Dynamic Deposits: The Role of Inflows on Future Outflows

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September 22, 2023

Abstract

Deposits serve as the main form of bank financing and are an important source of capital in the economy. However, unlike other liabilities, 43% of deposits flows do not stem from a bank actively seeking them. This in turn raises equity issuance concerns among the bank's shareholders. In this paper, we show that banks seek to compensate for more frequent costly equity issuances by reaching for yield and raising risk. When the fed funds rate rises, banks that experienced these deposit inflows face higher losses and deposit outflows. The main driver of the effect is uninsured deposits, as they represent the major source of deposit volatility, increasing more equity issuance concerns. This mechanism also plays a key role in understanding the 2022-2023 U.S. bank fragility episode, as the risky exposures of banks were amplified following deposit inflows in 2020-2021. High deposit inflows can serve as an early indicator for understanding changes in bank risk and future deposit outflows—and even runs to the bank—assisting depositors, bankers, stakeholders, and policymakers.

JEL Code: E50, E52, E58, G12, G20, G21, G28, G30, L5.

Keywords: Deposit Flows, Uninsured Deposits, Interest Rate Risk, Credit Risk, 2023 Bank Fragility

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I. Introduction

Deposits play an important source of capital in the economy and the main form of bank financing. However, unlike other liabilities, banks cannot fully control deposit levels and their maturities, as depositors can choose the timing and the amount of deposit inflows and outflows for reasons unrelated to the bank's actions (Bolton, Li, Wang, and Yang, 2021; Drechsler, Savov, and Schnabl, 2021; Jermann and Xiang, 2023). This leads to uncertainty regarding the bank's leverage, and raise concerns for the need of more frequent costly equity issuance (e.g., Bolton, Li, Wang, and Yang, 2021; Brunnermeier and Sannikov, 2014; Hugonnier and Morellec, 2017)).

In this paper, we analyze supply-driven deposits, i.e., inflows that do not stem from a bank actively seeking them, but from depositors deciding to increase deposits, for reasons unrelated to the bank. These deposits are the least controllable by the bank and account for 43% of all deposit flows, contributing the most to deposit uncertainty. Although the marginal supply-driven deposit inflow does not necessarily lead banks to take more risk, we show that it leads them to compensate shareholders for more frequent costly equity issuances by reaching for yield and increasing bank risk. As a result, when the fed funds rate rises, banks that experienced supply-driven deposit *inflows* face higher losses and deposit *outflows*. Uninsured deposit inflows are the main driver of the rise in risk, as they represent the major source of deposit volatility, raising more equity issuance concerns. This helps to explain why banks choose to raise risk despite the monitoring conducted by uninsured depositors (Diamond and Rajan, 2001; Martinez Peria and Schmukler, 2001).

This mechanism also plays a key role in understanding the 2022-2023 U.S. bank fragility episode, as the risk exposures of banks were amplified following deposit inflows in 2020-2021. This in turn sparked larger losses and deposit outflows following the rise in the fed funds rate in 2022-2023. Our results point to an underlying mechanism that helps explain the observed results documented in recent papers, and the media coverage of the current fragility episode.

Studying the effect of deposit inflows on bank risk, we face the hurdle of disentangling the effect of deposit inflows from the ex-ante decision of the bank to increase risk and collect deposits to achieve this goal.[1] To address this issue, we use supply-driven deposits as our main measure. To determine if deposits are supply-driven, we employ an identification strategy used by Cohen, Diether, and Malloy (2007). The argument is that for deposits to increase without a concurrent rise in the interest rate paid on the deposits, an outward shift in the supply of capital from depositors must have occurred. These deposits from households and firms are not under the full control of the bank, as they are driven by cyclical economic factors or idiosyncratic depositor circumstances. Hence, this component of the flows is external to the bank and less expected, making it more suitable to our identification strategy.

Analyzing the U.S. banking system from 2001-2022, we construct our main measure of supply-driven deposits that we use in all the specifications. We perform bank-level analysis and exclude deposit inflows from periods when the bank increases deposit rates in the current or the previous quarter. Periods when the bank raises deposit rates indicate that it actively seeks deposits to potentially achieve pre-determined goals, and these deposits are endogenous in our context. The supply-driven deposits inflows measure is defined as the quarterly growth rate in the non-excluded bank-quarter deposits.

Yet, this classification approach may not adequately capture the distinction between supply- and demand-driven deposits in cases where non-price factors affect deposit flows to the bank. Thus, we verify that the results remain robust using an alternative measure of supply-driven deposits constructed from more granular level data. Here, we conduct the analysis at the bank-county level deposit flows and changes in rates. Given the data availability, for this measure we are able to observe only annual changes in deposits. However, it allows us to make sure that the results are not driven by the market power of the bank in collecting deposits (Drechsler, Savov,

[1] Banks find it optimal to rely on deposits due to mispriced deposit insurance, the existence of a liquidity premium on deposits, and the tax deductibility of debt payments (Allen, Carletti, and Marquez, 2015; DeAngelo and Stulz, 2015; Gorton and Pennacchi, 1990). Banks collect deposits to expand risky assets (e.g., Kashyap, Rajan, and Stein, 2002), deposit franchise allows them to produce stable net interest margins (Drechsler, Savov, and Schnabl, 2021), and the bank's productivity at collecting deposits and making loans is positively related to its market value (Egan, Lewellen, and Sunderam, 2022).

and Schnabl, 2017), or by deposit inflows to newly established branches (as the bank chooses the timing and the location of opening new branches).

Another challenge arises with regard to the depositors. They hold deposits to cover future unexpected liquidity needs (Diamond and Dybvig, 1983; Miller and Orr, 1966), and may increase deposits in some banks more than others due to specific changes in the bank's characteristics. We deal with this concern by including relevant bank controls, such as size, profitability, risk and equity. In a separate analysis, we conduct nearest-neighbor matching based on an extensive set of variables used in prior studies to explain deposit flows, such as bank size, growth and profitability, riskiness, capital ratio, asset and funding composition (Acharya and Mora, 2015; Egan, Hortaçsu, and Matvos, 2017; Chen, Goldstein, Huang, and Vashishtha, 2022a,b). Matching allows us to show the effect of deposit inflows in a setting with banks that are similar on a variety of observables.

We also validate that the observed effects are not driven by changes in aggregate bank reserves stemming from quantitative easing periods (Acharya, Chauhan, Rajan, and Steffen, 2023; Acharya and Naqvi, 2012; Diamond, Jiang, and Ma, 2020), or low interest periods that might drive reaching for yield behavior. We confirm that the rise in deposits is not a mechanical outcome of credit line withdrawals (Li, Strahan, and Zhang, 2020), or other employed loan commitments. Additionally, we ensure that our findings hold also when excluding the COVID period (i.e., 2020 onwards) from the sample, and that the results are not driven by the implementation of the Temporary Liquidity Guarantee Program (TLGP) following the global financial crisis.[2]

Finally, we identify a period when deposit inflows increased sharply and unexpectedly (Levine, Lin, Tai, and Xie, 2021), and examine the effect of inflows on banks risk, as well as outflows following monetary tightening. In particular, we study the effect of substantial deposit inflows during first two quarters of the COVID period. These inflows stem from rise in risk-aversion of firms and households with the onset of the COVID pandemic and subse-

[2]In 2008, the FDIC implemented the TLGP, which fully guaranteed noninterest-bearing transaction accounts held at participating banks and thrifts through the end of 2009. The program was extended twice and expired on December 31, 2010.

quent government stimulus policies, making them less likely to be driven by bank decisions, or depositor-specific drivers. Nevertheless, bank-specific inflows might be determined endogenously. To this end, we match between banks and utilize our supply-driven deposit inflow estimate to perform a difference-in-differences analysis.

We start the time-series analysis by exploring what banks do with the supply-driven deposit inflows. Banks can utilize the new deposits to expand credit supply, hold more long-term securities or increase holdings of liquid assets (such as cash, fed funds, and T-bills). We find that they use the additional funds to expand credit supply and hold more securities. For our main measure, banks with one standard deviation higher supply-driven deposit inflows expand their loan and securities portfolios by 7% and 62% of the sample means (scaled by lagged assets), respectively.

The balance-sheet expansion is accompanied by reaching for yield behavior, and a rise in the riskiness of the bank. We find that banks that exhibit supply-driven deposit inflows improve their gross income and ROA, and increase their interest rate risk and credit risk. The rise in risk is not obvious, as the marginal deposit inflow does not necessarily lead banks to take more risk. However, consistent with banking models, we argue that banks seek to avoid costly future equity issuance by reaching for yield. Following Bolton, Li, Wang, and Yang (2021), we provide evidence for the existence of this concern by focusing on undercapitalized banks. These banks are closer to the regulatory requirement, thus any deposit-driven decrease in their equity ratios increases the likelihood for costly equity issuance. Indeed, we find that the reaching for yield behavior and the rise in risk are more pronounced among this subsample of banks, with about 20% and 27% larger increase in their interest rate risk and credit risk (compared to well-capitalized banks), respectively. We provide additional evidence for the importance of equity issuances in the COVID period analysis. We find that banks that experienced higher deposit inflows during this period heightened their risk-taking.

The rise in interest rate risk is reflected by holding more long-term securities. We measure this risk using the bank's maturity gap (following English, Van den Heuvel, and Zakrajšek, 2018).[3] A one standard deviation higher supply-driven deposit inflow is associated with a quarterly increase in the maturity gap equal to 12% of the mean quarterly change.[4] Focusing on the securities category—for which more granular data is available—we find that those banks increase holding of securities with maturities longer than 3 years by 19.5% of the sample mean. As most of the assets in the banking system are not hedged against changes in interest rates (Jiang, Matvos, Piskorski, and Seru, 2023a; McPhail, Schnabl, and Tuckman, 2023), these changes translate into interest rate risk.[5]

Further, we find a positive effect of supply-driven deposit inflow on credit risk. Using the bank's risk-weighted assets to total assets as an overall measure of credit risk, we find that it increases following deposit inflows. A one standard deviation higher supply-driven deposit inflow is associated with a more than two-and-a-half fold increase relative to the mean quarterly change in risk-weighted assets to total assets.[6] These banks hold more securities associated with higher credit risk (e.g., private-label mortgage-backed securities and asset-backed securities).

Uninsured deposits represent the main source of deposit volatility. Over our sample, their volatility is about three times larger than insured deposits. As the maturities of the deposits are not predetermined, and banks cannot perfectly control inflows, the higher volatility of uninsured deposits exacerbates the uncertainty regarding the equity boundary of the bank, thus motivating banks to engage more in reaching for yield behavior.[7] This volatility cannot be perfectly controlled by the bank, while insured depositors have less incentive to move deposits (often thought of as "sleepy"). Consequently, we find that banks with higher share of uninsured de-

[3]See also Flannery and James (1984) and Hutchison and Pennacchi (1996) for discussion of the maturity of assets, deposits, and the bank's interest rate risk.

[4]The results hold also when excluding C&I loans, as the majority of those loans carry floating rates.

[5]Drechsler, Savov, and Schnabl (2021) argue that the bank's deposit franchise in part serves to hedge interest rate risk. However, Drechsler, Savov, Schnabl, and Wang (2023) show theoretically that accounting for deposit outflows complicates this hedge. They argue banks cannot simultaneously hedge interest rate risk and liquidity risk exposures when uninsured deposits contribute to the bank's deposit franchise.

[6]Plosser and Santos (2014) present the incentives for banks to bias their internally generated risk estimates. Despite this potential bias, we find a rise in risk-weighted assets, indicating that the our results may underestimate the full effect.

[7]Similarly to models of defaults in which the volatility of the assets increases the probability of default, such as Merton (1973); Leland (1994); Chen (2010).

posits engage more in reaching for yield behavior following supply-driven deposits inflows. Their balance sheets are less stable, thus the marginal deposit inflow leads to bigger equity issuance concerns. Further, splitting between insured and uninsured supply-driven deposit inflows, we indeed find that the latter category drives the rise in bank risk more. The rise in interest rate and credit risk is about twice and five-fold as large for the supply-driven uninsured inflows, respectively.[8] Although uninsured depositors are often considered as monitors of bank risky behavior, we provide first evidence of the opposing effect of the equity-issuance concerns.

The rise in bank risk following deposit inflows remains robust in the matched sample, when utilizing bank-county level deposits and interest rates and excluding deposit inflows from newly established branches, as well as after scaling the non-excluded bank-quarter uninsured deposit growth by lagged total deposits.

Next, we show that the enhanced riskiness negatively affects bank performance in periods of monetary policy tightening. The higher the deposit inflows, the bigger the losses when the fed funds rate rises. We utilize monetary tightening periods to analyze the implications of the bank's decision following supply-driven deposit inflows, as rising interest rates typically lead to losses on banks' maturity mismatched exposures, and hardens borrowers' ability to repay their debts. We show that the losses are concentrated in banks with the highest equity issuance concerns, which led them to increase risk the most. For a one percentage point increase in the fed funds rate, undercapitalized banks with one standard deviation higher supply-driven deposit inflows exhibit increased losses on their securities portfolio equal to 3.4% of the sample mean. For credit losses, the increase in non-performing loans (NPLs) is equal to 27% of the sample mean.

Banks that exhibit supply-driven deposit inflows seek to overcome equity issuance concerns by reaching for yield. However, the higher risk and the negative outcomes during monetary tightening lead to heightened concerns regarding the solvency of the banks, making them more

[8]The result remains robust when scaling the non-excluded bank-quarter uninsured deposit growth by lagged total deposits to capture the importance of the uninsured inflows to the funding structure of the bank.

prone to deposit outflows. We find that undercapitalized banks, and less solvent ones, with a one standard deviation higher supply-driven deposit inflows exhibit reduction of 0.1% in deposit growth following a one percentage point increase in the fed funds rate (relative to the sample mean). This indicates of a positive relationship between the growth in deposit inflows and the scale of deposit outflows in periods of monetary tightening, where higher inflows lead to higher outflows. Additionally, consistent with the bigger rise in bank risk following enhanced equity issuances that stem from uninsured deposit inflows, we find that the outflows are driven by these inflows. The heightened concerns among uninsured depositors regarding the solvency of the banks lead them to pull their funds from these banks.

Our mechanism can also explain the 2022-2023 U.S. bank fragility episode. Bigger equity issuance concerns are expected to play an outsized role in periods with large deposit inflows, such as the COVID period in 2020-2021. As explained earlier, the deposit inflows during this period are less likely to be driven by bank decisions or depositor-specific drivers. However, unobserved factors can affect the heterogeneity of inflows across banks. To this end, we focus only on deposit inflows during the first two quarters of the pandemic, when the rise in risk-aversion was the highest. We also conduct nearest neighbor matching between banks at the end of 2019, and use the supply-driven deposit inflows estimator. This allows us to compare two similar banks, but only one of them experiences significant supply-driven deposit inflow in the first part of 2020. For the difference-in-differences analysis, the treated group consists of banks that exhibited the largest supply-driven inflow growth, and the control group consists of banks with the lowest growth rate.[9] We include the same controls as in the time-series analysis, and allow them to have their own independent effects.

Similar to our full sample results, we find that the treated banks engaged more in reaching for yield behavior, and increased their interest rate risk and credit risk. The treated banks raised their gross income, maturity gap and risk-weighted assets during 2020Q3-2021Q4 by 4.1%,

[9]Both Silicon Valley Bank and Signature Bank, the two bank failures of March 2023, are classified in the treatment group. The treated banks had higher presence in California and other areas with relatively dominant high-tech industry.

18.7% and 24.5% of the sample standard deviation, respectively. We provide evidence for the importance of equity issuances concerns also during this period by showing that the increase in reaching for yield behavior and bank riskiness is more pronounced among undercapitalized banks, and the ones with higher share of uninsured deposits of assets in 2019. Subsequently, these treated banks experienced higher deposit outflows in 2022. We find that the deposit growth is 12.2% more negative for the high-inflow undercapitalized banks (from the sample standard deviation). The outflows are more pronounced among treated banks that faced higher equity issuances concerns. Undercapitalized banks, less solvent ones, and banks that experienced higher uninsured deposit inflows in 2020 faced bigger outflows in 2022.

Our results have important implications for depositors, bankers, stakeholders, and policy-makers. While much of the current focus is on preventing bank runs, we introduce deposit inflows as a new early indicator for the potential of such events. It could also become a component for bank stress tests conducted by central banks around the globe since the financial crisis of 2008.

Our paper contributes to a few different strands of the literature. Bolton, Li, Wang, and Yang (2021) explore the uncertainty arising from deposit inflows, and the negative effects on bank value. We show empirically that deposit inflows lead banks to increase risk, which makes them more susceptible to losses and deposit outflows in periods of monetary tightening. This relates to the existing literature on how reliance on deposits exposes the banking system to outflows and panic-based runs (Diamond and Dybvig, 1983; Goldstein and Pauzner, 2005; Kashyap, Rajan, and Stein, 2002; Martin, Puri, and Ufier, 2018). It also increases the capacity of banks to originate new loans, and enhances their lending resiliency during crisis periods (e.g., Berger and Bouwman, 2009; Gilje, Loutskina, and Strahan, 2016; Ivashina and Scharfstein, 2010). We show the effect of supply-driven deposits on the response of the banks, and the role of equity issuance concerns.

Our study complements recent literature on the interactions between the monetary policy and the banking system (e.g., Drechsler, Savov, and Schnabl, 2017; Di Tella and Kurlat, 2021;

Drechsler, Savov, and Schnabl, 2021; Haddad, Hartman-Glaser, and Muir, 2023). Banks that experienced higher deposit inflows become more exposed to monetary policy tightening, which has broader implications for their ability to continue lending, the transmission of monetary policy to the economy, and the stability of the banking system. These banks might exhibit additional credit losses if high rates continue to put pressure on borrowers, similar to the evolution of the S&L crisis in the 1980s.[10]

We also contribute to recent studies that analyze U.S. banks' asset exposure to the 2022-2023 monetary tightening with implications for financial stability (Jiang, Matvos, Piskorski, and Seru, 2023a,b), banks experiencing uninsured deposit outflows (Drechsler, Savov, Schnabl, and Wang, 2023), unrealized losses on held-to-maturity (HTM) portfolios (Dursun-de Neef, Ongena, and Schandlbauer, 2023; Granja, 2023), and bank interest rate risk (Abdymomunov, Gerlach, and Sakurai, 2023). Finally, we provide a connection between the findings of Rosen and Zhong (2022) of a positive association between deposit inflows (outflows) and the bank's decision to purchase (sell) risky securities. Our study presents the role of deposit inflows, which affect the riskiness of the bank and increases its exposure to deposit outflows during monetary policy tightening.

II. Data and Variable Definitions

Our data cover the universe of U.S. banks from 2001 to 2022. We use the quarterly Report of Condition and Income (CALL reports), which contains data on the income statements, balance sheets, detailed supporting schedules, and off balance-sheet items for U.S. banks. The effective fed funds rate is taken from the St. Louis Fed's Federal Reserve Economic Data (FRED). We use the rate at the end of each quarter to calculate the quarterly change.

Our main measure of deposit inflows is the supply-driven deposits, i.e., deposit inflows

[10]In the 1980s, Paul Volcker, the Federal Reserve Chair at the time, raised rates. Higher rates exposed problems in bond portfolios first, and then the crisis also exposed other bad assets within American thrifts. See `https://www.economist.com/finance-and-economics/2023/03/16/how-deep-is-the-rot-in-americas-banking-industry`.

that do not stem from banks actively seeking deposits, but from depositors increasing deposits, unrelated to the bank. To determine if deposits are supply-driven, we employ an identification strategy used by Cohen, Diether, and Malloy (2007) in the context of the stock lending market. For each bank, we observe the quarterly deposit flow and the change in the interest rate paid on these deposits. We classify as supply-driven any quarters in which deposits increase but the deposit rate does not increase. To be conservative, we require the deposit rate has not increased in the current or previous quarter. Likewise, any quarters in which deposits decrease but the deposit rate does not decrease (in the current or prior quarter) is classified as a supply-driven outflow. The argument is that for deposits to increase without a concurrent increase in the interest rate paid on the deposits, an outward shift in the supply of capital from depositors must have occurred. Every quarter has some fraction of banks receiving these deposits. Over the full sample, 43% of bank-quarters are classified as having supply-driven deposits.

For the analysis that separates deposits into insured and uninsured components, we use a similar strategy. We use the rate paid on core deposits as the price measure for insured deposits, and the rate paid on uninsured time deposits as the price measure for uninsured deposits. Otherwise, we use the same approach as for total deposits when classifying the subset of these deposits as supply driven. In our analysis, we present these deposits both as growth rates and as changes scaled by lagged bank assets.

A concern is that this classification approach may not adequately capture non-price factors that could affect deposit flows to the bank. As a separate approach, we consider the change in total deposits for each bank using county-level data on the amount of deposits from the Summary of Deposits data and county-level deposit rate data. Here we can classify deposits as supply-driven on a bank-county-level rather than for the bank as a whole. The main limitation is that the deposit data is reported annually, so we can only compute this measure on an annual basis. However, we can incorporate two additional refinements. First, we exclude any deposit flows that coincide with the opening of additional bank branches in the county. This captures if banks are actively seeking deposits through expanding their branch network. Second, we exclude counties where the bank has limited competition (a county-level deposit HHI above the 90th percentile). This restriction recognizes that some banks have limited need to compete on rates (Drechsler, Savov, and Schnabl, 2017) and it is less clear that these deposit inflows are supply driven.

The outcome variables for bank activities include the quarterly growth in total loans and securities. We also present the results for the quarterly change in total loans and securities scaled by lagged assets. As measures of bank's earnings, we include the bank's gross income to assets and its ROA. For interest rate risk, we follow English, Van den Heuvel, and Zakrajšek (2018) and compute the quarterly change in the bank's maturity gap as the average difference between asset maturity and liability maturity in months. We also estimate the growth in the long-maturity assets, defined as assets with maturities longer than three years. For credit risk, we calculate the change in the risk-weighted assets and the quarterly growth in risky securities. Risky securities include non-agency MBS, ABS, non-government domestic securities, and foreign securities holdings.

As a measure of securities performance, we use the total losses on the bank's securities portfolio scaled by the prior's quarter total assets. Total losses include both the stated realized losses and any unrealized losses on both available-for-sale and held-to-maturity securities. For loan performance, we use the quarterly change in non-performing loans scaled by lagged assets. For deposit outflows, we use the quarterly growth rate in either total deposits or uninsured deposits.

The analysis uses lagged common bank-level variables such as the natural logarithm of total assets, equity to assets, and deposits to assets. As a measures of bank profitability, we include the quarterly net interest margin (NIM) and ROA. We also use the bank's average annual loan growth over the past three years.

The summary statistics for these variables are reported in Table I. The mean growth in total supply-driven deposits is 1.2%, but the heterogeneity across banks is significant as indicated by the standard deviation of nearly 10%. We also observe significant in variation in the levels and changes in maturity gaps and risk-weighted assets. About 37% of the banks-quarters exhibit net outflows in total deposits.

III. Deposit Inflows and Bank Risk

III.A. The Effect of Supply-Driven Deposit Inflows on Bank Risk

We start the analysis by exploring what banks do with deposit inflows. To this end, we estimate different versions of the following baseline specification:

$$\text{Y}_{it} = \beta_1 \text{Supply-Driven Deposit Flow}_{it-1} + \beta_2 \text{Bank Controls}_{it-1} + \alpha_i + \gamma_t + \varepsilon_{it} \tag{1}$$

Here Y represents different balance sheet and risk variables of bank i in quarter t. We first analyze changes in lending and securities holdings. Then, we study the bank's reaching for yield behavior using measures of bank earnings and risk. For earnings, we use changes in gross income to assets and ROA as the outcome variables. For interest rate risk, we use the change in bank's maturity gap and its growth in long-maturity assets. For credit risk, we use changes in the bank's risk-weighted assets and growth in risky securities holdings.

Our main measure of deposit inflows is *Supply-Driven Deposit Flow*. We use this measure to address one of our main empirical challenges—disentangling the effect of deposit inflows from the ex-ante decision of the bank to engage in reaching for yield behavior and collect deposits to achieve this goal. To determine if deposits are supply-driven, we employ an identification strategy used by Cohen, Diether, and Malloy (2007) in the context of the stock lending market. The argument is that for deposits to increase without a concurrent increase in the interest rate paid on the deposits, an outward shift in the supply of capital from depositors must have occurred. These deposits from households and firms are not under the full control of the bank, as they are driven by cyclical economic factors or idiosyncratic depositor circumstances. Hence, this component of the flows is external to the bank and less expected, making it more suitable to our identification strategy. The specific details of how we classify deposits as supply-driven are discussed in Section II.

Bank Controls include the bank's size, net interest margin (NIM), loan growth, ROA, and equity ratio. We also include the deposit ratio to account for the overall bank's reliance on deposits as a fraction of assets, separate of the effect of any inflows. We include bank fixed effects to account for any time-invariant bank characteristics and year-quarter fixed effects to control for macroeconomic factors that influence all banks and depositors in a given quarter. To ease interpretation, we standardize all continuous independent variables by their sample standard deviations. Standard errors are clustered by bank and the sample period is from 2001-2022.

Table II presents the results for the securities and loans portfolios. We find positive and statistically significant coefficients, meaning that banks utilize the additional funds to expand credit supply and hold more securities. The magnitudes are also meaningful. Banks with one standard deviation higher supply-driven deposit flows expand their securities and loan portfolios by 62% and 7% of the sample mean, respectively (Columns 2 and 4).

The balance-sheet expansion is accompanied with reaching for yield behavior and increased bank risk. We find that banks that exhibit supply-driven deposit inflows improve their ROA and gross income but also increase their interest rate risk and credit risk. Although the marginal deposit inflow does not necessarily lead banks to take more risk, we provide evidence in Section III.C that banks are concerned with future equity issuance and respond by reaching for yield.

Table III presents the results. We estimate reaching for yield behavior using the change in the bank's gross income to assets ratio (Column 1) as it indicates the changes in the bank's income before netting the expenses (that might be affected by the deposit inflows). As an additional measure, we use the change in the bank's ROA (Column 2). We find positive and statistically significant coefficients, meaning that banks that experience deposit inflows engage more in reaching for yield behavior. A one standard deviation higher supply-driven deposit inflows is associated with a 0.0124% increase in the bank's gross income to assets ratio, and a

0.00827% increase in ROA. These effects are comparable in magnitude to the sample means of these variables.

Next, we show these inflows also coincide with more risk. We measure interest rate risk using the bank's maturity gap (Column 3) and the change in long-term securities holdings with maturities above three years (Column 4). A one standard deviation higher supply-driven deposit inflow increases the maturity gap by 15% of the mean quarterly change. We also find that banks with higher deposit inflows grow their securities and loans with longer maturities (above three years) by 22% of the sample mean. As most of the assets in the banking system are not hedged against changes in interest rates (Jiang, Matvos, Piskorski, and Seru, 2023a; McPhail, Schnabl, and Tuckman, 2023), these changes translate through to interest rate risk.

Further, we find a positive effect of supply-driven deposit inflow on credit risk. Using the bank's risk-weighted assets to total assets as an overall measure of credit risk, we find that it increases following deposit inflows (Column 5). A one standard deviation higher supply-driven deposit inflow is associated with a more than two-and-a-half fold increase relative to the mean quarterly change in risk-weighted assets to total assets.[11] In Column 6, we find these banks hold more securities associated with higher credit risk (e.g., private-label mortgage-backed securities and asset-backed securities).

III.B. Alternative Explanations

Besides the reverse causality concern between the rise in risk and deposit inflows—that we address with our supply-driven deposit inflow measure—the results presented in Section III.A afford other alternative explanations. In this section, we address a battery of other concerns: heterogeneity in bank deposit collection across markets, depositors moving deposits for bank-specific factors, differences in local market power of banks, low interest-rate environments that drive reaching for yield behavior, the effect of QE on bank reserves, mechanical changes in

[11] Plosser and Santos (2014) present the incentives for banks to bias their internally generated risk estimates. Despite this potential bias, we do find a rise in risk-weighted assets, indicating that the our results underestimate the full effect.

deposits due to credit line withdrawals or utilizing loan commitments, the results being driven by the COVID period or by the implementation of the Temporary Liquidity Guarantee Program (TLGP) following the global financial crisis.

Our results in Section III.A might be affected by heterogeneity in how banks seek deposits across different markets. This could affect the cleanness of the supply-driven deposits inflow measure, as the bank might raise deposit rates in one area and reduce them in others. These changes in deposit rates could be also affected by the local market power of the bank in collecting deposits. To this end, we construct a granular-level alternative measure of supply-driven deposits by studying bank-county level deposit flows and changes in rates. This approach, using FDIC Summary of Deposits data, allows us to identify supply-driven flows for each bank-county. The limitation is the data is only available annually. To determine supply-driven inflows, we identify inflows that occur without a concurrent change in local deposit rates. In impose two further refinements. First, we exclude all deposit inflows in counties where the bank opens additional branches, as the bank chooses the timing and the location of opening new branches. Second, we exclude counties where the county-level deposit HHI is above the 90th percentile of the sample, as the deposit-collection behavior may differ in these less competitive counties (Drechsler, Savov, and Schnabl, 2017).

As county-level deposits are reported each June, we perform the baseline specification in Equation (1) for the third quarter of each year, and this time use the alternative measure of supply-driven deposits. Panel A of Table IV presents the results for the main reaching for yield (change in gross income to assets, Column 1), interest rate risk (change in maturity gap, Column 2) and credit risk measures (change in risk-weighted assets, Column 3). We find consistent results to the ones presented in the previous section.

Another important concern regarding our results arises from depositors choosing to increase deposits in some banks more than others. Specifically, changes in the bank's characteristics might simultaneously affect deposit flows and the bank's risk-taking. We deal with this concern in our baseline specification in Equation (1) by including relevant bank controls, such as size, profitability, loan growth, and equity. Further, we perform a separate analysis to address this concern more directly: we conduct nearest-neighbor matching based on an extensive set of variables used in prior studies to explain deposit flows (Acharya and Mora, 2015; Egan, Hortaçsu, and Matvos, 2017; Chen, Goldstein, Huang, and Vashishtha, 2022a,b). Matching allows us to show the effect of deposit inflows in a setting with banks that are similar on a variety of observables. We match those banks that experience positive supply-driven inflows to other banks that do not using bank size, growth and profitability, riskiness, capital ratio, asset and funding composition.[12] In Panel B of Table IV we focus on the matched subsample, and rerun the baseline specification in Equation (1) on the main reaching for yield and bank riskiness measures. Consistent to the results in Section III, we find that supply-driven deposits lead banks to engage more in reaching for yield and riskier activities. Comparing the magnitudes, we find similar effects in this restricted sample.

We also confirm that the observed effects are not driven by low interest periods that might drive reaching for yield behavior. Our results could be concentrated in these periods when the risk-aversion of banks goes down. In this case, the higher risk-taking is driven by the low interest rate and not by deposit inflows. We do not believe that this is the main channel, as during low interest periods households and firms might choose more profitable investment alternatives—in line with the decline in risk-aversion—instead of putting more money in the bank. Thus, we would not observe the positive association between deposits and risk. We also test this concern more directly. We rerun the baseline specification in Equation (1) excluding all quarters in our sample that have effective fed funds rates below 0.25%. Panel C of Table IV presents the results of this specification. Our results remain consistent, with similar magnitudes.

In Panel D of Table IV, we perform a similar analysis for QE periods.[13] QE affects aggregate bank reserves (Acharya, Chauhan, Rajan, and Steffen, 2023; Acharya and Naqvi, 2012),

[12]The exact set of variables are lagged measures of ROA, ROE volatility, deposit rate, deposits to assets, equity to assets, bank size, real estate loans to assets, C&I loans to assets, NIM, loan growth, and two lags of quarterly changes in fed funds rates and the CRSP value-weighted stock market return.

[13]These periods are 2008Q4-2010Q2, 2010Q4-2011Q2, 2012Q3-2014Q4, and 2020Q1-2021Q4.

which could explain both deposit levels and the behavior of the banks. Conducting our baseline specification, but excluding these periods, we find similar results.

Following the global financial crisis, the FDIC implemented the Temporary Liquidity Guarantee Program (TLGP) in 2008, which fully guaranteed noninterest-bearing transaction accounts held at participating banks and thrifts through the end of 2010. This program might affect deposit-taking and risk-taking behavior. We make sure that this is not the case by excluding this period from our analysis (Panel E).

Next, we ensure in Panel F of Table IV that our findings hold also when excluding the COVID period (i.e., 2020 onwards) from the sample. As described in Section V, the banking system experienced a sharp increase in deposits inflows during 2020-2021 following a rise in risk-aversion of firms and households with the onset of the pandemic, and subsequent government stimulus policies.

Finally, in Panel G of Table IV we verify that the rise in deposits is not mechanical following credit line withdrawals or utilizing established loan commitments (Li, Strahan, and Zhang, 2020). The demand for precautionary liquidity by households and firms might affect their usage of loans and credit lines. This usage translates into larger deposits in the bank, which raises the concern that the rise in deposits is not driven by new funds. We note that as we investigate the effect of the prior quarter's deposit flows on this quarter's bank behavior, it is less likely to be a purely mechanical result. Nonetheless, we add to the baseline specification in Equation (1) control variables for changes in credit lines: the lagged commitments to assets ratio and the contemporaneous change in commitments. We also add comparable variables for loans, i.e., the lagged loans to assets ratio and the contemporaneous change in loans. We find consistent results to the main specification.

III.C. Equity Issuance Concerns

The result that supply-driven deposit inflows lead to banks taking additional risk is not obvious, as a marginal deposit inflow does not necessarily require banks to take more risk. However, consistent with a class of banking models (e.g., Bolton, Li, Wang, and Yang, 2021; Brunnermeier and Sannikov, 2014; Hugonnier and Morellec, 2017), we argue that banks reaching for yield behavior is related to future equity issuance costs.

Generally, banks find it beneficial to finance themselves with deposits due to their unique characteristics compared to other liabilities. Reasons for this preference include mispriced deposit insurance, the existence of a liquidity premium on deposits, and the tax deductibility of debt payments (DeAngelo and Stulz, 2015; Gorton and Pennacchi, 1990; Hugonnier and Morellec, 2017). However, deposits levels are not under the full control of the bank, and the maturities of the deposits are not predetermined (Bolton, Li, Wang, and Yang, 2021; Drechsler, Savov, and Schnabl, 2021). This leads to uncertainty regarding its leverage and is particularly acute for supply-driven deposits, as the bank is not actively looking for these deposits. We argue that these additional deposits, by decreasing the bank's equity ratio, raise the concern that the bank would need raise additional equity. Such issuances are costly to the bank and current shareholders because adverse selection concerns (Myers and Majluf, 1984), and current shareholders will demand additional return to compensate for this expected cost. To provide evidence that this friction is central to bank behavior, we conduct three additional tests.

First, we split banks by their equity ratios. Banks that are closer to the regulatory requirement for capital ratios are more affected by any unexpected deposit inflows. We define the least capitalized banks as those in the bottom tercile of the lagged equity to assets distribution each quarter. We compare these banks to the most capitalized banks, which are in the top tercile of lagged equity to assets. In Panel A in Table V, we reestimate our baseline specification for three three measures of reaching for yield and bank risk, splitting the sample by equity. We find the effect of supply-driven deposit inflows are uniformly stronger for the low equity banks (Columns 1, 3, and 5) than for the high equity banks (Columns 2, 4, and 6). In the case of risk-weighted assets, the difference is statistically significant at the 5% level.

Second, we split banks by their use of uninsured deposits. In our sample, uninsured deposits flow are three times more volatile than insured deposit flows. The higher volatility of uninsured deposits exacerbates the concern that the bank will cross the boundary where it needs to issue equity.[14] Consequently, we expect banks with a higher share of uninsured deposits to engage more in reaching for yield behavior following supply-driven deposits inflows to compensate shareholders for the higher likelihood of costly equity issuances. To this end, in Panel B of Table V we perform a similar analysis to the one in Panel A, splitting between banks with high and low share of uninsured deposits (top and bottom terciles of lagged uninsured deposits to assets, respectively). Consistent with the higher equity issuance concerns, we find stronger effects in banks with more uninsured deposits (Columns 1, 3, and 5). The differences in coefficients for risk-weighted assets are statistically significant at the 1% level.

Third, we delve deeper into the uninsured deposits mechanism by splitting supply-driven deposit inflows into insured and uninsured ones. Performing our baseline specification in Equation (1), we find that the latter category drives the rise in bank reaching for yield and risk more. Table VI presents the results for our main measures of reaching for yield and riskiness. Columns 1-3 present the results for the quarterly growth rate in insured and uninsured supply-driven deposits and in Columns 4-6 we scale these changes by lagged total deposits to capture the importance of the uninsured deposits inflows to the funding structure of the bank. While both insured and uninsured supply-driven deposit inflows increase the bank's reaching for yield and risk measures, the uninsured deposits have a consistently stronger effect. For changes in gross income, the effects are 78% (Column 1) or 94% larger (Column 4). Maturity gap effects are 32% (Column 2) or 13% larger (Column 5). The differences in risk-weighted assets are the most pronounced: 7 times larger (Column 3) or 6 times larger (Column 6). With the exception of the maturity gap differences, these differences are statistically significant at the 1% level. Although uninsured depositors are often considered as monitors of bank risky behavior, we provide evidence that the equity issuance concerns dominate the monitoring effect.

[14]Similar effects exist in models of default in which the volatility of the assets increases the probability of default. See Merton (1973); Leland (1994); Chen (2010).

IV. Deposit Inflows, Bank Performance, and Deposit Outflows in Periods of Monetary Tightening

In this section, we show the consequences of the increased risk-taking presented in the previous section during monetary policy tightening. We utilize monetary tightening periods to analyze the implications of the bank's actions after receiving supply-driven deposit inflows, as rising interest rates typically lead to losses on existing security exposures, and increases the default risk for existing borrowers. To this end, we perform a similar specification as in Equation (1), but interact our main explanatory variable *Supply-Driven Deposit Flow* with the quarterly change in the fed funds rate, as follows:

$$\begin{aligned} \mathrm{Y}_{it} = {} & \beta_1 \text{Supply-Driven Deposit Flow}_{it-1} + \beta_2 \text{Supply-Driven Deposit Flow}_{it-1} \times \Delta \text{ FF Rate}_{t-1} \\ & + \beta_3 \text{Bank Controls} + \beta_4 \text{Bank Controls} \times \Delta \text{ FF Rate}_{t-1} + \alpha_i + \gamma_t + \varepsilon_{it} \end{aligned} \tag{2}$$

Here Y represents different performance and deposit outflows measures of bank i in quarter t. We focus on total securities losses (realized and unrealized) out of lagged assets, and on the change in non-performing loans scaled by lagged assets (as the main proxy for credit losses). Our measures of deposit outflows are the changes in total deposits and uninsured deposits. Bank controls are the same as in Equation (1), with a few additions. For the analysis of securities losses and non-performing loans, we include the lagged ratios of securities to assets and loans to assets. These inclusions allow us to determine whether increased supply-driven deposit inflows affect performance outcomes, separate from the amount of securities and loans the bank holds. For the deposit outflow analysis, we include the lagged deposit rate for all deposits or uninsured deposits, depending on the type of outflow we are considering. All bank controls are interacted with the change in the fed funds rate. This additional layer of robustness makes sure that the monetary tightening effect is operating through the recent supply-driven inflows, and not some other bank characteristic.

Table VII presents the results for the bank performance measures. Columns 1-3 show the results for securities losses. In Columns 4-6, we present the results for the change in non-performing loans. Columns 1 and 4 use the full sample. In the other columns, we split banks into low equity ratios (Columns 2 and 5) and high equity ratios (Columns 3 and 6). The securities losses and NPL measures are scaled by 100.

We find that the interaction terms are positive and statistically significant for the low equity banks, meaning that banks with higher supply-driven deposit flows in the prior quarter exhibit bigger losses in periods of monetary tightening. These banks face the highest equity issuance concerns, which leads them to increase risk the most (as shown in the previous section). For a one standard deviation increase in the fed funds rate (0.48%), banks with a one standard deviation higher deposit inflow exhibit 3.4% and 27% higher securities and credit losses compared to their sample means, respectively.

Banks that exhibit supply-driven deposit inflows seek to overcome equity issuance concerns by reaching for yield. However, the higher risk and the negative outcomes during monetary tightening lead to heightened concerns regarding the solvency of the banks, making them more prone to deposit outflows. Table VIII presents the results for the deposit growth. Column 1 presents the results for the full sample of banks, Columns 2 and 3 split the sample between less capitalized and more capitalized banks. Columns 4 and 5 splits between less solvent and more solvent banks, as proxied by Z-score terciles.

For all banks, we find that prior supply-driven deposit growth negatively affects deposit growth when the fed funds rate changes. A one standard deviation higher supply-driven deposit inflows exhibit 0.08% more negative deposit growth, following a one standard deviation increase in the fed funds rate (Column 1). The negative growth in deposits indicates that banks exhibit deposit outflows. Thus, the results show a positive relationship between the growth in prior supply-driven deposit inflows and the amount of total deposit outflows in periods of monetary tightening, where higher inflows lead to higher outflows.

Splitting the sample, the effect is 22.5% larger for less capitalized banks than the more capitalized banks. This lines up with the results in Table VII that banks with less equity take more risk and experience greater losses. When comparing banks by solvency risk, the banks in the lowest tercile by Z-score experience 84% more outflows for one standard deviation increases in deposit inflows and fed funds rate increases than the highest tercile by Z-score.

To further show that equity issuance concerns drive our results, we split between insured and uninsured deposit inflows, and observe each of them separately interacted with the change in the fed funds rate on the change in uninsured deposits. Table IX presents the results of this specification. Consistent with the bigger rise in bank risk that stem from uninsured deposit inflows, we find that uninsured deposit outflows are driven by these inflows. The higher volatility of uninsured deposits leads the bank to raise more risk. The heightened concerns among uninsured depositors regarding the solvency of the banks lead them to pull their funds from these banks.

In sum, we see that deposit inflows raise equity issuance concerns, which lead to higher risk. In times of monetary tightening, this leads to more negative outcomes. This leads to deposit outflows from these banks, which are mainly driven by uninsured depositors.

V. The Effect of COVID Deposit Inflows on the 2022-2023 U.S. Bank Fragility

In this section, we analyze the recent period of U.S. bank fragility and show that the mechanism presented in the previous sections plays a key role during this episode. We argue that the seeds for the 2022-2023 bank fragility were planted during the COVID period in 2020-2021. Significant and unexpected deposit inflows occurred in 2020-2021 (Levine, Lin, Tai, and Xie, 2021). Banks exhibited substantial deposit inflows following a rise in risk-aversion of firms and households with the onset of the COVID pandemic, and subsequent government stimulus policies. These large inflows put significant strain on the banking system, particularly from the perspective of equity issuance concerns. Indeed, the issue was sufficiently acute that the Federal Reserve temporary relaxed the Supplementary Leverage Ratio rule in April 2020, which applies to banks over $250 billion in assets.[15] Our claim is that these inflows led banks to reach for yield and take on additional risk in 2020-2021, which exposed them to the subsequent bank fragility observed in 2022-2023.

The unexpected nature of the initial deposit inflows in 2020-2021 provides an opportunity to further establish our mechanism, as the deposit inflows during this period are less likely to be driven by bank decisions, or by depositor-specific drivers. However, unobserved factors can affect the heterogeneity of inflows across banks. To be conservative, we take the following steps. First, we focus only on deposit inflows during the first two quarters of the pandemic (2020Q1 and 2020Q2), when the rise in risk-aversion was the highest. Second, we only use the subset of deposit inflows that we identify as supply driven and consider banks with some positive supply-driven inflows in this period. This is to avoid including banks that are not receiving inflows for potentially idiosyncratic reasons such as poor performance during this time. From these inflows, we categorize as treated those banks in the top quartile by supply-driven deposit flows, and as control those banks in the bottom quartile by supply-driven deposit flows. Again, both groups experience some positive supply-driven inflows, but differ in the magnitude of their inflows. Third, we conduct nearest neighbor matching between treatment and control banks at the end of 2019 using the same set of bank characteristics as in Section III.B that have been identified in the literature to affect deposit flows to banks (Acharya and Mora, 2015; Egan, Hortaçsu, and Matvos, 2017; Chen, Goldstein, Huang, and Vashishtha, 2022a,b). The motivation for these various steps is to make the treated and control banks as similar as possible, with the exception of the amount of supply-driven inflows they received in the first part of 2020.

Both Silicon Valley Bank and Signature Bank, the two bank failures of March 2023, are classified in the treatment group. It also includes other banks that experienced significant deposit outflows later in 2023, such as PacWest, Western Alliance, and Charles Schwab. The treated banks have a larger presence in California and other areas with relatively dominant high-tech

[15] See `https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm`. The relaxation was in effect until March 31, 2021.

industry. Banks classified in the control group include BNY Mellon, Barclays, and Farmers Bank.

Using this sample, we perform the following difference-in-differences analysis to capture the risk effects following the deposit inflows:

$$\mathrm{Y}_{it} = \delta_1 \mathrm{Treat}_{it} \times \mathrm{Post}_t + \delta_2 \mathrm{Bank\ Controls}_{i,2019Q4} \times \mathrm{Post}_t + \alpha_i + \gamma_t + \varepsilon_{it} \tag{3}$$

Here Y represents different variables for bank i in quarter t. These include the change in gross income to assets, maturity gap, and risk-weighted assets. *Post* is an indicator that equals one for 2020Q3-2021Q4. *Bank Controls* include same set of controls as in the previous sections, such as the bank's size, equity to assets ratio, NIM, profitability, loan growth, and deposits ratio. To avoid the "bad controls" problem (Angrist and Pischke, 2009), we fix the control variables just before the shock in 2019Q4. We interact these variables with the *Post* indicator, which allows these characteristics to have their own independent effects on the outcome variables of interest. These interactions control for a host of alternative channels that are correlated with but not the exact mechanism in which we are interested. We also include bank and year-quarter fixed effects. For this analysis, our time window is 2019Q1-2021Q4.

Figure 1 presents the average supply-driven deposit flow for the treatment and control banks. The deposit inflow shock occurs in 2020Q1-2020Q2. The figure shows that for the three years prior to COVID, the treated and the control groups had a similar trends in supply-driven deposit inflows. This strongly suggests that the treated and control banks did not have systematic differences which lead to higher or lower levels of deposit inflows before the shock. In 2020Q1-2020Q2, the supply-driven inflows to the treated banks rise significantly relative to the control banks. While the differences in the subsequent quarters become much smaller, there is no evidence that the inflows reverse. Overall, the treated banks experience a large shock of deposit flows in the first half of 2020 that are not undone in the rest of 2020 and 2021.

Panel A in Table X presents the results for the change in gross income to assets (Columns

1 and 2), interest rate risk (Columns 3 and 4) and credit risk (Columns 5 and 6), both with and without other controls. Consistent with the time-series results, we find that the treated banks reach for more yield and increase their risk significantly more than the control group. Relative to the control group, the magnitudes are meaningful. The treated banks increased gross income, maturity gap and risk-weighted assets by 0.007% (Column 2), 0.78 months (Column 4) and 0.93% (Column 6), respectively. All of these effects are much larger than the sample means and significant fractions of the sample standard deviations (4.1%, 18.7% and 24.5%, respectively).

In Panel B of Table X, we reintroduce our sample splits by high and low equity ratios. Here we include all the bank controls and use the equity ratios as of 2019Q4 to divide the sample. Although changes in gross income are not significant when dividing the sample (Columns 1 and 2), we find statistically significant effects for changes in maturity gap and risk-weighted assets for both subsamples (Columns 3-6). Further, the low equity subsample has larger estimated effects, although the differences across samples are not statistically significant.

In Panel C of Table X, we split the sample into high and low terciles by uninsured deposits to assets as of 2019Q4. Here we find the strongest evidence of differential risk-taking. The banks that rely most on uninsured deposits before the shock have the greatest increases in gross income, maturity gap, and risk weighted assets. All of the differences in estimates across the subsamples are statistically significant at the 5% or higher level. Overall, we find that substantial supply-driven inflows lead these banks to increase risk, and the effects are stronger for banks with higher ex-ante concerns about future equity issuance.

In Panel D, we use an alternative treatment sample, which sorts banks into the highest and lowest quartiles by uninsured supply-driven deposit inflows in 2020Q1 and 2020Q2. We match treatment and control banks as for the main treatment sample. We find similar effects as with the main treatment sample. This is consistent with the bigger equity issuance concerns associated with the higher volatility of uninsured deposits.

Finally, we investigate if these same banks that increase risk in 2020-2021 experience deposit outflows when monetary policy tightens in 2022-2023. Figure 2 shows that banks with large deposit inflows during the COVID period are more likely to experience deposit outflows in 2022-2023, when the fed funds rate increased from near zero to almost five percent. In Table XI, we consider the effect of the 2022 rate hike on the outflows of total deposits and uninsured deposits. Here the difference-in-differences setup is very similar to Equation (3) with a few adjustments. First, the sample window runs from 2019-2022 to include the rate increase. Second, the *Post* indicator here equals one in 2022, when the Fed's interest rate hike begins. Otherwise, the treatment and control definitions, bank control variables, and sample matching are the same.

Columns 1 and 2 consider the full sample of banks. We find that the treated banks have on average around 1.9% additional deposit outflows in 2022 compared to the control banks, equivalent to 30% of the sample standard deviation. These results are similar with and without bank controls and are statistically significant at the 1% level. In Columns 3 and 4, we subsample banks into low and high equity groups, and find a stronger effect for the low equity banks. However, the difference is not statistically significant. We find similar patterns when splitting the banks by Z-score (Columns 5 and 6). As a final test, we focus on uninsured deposit growth in Columns 7 and 8. Here, we use the alternative treatment sample based on uninsured supply-driven deposit inflows in 2020Q1 and 2020Q2. Again, we find that the banks with the highest uninsured supply driven inflows in early 2020 experience around 2.2% more uninsured outflows in 2022 than the control banks (12.2% of the sample standard deviation).

VI. Conclusions

In this paper, we study the effect of supply-driven deposits, i.e., inflows that do not stem from a bank actively seeking them, but from depositors deciding to increase deposits, for reasons unrelated to the bank. We show that they lead banks to compensate shareholders for more frequent costly equity issuances by reaching for yield and increasing risk. As a result, in periods of monetary tightening, banks that experienced supply-driven deposit inflows face higher losses and deposit outflows. Uninsured deposit inflows are the main driver of the rise in risk, as they represent the major source of deposit volatility, raising more equity issuance concerns. This mechanism also plays a key role in understanding the 2022-2023 U.S. bank fragility episode, as the risk exposures of banks were amplified following deposit inflows in 2020-2021. This in turn sparked larger losses and deposit outflows following the rise in the fed funds rate in 2022-2023. Our results point to an underlying mechanism that helps explain the observed results documented in recent papers, and the media coverage of the current fragility episode.

High deposit inflows can serve as an early indicator for understanding changes in bank risk and future deposit outflows—and even runs to the bank—assisting depositors, bankers, stakeholders, and policymakers.

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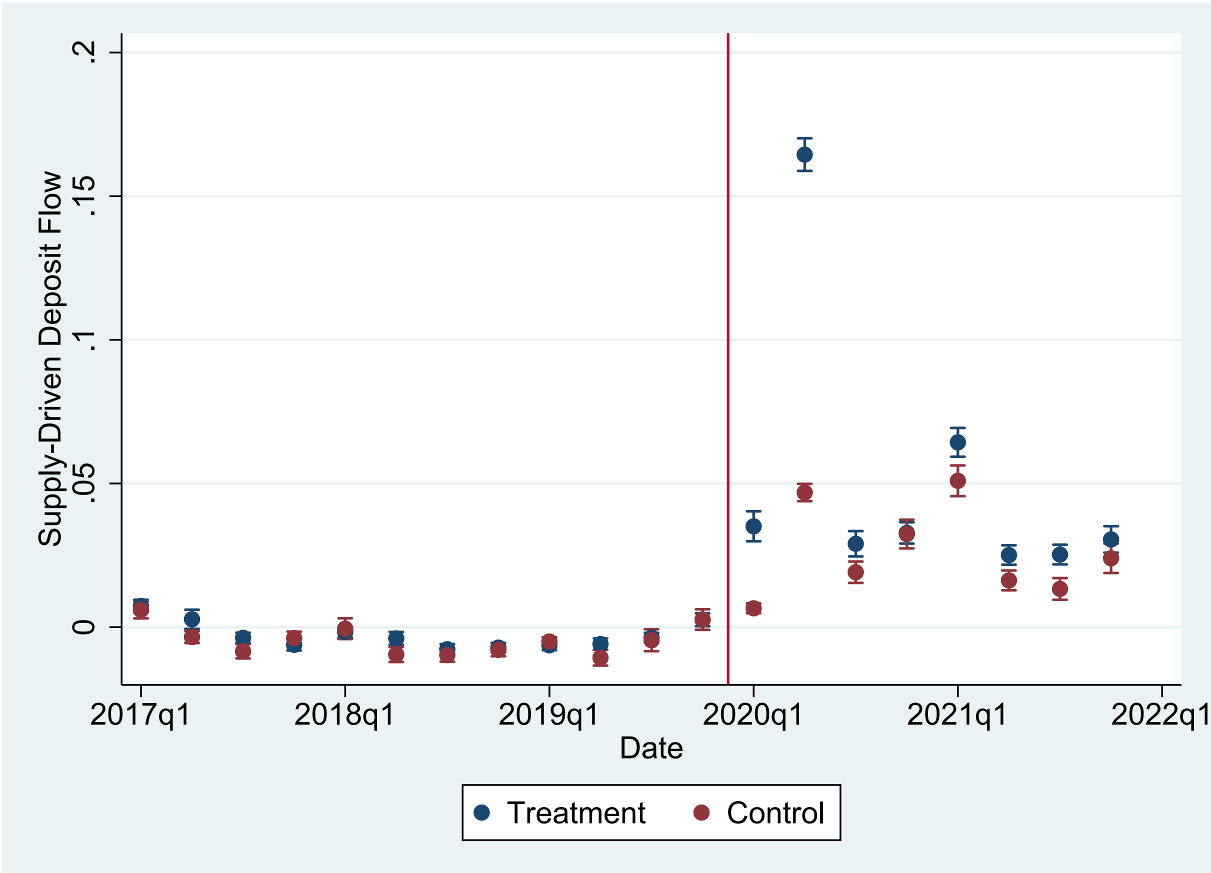

Figure 1: The figure plots the average supply-driven deposit flow for treatment and control banks for each quarter from 2017Q1 to 2021Q4. The deposit inflow shock occurs in 2020Q1 and 2020Q2. The treatment group are banks with supply-driven deposit inflows in the top quartile (among those banks with some positive supply-driven inflow) in 2020Q1 and 2020Q2, while control banks are in the bottom quartile (among those banks with some positive supply-driven inflow). Treatment and control banks are matched on bank characteristics as of 2019Q4.

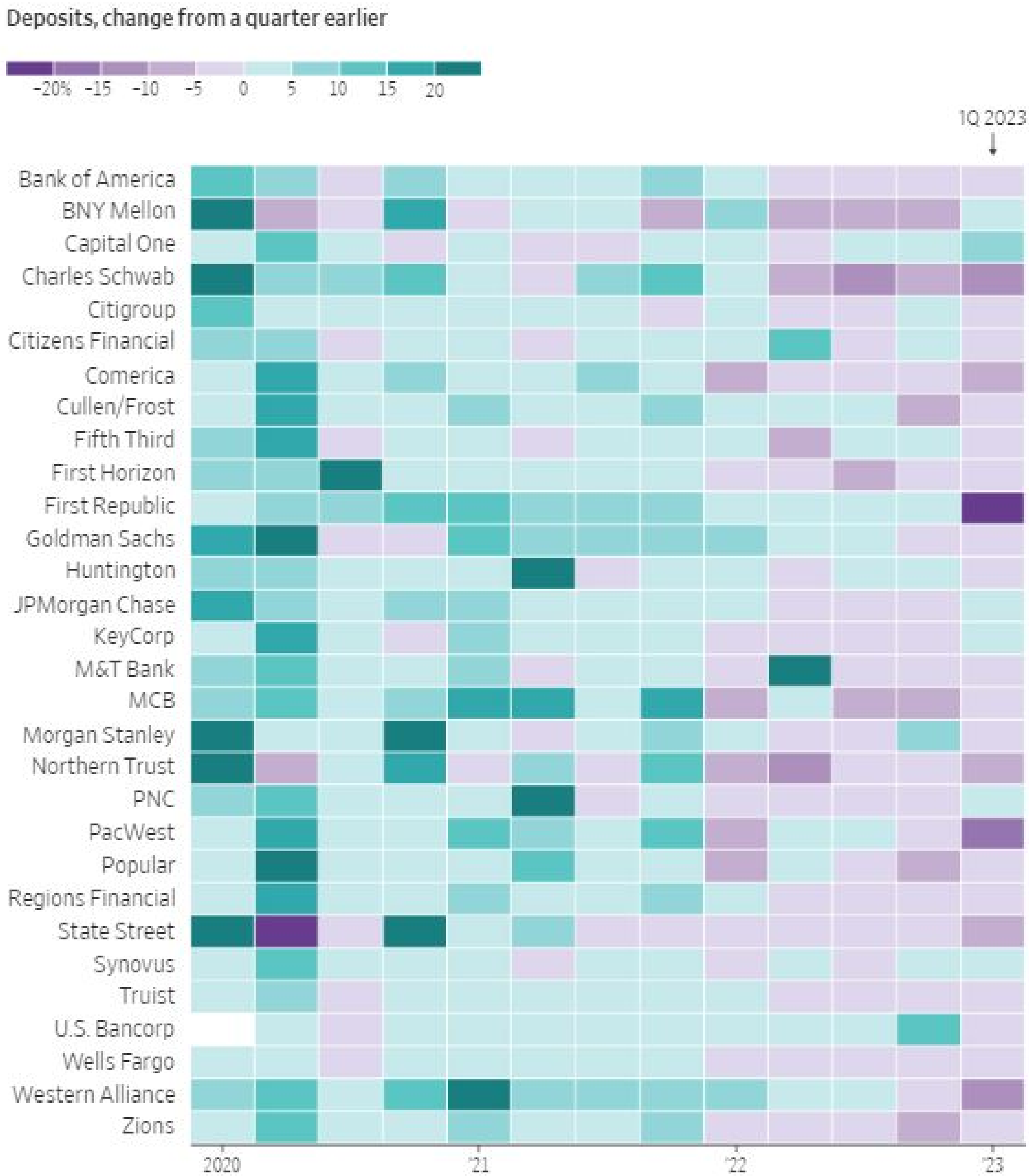

Figure 2: The Wall Street Journal Deposit Flows Tracker, 05/05/2023 (`https://www.wsj.com/articles/track-how-u-s-banks-are-faring-in-first-quarter-earnings-beaff0cc?mod=series_bankmeltdown`)

Table I: Summary Statistics

This table presents the summary statistics for our main variables. Our sample is from 2001-2022. *Bank Variables* are constructed at the bank level. *Macroeconomic Variable* is reported at a quarterly level.

	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Bank Variables						
Securities Growth	1.34	17.2	-5.29	-0.25	6.40	577,336
Δ Securities to Lag Assets	0.31	2.70	-0.84	-0.0020	1.17	596,614
Loan Growth	1.87	6.05	-1.16	1.23	3.93	587,036
Δ Loans to Lag Assets	1.29	3.87	-0.65	0.71	2.47	596,614
Δ Gross Income to Assets	-0.011	0.16	-0.070	-0.0053	0.050	596,613
ROA	0.0022	0.0033	0.0013	0.0023	0.0034	596,614
Δ ROA	0.00045	0.23	-0.054	0.0013	0.056	596,613
Maturity Gap	52.7	32.5	29.2	45.9	69.3	600,055
Δ Maturity Gap	0.33	4.20	-1.63	0.089	2.06	589,326
Risk-Weighted Assets	0.67	0.15	0.58	0.68	0.77	582,329
Δ Risk-Weighted Assets	0.088	3.80	-1.41	0.12	1.60	569,924
Long-Maturity Assets Growth	2.41	12.1	-3.00	1.35	6.49	589,526
Risky Securities Growth	-0.43	30.7	-3.88	0	1.48	190,301
Securities Losses to Lag Assets	-0.091	0.67	-0.34	-0.052	0.094	596,614
Δ NPL to Lag Assets	0.0098	0.44	-0.076	0	0.067	596,614
Total Dep. Growth	0.020	0.063	-0.013	0.011	0.040	580,004
Supply-Driven Deposit Flow	0.012	0.039	0	0	0.014	580,004
Uninsured Dep. Growth	0.025	0.18	-0.046	0.023	0.100	577,790
Supply-Driven Uninsured Deposit Flow	0.016	0.098	0	0	0	577,790
Insured Dep. Growth	0.019	0.080	-0.014	0.0057	0.030	577,622
Supply-Driven Insured Deposit Flow	0.011	0.050	0	0	0.0028	577,622

Table I: Summary Statistics—*Continued*

	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Bank Variables						
Log Assets	12.0	1.44	11.1	11.9	12.8	596,614
NIM	0.034	0.0080	0.030	0.034	0.039	564,778
Loan Growth	0.21	0.33	0.021	0.16	0.32	467,404
Equity to Assets	0.12	0.10	0.088	0.10	0.12	596,648
Deposits to Assets	0.82	0.13	0.80	0.85	0.88	596,648
Securities to Assets	0.22	0.16	0.10	0.19	0.31	596,614
Loans to Assets	0.62	0.18	0.53	0.65	0.75	596,614
Δ Loans to Lag Assets	1.29	3.87	-0.65	0.71	2.47	596,614
Commitments to Assets	0.045	0.051	0.0079	0.030	0.064	596,614
Δ Commitments to Lag Assets	0.0016	0.013	-0.0026	0	0.0040	596,614
Uninsured Deposits to Assets	0.27	0.13	0.18	0.25	0.35	594,385
Z-Score	1.60	1.30	0.66	1.27	2.16	483,930
Total Deposit Rate	-0.00011	0.00062	-0.00028	-0.000058	0.000063	580,004
Uninsured Deposits Rate	0.019	0.024	0.0043	0.011	0.024	572,487
Core Deposit Rate	0.0032	0.0026	0.0010	0.0024	0.0048	588,944
Macroeconomic Variables						
Δ FF Rate	-0.016	0.48	-0.030	0.0050	0.18	90

Table II: Supply-Driven Deposit Flows and Bank Activities

The table presents the effect of deposit flows on various bank characteristics. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is driven by depositors. *Loan Growth* and *Securities Growth* are the quarterly growth in total loans and securities, respectively. Δ *Loans to Lag Assets* and Δ *Securities to Lag Assets* are the quarterly change in total loans and securities, respectively, scaled by lagged assets. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Securities Growth (1)	Δ Securities to Lag Assets (2)	Loan Growth (3)	Δ Loans to Lag Assets (4)
Supply-Driven Deposit Flow	0.943***	0.191***	0.120***	0.0880***
	(0.0363)	(0.00599)	(0.0133)	(0.00812)
Log Assets	-0.641***	-0.186***	-2.171***	-1.548***
	(0.190)	(0.0286)	(0.100)	(0.0737)
NIM	-0.0759	0.0102	-0.664***	-0.314***
	(0.0577)	(0.00875)	(0.0291)	(0.0180)
Loan Growth	0.100**	-0.0152**	0.731***	0.570***
	(0.0433)	(0.00649)	(0.0197)	(0.0138)
ROA	0.161***	0.0394***	0.405***	0.284***
	(0.0461)	(0.00633)	(0.0177)	(0.0115)
Equity to Assets	0.752***	0.134***	0.868***	0.526***
	(0.0933)	(0.0138)	(0.0622)	(0.0403)
Deposits to Assets	1.111***	0.203***	0.255***	0.151***
	(0.0697)	(0.0114)	(0.0292)	(0.0183)
Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Observations	437,313	437,313	437,313	437,313
R^2	0.050	0.063	0.169	0.196

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table III: Total Deposits and Bank Risk

The table presents the effect of deposit flows on measures of bank income and risk. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is driven by depositors. Δ *Gross Income to Assets* is the change in the bank's quarterly gross income divided by assets, scaled as a percent. Δ *ROA* is the change in the bank's quarterly net income divided by assets, scaled as a percent. Δ *Maturity Gap* is the bank's quarterly change in the average difference between asset maturity and liability maturity in months following English, Van den Heuvel, and Zakrajšek (2018). *Long-Maturity Asset Growth* is the quarterly growth rate in assets with a maturity greater than three years. Δ *Risk-Weighted Assets* is the quarterly change in the ratio of risk-weighted assets to total assets. *Risky Securities Growth* is the quarterly growth rate in non-agency MBS, ABS, non-government domestic securities, and foreign securities holdings. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Δ Gross Income to Assets	Δ ROA	Δ Maturity Gap	Long-Maturity Assets Growth	Δ Risk-Weighted Assets	Risky Securities Growth
	(1)	(2)	(3)	(4)	(5)	(6)
Supply-Driven Deposit Flow	0.0123***	0.00824***	0.0513***	0.523***	0.223***	0.373***
	(0.000410)	(0.000412)	(0.00852)	(0.0250)	(0.00934)	(0.100)
Log Assets	0.0155***	0.0191***	0.0644	-2.197***	0.691***	-0.537
	(0.00167)	(0.00397)	(0.0411)	(0.155)	(0.0381)	(0.651)
NIM	-0.0166***	0.0399***	0.0180	-0.336***	-0.535***	-0.940***
	(0.000631)	(0.00114)	(0.0141)	(0.0461)	(0.0137)	(0.198)
Loan Growth	0.00353***	0.0152***	-0.100***	0.131***	-0.0586***	-0.186
	(0.000359)	(0.000790)	(0.0103)	(0.0338)	(0.00791)	(0.135)
ROA	-0.0405***	-0.162***	-0.0447***	0.282***	0.105***	0.841***
	(0.000799)	(0.00122)	(0.0108)	(0.0331)	(0.0101)	(0.141)
Equity to Assets	-0.00117	0.00110	0.0974***	1.136***	0.0552**	1.070***
	(0.000863)	(0.00181)	(0.0232)	(0.0964)	(0.0264)	(0.253)
Deposits to Assets	-0.00283***	-0.000283	0.159***	0.595***	0.0739***	0.931***
	(0.000624)	(0.00112)	(0.0161)	(0.0526)	(0.0181)	(0.199)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	431,657	431,657	431,657	431,393	431,657	137,851
R^2	0.120	0.351	0.069	0.073	0.078	0.060

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IV: Total Deposits and Bank Risk, Alternative Explanations

The table presents the effect of deposit flows on measures of bank income and risk. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is driven by depositors. Δ *Gross Income to Assets* is the change in the bank's quarterly gross income divided by assets, scaled as a percent. Δ *Maturity Gap* is the bank's quarterly change in the average difference between asset maturity and liability maturity in months following English, Van den Heuvel, and Zakrajšek (2018). Δ *Risk-Weighted Assets* is the quarterly change in the ratio of risk-weighted assets to total assets. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Panel A: County-Level Deposits			Panel B: Matched Sample		
	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets
	(1)	(2)	(3)	(4)	(5)	(6)
Supply-Driven Deposit Flow	0.00570***	0.0369**	0.100***	0.0118***	0.0544***	0.239***
	(0.000704)	(0.0172)	(0.0149)	(0.000464)	(0.0104)	(0.0106)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	77,045	77,045	77,045	204,071	204,071	204,071
R^2	0.184	0.129	0.170	0.140	0.093	0.118
	Panel C: Exclude Low Interest Rate Periods			Panel D: Exclude QE Periods		
	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets
	(1)	(2)	(3)	(4)	(5)	(6)
Supply-Driven Deposit Flow	0.0155***	0.0255**	0.232***	0.0142***	0.0327***	0.234***
	(0.000612)	(0.0128)	(0.0146)	(0.000553)	(0.0115)	(0.0123)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	244,441	244,441	244,441	293,512	293,512	293,512
R^2	0.155	0.097	0.066	0.131	0.078	0.053

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IV: Total Deposits and Bank Risk, Alternative Explanations—*Continued*

	Panel E: Exclude TLGP Period			Panel F: Exclude Post 2019		
	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets
	(1)	(2)	(3)	(4)	(5)	(6)
Supply-Driven Deposit Flow	0.0122***	0.0413***	0.231***	0.0132***	0.0453***	0.228***
	(0.000483)	(0.0102)	(0.0120)	(0.000441)	(0.00903)	(0.00973)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	334,642	334,642	334,642	406,173	406,173	406,173
R^2	0.143	0.089	0.081	0.114	0.058	0.057

	Panel G: Include Loans and Commitments		
	Δ Gross Income to Assets	Δ Maturity Gap	Δ Risk-Weighted Assets
	(1)	(2)	(3)
Supply-Driven Deposit Flow	0.0121***	0.0583***	0.174***
	(0.000403)	(0.00844)	(0.00926)
Δ Commitments to Lag Assets	0.00345***	0.0356***	0.0727***
	(0.000319)	(0.00722)	(0.00742)
Δ Loans to Lag Assets	0.00771***	-0.420***	0.986***
	(0.000543)	(0.0170)	(0.0163)
Commitments to Assets	0.00584***	0.00761	-0.0866***
	(0.000667)	(0.0152)	(0.0138)
Loans to Assets	-0.00243***	0.0721***	-1.067***
	(0.000688)	(0.0203)	(0.0235)
Additional Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes
Observations	448,049	448,049	448,049
R^2	0.123	0.077	0.161

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table V: Total Deposits and Bank Risk, Equity Issuance Concerns

The table presents the effect of deposit flows on measures of bank income and risk. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is driven by depositors. *Low Equity* is the sample of firms in the lowest tercile by equity to assets. *High Equity* is the sample of firms in the highest tercile by equity to assets. *Low Uninsured* is the sample of firms in the lowest tercile by uninsured deposits to assets. *High Uninsured* is the sample of firms in the highest tercile by uninsured deposits to assets. Δ *Gross Income to Assets* is the change in the bank's quarterly gross income divided by assets, scaled as a percent. Δ *Maturity Gap* is the bank's quarterly change in the average difference between asset maturity and liability maturity in months following English, Van den Heuvel, and Zakrajšek (2018). Δ *Risk-Weighted Assets* is the quarterly change in the ratio of risk-weighted assets to total assets. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Panel A: Subsamples by Equity Ratios					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	Low Equity (1)	High Equity (2)	Low Equity (3)	High Equity (4)	Low Equity (5)	High Equity (6)
Supply-Driven Deposit Flow	0.0128***	0.0115***	0.0532***	0.0447***	0.228***	0.179***
	(0.000659)	(0.000733)	(0.0148)	(0.0152)	(0.0150)	(0.0186)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,558	143,447	143,558	143,447	143,558	143,447
R^2	0.133	0.147	0.095	0.092	0.120	0.085

	Panel B: Subsamples by Uninsured Deposit Ratios					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	High Uninsured (1)	Low Uninsured (2)	High Uninsured (3)	Low Uninsured (4)	High Uninsured (5)	Low Uninsured (6)
Supply-Driven Deposit Flow	0.0121***	0.0106***	0.0589***	0.0505***	0.236***	0.159***
	(0.000627)	(0.000855)	(0.0127)	(0.0176)	(0.0138)	(0.0217)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,368	143,485	143,368	143,485	143,368	143,485
R^2	0.146	0.132	0.090	0.086	0.113	0.090

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VI: Maturity and Risk Changes, Uninsured and Insured Deposits

The table presents the effect of uninsured and insured deposit flows on measures of bank income and risk. *Supply-Driven Uninsured Deposit Flow* is the subset of lagged quarterly growth in uninsured deposits that is classified as supply driven. *Supply-Driven Insured Deposit Flow* is the subset of lagged quarterly growth in insured deposits that is classified as supply driven. Δ *Supply-Driven Uninsured to Total Dep* is the subset of the lagged change in uninsured deposits scaled by lagged total domestic deposits that is classified as supply driven. Δ *Supply-Driven Insured to Total Dep* is the subset of subset of the lagged change in insured deposits scaled by lagged total domestic deposits that is classified as supply driven. Δ *Gross Income to Assets* is the change in the bank's quarterly gross income divided by assets, scaled as a percent. Δ *Maturity Gap* is the bank's quarterly change in the average difference between asset maturity and liability maturity in months following English, Van den Heuvel, and Zakrajšek (2018). Δ *Risk-Weighted Assets* is the quarterly change in the ratio of risk-weighted assets to total assets. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Δ Gross Income to Assets (1)	Δ Maturity Gap (2)	Δ Risk-Weighted Assets (3)	Δ Gross Income to Assets (4)	Δ Maturity Gap (5)	Δ Risk-Weighted Assets (6)
Supply-Driven Uninsured Deposit Flow	0.00812***	0.0303***	0.156***			
	(0.000307)	(0.00707)	(0.00723)			
Supply-Driven Insured Deposit Flow	0.00455***	0.0230***	0.0220***			
	(0.000418)	(0.00861)	(0.00791)			
Δ Supply-Driven Uninsured to Total Dep				0.00895***	0.0313***	0.176***
				(0.000314)	(0.00736)	(0.00754)
Δ Supply-Driven Insured to Total Dep				0.00461***	0.0277***	0.0290***
				(0.000427)	(0.00877)	(0.00800)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	430,313	430,313	430,313	431,657	431,657	431,657
R^2	0.119	0.069	0.078	0.119	0.069	0.077

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VII: Total Deposit Flows and Bank Performance

The table presents the effect of uninsured deposit flows and changes in the Fed funds rate on different bank outcomes. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is classified as supply driven. *Securities Losses to Lag Assets* is the quarterly total realized and unrealized securities losses on securities scaled by the prior quarter's assets (scaled by 100). Δ *NPL to Assets* is the quarterly change in the level of non-performing loans scaled by the prior quarter's assets (scaled by 100). All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Securities Losses to Lag Assets			Δ NPL to Lag Assets		
	Full Sample	Low Equity	High Equity	Full Sample	Low Equity	High Equity
	(1)	(2)	(3)	(4)	(5)	(6)
Supply-Driven Deposit Flow	-0.00221**	-0.00374**	-0.000810	0.00543***	0.00722***	0.00407***
	(0.000975)	(0.00163)	(0.00167)	(0.000802)	(0.00138)	(0.00142)
Supply-Driven Deposit Flow $\times$ Δ FF Rate	0.000874	0.00309**	0.000186	0.00259***	0.00263**	0.000531
	(0.000900)	(0.00132)	(0.00156)	(0.000737)	(0.00118)	(0.00132)
Securities to Assets	0.385***	0.803***	0.201**	0.0112	0.0350	-0.0422**
	(0.0516)	(0.0876)	(0.0915)	(0.0127)	(0.0266)	(0.0212)
Securities to Assets $\times$ Δ FF Rate	0.804***	0.572***	0.688***	0.0149*	-0.00373	0.0279**
	(0.0240)	(0.0450)	(0.0323)	(0.00813)	(0.0162)	(0.0128)
Loans to Assets	0.341***	0.515***	0.537***	0.0377**	0.0107	0.00931
	(0.0482)	(0.0826)	(0.0821)	(0.0153)	(0.0319)	(0.0261)
Loans to Assets $\times$ Δ FF Rate	0.227***	0.278***	0.0868***	-0.0371***	-0.0479***	-0.0369***
	(0.0228)	(0.0403)	(0.0321)	(0.00800)	(0.0154)	(0.0127)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	455,481	151,489	151,362	455,481	151,489	151,362
R^2	0.587	0.679	0.593	0.040	0.081	0.046

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table VIII: Deposit Outflows Following Supply-Driven Deposit Inflows

The table presents the effect of total deposit flows and changes in the Fed funds rate on subsequent bank deposit outflows. *Supply-Driven Deposit Flow* is the subset of lagged quarterly growth in total domestic deposits that is driven by depositors. Δ *FF Rate* is the lagged quarterly change in the Fed funds rate (as a percent). *Total Deposit Growth* is the current quarter's percent growth rate in total deposits. *Low Equity* is the sample of firms in the lowest tercile by equity to assets. *High Equity* is the sample of firms in the highest tercile by equity to assets. *Low Z-Score* is the sample of firms in the lowest tercile by Z-score. *High Z-Score* is the sample of firms in the highest tercile by Z-score. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Total Deposit Growth				
	Full Sample	Low Equity	High Equity	Low Z-Score	High Z-Score
	(1)	(2)	(3)	(4)	(5)
Supply-Driven Deposit Flow	-0.367***	-0.370***	-0.343***	-0.297***	-0.475***
	(0.0159)	(0.0233)	(0.0300)	(0.0252)	(0.0238)
Supply-Driven Deposit Flow $\times$ Δ FF Rate	-0.0842***	-0.0938***	-0.0766***	-0.0938***	-0.0510***
	(0.0121)	(0.0175)	(0.0219)	(0.0200)	(0.0195)
Additional Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	467,190	146,866	146,771	146,980	146,850
R^2	0.155	0.216	0.189	0.208	0.189

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table IX: Uninsured Deposit Outflows Following Supply-Driven Uninsured Deposit Inflows

The table presents the effect of total deposit flows and changes in the Fed funds rate on subsequent bank deposit outflows. *Supply-Driven Uninsured Deposit Flow* is the subset of lagged quarterly growth in uninsured deposits that is classified as supply driven. *Supply-Driven Insured Deposit Flow* is the subset of lagged quarterly growth in insured deposits that is classified as supply driven. Δ *FF Rate* is the lagged quarterly change in the Fed funds rate (as a percent). *Uninsured Deposit Growth* is the current quarter's percent growth rate in uninsured deposits. *Low Equity* is the sample of firms in the lowest tercile by equity to assets. *High Equity* is the sample of firms in the highest tercile by equity to assets. *Low Z-Score* is the sample of firms in the lowest tercile by Z-score. *High Z-Score* is the sample of firms in the highest tercile by Z-score. All continuous control variables are scaled by their sample standard deviations. Standard errors are clustered by bank.

	Uninsured Deposit Growth				
	Full Sample	Low Equity	High Equity	Low Z-Score	High Z-Score
	(1)	(2)	(3)	(4)	(5)
Supply-Driven Uninsured Deposit Flow	-2.088***	-1.914***	-2.105***	-1.906***	-2.343***
	(0.0419)	(0.0696)	(0.0687)	(0.0658)	(0.0708)
Supply-Driven Uninsured Deposit Flow × Δ FF Rate	-0.204***	-0.266***	-0.221***	-0.282***	-0.120*
	(0.0339)	(0.0524)	(0.0589)	(0.0532)	(0.0619)
Supply-Driven Insured Deposit Flow	0.867***	0.832***	1.049***	0.778***	1.258***
	(0.0424)	(0.0685)	(0.0776)	(0.0666)	(0.0782)
Supply-Driven Insured Deposit Flow × Δ FF Rate	0.0858**	0.0300	0.0632	0.0561	0.0886
	(0.0334)	(0.0552)	(0.0648)	(0.0562)	(0.0635)
Additional Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	465,088	146,789	146,527	146,805	146,765
R^2	0.211	0.263	0.221	0.223	0.273

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table X: Maturity and Credit Risk

The table presents the effect of deposit flows on bank maturity and risk characteristics from 2019-2022. *Treated* is an indicator that equals one if the external growth in total deposits is in the top quartile in 2020Q1-2020Q2 (among banks with positive supply-driven deposit flows), or 0 if it is in the bottom quartile (among banks with positive supply-driven deposit flows). *Post* is an indicator that equals one for 2020Q3-2021Q4. *Additional Controls* are the bank control variables as of 2020Q1, interacted with the *Post* indicator. Treated and control sample are constructed using nearest neighbor matching. Standard errors are clustered by bank.

	Panel A: Full Sample					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	0.0114***	0.00664*	0.788***	0.787***	0.968***	0.931***
	(0.00375)	(0.00378)	(0.134)	(0.139)	(0.136)	(0.136)
Additional Controls	No	Yes	No	Yes	No	Yes
Bank, Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,092	22,092	22,092	22,092	17,280	17,280
R^2	0.064	0.067	0.175	0.178	0.255	0.256
	Panel B: Subsamples by Equity Ratios					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	Low Equity (1)	High Equity (2)	Low Equity (3)	High Equity (4)	Low Equity (5)	High Equity (6)
Treated × Post	0.00299	0.00431	0.806***	0.536**	1.007***	0.785**
	(0.00633)	(0.00676)	(0.234)	(0.235)	(0.169)	(0.311)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank, Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,366	7,374	7,366	7,374	6,302	5,404
R^2	0.070	0.066	0.193	0.160	0.317	0.194

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table X: Maturity and Credit Risk—*Continued*

	Panel C: Subsamples by Uninsured Deposit Ratios					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	High Uninsured	Low Uninsured	High Uninsured	Low Uninsured	High Uninsured	Low Uninsured
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	0.0208***	-0.00537	1.484***	0.482**	1.464***	0.661***
	(0.00689)	(0.00702)	(0.275)	(0.230)	(0.228)	(0.228)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank, Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,380	7,354	7,380	7,354	6,197	5,319
R^2	0.098	0.054	0.193	0.177	0.325	0.166
	Panel D: Alternative Treatment Using Supply-Driven Uninsured Flow					
	Δ Gross Income to Assets		Δ Maturity Gap		Δ Risk-Weighted Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
Alt. Treated × Post	0.00157	-0.00304	0.768***	0.702***	0.929***	0.847***
	(0.00680)	(0.00718)	(0.241)	(0.240)	(0.226)	(0.238)
Additional Controls	No	Yes	No	Yes	No	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,832	7,832	7,832	7,832	5,950	5,950
R^2	0.061	0.064	0.159	0.164	0.286	0.289

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01

Table XI: Recent Period Outflows of Uninsured Deposits

The table presents the effect of uninsured deposit flows and changes in the Fed funds rate on deposit outflows from 2019-2022. *Treated* is an indicator that equals one if the external growth in total deposits is in the top quartile in 2020Q1-2020Q2 (among banks with positive supply-driven deposit flows), or 0 if it is in the bottom quartile (among banks with positive supply-driven deposit flows). *Alt. Treated* is an indicator that equals one if the supply-driven growth in uninsured deposits is in the top quartile in 2020Q1-2020Q2 (among banks with positive supply-driven uninsured deposit flows), or 0 if it is in the bottom quartile (among banks with positive supply-driven uninsured deposit flows). *Post* is an indicator that equals one in 2022. *Total Deposit Growth* is the quarterly growth rate in total deposits, as a percent. *Uninsured Deposit Growth* is the quarterly growth rate in uninsured deposits, as a percent. *Additional Controls* are the bank control variables as of 2020Q1, interacted with the *Post* indicator. Treated and control sample are constructed using nearest neighbor matching. Standard errors are clustered by bank.

	Total Deposit Growth						Uninsured Deposit Growth	
	Full Sample		Low Equity	High Equity	Low Z-Score	High Z-Score	Full Sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated × Post	-1.873***	-1.906***	-2.318***	-2.021***	-2.047***	-1.657***		
	(0.195)	(0.202)	(0.364)	(0.349)	(0.403)	(0.298)		
Alt. Treated × Post							-2.277***	-2.242***
							(0.516)	(0.548)
Additional Controls	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	29,055	29,055	9,688	9,670	9,662	9,698	10,279	10,279
R^2	0.296	0.298	0.318	0.282	0.294	0.311	0.168	0.169

Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01