Depositor Runs and Financial Literacy*

Dasol Kim†

September 2015

Abstract

This paper provides evidence that financial literacy mitigates biases in depositor behavior during depositor runs following issuance of FDIC enforcement actions. Using survey data from the National Financial Capability Study, the financial literacy of respondents nearby branches of banks receiving an enforcement action significantly reduces deposit outflows. Additional tests exploiting heterogeneity in respondent characteristics show that the effects are unlikely due to uninsured depositors, knowledge of deposit insurance, or market-related factors, but rather related to misattribution of institution-specific shocks to potential losses in insured accounts if the bank were to fail. In other words, depositors lacking financial literacy may require additional assurances of safety by running rather than relying on deposit insurance guarantees. Depositors that run do not appear to completely leave the banking system, as nearby competing banks experience deposit inflows. Finally, I provide evidence of social factors that contribute to financial literacy development, suggesting plausibility for the identification strategy.

JEL Codes: D10, D12, E35, G21, H31
Keywords: Depositor Runs, Prospect Theory, Misattribution Bias, Financial Literacy, Deposit Insurance, Peer Effects

[PRELIMINARY DRAFT]

*I thank Allen Berger and Jungsuk Han for useful comments and discussions. I owe a special thanks to the Financial Industry Regulatory Authority, for making their data available.

†Case Western Reserve University, Cleveland, OH 44106. E-mail: dasol.kim@case.edu.

1 Introduction

Explaining depositor behavior following fundamental shocks remains an important issue for academics and bank regulators. The recent financial crisis provided examples of heavy deposit outflows coinciding with institution-specific events, even for insured deposit accounts. For example, Washington Mutual Bank experienced approximately $2.8 billion in insured deposit outflows in the months following the IndyMac Bank failure in July 2008 (Office of Thrift Supervision, 2008). Unlike other countries where resolution procedures are complicated and may lead to long delays in deposit insurance claims, these procedures are quite clear in the United States and access to accounts are typically available the next business day.[1] When Washington Mutual Bank was eventually closed by bank regulators and acquired by JP Morgan Chase in September 2008, all insured deposit accounts were accessible the following day and there were no interruptions in customer services. While insurance limits could potentially explain flows from large depositors, outflows from insured deposit accounts suggest influence of other, non-market factors.

This paper examines how behavioral biases in bank customers can lead to depositor runs. A number of studies from the psychology literature show how errors in judgement can arise from misattributing information in decision-making that would be otherwise irrelevant. These biases may arise systematically in environments with greater uncertainty or limited information (Johnson and Tversky, 1983; Clore, Schwarz, and Conway, 1994; Forgas, 1995). When related to financial decisions, individuals with insured accounts may confuse uncertainty in their bank's solvency due to institution-specific shocks with the likelihood of losses in the event that their bank fails, which is low due to deposit insurance.[2] Related studies have shown that these biases are mitigated by competency in the domain of the judgment (Ottati and Isbell, 1996; Sedikides, 1995). Competency in the context of managing household finances may be related to financial literacy,[3] given its relevance to a wide range of

[1] This may also generally apply to potential disruptions in banking services. However, these concerns are less applicable to larger banks, given that an acquirer is typically found prior to closing the bank in these cases.

[2] This is consistent with findings in the literature related to undervaluation of insurance policies (Mossin, 1968), given that insured depositors may choose to exit the banking system due to overweighting of small probability events where they may face losses (Wakker, Thaler, and Tversky, 1997).

[3] Cole et al. (2011) provide evidence that financial literacy is associated with better financial decisions,

financial applications, so that lack of financial literacy may increase susceptibility to these biases. In other words, individuals lacking financial literacy may require additional assurance of safety for their savings following institution-specific shocks by withdrawing funds rather than relying on explicit guarantees provided by deposit insurance.[4]

To test this conjecture, I examine how financial literacy influences branch-level deposit flows during depositor runs using a number of data sources. First, survey data from the National Financial Capability Study includes questions that evaluate the financial literacy of a large number of respondents in the United States, covering topics from rudimentary financial calculations to risk diversification.[5] These questions focus on general financial knowledge rather than expertise in specific applications. Second, I identify bank branches that are more likely to experience heavy deposit withdrawals using enforcement actions issued by the FDIC from 2007 to 2012. I show that branches of banks receiving enforcement actions experience an 15-22% reduction in deposit levels relative to other nearby banks, and the effects remain significant even after excluding the most troubled banks.[6] There is no effect in the year prior, as enforcement orders are kept confidential beforehand, making these events ideal to assess depositor reaction to institution-specific shocks. I merge the data sources to construct a proxy for the financial literacy of the bank's customers, measured by the average financial literacy scores of the survey respondents located within a 15 mile radius of the bank branch. I assess the plausibility of the identifying assumption that the financial literacy of nearby survey respondents captures that of the bank customers using a number of tests throughout the analysis, providing supportive results.

The results show that financial literacy reduces deposit outflows in banks receiving enforcement actions. That is, depositors with low financial literacy are associated with larger

particularly for those with low financial literacy.

[4]There may also be a relationship between financial literacy and knowledge of deposit insurance. The mechanism I focus on is different. Individuals with knowledge of deposit insurance are likely to self-select into the banking system, and the predictions are conditional on participation. I provide tests to assess this, and provide supportive evidence.

[5]In the analysis, financial literacy is proxied for as the percentage of correct responses to the five questions related to financial literacy. See the Appendix for the wording of survey questions.

[6]Iyer et al. (Forthcoming) document similar evidence using account-level data for a bank in India. Following regulatory events, while depositors with funds in excess of the insurance limit are more likely to run, fully-insured depositors that are closer to the insurance limit are also more likely to run, regardless of whether the event is informative to the bank's solvency.

withdrawals. The results are robust to controlling for local market conditions, as well as bank-level characteristics, either through the inclusion of observable bank characteristics related to size, lending operations, and deposit yields in the regression models; or by estimating fixed effect models that only allows for variation in deposit flows across branches for the same bank and year. The effects of financial literacy are insignificant in the year prior to the shock, suggesting that bank customers are indeed reacting to the enforcement action. Additionally, the effect of financial literacy scores of respondents located farther away, or 15 to 30 mile away from the branch, is both statistically and economically insignificant.

A key identifying assumption for these tests is that the financial literacy of the survey respondents captures that of the bank's customers. An additional concern is that the results could be driven by uninsured deposit accounts or other market-related factors which may be correlated with the financial literacy measure. I directly address these concerns through tests that exploit heterogeneity in the characteristics of respondents nearby the bank receiving the enforcement action. First, I calculate financial literacy separately for respondents with and without a bank account. If the financial literacy measures correspond with the bank customers, the results should be stronger for those of respondents with bank accounts. The effects are large and significant for those with bank accounts, and are small and insignificant for those without. Additionally, given that individuals with knowledge of deposit insurance are likely to self-select into the banking system, the effects are unlikely to be due to relationships between financial literacy and knowledge of deposit insurance amongst the underbanked, and these results provide additional support.[7] Second, I compare the impact of the financial literacy scores of respondents that are more and less likely to have uninsured deposits, proxied for using the dollar value of their total investments excluding retirement accounts.[8] The effects remain significant for both measures, and the magnitudes are comparable. The effects on respondents with greater wealth may capture large depositors who

[7]This should be particularly true for bank customers who also carry savings accounts, and the results are strongest for these respondents. This is consistent with findings in Iyer et al. (Forthcoming), who show that fully insured depositors with greater savings are more likely to run following regulatory events.

[8]Respondents are divided into two groups based upon whether their total, non-retirement investments are above or below $100 thousand. Respondents with investments below $100 thousand are unlikely to hold uninsured accounts given that this threshold is less than the deposit insurance limit of $250 thousand during the sample period, and may not necessarily correspond with non-insured products sold by the bank.

use account-splitting schemes, which could be complicated to implement.[9] Third, I test whether the results are driven by factors related to local deposit market competition. The enforcement action may cap yields on deposit accounts at relatively unattractive levels. To address this issue, the financial literacy scores are calculated separately for respondents that are more and less likely to shop for better yields on their deposit accounts.[10] The results show that the effects are concentrated in the financial literacy of respondents less likely to shop around, suggesting that the effects are unlikely to be driven by local deposit market factors.

To directly assess whether the results are related to non-market factors, I use information on self-reported risk aversion scores from the survey.[11] The effects of misattribution should increase in risk aversion due to greater weight placed on adverse events. As such, the results should be stronger for respondents with high risk aversion, and should be weaker for the risk tolerant. On the other hand, if the results are influenced by unobservable, fundamental factors related to other local market conditions, the effects should be similar for respondents with low and high risk aversion. This is not the case. The effects are concentrated in the financial literacy of respondents with high risk aversion, and insignificant for those with low risk aversion. In other words, deposit outflows are stronger only for risk averse depositors lacking financial literacy relative to those with financial literacy. This provides evidence consistent with conditioning factors related to the effects of misattribution.

The results so far provide evidence that deposit outflows in banks receiving enforcement actions are influenced by the financial literacy of their customers. A natural question to ask is whether depositors that run remain in the banking system, and what happens to deposit flows in other nearby banks. Depositors at banks receiving enforcement actions may exit the banking system if they believe that the event is a symptom of broader fragility in

[9]There are services that allow accounts larger than what is permitted by insurance limits to be covered using a number of different services. Large deposit accounts, up to $50 million, are commonly broken down over across multiple institutions, using various approaches such as trust accounts (e.g., payable-on-death (POD) accounts), deposit placement services (e.g., Certificate of Deposit Account Registry Services (CDRS)), and so on.

[10]Respondents are divided based upon those compared rates for their most recent credit card application are more likely to also compare yields on deposit accounts, which may be informative for broader consumer behavior.

[11]The survey asks respondents to evaluate willingness to take on financial risks based upon a 10-point scale. Responses with lower (higher) values are taken as greater (smaller) risk aversion.

the banking system. If depositors at other banks interpret these events in the same way, then they may decide to run from their banks as well.[12] This question is interesting given evidence of exit in other studies that examine episodes of banking panics (Ramirez and Zandbergen, 2014; Iyer and Puri, 2012). To evaluate these views, I examine the deposit flows of competing banks in the same local market around the period when the enforcement action is issued. Neighbouring bank branches located within a 15 mile radius of the bank receiving an enforcement action experience significantly larger deposit inflows than those located farther away. The results are similar when only using inter-branch variation within the same bank and year, suggesting that the effects are unlikely to be driven by bank-specific factors. Moreover, these effects are also related to the financial literacy of nearby respondents. Lower financial literacy increases deposit inflows into the competing banks, providing evidence that the effects are related to the same depositors leaving the bank that received the enforcement action. These findings are consistent with running depositors shifting accounts to safer institutions to provide additional assurances of safety for their savings beyond explicit guarantees provided by deposit insurance.

Finally, I test for social mechanisms that help explain why the financial literacy of the survey respondents would correspond with those of the bank customers in the tests. Social formation of financial literacy is important for a number of other reasons as well, given that it has implications on the effectiveness of financial education programs and can potentially mitigate the effects of social contagion in depositor runs.[13] The tests estimate the degree to which financial literacy scores can be explained by those of other nearby respondents, controlling for demographic characteristics of both the respondent and the surrounding region. The

[12]One alternative explanation for the results is that depositor runs may be related to ambiguity aversion. Regulatory actions during crisis periods may contribute to uncertainty in the stability of the banking system, inducing depositors at all banks to run. I provide evidence that this is not the case. Another account of ambiguity aversion is relevant to depositors who may not well understand resolution procedures under deposit insurance, so that enforcement actions may increase uncertainty in losses directly associated with the failure of their institution. Understanding of these procedures may be related to financial literacy. However, I show comparable results on respondents with higher wealth levels, who are more likely to understand how deposit insurance works. These results provide evidence that the effects I document are distinct from those that could be due to ambiguity aversion.

[13]Other studies have provided evidence of peer effects in the context of retirement planning (Beshears, Choi, Laibson, Madrian, and Milkman, 2015), stock market participation (Kaustia and Knüpfer, 2012), stock picking (Bursztyn, Ederer, Ferman, and Yuchtman, 2014; Shiller and Pound, 1989; Ivković and Weisbenner, 2007), and so on.

results show that neighboring financial literacy scores have an economically and statistically significant effect. For every additional two questions that neighboring respondents answer correctly, the respondent answers one additional question correctly. In contrast, the financial literacy scores of other respondents located farther away have little effect. Moreover, the effects are strongest for neighboring respondents with similar demographic attributes that are commonly associated with social groupings through which interactions may take place. These results suggest the existence of social factors that result in geographical variation in financial literacy, and provide further evidence on the validity of the identification strategy.

This study is closely related to Iyer et al. (Forthcoming). Using account-level data for a bank in India, they document depositor runs following institution-specific regulatory events. While uninsured depositors are more likely to run relative insured depositors overall, they find that fully insured depositors close to the insurance limit are more likely to run than uninsured depositors, particularly when the regulatory event is less likely to be informative about the bank's solvency. While the regulatory environment is different for banks in the United States, as depositors typically have immediate access to their accounts following the closure of an institution, their findings raise questions as to why these insured depositors decide to run. I address these questions by providing evidence for explanations related to biases in depositor behavior.

My findings are also related to the literature that examines depositor behavior during banking panics. Ramirez and Zandbergen (2014) uses daily deposit data over multiple banks to provide evidence for bank contagion following news of bank runs elsewhere in the country during the Panic of 1893. Kelly and Ó Gráda (2000) and Ó Gráda and White (2003) provide evidence on the transmission of banking panics through social networks in the United States prior to the adoption of deposit insurance, while Iyer and Puri (2012) find consistent evidence using recent more data from India. This paper contribute to this literature by examining behavioral mechanisms that could potentially trigger panics. Additionally, this study differs from others that use earlier data where deposit insurance was widely not available, and provides evidence for insured accounts.

This study also contributes to the literature on financial literacy. Cole et al. (2011) provide evidence that financial literacy leads to improved financial decision-making, showing

that it increases propensities for participation in formal banking systems in emerging markets. Klapper et al. (2013) find that financial literacy improves stock market participation and reduces reliance on informal borrowing sources. This paper provides complementary results. While lack of financial literacy can increase the propensity of individuals to make bad financial decisions, I provide evidence that behavioral biases can exacerbate these effects. Furthermore, one implication of this paper's findings is that financial literacy can also help weaker banking institutions during financial crises by promoting stability in their funding sources.

The remainder of this paper is organized as follows. Section 2 explains the hypothesis development, describes the data, and the empirical methodology. Section 3 contains the main results. Section 4 provides results from tests on social determinants of financial literacy. Section 5 concludes.

2 Hypothesis Development, Data, and Methodology

2.1 Hypothesis Development

The adoption of nationwide deposit insurance in 1933 helped stabilize confidence in the U.S. banking system following a slew of depositor runs during the Great Depression. A number of studies examine depositor behavior during this and preceding periods, providing evidence of banking panics, where depositors would choose to run regardless of the solvency of their institution (Gorton, 1985, 1988; Calomiris and Gorton, 1991). Even with deposit insurance, various accounts reveal a number of banks experiencing depositor runs during the recent financial crisis (Office of Thrift Supervision, 2008; Federal Reserve Board of Governors, 2008). While uninsured accounts comprised of a significant fraction of the deposit outflows, insured accounts were also affected. Iyer and Puri (2012) and Iyer et al. (Forthcoming) also document evidence of depositor runs using daily records of an Indian bank for accounts that were fully insured.

Evidence of insured depositor runs may be consistent with findings from the literature examining undervaluation of insurance policies (Mossin, 1968), where insurees seek full cov-

erage policies even when it is suboptimal to do so. Wakker et al. (1997) propose a behavioral explanation, providing experimental evidence of subjects overweighting the likelihood of large losses associated with low probability events. They find that this behavior can be captured with the probability weighting function of prospect theory. Shapira and Venezia (2008) provide an explanation related to cognitive biases rooted in reliance on anchoring heuristics. Under this narrative, depositors may choose to withdraw insured accounts following bad news concerning their institution if they believe that it provides additional security against potential losses in the event of failure. Similar behavior could result from beliefs that, while they will be able to recover their insured accounts in full, their funds may not be immediately accessible if the institution were to fail. However, resolution procedures in the United States is quite clear, where insured depositors typically receive payout to deposit insurance claims by the next business day. Moreover, these concerns should be mitigated for larger banking institutions, and this explanation does not square with evidence of insured depositor runs even for these institutions.[14] These biases may also be relevant to customers with large savings, where multiple accounts are generated to ensure that they are fully covered,[15] as there may be uncertainty in the account resolution process due to the complexity of some account-splitting schemes and the difficulty related to implementation.

The likelihood of losses in the event of a bank failure may be particularly salient. Depositors may misattribute institution-specific shocks that may increase uncertainty in their bank's solvency to the likelihood of losses in their insured accounts, which is low and should be independent of the institution.[16] Misattribution of information that would be otherwise

[14]Regulatory interventions at troubled banks could be resolved through acquisition by another banks, at which event the deposit accounts would be transferred and be made available immediately. The timing of when an institution is closed is often a consideration for the regulator. Regulators generally wind-down failing institutions using arrangements with another bank to assume accounts and make funds immediately available. For example, in the case of Washington Mutual, JP Morgan Chase was selected as the acquiring institutions, and the Washington Mutual branches remained open. If the bank is liquidated and no buyer can be found, insured deposits are entered into a claims process. Unlike many other countries, the depositor is not required to file the claim and is automatically paid out by the insurer, typically by the next business day.

[15]For example, one commonly used service is the Certificate of Deposit Account Registry Service allows for large deposit accounts up to $50 million to be broken into multiple, smaller accounts in increments below the maximum amount allowed to be fully insured by the FDIC. The accounts are certificates of deposits with maturities that range from four weeks to one year. The account can be spread over multiple FDIC-insured banks if required at a single yield. The program was initiated in 2003, and grew in popularity given that it allows depositors to manage large accounts from a single point of contact so to ensure convenience.

[16]Misattribution could be related to uncertainty in the insolvency of the Deposit Insurance Fund, which

irrelevant in decision-making may arise systematically in environments with greater uncertainty or limited information (Johnson and Tversky, 1983; Clore, Schwarz, and Conway, 1994; Forgas, 1995). Johnson and Tversky (1983) present results from an experiment where subjects read an account of an individual dying due to a specific cause, and are asked subsequently to evaluate the likelihood of various adverse events. They show that subjects systematically overestimated the frequency of risks that were both related and unrelated to the one described in the account relative to a control group. The results are consistent with reliance on availability heuristics (Tversky and Kahneman, 1973), where the perceived frequency of an event is biased by specific instances that are more readily accessible to the individual. Importantly, related studies have shown that these biases are mitigated with competency in the domain of the judgment (Ottati and Isbell, 1996; Sedikides, 1995). These findings suggest that greater competency in the domain of financial decision-making may mitigate biases in depositor behavior following perceived uncertainty arising from institution-specific shocks.

This paper examines whether the financial literacy of bank customers can mitigate the severity of depositor runs following institution-specific shocks. Competency in the context of managing household finances may be related to financial literacy. Cole et al. (2011) provide evidence from a field experiment where some, but not all, individuals are subjected to a financial education program, and track their subsequent financial decisions. They show that financial literacy resulted in improved financial decision-making, including participation in formal banking systems. General understanding of financial concepts should be associated with ability to evaluate decisions across a wide variety of financial applications, so that lower levels of financial literacy should be associated lower perceptions of competence in financial decision-making. While there are many facets to financial literacy, I use a measure that captures general knowledge of basic financial concepts across multiple dimensions.[17] This measure is more likely to correspond with general competence in financial decisions rather

has implicit government backing. It could also be related to uncertainty in the effectiveness of resolution procedures to recover their accounts in full in the event of failure, which again ignores the explicitness of these procedures made public by the Deposit Insurance Fund.

[17]The survey does not directly ask whether the individual understands how deposit insurance works. Individuals without any experience in the banking system may lack even fundamental knowledge of deposit insurance. However, the survey mostly focuses on individuals that are already in the banking system.

than expertise in specific financial applications, and should be relevant to decision-making in environments with greater uncertainty.

2.2 Data Sources

The survey data is from the National Financial Capability Study commissioned by the Financial Industry Regulatory Authority.[18] The survey was conducted on-line in two waves, one in 2009 and one in 2012.[19] The survey is randomized to provide a nationally-representative sample over residents in all 50 states and the District of Columbia in the United States. In addition to respondent demographic characteristics, the survey asks a number of questions related to financial literacy and attitudes; current and past household financial conditions; and savings and spending behavior.

Financial literacy is measured based upon five questions that evaluate understanding related to rudimentary financial calculations and concepts.[20] The questions are displayed in the Appendix. The financial literacy of each respondent is measured as the proportion of questions answered correctly. Respondents who fail to answer all five questions are excluded from the sample.

The data on enforcement actions are collected from the FDIC website from 2007 to 2012.[21,22] Each action includes the date of issuance, the name of the institution, the institution's address, and enforcement action type. The bank's RSSD identification code used to match to other bank-related datasets is not directly available, and a fuzzy matching algorithm is used to obtain the identification code based upon the institution's name for banks within the same state and city.[23] Amendments to previous actions are excluded, as are cases where another action to the same bank was issued within the past year.

[18]Specifically, the state-by-state version of the survey is used that includes the ZIP code location of each respondent.

[19]The response rate to the survey is approximately 5.85%.

[20]Concepts include interest rate calculation, inflation, bond price calculation, mortgage payment calculations, and risk diversification.

[21]https://www.fdic.gov/bank/individual/enforcement/index.html

[22]enforcement actions by the OCC, Federal Reserve and other regulatory institutions are also available during this time period. However, a vast majority of the enforcement periods across all regulators during this sample period originate from the FDIC.

[23]Specifically, the generalization of the Levenshtein edit distance is used for the matching. For each city and state, edit distances are computed for all possible bank matches and the banks with the smallest distance is chosen as the match. The matches are then inspected by hand, and incorrect matches are not used.

Data on U.S. bank branches are from the FDIC's annual Summary of Deposits (SoD) dataset from June 2007 to June 2012. Branch-level information on each bank includes location and deposit size. The branch-level variables used in the analysis include deposit flows and bank concentration for a particular market. Deposit flows are measured as the annual percentage change in core deposits for a bank in a particular market, as described in the next section. Commercial bank information is collected from the Call Report data from June 2007 to June 2012. The bank-level variables used in the analysis include total assets; the ratio of total loans-to-total deposits; the ratio of total cash and marketable securities-to-total assets; the total interest expense related to deposit accounts-to-total deposits.

Finally, ZIP code-level demographic data are obtained from the 2000 U.S. Census. The local demographic data used in the analysis includes the total population, median household income, percentage of female individuals, percentage of individuals over age 65, and percentage of individuals without any college education.

The datasets are merged based upon bank and geographic identifiers. The enforcement action, SoD and Call Report data are matched based upon the RSSD identification code. The survey and census data are matched to the bank data based upon the ZIP code location of the branch based upon geographic distance, as described in the proceeding sections.[24]

Panel A of Table 1 summarizes the key variables used in the analysis. Panel B presents the summary statistics. Other variables used in the analysis are explained in the next section. The average financial literacy score for each survey respondent is approximately 60% ($mean = 0.621$). The 25th to 75th sample percentiles is 40% and 80%, respectively, suggesting considerable variation in the financial literacy score. Slightly more than half of the respondents are female ($mean = 0.541$). The average age of the respondents is 44.777, while the 25th and 75th sample percentiles is 31 and 58, respectively. A majority of the same respondents attended college. Finally, the average household income of the respondents is \$48.660 thousand, while the 25th and 75th sample percentiles are \$25 and \$75 thousand, respectively. While we cannot observe bank account balances, the demographic information suggest that most of the survey respondents are likely to be have fully insured deposit

[24]Geographic distance is calculated based upon haversine formula using the centroid coordinates of each location's ZIP codes. The distance (d) in miles between locations A and B can be calculated as:
$d_{A,B} = 0.621371 \times 2 \times R \times \arcsin([\sin^2(0.5 \times (Y_A - Y_B)) + \cos(Y_A) \times \cos(Y_B) \times \sin^2(0.5 * (X_B - X_A))]^{1/2})$.

accounts.[25]

2.3 Regulatory Events

The analysis focuses on depositor behavior around periods where the bank receives an enforcement action. Enforcement actions represent institution-specific events, are issued based upon information from on- and off-site examinations, and have power to immediately impose restrictions on or close a depository institution. Due to confidentiality on bank regulatory proceedings, these enforcement actions are not generally publicly known prior to issuance, so that deposit flows prior to the announcement are unlikely to be affected. After issuance, the enforcement action is publicized, generally in local media outlets. This makes enforcement actions an ideal event to examine, as depositor behavior following the announcement is likely to be directly a response to these events. In contrast, identifying depositor runs using deposit outflows may be related to changes in local market conditions, which may have effect over longer periods of time.

The reasons for enforcement actions can vary,[26] and in some cases includes specific corrective actions, which may be lifted in the future if the bank demonstrates to regulators that the causes for the order have been rectified. These restrictions also vary, and may include additional reserve requirements on their loan portfolios, deposit rate caps, and so on, though a vast majority of enforcement actions are less likely to be related to the bank's solvency.

I document evidence of depositor runs following these events, which is detailed below. Specifically, branches of banks receiving enforcement actions experience relatively heavier deposit withdrawals relative to neighbouring banks, and that it does not appear to be a continuation of pre-existing trends before the enforcement action is issued.

Because household customers are likely to be geographically restricted due to search costs and convenience in access to the physical location of the bank, comparisons in de-

[25]The survey data also include information about participation in the banking system. Approximately 91% of the respondent have checking accounts, while approximately 74% also have savings accounts. This suggests that the sample is unlikely to reflect underbanked individuals. One potential reason is that the survey is conducted on-line, and underbanked individuals may not readily have access to the survey.

[26]These include orders to cease and desist; prohibit certain individuals from working at any insured banking institution; deny acquisition of control; pay civil money penalties; impose prompt correction actions; and so on.

posit flows will be conducted based upon geographic proximity to the bank receiving the enforcement action, or the EA bank. Distance-based comparisons have advantages over using traditional definitions of banking markets, such at Metropolitan Statistical Areas (MSA) or counties, given that they more precisely represent the local area that are relevant to customers. Furthermore, reporting instructions for the SoD data requires banks to classify accounts according to closest proximity to the address provided by the depositor.

Each location z is defined as the area within a 60 mile radius surrounding the ZIP code of a branch located in ZIP code $z(EA)$, whose parent bank received an enforcement action from June of year t to June of year $t+1$.[27] For each bank i, the growth rate in deposits is calculated for branches j across ZIP codes $z(j)$ within location z. In other words, the distance between $z(EA)$ and $z(j)$ is less than 60 miles. To avoid influence of extreme observations, instances where the deposit flow measure is above the 99.9th percentile are removed from the analysis.

$$\Delta Dep_{i,z,t} = \sum_{dist(z(j),z(EA))\in[0mi,60mi)} \frac{Dep_{i,j,t+1} - Dep_{i,j,t}}{Dep_{i,j,t}} \tag{1}$$

The following OLS regression model measures the deposit flows of bank receiving an enforcement action relative to neighbouring bank branches. Each observation is on the level of bank i, location z, and year t.

$$\begin{aligned} \Delta Dep_{i,z,t} = \beta_0 + \beta_1 \times EABank_{i,t} + \boldsymbol{\beta} \times \boldsymbol{X_{i,z,t}} \\ + \sum_z \sum_t \tau_t \times \gamma_z + \epsilon_{i,z,t} \end{aligned} \tag{2}$$

The key explanatory variable is $EABank$, which is an indicator variable taking value 1 if the branch's parent bank received an enforcement action from June of year t to June of year $t+1$, and 0 otherwise. The control variables ($\boldsymbol{X}$) are associated with other bank factors that may explain deposit flows for each bank i: the natural log of the bank's total assets ($ln(TA)$), the total loan-to-total deposits ratio ($Loan/Deposit$), the total interest expense on deposit accounts-to-total deposits ($DepositCost$), and the Herfindahl-Hirschman Index based upon deposits across banks in location z ($DepositHHI$). To allow for comparisons of deposit flows within location z, the main specifications include fixed effects by year (τ)

[27] Using a distance threshold of 30 miles yields similar results.

and location (γ), or $\tau \times \gamma$. Given that the setup allows for repeated observations, standard errors are double clustered on the location-year and bank levels[28]

The results confirm depositor runs following issuance of enforcement actions. Table 2 presents the results. Model (1) displays the estimates without any of the control variables with exception of year fixed effects. The coefficient on $EABank$ is negative and statistically significant ($estimate = -0.220$, $t - value = -9.53$), which implies that branch-level deposit flows decrease on average by 22% when a bank receives an enforcement action relative to branches of other banks.[29] Iyer et al. (Forthcoming) also documents depositor runs following regulatory events, though their focus is on a single bank in India where the regulatory environment may not be comparable. When including bank-level and bank competition control variables, the estimates remain similar ($estimate = 0.159$, $t - value = -6.09$). Given that deposit flows are likely to significantly differ across regions, Model (3) also includes location-year fixed effects in place of the year fixed effects. The $EABank$ coefficient is -0.155 ($t - value = -5.67$), suggesting that branch-level deposits decrease by 15.5% for EA banks compared to other banks within the same location. Model (4) examines deposit flows in the year prior to the enforcement action, and is a test of whether depositors anticipated the event. The coefficient on $EABank$ is statistically insignificant ($estimate = -0.059$, $t - value = -1.27$). Finally, the effects could be driven by branches that are closed following the enforcement action. Model (5) displays the estimates. As expected, the coefficient on $EABank$ decreases ($estimate = -0.116$, $t - value = -4.69$), but remains economically significant.

Iyer et al. (Forthcoming) compares the effects of the informativeness of the regulatory event to bank solvency, and finds evidence of depositor runs for high as well as low solvency events. While a majority of the regulatory events I consider are less likely to be related to the bank's solvency, there are some that are typically associated with troubled banks, including prompt corrective actions, cease and desist orders, and safety and soundness orders. Additionally, these types of actions are also associated with restrictions placed on the institution,

[28]The geographical clustering of enforcement orders to banks located in densely populated regions provide additional motivation. I also find similar results when double clustering on the location and bank-year level.

[29]The effects are similar when examining the effects related to the total assets of the bank receiving the enforcement order. In untabulated results, the tests are repeated excluding EA banks with total assets under $10 billion or excluding EA banks with total assets at least $10 billion.

and may affect services that the bank may provide. In untabulated results, I show that the effects remain significant when excluding these events from the sample. When including the control variables and the location-year fixed effects, these events are associated with a 12.5% reduction in deposits ($t - value = 4.88$), which is smaller than the effects found in Model (3), as expected.

2.4 Empirical Methodology

The main tests focus on whether financial literacy of depositors can explain variation in the deposit flows of EA banks during these events. One major identification issue is in measuring the financial literacy of the EA bank customers. I proxy for the financial literacy of the EA bank customers using information from survey respondents located nearby. The identifying assumption is that the financial literacy of these survey respondents is informative due to determinants for financial literacy related to geographic proximity, such as social factors. In later sections, I will further examine the validity of this assumption and assess other explanations which may induce spurious relationships in the tests.

The following OLS regression model comparing the deposit flows of banks receiving an enforcement actions ($Dep^{EA}_{i,z,t}$). Each observation is on the level of bank i, location z, and year t.

$$\begin{aligned} \Delta Dep^{EA}_{i,z,t} = \beta_0 + \beta_1 \times LocalFinlit_{z,t,[x\text{mi},y\text{mi})} + \boldsymbol{\beta} \times \boldsymbol{X_{i,z,t}} \\ + \sum_i \sum_t \tau_t \times \iota_i + \epsilon_{i,z,t} \end{aligned} \tag{3}$$

The key explanatory variable is $LocalFinlit_{z,t,[x\text{mi},y\text{mi})}$ is the average financial literacy scores of respondents located between x and y miles from the branches of the EA bank. The observations are restricted to years when the survey was conducted, specifically for enforcement actions between June 2008 to June 2009 and June 2011 to June 2012.[30] This approach assumes that the financial literacy of individuals in particular regions may have changed between the two survey waves, though this assumption is relaxed in later tests

[30]The results are similar when using the 2009 survey data for the June 2009 to June 2010, and the 2012 survey data for June 2012 to June 2013. However, this alternative mapping results in significantly fewer regulatory events, limiting the power of some of the other tests performed in the next section.

that find similar results. At least five respondents are required for the calculation to ensure reliability in measurement. The control variables are similar to the previous specifications.

One potential issue is that the enforcement actions may vary in terms of the types of restrictions imposed. There may be inter-bank variation in the types of areas that the bank chooses for their branch locations, which could be related to $LocalFinLit$. To overcome this issue, I compare deposit flows across branches within the same bank i by using fixed effects by year (τ) and bank (ι), or $\tau \times \iota$, in the main specifications. The bank characteristics are dropped in these specifications due to collinearity with the year-bank fixed effects. Given that the residuals in the model are unlikely to be independent, standard errors are double clustered on the location-year and bank levels.

3 Main Results

Table 3 presents the results for the OLS regression model described in equation (3).[31] Model (1) displays the results only including the financial literacy scores of respondents within a 15 mile radius of the EA bank branch, or $LocalFinLit_{[0\text{mi},15\text{mi})}$, and year fixed effects. The coefficient on $LocalFinLit_{[0\text{mi},15\text{mi})}$ is positive and statistically significant ($estimate = 0.271$, $t - value = 3.41$). If respondents answered one additional question correctly in the financial literacy test, the deposit flows would increase by 5.4 percentage points, which represents almost 25% of the predicted decrease in deposit flows in EA banks in Model (1) of Table 2 and 10% of the sample standard deviation in the deposit flows of these banks. In other words, decreasing the average financial literacy score makes the depositor run more severe. When including the bank and market characteristics in Model (2), the results are similar.

As a placebo test, Model (3) examines whether similar results obtain using deposit flows from the year prior to the enforcement action, or from June of year $t-1$ to June of year t. The coefficient on $LocalFinLit_{[0\text{mi},15\text{mi})}$ is statistically insignificant ($estimate = 0.042$, $t - value = 0.68$). The results provide evidence that the effects are a direct response to the shock.

[31] The results are similar when using a Tobit estimator, which accounts for the fact that the deposit flow measure cannot fall below -100%.

To verify the locality of the effects, Model (4) adds the average financial literacy scores of respondents located relatively further away from the EA bank. Specifically, $LocalFinLit_{[15\text{mi},30\text{mi})}$ is calculated using respondent values located from 15 up to 30 miles away from the bank branch. These scores are less likely to correspond with depositors in the bank's branch, and so is expected not to significantly affect deposit flows. The coefficient on $LocalFinLit_{[15\text{mi},30\text{mi})}$ is statistically insignificant ($estimate = -0.056$, $t - value = -0.61$). The insignificance of the financial literacy of respondents located further away provides some evidence that the effects are directly related to the bank customers, rather than other regional factors that may also be correlated with financial literacy.

Finally, I examine whether the results still hold when only using intra-bank variation across branches of the EA bank. This approach purges effects related to specific characteristics associated with the enforcement order. Depositor withdrawals could be pronounced in banks receiving orders with greater restrictions, though it would not necessarily bias the estimates in the same direction as the results. For example, restrictions limiting deposit rates could induce depositors with greater financial literacy to withdraw funds. Indeed, when including year-bank fixed effects in Model (5), the point estimates are similar and slightly higher ($estimate = 0.235$, $t - value = 3.22$).

The positive coefficient on $LocalFinLit_{[0\text{mi},15\text{mi})}$ is consistent with depositors with lower financial literacy withdraw their funds more heavily than those with higher financial literacy. To confirm whether the effects are indeed driven by depositors with lower financial literacy, the continuous measure of financial literacy is replace with indicator variables associated with low financial literacy, or where $LocalFinLit$ is in the bottom sample quartile, and high financial literacy, or where $LocalFinLit$ is in the top sample quartile. In untabulated results, low financial literacy decreases deposit flows ($estimate = -0.044$, $t - value = -2.38$) while high financial literacy is statistically insignificant ($estimate = 0.027$, $t - value = 1.40$). These results confirm that the the explanatory power of $LocalFinLit$ is driven by depositors with low financial literacy.

Another explanation for the results is that customers may be wary of temporary disruptions in their banking services if their bank were to fail. In most cases, bank customers have access to their accounts without any interruption in their services after a bank fails. This

depends upon whether the regulator can quickly find an acquirer for the failed bank's assets before closing the institution, and their inability to do so may result in delays for the customer. These considerations are more likely to be relevant for customers with high financial literacy, as those with low financial literacy may not be aware of these issues, and would imply effects going in the opposite direction of the results. Moreover, in untabulated results, I find that the effects hold for subsamples based upon EA bank size.[32] Community banks, or banks with total assets under $10 billion, may have greater difficulty in finding an acquirer in the event of failure. $LocalFinLit$ is significant for both large and community EA bank subsamples. The significance in the large EA bank subsample provide further evidence that the results are unlikely to be driven by customers concerned about temporary disruptions in banking services in the event of failure. Additionally, I find similar effects when excluding enforcement actions that are more likely to be related to the bank's solvency. In untabulated results, the coefficient on $LocalFinLit_{[0\text{mi},15\text{mi})}$ remains positive and statistically significant ($estimate = 0.190$, $t - value = 3.04$).

3.1 Validation Checks

A key identifying assumption made in the tests is that the financial literacy of the survey respondents should correspond with that of the bank's customers. Additionally, the estimates could be potentially biased due to correlations between the financial literacy scores and other market-related factors. While the results in Table 3 suggest this not to be the case, I consider three validation checks to address these concerns by exploiting heterogeneity in nearby respondent characteristics. I also perform additional tests to assess the source of the effects and determine whether they are related to behavioral biases of these depositors.

The depositor runs documented in Table 2 should be primarily related to individuals with access to banking services. Individuals without checking accounts may instead use other non-bank institutions, such as check-cashing services, and so should not be relevant to explaining deposit outflows. Even for individuals with checking accounts, the effects are also unlikely to be driven by those who do not have savings accounts, given that savings accounts

[32]When also repeating the analysis in Table 2 for larger and smaller EA banks separately, I also find that the results are significant for both groups of EA banks.

represent a large fraction of a bank's total deposits. In other words, inclusion of individuals who are unlikely to be bank customers or who may not have sufficiently large accounts in the financial literacy measure may understate the effects.

To further examine these views, the regression model in equation (3) is altered to compare the effects of financial literacy of different groups. That is, the financial literacy measure is recalculated to only include values from respondents with specific characteristics from the survey. $Finlit^k$ is the average financial literacy scores of only respondents with characteristic k located between x and y miles from the branches of the bank receiving the enforcement action ($z(EA)$).

Models (1) and (2) of Table 4 presents the results when using categories associated with whether the respondent has a checking account ($Check$) or not ($NoCheck$), and if she also have a savings account ($Save$) or not ($NoSave$). In Model (1), the explanatory variables related to financial literacy of respondents with and without checking accounts are included, in addition to the control variables from Model (5) of Table 3. Only the financial literacy of respondents with checking accounts are significant, and its coefficient ($estimate = 0.310$, $t-value = 3.16$) is larger compared to that of Model (5) of Table 3. On the other hand, the coefficient for the financial literacy of respondents without checking accounts is statistically insignificant.

Model (2) decomposes the effects of respondents with checking accounts into those with or without savings accounts. The effects are concentrated in those with savings accounts ($estimate = 0.256$, $t-value = 2.44$). The coefficients on the financial literacy scores without savings accounts and without checking accounts are statistically insignificant. The results square with intuition that only financial literacy of individuals with access to banking services and sufficient savings should be relevant in explaining depositor withdrawals. The results are interesting, given that individuals who do not participate in formal banking systems are generally associated with low financial literacy, and the effects appear to be driven by variation in financial literacy amongst bank customers. The results would also suggest that potential differences in financial literacy related to financial fragility is unlikely to be driving the effects, given that individuals without savings are more susceptible to household financial fragility.

I next examine whether the results are driven by uninsured depositors. While the survey does not solicit the size of bank savings accounts, it does ask respondents for their overall dollar amount of non-retirement investments, which includes stocks, bonds, mutual funds and other securities. I proxy for respondents with uninsured savings based upon whether they have high levels of non-retirement investments. Given that the limits for deposit insurance during this period are for accounts with up to $250,000 during the survey period, respondents with investments levels well under this limit are considered to be less likely to have uninsured savings accounts. Specifically, the financial literacy measure is reestimated for respondents with checking accounts for total investments up to $100,000 ($LowInvest$) and above $100,000 ($HighInvest$). A lower fraction of the respondents are associated with high investment levels, which serves to decrease the number of observations. Model (3) presents the results. The estimates on the financial literacy measure for both groups are positive and statistically significant, and do not differ between each other significantly.[33] The effects on respondents with greater wealth are interesting, given that insured depositors with high financial literacy would be expected to be more prone to running than those with low financial literacy. On the other hand, uninsured depositors may run regardless of financial literacy. Instead, the effects on respondents with greater wealth could be related to large depositors who engage in account-splitting schemes. Similar biases could arise in these depositors, given that these schemes may be complicated to implement.

I next examine whether the results are driven by uninsured depositors. While the survey does not solicit the size of bank savings accounts, it does ask respondents for their overall dollar amount of non-retirement investments, which includes stocks, bonds, mutual funds and other securities. I proxy for respondents with uninsured savings based upon whether they have high levels of non-retirement investments. Given that the limits for deposit insurance during this period are for accounts with up to $250,000 during the survey period, respondents with investments levels well under this limit are considered to be less likely to have uninsured savings accounts. Specifically, the financial literacy measure is reestimated for respondents

[33] As an alternative test, I divide the sample of EA banks based upon their proportion of deposits that are insured. Because branch-level breakdowns are unavailable, I measure the proportion of insured deposits on the bank-level using the approach described in Berger and Turk-Ariss (2014). The financial literacy measure is significant across subsamples with lower and higher proportion of insured deposits.

with checking accounts for total investments up to $100,000 ($LowInvest$) and above $100,000 ($HighInvest$). A lower fraction of the respondents are associated with high investment levels, which serves to decrease the number of observations. Model (3) presents the results. The estimates on the financial literacy measure for both groups are positive and statistically significant, and do not differ between each other significantly.[34] The effects on respondents with greater wealth are informative, given that large depositors with high financial literacy would be expected to be more prone to running than those with low financial literacy.

Finally, the depositor withdrawals could be influenced by local market factors related to competition with other nearby banks. Depositors that compare competing deposit yields across banks would be more likely be influenced to withdraw funds if the enforcement action imposed strict caps on deposit yields for the EA bank. While this behavior is difficult to observe, these individuals may be prone to engaging in similar behavior for other financial decisions. To proxy for these individuals, I use information from the survey about whether the respondent compared rates when applying for their most recent credit card. I compare the financial literacy measure in the tests for respondents with checking accounts who compared rates ($Compare$) to those who did not ($NoCompare$). Model (4) presents the results. Interestingly, the coefficients on financial literacy for those that compared rates is statistically insignificant and close to zero ($estimate = 0.008$, $t - value = 0.16$), while those who did not is statistically significant ($estimate = 0.238$, $t - value = 2.75$). The results do not appear to be related to depositors shopping for rates. On the other hand, behavior related to shopping around for credit cards may also relate to overall financial capability. The results would also be consistent with behavioral explanations, given that general financial knowledge should mitigate perceptions of uncertainty in those that do not routinely engage in financial decision-making.

[34] As an alternative test, I divide the sample of EA banks based upon their proportion of deposits that are insured. Insured deposits is measured as the dollar value of demand deposits and time deposits with account size under $100 thousand. Time deposit breakdowns for accounts under $250 thousand is not available for the full sample period. The financial literacy measure is significant across subsamples with lower and higher proportion of insured deposits.

3.2 Risk Aversion

The results so far indicate that the effects related to $LocalFinLit$ are unlikely to be driven by institutional or market-related factors. This section provides direct tests for explanations related to non-market factors. In particular, I examine how the risk aversion of the respondents influences the results. The effects of misattribution are expected to be pronounced for respondents with higher risk aversion, given that they would be more affected by overweighting the likelihood of losses in the event of failure. Respondent with high risk aversion should be more sensitive to the institution-specific shocks, while risk tolerant respondent should be less sensitive. Additionally, while local market conditions could influence inter-regional variation in financial literacy, it is unlikely to affect its intra-regional variation based upon the respondent's risk aversion.

The risk aversion of the survey respondents is based upon the question, "When thinking of your financial investments, how willing are you to take risks?" The responses are based upon a ten-point scale, from "Not at all willing" (1) to "Very willing" (10). Respondents are divided into three categories: self-reported risk aversion scores below the 25th percentile are categorized as high ($HighRA$), those within the 25th to 75th percentile are categorized as medium ($MediumRA$), and those above the 75th percentile are categorized as low ($LowRA$) risk aversion. The financial literacy measure is calculated for each group of respondents with checking accounts in each location within a 15 mile radius of the bank branch.

Table 5 presents the results. Models (1) through (3) shows the estimates on the financial literacy measure of only respondents with high, medium, and low risk aversion, while Model (4) shows the results with all three variables in the same model. Control variables from Model (5) of Table 3 are included. The results shows that only financial literacy of respondents with high risk aversion has explanatory power over deposit flows in Model (1) ($estimate = 0.138$, $t-value = 3.01$) and Model (4) ($estimate = 0.166$, $t-value = 2.77$). The estimates are non-linear, though monotonically increase in risk aversion. The results provide direct evidence that the effects are unlikely to be driven by market factors, and that financial literacy serves to mitigate the effects for the most risk averse.

For further robustness, the financial literacy scores for the risk aversion groups are re-

calculated only for respondents with a low level of investments ($LowInvest$), given that risk aversion may be positively associated to account size. Again, these depositors are more likely to have accounts under the deposit insurance threshold. Model (5) presents the results. Consistent with the other results, the coefficient on financial literacy for respondents with high risk aversion is again positive and statistically significant ($estimate = 0.151$, $t - value = 3.36$), while the other estimates are statistically significant.

The effects are concentrated in the financial literacy scores of respondents with high risk aversion. That is, the deposit outflows are stronger for risk averse depositors with low financial literacy compared to those with high financial literacy. This is consistent with the conjecture that depositors that run do so due to biases related to misattribution, as sensitivity to overweighting adverse events due to misattribution should be pronounced in individuals exhibiting higher risk aversion. The results also show that the deposit behavior of customers with low risk aversion are not as sensitive to misattribution, so that the mitigating effects of financial literacy is weaker.

3.3 Depositor Runs and Neighboring Banks

The results so far provide evidence that the severity of depositor runs in banks receiving enforcement actions is influenced by the financial literacy of their customers. Insured depositors appear to misattribute these institution-specific shocks to potential losses in the event of failure, possibly arising from perceived insolvency of the Deposit Insurance Fund or ineffectiveness of resolution procedures to recover insured accounts in full if their bank were to fail. Studies that examine banking panics show that some depositors subsequently exit the banking system, both in environments with (Iyer and Puri, 2012) and without (Ramirez and Zandbergen, 2014; Iyer and Puri, 2012) explicit deposit insurance. Depositors at EA banks may exit the banking system, while depositors at neighboring non-EA banks may also run if the enforcement order is perceived to be a symptom of broader issues related to fragility in the banking system. Without account-level data, it is difficult to determine what fraction of depositors that run following issuance of enforcement actions exit or transfer accounts to other banks. However, it is feasible to test whether competing banks accessible to the depositors that run experience abnormal deposit flows. The earlier results suggest that the effects

are concentrated to customers in close proximity to the bank branch. These customers may be sensitive to geographic proximity in choosing a bank, possibly due to convenience, search costs and so on.

For these tests, the sample is extended to all banks receiving an enforcement action from June 2007 through June 2012 and their neighboring banks, as in Table 2. The average financial literacy score for a particular area is now calculated using respondent location, ignoring the survey year given that the survey was not conducted every year, in order to increase the number of locations with sufficient responses.[35] This approach allows me to consider a broader set of events. Given that the distance of the neighboring bank from the EA bank is relevant, deposit flows are calculated for each neighboring bank by distance groupings for a given location. Specifically, deposit flows are calculated separately for each bank i over all branches located within distance $d \in \{[0,15),[15,30),[30,45),[45,60)\}$ miles from the branch of the bank receiving the enforcement action in location z. The financial literacy measure is also calculated for each distance group d within location z. The observation is on the level of bank i, location z, distance group d, and year t.

The following OLS regression model comparing the deposit flows of banks receiving an enforcement actions relative to neighboring banks by distance groups.

$$\begin{aligned}\Delta Dep_{i,z,d,t} = {} & \beta_0 + \beta_1 \times NonEABank_{i,d=[0\text{mi},15\text{mi}),t} + \beta_2 \times EABank_{i,t} \\ & + \beta_3 \times LocalFinLit_{z,d} + \beta_4 \times LocalFinLit_{z,d} \times EABank_{i,t} \\ & + \boldsymbol{\beta} \times \boldsymbol{X_{i,z,t}} + \sum_z \sum_t \tau_t \times \gamma_z + \sum_i \sum_t \tau_t \times \iota_i + \epsilon_{i,z,d,t}\end{aligned} \tag{4}$$

The key explanatory variable is $NonEABank_{i,d=[0\text{mi},15\text{mi}),t}$, which is an indicator variable taking value 1 if a bank not received the enforcement action and is in distance group $d = [0\text{mi}, 15\text{mi})$, and 0 otherwise. $LocalFinLit_{z,d}$ is the average financial literacy score of respondents in location z that are within distance group d within location z. The bank-level control variables are similar to the previous specifications. Local income and population are calculated for each distance group d in location z. Fixed effects by year (τ) and bank (ι),

[35] By doing so, these tests assume that financial literacy is unlikely to have changed dramatically for individuals over the sample period. If this is not the case, then the estimates should be susceptible to attenuation bias due to measurement error. Accordingly, the analysis also includes tests that are somewhat comparable to the earlier results to assess whether the effects are related.

or $\tau \times \iota$, and year (τ) and location (γ), or $\tau \times \gamma$, are included in the main specifications. The bank-level terms are dropped due to collinearity when the year-bank fixed effects are included in the model. Given that the residuals are likely to be independent across locations and banks for each event year, standard errors are double clustered on the location-year and bank-year levels.[36]

Table 6 presents the results. The specification in model (1) is comparable to those in Table 3, but also includes neighboring banks. The coefficient on $LocalFinLit$ represents the impact of financial literacy on all banks in the local area, while that of the interaction term $LocalFinLit \times EABank$ represents the impact of financial literacy on the bank receiving the enforcement action, which is again expected to be positive. The fixed effects included in this specification is on the $Year \times Local$ level, so that the effects are restricted to intra-regional variation. The coefficient on the interaction term is positive and statistically significant, and the coefficient is comparable to those in Table 3. The $LocalFinLit$ coefficient is statistically insignificant and close to zero. The coefficient on $EABank$ is also negative and statistically significant, as before. Similar to previous estimates, an additional correct response on the financial literacy test increases the deposit flows by approximately 5 percentage point, which represents almost 17% of the $EABank$ coefficient of -30.5%. This confirms the results in Table 3 using the broader sample, and not just the survey years.

The results provide evidence that the running depositors shift accounts to other banks to provide additional assurance of safety for their savings beyond the explicit guarantees of deposit insurance. Model (2) includes the $NonEABank$ term, and is positive and statistically significant. Neighboring banks within a 15 mile radius of the bank receiving an enforcement action experiences an increase in deposit flows of approximately 11.3% relative to other, neighboring banks located relatively farther away. To ensure that the estimates are not driven by banks the furthest away, Model (3) estimates the same model but only includes banks within 30 miles from the EA bank. The estimates are quite similar. Model (4) uses $Bank \times Year$ fixed effects to allow for intra-bank comparisons across branches for the

[36]The motivation for clustering on the bank-year level is based upon the broader sample period, given that bank-specific policies were unlikely to be independent across this period. Alternative specifications on the standard errors provide less conservative estimates, including double clustering on the location-year and bank-location levels, or the location-year and bank levels.

same event year. Again, the $NonEABank$ coefficient is statistically significant. The results suggest that neighboring bank branches experience deposit inflows from former customers of the EA bank. While it is difficult to directly examine whether the any customer left the market altogether, the estimates suggest that at least some were transferred to other banks. Of course, the tests cannot completely account for all customers, given that the SoD data does not include branches of credit unions, which also carry FDIC deposit insurance, as well as non-bank institutions. The results provide evidence that depositors that run flee to institutions of better quality.

To confirm whether the effects are driven by depositors of the bank receiving the enforcement action, Model (5) includes the interaction term $LocalFinLit \times NonEABank$ to the specification in Model (4). Given that customers with low financial literacy appear to be driving the deposit outflows from the EA banks, the coefficient on the interaction term should be negative if the deposit inflows are driven by these customers. The coefficient on the interaction term is indeed negative and statistically significant.[37] An additional correct response on the financial literacy test decreases the deposit flows in the neighbouring banks by approximately 5 percentage points. Model (6) restricts the sample to banks within 30 miles of the EA bank, and the results again appear comparable. One caveat of these tests is that the effects on the EA and non-EA banks are not directly comparable, given that they are based upon percentage changes.

4 Financial Literacy and Social Factors

The main results are based upon the identifying assumption that the financial literacy of the survey respondents should be related to those of the bank's customers, and further tests provide supportive evidence. While the number of respondents in the survey overall is quite large, it may be implausible for the proxies capture the financial literacy of the bank's customers without high measurement error, unless if there are other factors influencing the

[37] In untabulated results, I also consider including interaction terms between $LocalFinLit$ and $EABank$. The positive coefficient on $LocalFinLit$ in Model (5) becomes statistically insignificant, suggesting that those results are driven by the EA bank depositors. However, high collinearity with the $EABank$ and $NonEABank$ interaction terms make those estimates difficult to interpret.

formation of financial literacy within regions. The effects are highly localized, which may also suggest that the acquisition of financial literacy may occur through social channels. Other studies have also provided evidence of peer effects in the context of retirement planning (Beshears, Choi, Laibson, Madrian, and Milkman, 2015), stock market participation (Kaustia and Knüpfer, 2012), stock picking (Bursztyn, Ederer, Ferman, and Yuchtman, 2014; Shiller and Pound, 1989; Ivković and Weisbenner, 2007), and so on.

Social formation of financial literacy is potentially important for a number of reasons. It may have important policy implications on the effectiveness of financial education programs, as financial education for a few individuals could propagate to financial literacy for a broader group. It also has implications on findings related to social contagion in depositor runs. Kelly and Ó Gráda (2000) and Ó Gráda and White (2003) provide evidence of social network effects in banking panics in the United States prior to the adoption of deposit insurance, while Iyer and Puri (2012) finds consistent evidence using recent data from India. Biases in depositor behavior could be mitigated through financial literacy, and so could impede the transmission of panic.

To assess peer effects in financial literacy, I perform the respondent-level tests from the survey data to examine the degree to which financial literacy can be determined by the financial literacy of other, neighboring respondents. Geographic proximity is likely to be a strong determinant in the development of social relationships, and peer financial literacy should explain an individual's financial literacy if it is socially acquired, controlling for the individual characteristics.

Beyond geographic proximity, there are other social groupings that can be identifiable based upon demographic characteristics. In particular, individuals are likely to socialize within groups based upon gender, education, age and income status. Individuals within these social groups are likely to communicate with each other, and financial literacy are likely to be transmitted within these groups.[38] After controlling for individual characteristics, the proximity of neighbours with similar characteristics should not influence financial literacy

[38]Financial literacy may be positively related to age, given that older individuals have had more time to acquire basic financial knowledge, while education may provide individuals with more opportunities to be exposed to financial concepts. Greater income may facilitate higher financial literacy, as individuals with low income may not feel compelled to acquire such knowledge. Females may be associated with lower financial literacy for other social reasons, possibly related to social norms.

unless if it can be acquired socially.

The following OLS regression model comparing the financial literacy scores of respondents i for time t.

$$\begin{aligned} Finlit_{i,t} = \beta_0 + \beta_1 \times PeerFinlit_{i,[x\text{mi},y\text{mi}),t} + \boldsymbol{\beta} \times \boldsymbol{W_{i,t}} \\ + \sum_t \tau_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

The key explanatory variable is $PeerFinlit_{i,[0\text{mi},15\text{mi}),t}$, defined as the average financial literacy scores of other respondents located from x up to y miles from respondent i. Control variables ($\boldsymbol{W}$) include respondent and local demographic characteristics. The control variables related to the respondent's characteristics include whether the respondent is female ($Female$), the natural log of the respondent's age ($ln(Age)$), whether the respondent did not graduate from high school ($LowEducation$), and the natural log of the respondent's income ($ln(Income)$). Control variables related to demographics of individuals within a 15 mile radius of the respondent's location include: the natural log of the population ($ln(LocalPopulation)$), proportion of population that is female ($\%Female$), proportion of population that is above 65 years old ($\%Retire$), proportion of population that did not graduate high school ($\%LowEducation$), and the natural log of the median household income ($ln(LocalIncome)$). Fixed effects by the year of the survey (τ) are included in the model. Given that the residuals in the model are unlikely to be independent, standard errors are clustered on the ZIP code level.

Table 7 presents the results using OLS regression models. In Model (1), only $PeerFinLit_{[0\text{mi},15\text{mi})}$ and year fixed effects of the survey year is included in the model. The coefficient on $PeerFinLit$ is positive and statistically significant. In other words, if neighboring respondents answer one additional correctly on the financial literacy test, the respondent answers almost one-half additional questions correctly. When adding the respondent's demographic characteristics in Model (2), the coefficient on $PeerFinLit$ remains significant. Female respondents answer correctly more than one-half questions fewer than male respondents. A respondent with age 65 answers almost one more question correctly than a respondent with age 22. Respondents who did not graduate high school answer one less question correctly

than those who did. Finally, respondents whose households earn $100,000 annually answer correctly almost one-half questions more than those whose households earn $35,000 annually.

When using analogous measures based upon the entire population over 18 years old located within a 15 mile radius of the respondent, the estimates from Model (3) provide similar results. The model estimate for $PeerFinLit$ remains statistically significant. The demographic characteristics of the local area are signed consistently with the individual characteristics. The results on $PeerFinLit$ are also similar when including both sets of control variables as well as local population in Model (4). The coefficient on $PeerFinLit$ remains positive and is slightly lower than estimates in Models (2) and (3). Additionally, the local demographic characteristics remain significant even after controlling for respondent characteristics. The estimates on the respondent characteristics remain stable even after the inclusion of the location demographic characteristics.

As an additional test, I evaluate geographical proximity in the peer effects by examining the impact of financial literacy of respondents located relatively farther away. Model (5) adds a term related to the average financial scores of other respondents from 15 up to 30 miles away from the respondent, or $PeerFinLit_{[15\text{mi},30\text{mi})}$. While the $PeerFinLit_{[15\text{mi},30\text{mi})}$ coefficient is statistically significant, the estimate is economically negligible and is substantially smaller than those for $PeerFinLit_{[0\text{mi},15\text{mi})}$. In other words, if respondents located farther away answer one additional correctly on the financial literacy test, the respondent answers almost 0.03 additional questions correctly. The magnitudes are close to five times larger for neighbors located nearby.

Finally, I test whether the neighboring financial literacy of respondents with similar demographic characteristics as the respondent has greater impact than those with dissimilar characteristics. $PeerFinLit_{[0\text{mi},15\text{mi})}$ is decomposed into the average financial literacy of neighboring respondent with the same categorical demographic characteristics ($SameCat$) and that of everyone else ($NotSameCat$). The categorical demographic characteristics include whether the respondent is a female, is under 65 years of age, did not attend college, and has a household income under $100 thousand. For example, if the respondent is a male, is over 65 years of age, did not attend college and has a household income under $35 thousand, then only other nearby respondents with all of the same four attributes is used to calculate

$PeerFinLit^{SameCat}_{[0\text{mi},15\text{mi})}$, while everyone else is used to calculate $PeerFinLit^{NotSameCat}_{[0\text{mi},15\text{mi})}$.

Model (6) includes both of the neighboring financial literacy measures in the regression model. The coefficient on $PeerFinLit^{SameCat}_{[0\text{mi},15\text{mi})}$ is positive and statistically significant ($estimate = 0.252$, $t-value = 13.94$), and is larger than the $PeerFinLit_{[0\text{mi},15\text{mi})}$ estimates in Model (4). In comparison, the coefficient on $PeerFinLit^{NotSameCat}_{[0\text{mi},15\text{mi})}$ is considerably smaller ($estimate = 0.066$, $t-value = 2.09$). The results show that the effects of neighboring financial literacy is driven by those with similar demographic attributes, which may correspond with social groups that the respondent is more likely to interact with. The magnitudes are close to four times larger for neighbors that the respondent is more likely to interact with. On the whole, the results provides validity to the identifying assumption in the main results of the paper, and also provide supportive evidence of social factors related to the development of financial literacy. Without direct information on social network mappings across the respondents, it is difficult to infer causal relationships in peer literacy. At the least, they imply local determinants of financial literacy related to social factors.

I also assess the sensitivity of the OLS regression model results compared to using a Tobit regression model as the estimator. The Tobit regression models account for the range of the dependent variable, or from 0% to 100%. In untabulated results, the estimates remain stable, suggesting that the estimates are not sensitive to model linearity assumptions.

5 Conclusion

This paper provides evidence that financial literacy can mitigate biases in depositor behavior during depositor runs. Specifically, insured depositors may overweight the likelihood of losses in the event of failure, which is low, due to misattributing regulatory actions that generate uncertainty in the bank's solvency but not in deposit insurance claims procedures. I show that the financial literacy of respondents nearby branches of banks receiving an enforcement action reduces depositor withdrawals, and provide a number of robustness checks to confirm that the effects are not driven by other market-related factors, including local conditions and uninsured depositors. Depositors with low financial literacy that run appear to transfer their accounts to nearby competing banks. Finally, I provide an explanation for how the

financial literacy proxy captures the financial literacy of bank customers, showing evidence for social factors in the formation of financial literacy.

While financial literacy has been shown to be associated with desirable financial behavior, such as entry into the banking system (Cole, Sampson, and Zia, 2011), stock market participation (Klapper, Lusardi, and Panos, 2013), debt management (Klapper, Lusardi, and Panos, 2013), and so on, it may do so by mitigating cognitive biases in financial decisions. Individuals lacking financial literacy may be more prone to misattributing irrelevant information in forming their decisions associated with suboptimal outcomes. This study provides suggestive evidence that these consequences can also extend to funding stability for banks during financial crises.

The results provide motivation for avenues of future research. The results complement evidence of social network effects during banking panics, and suggest that financial literacy can serve to mitigate transmission of contagion. I cannot directly test for this given data limitations, but could be better examined using data from developing countries. The results on social formation of financial literacy also motivates further examination, and should be relevant to policy-makers.

References

Berger, Allen N and Rima Turk-Ariss (2014), "Do depositors discipline banks and did government actions during the recent crisis reduce this discipline? an international perspective." *Journal of Financial Services Research*, 1–24.

Beshears, John, James J Choi, David Laibson, Brigitte C Madrian, and Katherine L Milkman (2015), "The effect of providing peer information on retirement savings decisions." *The Journal of Finance*, 70, 1161–1201.

Bursztyn, Leonardo, Florian Ederer, Bruno Ferman, and Noam Yuchtman (2014), "Understanding mechanisms underlying peer effects: Evidence from a field experiment on financial decisions." *Econometrica*, 82, 1273–1301.

Calomiris, Charles W and Gary Gorton (1991), "The origins of banking panics: models, facts, and bank regulation." In *Financial markets and financial crises*, 109–174, University of Chicago Press.

Clore, Gerald L, Norbert Schwarz, and Michael Conway (1994), "Affective causes and consequences of social information processing." *Handbook of social cognition*, 1, 323–417.

Cole, Shawn, Thomas Sampson, and Bilal Zia (2011), "Prices or knowledge? what drives demand for financial services in emerging markets?" *The Journal of Finance*, 66, 1933–1967.

Federal Reserve Board of Governors (2008), "Wachovia case study." *Financial Crisis Inquiry Commission*.

Forgas, Joseph P (1995), "Strange couples: Mood effects on judgments and memory about prototypical and atypical relationships." *Personality and Social Psychology Bulletin*, 21, 747–765.

Gorton, Gary (1985), "Bank suspension of convertibility." *Journal of Monetary Economics*, 15, 177–193.

Gorton, Gary (1988), "Banking panics and business cycles." *Oxford Economic Papers*, 40, 751–781.

Ivković, Zoran and Scott Weisbenner (2007), "Information diffusion effects in individual investors' common stock purchases: Covet thy neighbors' investment choices." *Review of Financial Studies*, 20, 1327–1357.

Iyer, Rajkamal and Manju Puri (2012), "Understanding bank runs: The importance of depositor-bank relationships and networks." *American Economic Review*, 102, 1414–1445.

Iyer, Rajkamal, Manju Puri, and Nicholas Ryan (Forthcoming), "A tale of two runs: Depositor responses to bank solvency risk." *Journal of Finance*.

Johnson, Eric J and Amos Tversky (1983), "Affect, generalization, and the perception of risk." *Journal of personality and social psychology*, 45, 20.

Kaustia, Markku and Samuli Knüpfer (2012), "Peer performance and stock market entry." *Journal of Financial Economics*, 104, 321–338.

Kelly, Morgan and Cormac Ó Gráda (2000), "Market contagion: Evidence from the panics of 1854 and 1857." *American Economic Review*, 1110–1124.

Klapper, Leora, Annamaria Lusardi, and Georgios A Panos (2013), "Financial literacy and its consequences: Evidence from russia during the financial crisis." *Journal of Banking & Finance*, 37, 3904–3923.

Mossin, Jan (1968), "Aspects of rational insurance purchasing." *The Journal of Political Economy*, 553–568.

Ó Gráda, Cormac and Eugene N White (2003), "The panics of 1854 and 1857: A view from the emigrant industrial savings bank." *The Journal of Economic History*, 63, 213–240.

Office of Thrift Supervision (2008), "Wamu ratings of 3/343432." *Financial Crisis Inquiry Commission; Senate Permanent Committee on Investigations Exhibits*.

Ottati, Victor C and Linda M Isbell (1996), "Effects on mood during exposure to target information on subsequently reported judgments: An on-line model of misattribution and correction." *Journal of Personality and Social Psychology*, 71, 39.

Ramirez, Carlos D and Wayne Zandbergen (2014), "Anatomy of bank contagion: Evidence from helena, montana during the panic of 1893."

Sedikides, Constantine (1995), "Central and peripheral self-conceptions are differentially influenced by mood: tests of the differential sensitivity hypothesis." *Journal of Personality and Social psychology*, 69, 759.

Shapira, Zur and Itzhak Venezia (2008), "On the preference for full-coverage policies: Why do people buy too much insurance?" *Journal of Economic Psychology*, 29, 747–761.

Shiller, Robert and John Pound (1989), "Survey evidence on the diffusion of interest and information among investors." *Journal of Economic Behavior and Organization*, 12, 47–66.

Tversky, Amos and Daniel Kahneman (1973), "Availability: A heuristic for judging frequency and probability." *Cognitive psychology*, 5, 207–232.

Wakker, Peter, Richard Thaler, and Amos Tversky (1997), "Probabilistic insurance." *Journal of Risk and Uncertainty*, 15, 7–28.

Table 1: Variable Descriptions and Summary Statistics

Several datasets are merged across a number of different datasets: National Financial Capability Study (NFCS) data available in 2009 and 2012; FDIC enforcement actions (EA) available from 2007 through 2012; Summary of Deposits (SoD) data available annually in June; Census Bureau (Census) data available in 2000; and quarterly bank Call Reports. The datasets are merged based upon whether the ZIP code is within location z, defined as the 60 mile radius around a ZIP code of a bank receiving an enforcement action within the next 12 months. The NFCS data fields are only merged for years where the data is available. Panel A briefly describes the regression variables and gives the data sources. Panel B displays summary statistics of all the variables based upon the data sample on the merged dataset. Sample percentiles and standard deviations are displayed for each variable.

Panel A: Variable Descriptions

Variable	Description	Source
Respondent-level Variables		
FinLit	Financial literacy score of a respondent measured as the proportion of questions answered correctly.	NFCS
Female	Dummy variable coded as 1 if respondent is female, and 0 otherwise.	NFCS
Age	Age of respondent.	NFCS
NoCollege	Dummy variable coded as 1 if respondent did not attend college, and 0 otherwise.	NFCS
Income	Annual household income of respondent.	NFCS
Local Financial Literacy and Demographic Variables		
$\text{LocalFinLit}_{[x\text{mi},y\text{mi})}$	Average financial literacy scores of respondents location $[x,y)$ miles from the centroid of location z.	NFCS
LocalIncome	Average household income for all ZIP codes in location z.	Census
LocalPopulation	Total population for all ZIP codes in location z.	Census
Branch-level Variables		
ΔDep_t	The annual percentage change in total deposits for a bank in location z.	SoD
DepositHHI	Herfindahl-Hirschman Index based upon deposits across banks in location z.	SoD
Bank-level Variables		
EABank	Dummy variable coded as 1 if the bank receives an enforcement action in the next 12 months, and 0 otherwise.	EA
TA	Bank-level total assets.	Call Report
Loan/Deposit	Bank-level total loans-to-total deposits.	Call Report
Liquidity/TA	Bank-level cash and marketable securities-to-total assets.	Call Report
DepositCost	Bank-level interest expense on deposit accounts-to-total deposits.	Call Report

Panel B: Summary Statistics

Variable	Mean	StDev.	25th Pctl.	Median	75th Pctl.
Respondent-level Variables					
FinLit	0.621	0.283	0.400	0.600	0.800
Female	0.541	0.498	0.000	1.000	1.000
Age	44.777	15.761	31.000	45.000	58.000
NoCollege	0.296	0.457	0.000	0.000	1.000
Income ($thou)	48.660	39.286	25.000	35.000	75.000
Local Financial Literacy and Demographic Variables					
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}$	0.632	0.078	0.593	0.640	0.682
LocalIncome ($thou)	49.3	10.5	41.5	50.1	57.5
LocalPopulation (thou)	691.5	621.9	187.2	474.6	948.3
Branch-level Variables					
ΔDep_t	0.165	2.058	-0.039	0.034	0.127
DepositHHI	0.110	0.064	0.073	0.103	0.135
Bank-level Variables					
EABank	0.065	0.247	0.000	0.000	0.000
TA ($mill)	41262.6	209134.7	140.0	362.8	1483.7
Loan/Deposit	14.574	711.368	0.704	0.845	0.959
Liquidity/TA	0.101	0.117	0.030	0.061	0.127
DepositCost	0.008	0.006	0.004	0.007	0.012

Table 2: Regulatory Events

The dependent variable in the OLS regression models is the growth rate in branch-level deposits (ΔDep_t) of branches for bank i between years t to $t+1$ and in location z. Each location z is defined as area within the 60 mile radius from a branch whose parent bank received an enforcement action between years t and $t+1$. The sample period is from 2008-2011 for year t. $EABank$ is an indicator variable associated with whether the parent bank of the branch received an enforcement action. Other bank-level characteristics include total assets (TA), total loan-to-total deposit ratio ($Loan/Deposit$), cash and marketable securities-to-total assets ratio ($Liquidity/TA$), total interest expense on deposits-to-total deposits ratio ($DepositCost$), and the Herfindahl index based upon deposits over all banks within a 60 mile radius of the bank receiving the enforcement action ($DepositHHI$). All bank-level variables are measured as of June of year t. $Year \times Location$ fixed effects are included where indicated. Observations where a bank branch is closed in year $t+1$ are excluded from Model (5). Robust standard errors are double clustered on the bank and year-location levels. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:	ΔDep_t	ΔDep_t	ΔDep_t	ΔDep_{t-1}	$\Delta Dep_t^{NotClosed}$
EABank	-0.220***	-0.159***	-0.155***	-0.059	-0.116***
	(0.023)	(0.026)	(0.027)	(0.046)	(0.025)
log(TA)		-0.026**	-0.031***	-0.010	-0.029***
		(0.011)	(0.011)	(0.009)	(0.011)
Loan/Deposit		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Liquidity/TA		0.273	0.243	0.077	0.271
		(0.396)	(0.411)	(0.213)	(0.438)
DepositCost		-33.974***	-35.683***	-10.520**	-35.619***
		(8.167)	(8.496)	(4.535)	(9.276)
DepositHHI		0.365**			
		(0.155)			
ln(LocalIncome)		-0.048			
		(0.030)			
ln(LocalPopulation)		0.019***			
		(0.006)			
Year FEs	NO	NO	YES	YES	YES
Year × Local FEs	YES	YES	NO	NO	NO
N	1367572	1361423	1361691	1299381	1286444
Adjusted R^2	0.41%	1.54%	1.66%	0.50%	1.74%

Table 3: Depositor Runs and Financial Literacy

The dependent variable in the OLS regression models is the growth rate in branch-level deposits (ΔDep_t^{EA}) of branches for bank i receiving an enforcement action between years t to $t+1$ and in location z. $LocalFinLit_{[}x\text{mi}, y\text{mi})$ is the average financial literacy score of all survey respondents located between from x but below y miles from the bank branch during the same year. All control variables from Table 1 are included in the specifications. $Year$ and $Year \times Bank$ fixed effects are included where indicated. Robust standard errors are double clustered on the bank and year-location levels. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

Dependent Variable:	(1) ΔDep_t^{EA}	(2) ΔDep_t^{EA}	(3) ΔDep_{t-1}^{EA}	(4) ΔDep_t^{EA}	(5) ΔDep_t^{EA}
LocalFinLit$_{[0\text{mi},15\text{mi})}$	0.271***	0.185**	0.042	0.228***	0.235***
	(0.080)	(0.083)	(0.061)	(0.089)	(0.073)
LocalFinLit$_{[15\text{mi},30\text{mi})}$				-0.056	
				(0.091)	
log(TA)		0.002	-0.006	0.002	
		(0.008)	(0.009)	(0.008)	
Loan/Deposit		0.002	-0.024	0.003	
		(0.035)	(0.020)	(0.039)	
Liquidity/TA		0.042	-0.018	0.034	
		(0.175)	(0.203)	(0.181)	
DepositCost		-10.095	6.641	-10.162	
		(6.270)	(7.722)	(6.312)	
DepositHHI		-0.370**	-0.056	-0.457**	-0.085
		(0.150)	(0.082)	(0.189)	(0.125)
ln(LocalPopulation)		0.003	0.011	0.002	0.030**
		(0.011)	(0.012)	(0.011)	(0.013)
ln(LocalIncome)		0.044	0.047	0.040	0.048
		(0.042)	(0.043)	(0.044)	(0.061)
Year FEs	YES	YES	YES	YES	NO
Year × Bank FEs	NO	NO	NO	NO	YES
N	6861	6852	7943	6752	6852
Adjusted R^2	1.02%	1.49%	0.22%	1.53%	9.08%

Table 4: Validation Tests

The dependent variable in the OLS regression models is the growth rate in branch-level deposits (ΔDep_t^{EA}) of branches for bank i receiving an enforcement action between years t to $t+1$ and in location z. $LocalFinLit_{[}xmi, ymi)^k$ is the average financial literacy score of all survey respondents belonging to category k located between from x but below y miles from the bank branch during the same year. Categories k for Models (1) and (2) include if the respondent has a checking account ($Check$); has a checking and savings account ($Check, Save$); has a checking but not a savings account ($Check, NoSave$); does not have a checking account ($NoCheck$). The remaining categories include respondents with checking accounts that have a low level of investments ($LowInvest$); have a high level of investments ($HighInvest$); compared rates on their most recent credit card ($Compare$); and did not compare rates on their most recent credit card ($NoCompare$). All control variables from Table 1 are included in the specifications. $Year \times Bank$ fixed effects are included in all specifications. Robust standard errors are double clustered on the bank and year-location levels. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

Dependent Variable:	(1) ΔDep_t^{EA}	(2) ΔDep_t^{EA}	(3) ΔDep_t^{EA}	(4) ΔDep_t^{EA}
$\text{LocalFinLit}^{Check}_{[0\text{mi},15\text{mi})}$	0.310***			
	(0.098)			
$\text{LocalFinLit}^{Check,Save}_{[0\text{mi},15\text{mi})}$		0.256**		
		(0.105)		
$\text{LocalFinLit}^{Check,NoSave}_{[0\text{mi},15\text{mi})}$		0.023		
		(0.038)		
$\text{LocalFinLit}^{NoCheck}_{[0\text{mi},15\text{mi})}$	0.046	0.052		
	(0.044)	(0.043)		
$\text{LocalFinLit}^{LowInvest}_{[0\text{mi},15\text{mi})}$			0.168**	
			(0.080)	
$\text{LocalFinLit}^{HighInvest}_{[0\text{mi},15\text{mi})}$			0.190**	
			(0.090)	
$\text{LocalFinLit}^{Compare}_{[0\text{mi},15\text{mi})}$				0.238***
				(0.087)
$\text{LocalFinLit}^{NoCompare}_{[0\text{mi},15\text{mi})}$				0.008
				(0.047)
Control Variables	YES	YES	YES	YES
Year × Bank FEs	YES	YES	YES	YES
N	5649	5434	4496	6627
Adjusted R^2	8.99%	8.94%	11.15%	9.21%

Table 5: Risk Aversion

The dependent variable in the OLS regression models is the growth rate in branch-level deposits (ΔDep_t^{EA}) of branches for bank i receiving an enforcement action between years t to $t+1$ and in location z. $LocalFinLit_{[}xmi, ymi)^k$ is the average financial literacy score of all survey respondents belonging to category k located between from x but below y miles from the bank branch during the same year. Categories k include respondents with checking accounts that have high risk aversion ($HighRA$); medium risk aversion ($MediumRA$); low risk aversion ($LowRA$); and a low level of investments ($LowInvest$). All control variables from Table 3 are included in the specifications. $Year \times Bank$ fixed effects are included in all specifications. Robust standard errors are double clustered on the bank and year-location levels. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

Dependent Variable:	(1) ΔDep_t^{EA}	(2) ΔDep_t^{EA}	(3) ΔDep_t^{EA}	(4) ΔDep_t^{EA}	(5) ΔDep_t^{EA}
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{HighRA}$	0.138***			0.166***	
	(0.046)			(0.060)	
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{MediumRA}$		0.047		0.036	
		(0.067)		(0.081)	
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{LowRA}$			0.039	0.027	
			(0.041)	(0.041)	
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{HighRA,LowInvest}$					0.151***
					(0.045)
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{MediumRA,LowInvest}$					0.109
					(0.095)
$\text{LocalFinLit}_{[0\text{mi},15\text{mi})}^{LowRA,LowInvest}$					-0.053
					(0.046)
Control Variables	YES	YES	YES	YES	YES
Year × Bank FEs	YES	YES	YES	YES	YES
N	6505	6849	6249	5988	4401
Adjusted R^2	9.44%	9.03%	8.68%	9.21%	11.35%

Table 6: Deposit Flows in Neighboring Banks

The dependent variable in the OLS regression models is the growth rate in branch-level deposits (ΔDep_t) for bank i within location z based upon four distance groups. For each location z, bank branches are categorized based upon whether the a bank branch is located within distance $d \in \{[0, 15), [15, 30), [30, 45), [45, 60)\}$ miles from the EA bank branch in location z. For each bank i from years t to $t+1$, the growth rates are calculated over all branches for distance d in location z. The sample period is from 2008-2011 for year t. $LocalFinLit$ is the average financial literacy score of respondents within distance d. $NonEABank_{d=[0mi,15mi)}$ is an indicator variable associated with whether a non-EA bank is located within a 15 mile radius of the EA bank branch. All control variables from Table 3 are included in the specifications. $Year \times Location$ and $Year \times Bank$ fixed effects are included where indicated. Observations where bank branches is located farther than 30 miles from the EA bank are excluded from Models (3) and (6). Robust standard errors are double clustered on the bank and year-location levels. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Subsample:	<60mi	<60mi	<30mi	<60mi	<60mi	<30mi
Dependent Variable:	ΔDep_t	ΔDep_t	ΔDep_t	ΔDep_t	ΔDep_t	ΔDep_t
$\text{NonEABank}_{d=[0\text{mi},15\text{mi})}$		0.113***	0.110***	0.101***	0.256***	0.240**
		(0.027)	(0.026)	(0.031)	(0.093)	(0.095)
EABank	-0.305***	-0.220**	-0.224**			
	(0.098)	(0.097)	(0.097)			
LocalFinLit	0.034	0.001	0.016		0.192**	0.207**
	(0.081)	(0.083)	(0.090)		(0.093)	(0.104)
LocalFinLit × EABank	0.253*	0.270*	0.276*			
	(0.153)	(0.152)	(0.154)			
$\text{LocalFinLit} \times \text{NonEABank}_{d=[0\text{mi},15\text{mi})}$					-0.252*	-0.243*
					(0.138)	(0.147)
log(TA)	-0.028***	-0.026***	-0.029***			
	(0.010)	(0.010)	(0.011)			
Loan/Deposit	0.000	0.000	0.000			
	(0.000)	(0.000)	(0.000)			
Liquidity/TA	0.420	0.408	0.432			
	(0.447)	(0.443)	(0.460)			
DepositCost	-30.066***	-30.524***	-31.227***			
	(9.056)	(9.112)	(9.377)			
ln(LocalIncome)	-0.037***	-0.004	-0.006	-0.008	-0.008	-0.005
	(0.010)	(0.007)	(0.007)	(0.008)	(0.008)	(0.006)
ln(LocalPopulation)	-0.056	-0.022	-0.033	-0.078	-0.084	-0.056
	(0.078)	(0.075)	(0.072)	(0.071)	(0.073)	(0.058)
Year × Local FEs	YES	YES	YES	YES	YES	YES
Year × Bank FEs	NO	NO	NO	YES	YES	YES
N	1416598	1416598	1341800	1420363	1419095	1344780
Adjusted R^2	1.44%	1.49%	1.52%	63.20%	63.21%	65.97%

Table 7: Social Determinants of Financial Literacy

The dependent variable in the OLS regression models is the financial literacy score ($FinLit_t$) of survey respondent i. $PeerFinLit_{[}x\text{mi}, y\text{mi})$ for each respondent is the average financial literacy score of neighboring respondents located from x but below y miles from respondent i in the same year. $PeerFinLit_{[}0\text{mi}, 15\text{mi})^{SameCat}$ is the average financial literacy score of neighboring respondents that have the same categorical demographic attributes as respondent i, while $PeerFinLit_{[}0\text{mi}, 15\text{mi})^{NotSameCat}$ is that for nearby respondents with dissimilar categorical demographic attributes. The categorical attributes include: whether the respondent is female, is under 65 years of age, did not attend college, and has a household income under $35 thousand. The respondent's characteristics include an indicator variables based upon whether the respondent is female ($Female$), the respondent's age (Age), an indicator variable based upon whether the respondent did not attend college ($NoCollege$), and the respondent's household income ($Income$). The local demographic characteristics include the proportion of the population located witin 15 miles of the respondent that is female ($\%Female$), retired ($\%Retired$), did not attend college ($\%NoCollege$), and earns less than $35,000 annually ($\%LowIncome$). $Year$ fixed effects are included in all specifications. Robust standard errors are clustered on the ZIP code level. Statistical significance at the 10%, 5%, and 1% levels are denoted with *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	$FinLit_t$	$FinLit_t$	$FinLit_t$	$FinLit_t$	$FinLit_t$	$FinLit_t$
PeerFinLit$_{[0\text{mi},15\text{mi})}$	0.434***	0.262***	0.197***	0.137***	0.134***	
	(0.020)	(0.017)	(0.021)	(0.019)	(0.019)	
PeerFinLit$_{[15\text{mi},30\text{mi})}$					0.028*	
					(0.016)	
PeerFinLit$^{SameCat}_{[0\text{mi},15\text{mi})}$						0.252***
						(0.018)
PeerFinLit$^{NotSameCat}_{[0\text{mi},15\text{mi})}$						0.066**
						(0.031)
Female		-0.112***		-0.111***	-0.111***	-0.090***
		(0.002)		(0.002)	(0.002)	(0.004)
ln(Age)		0.147***		0.144***	0.143***	0.135***
		(0.003)		(0.003)	(0.003)	(0.005)
NoCollege		-0.155***		-0.144***	-0.143***	-0.109***
		(0.003)		(0.003)	(0.003)	(0.005)
ln(Income)		0.013***		0.012***	0.012***	0.011***
		(0.000)		(0.000)	(0.000)	(0.000)
%Female			-0.447***	-0.276***	-0.279***	-0.334***
			(0.077)	(0.074)	(0.074)	(0.096)
%Retire			0.312***	0.134***	0.138***	0.132***
			(0.029)	(0.027)	(0.027)	(0.037)
%NoCollege			-0.289***	-0.169***	-0.169***	-0.163***
			(0.013)	(0.011)	(0.011)	(0.014)
ln(LocalIncome)			0.056***	0.028***	0.027***	0.028***
			(0.006)	(0.005)	(0.005)	(0.005)
ln(LocalPopulation)				-0.006***	-0.006***	-0.006***
				(0.001)	(0.001)	(0.002)
Year FEs	YES	YES	YES	YES	YES	YES
N	45801	45801	44363	44293	43800	26723
Adjusted R^2	1.41%	22.96%	5.16%	24.03%	24.02%	23.39%

Appendix. Financial Literacy Questions from NFCS

The questions in the National Financial Capability Study related to financial literacy are listed below:

1. Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?
   (a) More than $102
   (b) Exactly $102
   (c) Less than $102
   (d) Don't know
   (e) Prefer not to say
2. Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?
   (a) More than today
   (b) Exactly the same
   (c) Less than today
   (d) Don't know
   (e) Prefer not to say
3. If interest rates rise, what will typically happen to bond prices?
   (a) They will rise
   (b) They will fall
   (c) They will stay the same
   (d) Don't know
   (e) Prefer not to say
4. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less.
   (a) True
   (b) False
   (c) Don't know
   (d) Prefer not to say
5. Buying a single company's stock usually provides a safer return than a stock mutual fund.
   (a) True
   (b) False
   (c) Don't know
   (d) Prefer not to say