner, S., 2008. Neighbors matter: Causal community effects and stock market participation. The Journal of Finance 63 (3), 1509–1531.

Chirinko, R. S., Schaller, H., 2001. Business fixed investment and "bubbles": The Japanese case. The American Economic Review 91 (3), 663–680.

Chodorow-Reich, G., 2014. The employment effects of credit market disruptions: Firm-level evidence from the 2008-09 financial crisis. The Quarterly Journal of Economics 129 (1), 1–59.

Cornett, M. M., McNutt, J. J., Strahan, P. E., Tehranian, H., 2011. Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics 101 (2), 297 – 312.

Drechsler, I., Savov, A., Schnabl, P., 2016. The deposits channel of monetary policy. Quarterly Journal of Economics, forthcoming.

Fettig, D., Feldman, R. J., 1998. Declining deposits ... is it all bad news? fedgazette, Federal Reserve Bank of Minneapolis.

Fischer, S., Merton, R. C., 1984. Macroeconomics and finance: The role of the stock market. Carnegie-Rochester Conference Series on Public Policy 21, 57 – 108.

Gatev, E., Strahan, P. E., 2006. Banks' advantage in hedging liquidity risk: Theory and evidence from the commercial paper market. The Journal of Finance 61 (2), 867–892.

Genay, H., 2000. Recent trends in deposit and loan growth: Implications for small and large banks. Chicago Fed Letter.

Gertler, M., Gilchrist, S., 1994. Monetary policy, business cycles, and the behavior of small manufacturing firms. The Quarterly Journal of Economics 109 (2), 309–340.

Gilje, E. P., Loutskina, E., Strahan, P. E., 2016. Exporting liquidity: Branch banking and financial integration. The Journal of Finance 71 (3), 1159–1184.

Greenwood, R., Shleifer, A., 2014. Expectations of returns and expected returns. The Review of Financial Studies 27 (3), 714–746.

Hannan, T. H., Berger, A. N., 1991. The rigidity of prices: Evidence from the banking industry. The American Economic Review 81 (4), 938–945.

Hong, H., Kubik, J. D., Stein, J. C., 2004. Social interaction and stock-market participation. The Journal of Finance 59 (1), 137–163.

Ivashina, V., Scharfstein, D., 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics 97 (3), 319 – 338.

Kumar, A., 2009. Who gambles in the stock market? Journal of Finance 64 (4), 1889–1933.

Levine, R., Zervos, S., 1998. Stock markets, banks, and economic growth. The American Economic Review 88 (3), 537–558.

Machlup, F., 1940. Bank deposits and the stock market in the cycle. The American Economic Review 30, 83–91.

Mian, A., Sufi, A., August 2011. House prices, home equity-based borrowing, and the us household leverage crisis. American Economic Review 101 (5), 2132–56.

Mian, A., Sufi, A., 2014. What explains the 2007-2009 drop in employment? Econometrica, 2197–2223.

Morck, R., Shleifer, A., Vishny, R. W., 1990. The stock market and investment: Is the market a sideshow? Brookings Papers on Economic Activity 21 (2), 157–216.

Neumark, D., Sharpe, S. A., 1992. Market structure and the nature of price rigidity: Evidence from the market for consumer deposits. The Quarterly Journal of Economics 107 (2), 657–680.

Parlour, C. A., Stanton, R., Walden, J., 2012. Financial flexibility, bank capital flows, and asset prices. The Journal of Finance 67 (5), 1685–1722.

Parra, C., 2016. Deposit shocks and credit supply: Evidence from U.S. lottery winners. Working Paper, University of Texas at Austin.

Plosser, M. C., 2014. Bank heterogeneity and capital allocation: Evidence from 'fracking' shocks. FRB of New York Working Paper.

Poterba, J. M., 2000. Stock market wealth and consumption. The Journal of Economic Perspectives 14 (2), 99–118.

Rigobon, R., Sack, B., 2003. Measuring the reaction of monetary policy to the stock market. The Quarterly Journal of Economics 118 (2), 639–669.

Shleifer, A., Vishny, R. W., September 2010. Unstable banking. Journal of Financial Economics 97 (3), 306–318.

Song, F., Thakor, A. V., 2010. Financial system architecture and the co-evolution of banks and capital markets. The Economic Journal 120 (547), 1021–1055.

Starr-McCluer, M., 2002. Stock market wealth and consumer spending. Economic Inquiry 40 (1), 69–79.

Stein, J. C., October 1996. Rational Capital Budgeting in an Irrational World. The Journal of Business 69 (4), 429–55.

Sundaresan, S., Wang, Z., 2017. Bank liability structure. Working Paper.

Warther, V. A., 1995. Aggregate mutual fund flows and security returns. Journal of Financial Economics 39 (2), 209 – 235.

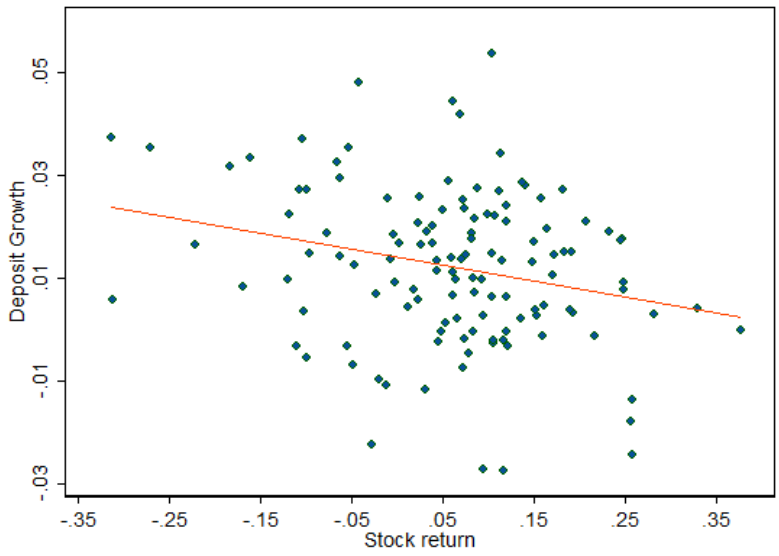


Figure I: Quarterly Deposit Growth and Stock Return, 1984-2014. This figure plots quarterly domestic-office deposit growth against the cumulative stock returns measured over the most recent two quarters. Quarterly deposit data are from the FDIC Quarterly Banking Profile. The stock return is the cumulative return of the value-weighted stock index from CRSP.

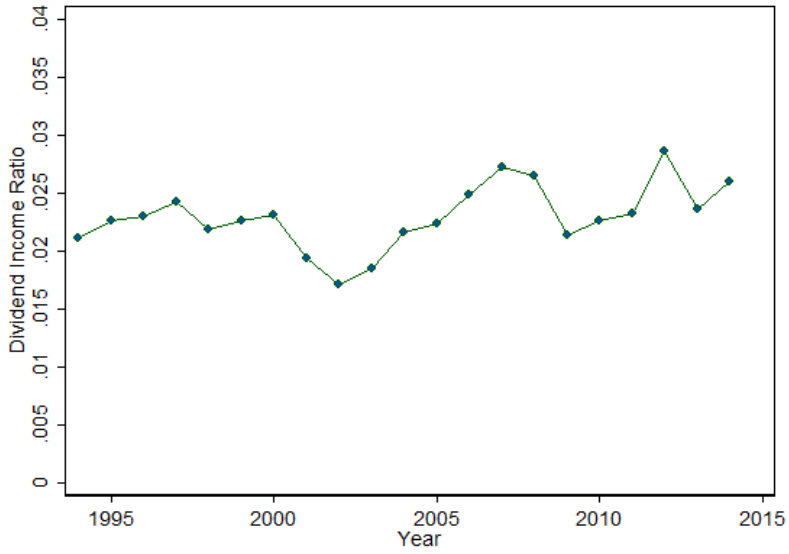
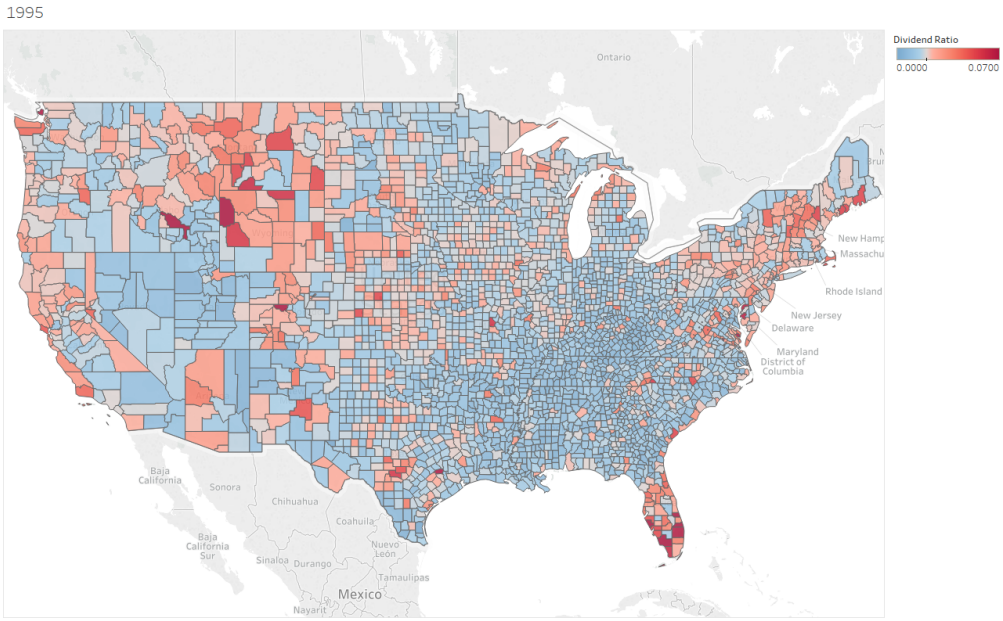
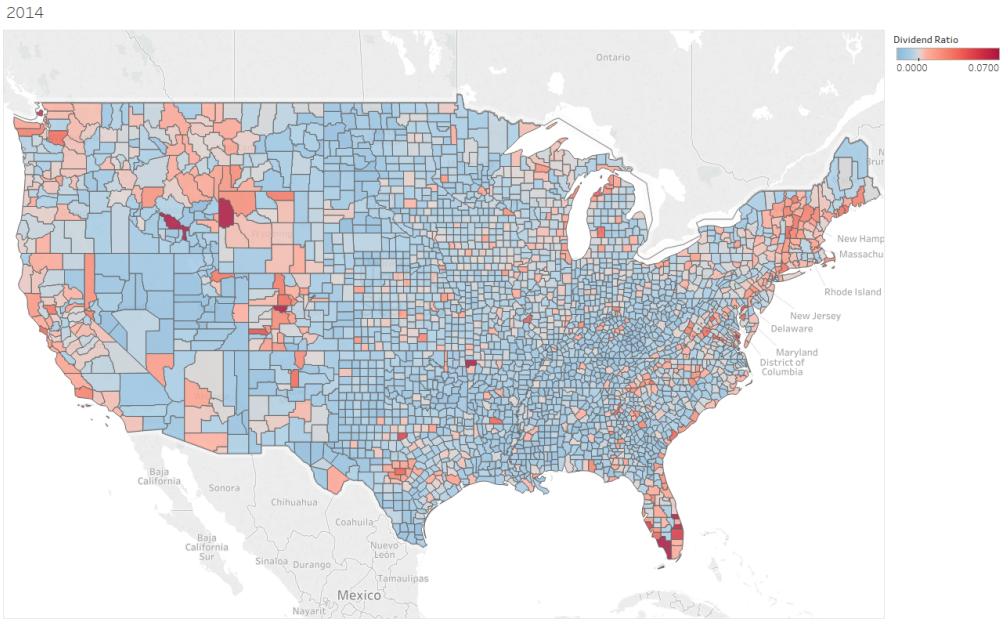


Figure II: Dividend-Income Ratio, 1994-2014. This figure plots the ratio of total dividend income over total adjusted gross income. Source: IRS Statistics of Income.



(a) 1995



(b) 2014

Figure III: Stock Market Participation. This figure shows the ratio of aggregate dividend income over aggregate taxable income for U.S. counties in 1995 and 2014.

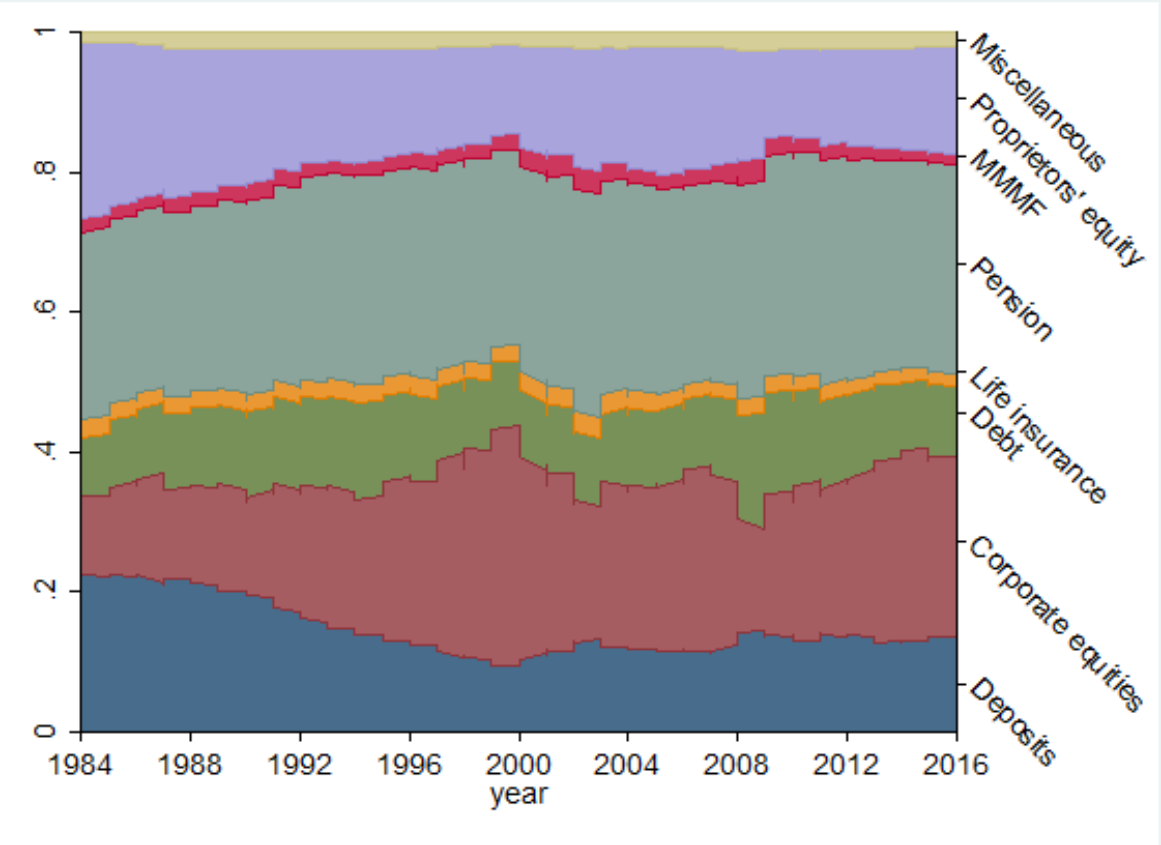
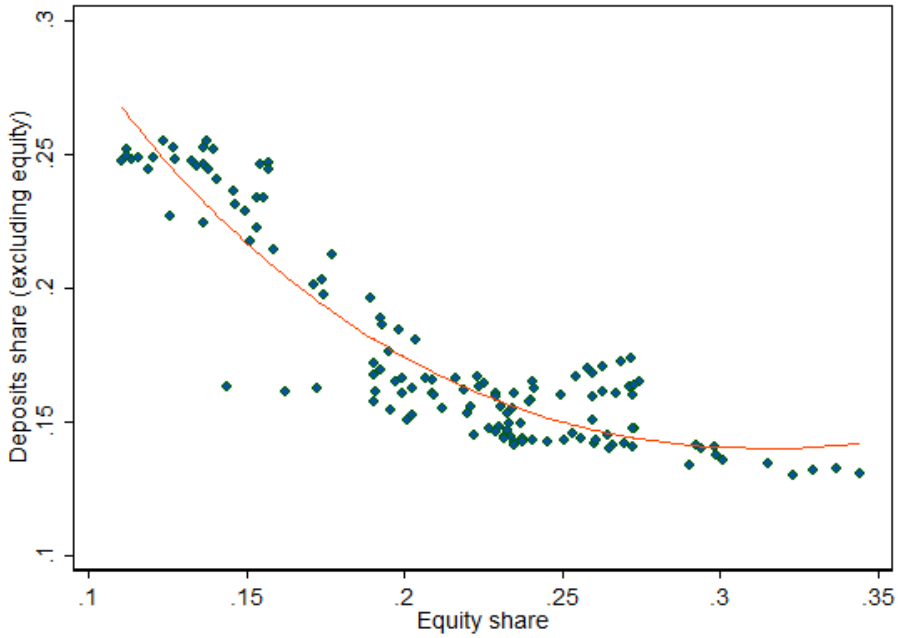
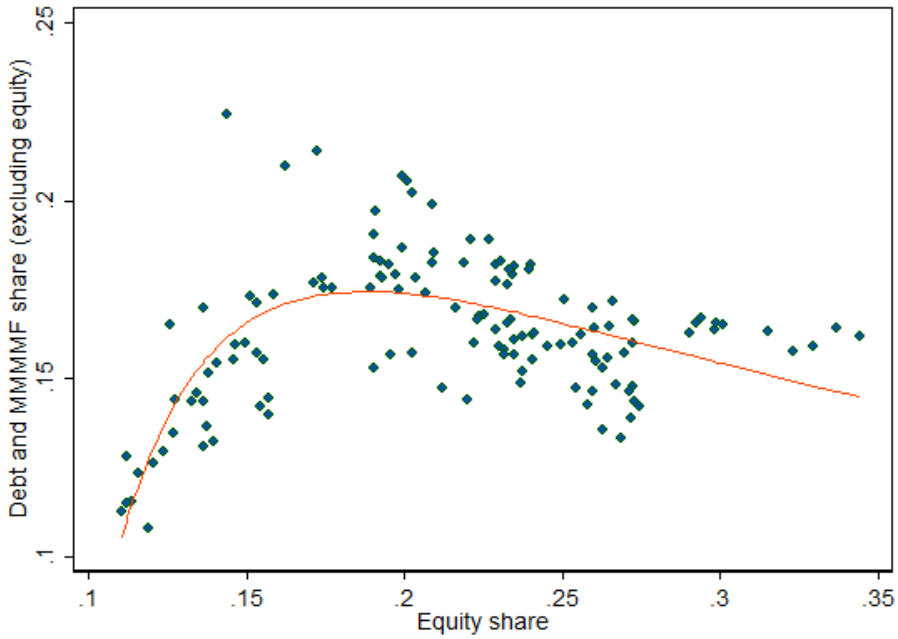


Figure IV: Household Financial Assets from 1984 to 2016. Source: Federal Reserve Flow of Funds. The following series are used: Proprietors' equity (FL152090205); deposits: checkable deposits (FL153020005) + time and savings deposits (FL153030005); money market fund shares (FL153034005); life insurance (FL153040005); pension entitlements (FL153050005); corporate equities: corporate equities (FL153064105) + equity mutual fund shares (FL153064245); debt: debt securities (FL154022005) + loans (FL154023005) + bond mutual fund shares (FL153064235); total financial assets (FL154090005).



(a) Share of Corporate Equity and Share of Deposits



(b) Share of Corporate Equity and Share of Debt and MMMF

Figure V: This figure plots the share of corporate equities in household financial assets against the share of deposits (Panel (a)) and the share of debt securities and MMMF (Panel (b)) in total financial assets excluding corporate equities. Source: Federal Reserve Flow of Funds.

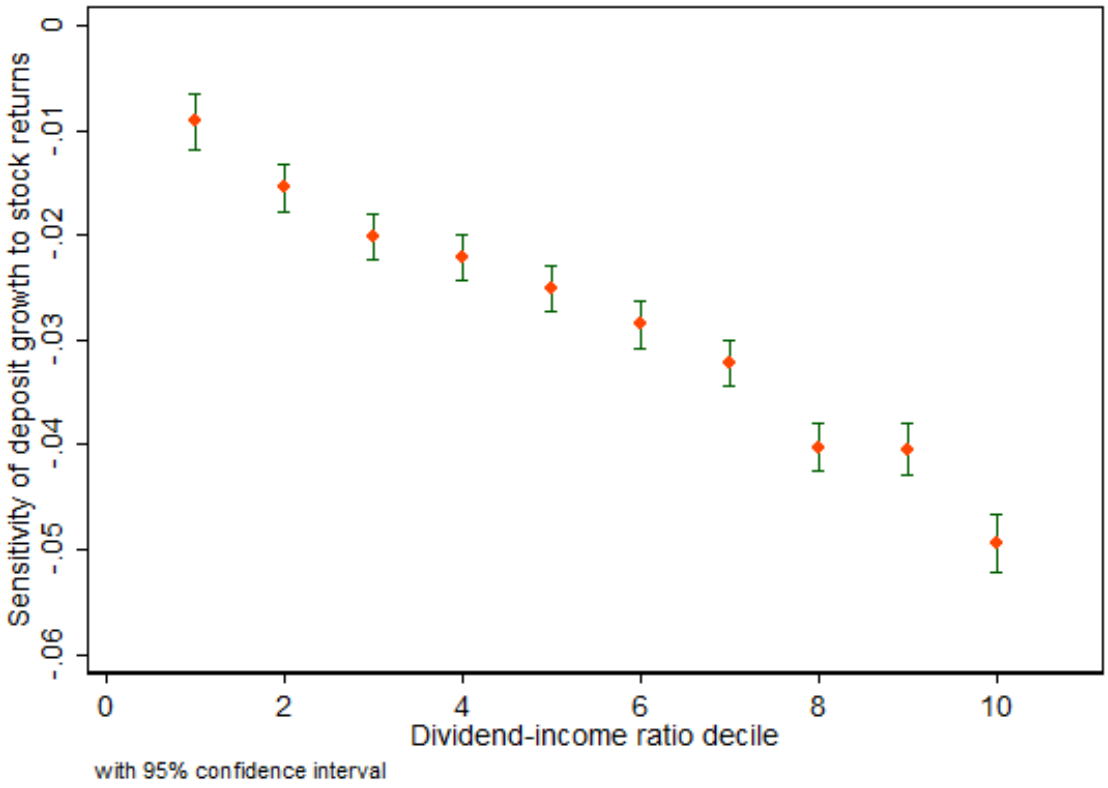


Figure VI: Deposit-stock return sensitivity and county stock market participation. For each county dividend-income ratio decile, this figure plots the average coefficients of stock returns, β_i, from the time-series regression of annual deposit growth on contemporaneous stock returns for each county i, $\Delta Depo_{i,t} = \alpha + \beta_i ret_t + \epsilon_{i,t}$.

Table I. Summary Statistics

Panel A reports the summary statistics of quarterly aggregate data from 1984 to 2014. Deposit and loan growth is the aggregate deposit and loan growth from FDIC. Stock return is the quarterly return of the value-weighted index from CRSP. *FF rate* is the average monthly effective federal funds rate in the last month of a quarter. *GDP growth* is from the Federal Reserve Bank of St. Louis. *HP growth* is the growth of residential housing price index from FHFA. *Investor sentiment* is the sentiment index from Baker and Wurgler (2006) and updated by the authors. *Flow into stock* is the net dollar inflows in each quarter into equity mutual funds, scaled by lagged aggregate capitalization of the U.S. stock market. Panel B reports the county level data from 1995 to 2014. *Div_ratio* is the ratio of taxable dividend income to total adjusted taxable income from the IRS. *Ipc* and *Pop* are the income per capita and population from the Bureau of Economic Analysis. Deposit growth is the growth of aggregate county deposits computed using the Summary of Deposits. Herfindahl index (*HHI*) is the sum of the squared deposit market shares of all banks with branches in a given county in a given year. *Emp growth* and *HP growth* are the county level employment and house price growth, respectively. *Age* is the county median age in 1990. *Bachelor* is the fraction of people 25 or above who have a bachelor's degree or higher in 1990. *Lutheran Protestant* and *Southern Baptist* are the fraction of the population that are members of Lutheran Protestant churches and Southern Baptist churches in 1990, respectively. Panel C reports the bank level data. The county characteristics include deposit-weighted dividend ratio, income per capita, and population across counties where a bank has deposits. *Deposit growth*, *Insured deposit growth*, *Loan growth*, *C&I Loan growth*, and *RE Loan growth* are the log difference of deposits (rcon2200), insured deposits (rcon2702 prior to the second quarter of 2006, and rconf045+rconf049 afterwards), loans (rcon1400), C&I loans (rcon1766), and real estate loans (rcon1410). The third quarter of 2009 is dropped for insured deposit growth because the item rconf045 was revised to incorporate the increase in the maximum deposit insurance amount from $100,000 to $250,000. *Stock return* is the return of CRSP value-weighted index over the previous and current quarters. *Deposit ratio* is the ratio of total domestic deposits (rcon2200) to total assets (rcfd2170). *Equity ratio* is the ratio of bank equity (rcfd3210) to total assets (rcfd2170). *Income ratio* is the ratio of bank total income (riad4340) to total assets. Rates on 12-month $10,000 CDs ($Rate_12mcd10k$) and $25,000 money market accounts ($Rate_mm25k$) are the average weekly branch-level rates within a quarter from Ratewatch.

Panel A: Time series data (quarterly)

	Mean	Median	Std	Min	Max	No of obs
Deposit growth	0.012	0.013	0.015	-0.028	0.054	123
Loan growth	0.011	0.014	0.015	-0.028	0.043	123
Stock return	0.030	0.039	0.085	-0.237	0.213	123
FF rate	0.042	0.047	0.030	0.001	0.113	123
GDP growth	0.007	0.007	0.006	-0.021	0.019	123
HP growth	0.009	0.010	0.012	-0.031	0.038	123
Investor sentiment	0.296	0.199	0.616	-0.820	2.760	123
Flow into stocks	0.002	0.002	0.003	-0.007	0.010	123

Panel B: County and zip-code data (annual)						
	Mean	Median	Std	Min	Max	No of obs
County-year data						
Div_ratio	0.016	0.014	0.009	0.003	0.063	62,154
Deposit growth	0.036	0.031	0.071	-0.258	0.450	62,154
Ipc	26,597	25,126	9093	5082	189,550	62,154
Pop	93,433	25,776	296,977	421	9,974,868	62,154
Ipc growth	0.038	0.038	0.053	-0.850	1.079	62,154
Pop growth	0.006	0.004	0.017	-1.460	0.355	62,154
HHI	0.319	0.255	0.209	0.000	1.000	62,154
Emp growth	0.005	0.007	0.077	-1.874	1.923	61,612
HP growth	0.026	0.026	0.055	-0.445	0.553	52,681
County data in 1990						
Age	34.4	34.3	3.6	20.0	55.4	3,117
Bachelor	0.134	0.118	0.641	0.037	0.534	3,117
Lutheran Protestant	0.007	0.004	0.013	0.000	0.337	3,117
Southern Baptist	0.140	0.046	0.167	0.000	0.662	3,117
Zip-code-year data						
Div_ratio	.0144	.0101	.0147	.0003	.1035	388,968
Deposit growth	0.069	0.032	0.281	-0.645	2.732	388,968

Panel C: Bank level data (quarterly)						
Computed bank level data: Div_ratio, Ln(Ipc), and Ln(Pop) are weighted by deposits						
Div_ratio	0.017	0.016	0.008	0.002	0.063	651,182
Ln(Ipc)	10.266	10.252	0.333	8.940	12.035	651,182
Ln(Pop)	11.335	11.037	1.760	6.122	16.130	651,182
Stock return	0.056	0.074	0.127	-0.314	0.377	651,182
Bank data from the call report and Ratewatch:						
Deposit growth	0.019	0.012	0.061	-0.126	0.392	651,182
Insured deposit growth	0.015	0.006	0.068	-0.174	0.438	644,051
Loan growth	0.021	0.016	0.062	-0.177	0.450	651,182
C&I Loan growth	0.020	0.013	0.150	-0.519	0.700	651,182
RE Loan growth	0.025	0.016	0.070	-0.153	0.460	651,182
Ln(assets)	11.711	11.565	1.341	7.313	21.463	651,182
Deposit ratio	0.837	0.856	0.079	0.089	0.931	651,182
Equity ratio	0.106	0.098	0.037	0.054	0.650	651,182
Income ratio	0.006	0.005	0.006	-0.026	0.028	651,182
Rate_12mcd10k	2.370	1.990	1.762	0.010	8.086	333,879
Rate_mm25k	1.309	0.967	1.189	0.001	6.731	320,324

Table II: Deposit Growth and Stock Market

The dependent variable is the quarterly aggregate deposit growth in columns (1) and (2), and loan growth in column (3) from 1984 to 2014. In the last column, the dependent variable is the net dollar inflows in each quarter into equity mutual funds, scaled by lagged aggregate capitalization of the U.S. stock market. *Return* is the quarterly return of the value-weighted index from CRSP. $FFrate$ is the effective Federal funds rate (not seasonally adjusted) from the Federal Reserve Bank of St. Louis. *GDP growth* is the quarterly growth rate of the U.S. GDP from the Federal Reserve St. Louis. $HP\ growth$ is the quarterly growth rate of U.S. residential housing price index from FHFA.

	Deposit Growth (1)	Deposit Growth (2)	Loan Growth (3)	Flow into Stock Market (4)
$Return_t$	−0.023	−0.027*	−0.015	0.012***
	(0.016)	(0.016)	(0.013)	(0.003)
$Return_{t-1}$	−0.038**	−0.038**	−0.031**	0.009***
	(0.016)	(0.016)	(0.013)	(0.003)
$GDP\ growth_t$		−0.048	0.551**	0.080
		(0.271)	(0.218)	(0.050)
$GDP\ growth_{t-1}$		0.224	0.542***	0.028
		(0.247)	(0.198)	(0.045)
$\Delta FFrate_t$		−0.416*	0.271	0.006
		(0.250)	(0.201)	(0.046)
$HP\ growth_t$		−0.010	0.257*	−0.013
		(0.169)	(0.135)	(0.031)
$HP\ growth_{t-1}$		0.232	0.174	0.053
		(0.173)	(0.139)	(0.032)
R-squared	0.064	0.116	0.389	0.325
N	123	123	123	123

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table III: Deposit Growth and Stock Market Participation at the County Level

The model estimated here is

$$\Delta Depo_{i,t} = \alpha + \beta_1 Div\_ratio_{i,t-1} \times ret_t + \beta_2 Div\_ratio_{i,t-1} + \gamma X_{i,t-1} + \mu_t + \epsilon_{i,t}$$

where the dependent variable is the deposit growth in county i from June 30 of year $t-1$ to June 30 of year t. ret is the annual return of CRSP value-weighted index over the same period for which deposit growth is measured. The definitions of other variables are in Table I. Standard errors are two-way clustered by year and county.

	(1)	(2)	(3)	(4)	(5)
$Div\_ratio \times ret$	-1.41^{**}	-1.24^{***}	-2.28^{**}	-1.24^{**}	-1.55^{***}
	(0.53)	(0.39)	(1.08)	(0.51)	(0.52)
$Div\_ratio \times sentiment$					-0.35^{***}
					(0.11)
Div_ratio	0.44^{***}	0.09	0.39^{*}	0.10	0.21
	(0.12)	(0.10)	(0.20)	(0.13)	(0.12)
$Ln(Pop)$		-0.00	0.00^{*}	-0.05^{**}	-0.00
		(0.00)	(0.00)	(0.02)	(0.00)
$Ln(Ipc)$		0.03^{***}	0.03^{***}	0.05^{***}	0.03^{***}
		(0.01)	(0.01)	(0.02)	(0.01)
$Pop\ growth$		0.59^{***}	0.87^{***}	0.30^{***}	0.59^{***}
		(0.11)	(0.19)	(0.08)	(0.11)
$Ipc\ growth$		0.14^{***}	0.23^{***}	0.12^{***}	0.13^{***}
		(0.03)	(0.04)	(0.02)	(0.03)
$Ln(Ipc) \times ret$		-0.00			
		(0.03)			
$Ln(Pop) \times ret$		-0.01			
		(0.01)			
Year fixed effects	Yes	Yes	Yes	Yes	Yes
County fixed effects	No	No	No	Yes	No
Population weighted	No	No	Yes	No	No
R-squared	0.028	0.062	0.114	0.123	0.062
N	62,154	62,154	62,154	62,154	62,154

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table IV: Determinants of Stock Market Participation and the IV Estimation

In panel A, the dependent variable is the ratio of taxable dividend income over total adjusted taxable income, measured in percentage points. Panel B reports the results for the IV estimation, where the dependent variable is deposit growth and the model estimated is the same as the one in Table III. In column (1), the instruments for dividend-income ratio are the share of Lutheran Protestant members and the share of Southern Baptist members. In column (2), the instrument is the fraction of population of age 25 or above with a bachelor's degree or above. The instruments for the interaction of dividend-income ratio and stock returns are the interaction of the IV and stock returns. Controls include Div_ratio, log lagged deposits, lagged income per capita, lagged population, income per capita growth, and population growth. The definitions of other variables are in Table I. Standard errors are two-way clustered by year and county in both panels.

Panel A: Determinants of stock market participation					
	(1)	(2)	(3)	(4)	(5)
$Ln(Pop)$	-0.065^{***}	-0.123^{***}	-0.049^{***}	-0.044^{***}	-0.036^{**}
	(0.020)	(0.016)	(0.015)	(0.014)	(0.015)
$Ln(Ipc)$	1.925^{***}	1.141^{***}	0.520^{***}	0.387^{***}	0.395^{***}
	(0.090)	(0.094)	(0.088)	(0.089)	(0.090)
$Bachelor_{1990}$		0.046^{***}	0.064^{***}	0.057^{***}	0.056^{***}
		(0.004)	(0.004)	(0.004)	(0.004)
Age_{1990}			0.088^{***}	0.088^{***}	0.088^{***}
			(0.005)	(0.005)	(0.005)
$Southern\_bap_{1990}$				-0.541^{***}	-0.544^{***}
				(0.071)	(0.071)
$Lutheran_{1990}$				10.148^{***}	10.073^{***}
				(2.789)	(2.790)
HHI					0.074
					(0.073)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.224	0.285	0.384	0.414	0.414
N	62,154	62,154	62,154	62,154	62,154

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Panel B: IV estimation		
IV:	Religion	Education
	(1)	(2)
$Div\_ratio \times ret$	-3.41^{*}	-4.02^{**}
	(1.85)	(1.89)
Div_ratio	0.60	1.88^{***}
	(0.54)	(0.34)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
R-squared	0.063	0.039
N	62,154	62,154

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table V: Deposit Growth and Stock Market: Within Bank Analysis

The dependent variable is the bank-county level deposit growth. *ret* is the annual return of the CRSP value-weighted index over the same period for which deposit growth is measured. Other variables are measured the same way as in Eq. 3. Controls include *Div_ratio*, lagged income per capita, lagged population, income per capita growth, and population growth. The definitions of other variables are in Table I. Standard errors are two-way clustered by year and county.

	(1)	(2)
$Div\_ratio \times ret$	-2.29^{**}	-1.74^{**}
	(0.89)	(0.61)
$Div\_ratio \times sentiment$	-0.46^{**}	-0.73^{**}
	(0.21)	(0.27)
Controls	Yes	Yes
Year fixed effects	Yes	No
Bank×year effects	No	Yes
R-squared	0.030	0.308
N	187,085	187,085

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VI: Deposit Growth and Stock Market: Within County Analysis

The dependent variable is zip-code level deposit growth. *Div_ratio* is the total dividend income over total income in a zip code. *ret* is the annual return of the CRSP value-weighted index over the same period for which deposit growth is measured. County controls in column (1) include *Div_ratio*, lagged income per capita, lagged population, income per capita growth, and population growth. The definitions of other variables are in Table I. Standard errors are two-way clustered by year and county.

	(1)	(2)
$Div\_ratio \times ret$	-1.33^{**}	-0.76^{*}
	(0.59)	(0.36)
$Div\_ratio \times sentiment$	-0.27^{**}	-0.33^{***}
	(0.12)	(0.07)
County controls	Yes	No
Year fixed effects	Yes	No
County×year fixed effects	No	Yes
R-squared	0.015	0.130
N	388,968	388,968

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VII: Alternative Channels and Robustness Checks

The dependent variable is county deposit growth. *ret* is the annual return of the CRSP value-weighted index. Δfed_rate is the change in the effective Federal funds rates over the same period. *vol* is the standard deviation of monthly CRSP returns over the same period. *Div_ratio* is the ratio of taxable dividend income to total adjusted taxable income from the IRS, except for in column (3), where *div_ratio* is the fraction of income tax returns that report dividend income in a county. The number of dividend tax returns in 2004 when it becomes available is used for the pre-2004 years. In column (4), *Equity inflow* is defined as aggregate net inflows into equity mutual funds during the same period, scaled by the lagged aggregate capitalization of the U.S. stock market. *Controls* include *div_ratio*, lagged income per capita, lagged population, income per capita growth, population growth, the interactions of lagged population with stock returns, and the interaction of lagged income per capita with stock returns, and additionally (in column (1)) the interactions of lagged population with federal fund rate and the interaction of lagged income per capita with federal fund rate, and (in column (2)) the interactions of lagged population with stock return volatility and the interaction of lagged income per capita with stock return volatility. Standard errors are two-way clustered by year and county.

	Interest rate	Volatility	No. of returns	Equity inflow
	(1)	(2)	(3)	(4)
$Div\_ratio \times ret$	-1.55^{***}	-1.27^{**}	-0.21^{***}	
	(0.50)	(0.56)	(0.06)	
$Div\_ratio \times \Delta fed\_rate$	0.08			
	(0.08)			
$Div\_ratio \times vol$		−0.35		
		(4.39)		
$Div\_ratio \times inflow$				-21.62^{***}
				(6.00)
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R-squared	0.065	0.062	0.063	0.061
N	62,154	62,154	62,067	62,154

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table VIII: Deposit and Loan Growth at the Bank Level

The model estimated here is

$$\Delta Y_{i,t} = \alpha + \beta_1 Div\_ratio_{i,t-1} \times ret_{[t-1,t]} + \beta_2 Div\_ratio_{i,t-1} + \beta_3 Z_{i,t-1} + \gamma X_{i,t-1} + \mu_t + \epsilon_{i,t}$$

where the dependent variable in columns (1) to (5) is quarterly bank deposit growth or loan growth, and columns (6) and (7) the change in quarterly rates of the 12-month CDs of $10,000 and the change in rates of $25,000 money market accounts. The quarterly rates are computed as the average weekly deposit rates across all branches within a bank. *Div_ratio* is the deposit-weighted dividend-income ratio in counties where a bank has deposits. *ret* is the cumulative return of the CRSP value-weighted index over quarters $t-1$ and t. Other variables are defined in Table I. Z is bank level control variables such as size, capitalization, and income. X is the deposit-weighted county control variables such as population and income per capita. μ_t is time (year-quarter) fixed effects. Standard errors are two-way clustered by by bank and time.

	(1) Deposits	(2) Insured deposits	(3) Loans	(4) C&I loans	(5) RE loans	(6) 12m 10K CD	(7) 25K MM
Div_ratio×*ret*	−0.76**	−0.84**	−0.53*	−0.67**	−0.64**	1.24	2.96***
	(0.31)	(0.41)	(0.28)	(0.26)	(0.28)	(2.00)	(1.11)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time fixed effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R-squared	0.047	0.035	0.066	0.013	0.043	0.720	0.351
N	651,182	644,051	651,182	651,182	651,182	327,256	313,648

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table IX: Real Effects of the Deposit Channel

The dependent variable is the log growth of county employment from March of calendar year t to March of calendar year $t+1$. *Bank Div_ratio* is defined as the weighted average of bank dividend-income ratios across all banks in a given county, using their lagged deposits shares as weights. *ret* is the cumulative return of the CRSP value-weighted index from the end of calendar year $t-1$ to the end of calendar year t. The regressions control for the county's own dividend-income ratio and its interaction with *ret*, as well as deposits-weighted bank assets, equity ratio, income ratio, deposit ratio, real estate loan ratio, the county's house price growth, and their interactions with the year dummy of 2008. Standard errors are two-way clustered by year and county.

	(1)	(2)
Bank Div_ratio×*ret*	-0.88^{**}	-0.89^{**}
	(0.38)	(0.42)
Bank Div_ratio	0.31^{***}	0.10
	(0.09)	(0.16)
Controls	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*
County fixed effects	*No*	*Yes*
R-squared	0.097	0.155
N	49,800	49,800

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

APPENDICES
(NOT INTENDED FOR PUBLICATION UNLESS REQUESTED)

A.I State-level Stock Market Participation Based on IRS Data and in Hong et al. (2004)

Figure A.I shows the scatter plot of dividend income ratio from IRS in 1994 and participation rates for 38 states from their Panel A of Table V. The correlation is 0.35.

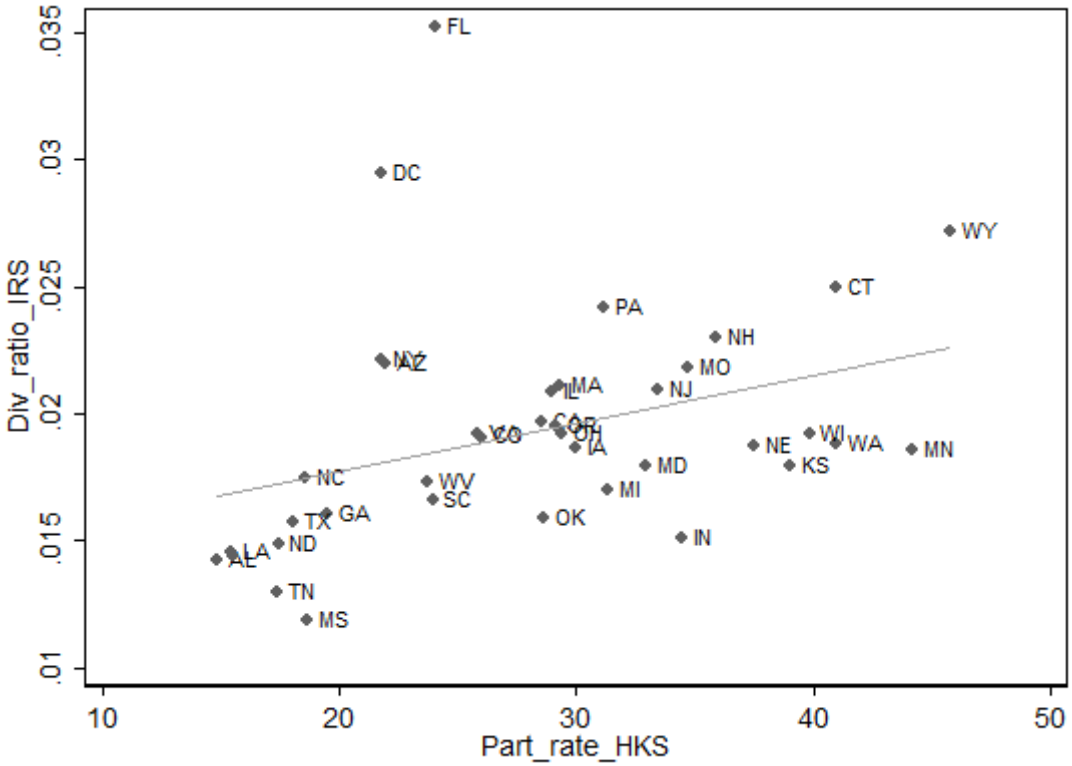


Figure A.I: State Level Stock Market Participation. This figure plots the dividend income ratio of U.S. states in 1994 against the 1992 stock market participation rate from Hong et al. (2004) using household data. The dividend income ratio is state-wide dividend income over adjusted gross income from the IRS.

A.II Boom vs. Bust

Table A.I: Deposit Growth and Stock Market Participation at the County Level: Boom vs. Bust

This table examines how deposit growth varies with stock market participation for the year with the lowest and highest 12-month stock returns from July to June during the sample period. The dependent variable is the deposit growth during the time period indicated in the table header, where the stock returns during each period are also shown. The definitions of other variables are in Table I. Controls include lagged income per capita, lagged population, income per capita growth, and population growth.

	July 2008 to June 2009 (ret=-26.9%)	July 2010 to June 2011 (ret=31.5%)
Div_ratio	0.36^{**}	-0.55^{***}
	(0.17)	(0.17)
Controls	*Yes*	*Yes*
R-squared	0.045	0.109
N	3,109	3,107

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A.III Cross-country Analysis

Table A.II: Deposit Growth and the Stock Market: Cross-country Analysis

The dependent variable is the change in deposits to GDP ratio from year $t-1$ to year t. *Stock_GDP* is the ratio of stock market capitalization to GDP, measured in year $t-1$. *ret* is the annual country stock return. The sample is an unbalanced panel of 87 countries from 1990 to 2014. *Controls* include GDP growth and log lagged GDP per capita. The data are from World Bank's Global Financial Development database.

	(1)	(2)
Stock_GDP×*ret*	-2.69^{***}	-2.71^{**}
	(0.90)	(0.94)
Stock_GDP	0.97^{***}	0.58^{*}
	(0.19)	(0.32)
Ret	0.68	0.80
	(0.45)	(0.48)
Controls	*Yes*	*Yes*
Year fixed effects	*Yes*	*Yes*
Country fixed effects	*No*	*Yes*
R-squared	0.088	0.131
N	1,586	1,586

* $p<0.1$, ** $p<0.05$, *** $p<0.01$