Capital Mobility and Regulation Frictions: Evidence from U.S. Lottery Winners

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Abstract

I empirically analyze how banks reallocate capital across lending markets following funding shocks. I exploit a new source of quasi-experimental variation in bank funding from lottery winners. Exposure to jackpot shocks leads to a significant increase in both deposits and lending at the bank level. Funds are transmitted across markets, but allocations are five times greater in the state in which the shock occurs. Features of banking regulation (Section 109) negatively affect fund mobility and loan performance. These results suggest that state boundaries matter for capital mobility in part because of regulatory distortions.

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The banking system in the United States has gone through significant changes since the last part of the 20th century. In particular, the removal of restrictions on banks' ability to expand across geographical markets has led to a more consolidated banking system, which is dominated by banking organizations that can gain an advantage by operating across state lines (Kroszner and Strahan, 2014). This process of consolidation has fostered the role that banks play in integrating the local credit markets to efficiently allocate capital. Given recent interest in the role of capital allocation in macroeconomics and industrial organization (e.g., Foster et al. 2008; Hsieh and Klenow 2009), understanding how banks allocate capital is a first-order question.

This paper explores how multimarket banks reallocate capital, following an exogenous increase in funding, and evaluates potential mechanisms that affect fund mobility. The ideal experiment for answering these questions would be to randomly assign funding across banks in different markets. The new quasi-experimental design that this paper exploits offers a close alternative to the ideal experiment: I study jackpot winners of Powerball (PB) and Mega Millions (MM) lotteries.

The empirical design takes advantage of the fact that a winner in a specific location and at a specific time is randomly assigned, conditional on the sale of lottery tickets.[1] In addition, the prize amount is random.[2] At the bank level, the approach exploits banks' exposure to a winner's location (i.e., a winner's ZIP code). Specifically, it uses the fact that the retailer's address, where a winning ticket is sold, is public information and that players usually live close to where they buy their lottery tickets.[3] Thus, it is plausibly exogenous that a bank has a presence (branch) in the winner's ZIP code, conditional on bank size. In addition, to conduct my analysis, I hand-collected a dataset containing information about all MM and PB jackpot winners (e.g., the location, claiming date, and amount of the winnings). Furthermore, the empirical strategy (with funding shocks in more than 40 states) allows me (1) to provide new insights on how fast banks change their credit supply (if at all) following increases in funding availability and (2) to trace the shock throughout banks' entire organization. It also enables me to account for local credit demand by comparing loan originations for banks exposed to the jackpot shock to those for

[1]Because every lottery ticket has an equal chance of being the winning ticket, the probability of selling a winner is a linear function of lottery sales for a particular game.

[2]The mean jackpot prize was $46.56 million (in 2013 dollars) after tax withholdings.

[3]For instance, the Powerball website (http://www.powerball.com) states the following: "The vast majority of winning tickets are purchased by someone who is close to the lottery terminal where the purchase was made."

unexposed banks, while controlling for any observable and unobservable time-varying effects at the core-based statistical area (CBSA) level (e.g., demand-side effects affecting all banks within a given CBSA-year).

I have four primary findings. First, the estimates provide evidence that exposure to a jackpot shock economically and significantly increases deposits and loan origination at the bank level. In particular, these banks experience, on average, an increase in deposits of 19.48%, relative to the mean, and small business lending expands by 14.93%.[4] In addition, the effect of the shock is concentrated on small and medium-sized banks. Second, for the speed at which banks increase their lending following the windfall shock, I find a positive credit supply effect in the first two quarters of the treatment.

Third, I find that the funding shock is transmitted across different markets. However, the impact of the jackpot shock is around five times higher in the state in which the deposit shock occurs (i.e., the winner's state) relative to other states. In addition, greater resource allocation in the winner's state occurs in markets both with and without branches. Subsequently, I examine two channels to explain the greater allocation in the winner's state. The first mechanism is Section 109 of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, which requires banks to lend deposits locally in their out-of-state markets.[5] The second channel is optimal decentralization. Through this channel, frictions, such as information asymmetries, lead banks to optimally assign lending discretion to local managers, to induce effort for fundraising deposits. My results support the first channel. In particular, I find that the increase in lending within the winner's state only occurs in out-of-state markets, where Section 109 applies. Also, capital allocations following the jackpot shock are greater in states in which the Section 109 constraint presumably binds more (i.e., where banks must lend a greater fraction of deposits locally).[6]

Fourth, I find that exposure to jackpot shocks deteriorates banks' loan performance. In addi-

[4] At the local level, I find that the jackpot shock leads to a significant economic increase in deposits (3.13%) and small business lending (3.71%) at the CBSA level.

[5] Out-of-state markets are those in which the local market is in a different state from the bank's home state.

[6] Under Section 109, the bank is subject to a loan-to-deposit ratio test, in which the bank's statewide operations are compared to the host state's loan-to-deposit ratio. I find that, on average, loan originations are larger following a funding shock in states with greater loan-to-deposit ratios. Also, this channel can help explain the average increase in lending in the first year of treatment; this may be because the bank is subject to yearly tests of Section 109 compliance.

tion, Section 109 appears to increase loan losses.[7] However, waning loan portfolio performance is not persistent: it generally only occurs in the year of the shock. Furthermore, this finding holds for different measures of loan performance, and the estimates show no evidence of pre-trends for the different measures.

My empirical strategy identifies the effect of a jackpot shock on deposits and on loan originations under the assumption that the outcomes, such as lending, would have similarly evolved for banks with and without exposure to the jackpot shock. To test the validity of this assumption, I conduct a range of robustness checks. First, I do not find evidence of pre-trends in the different outcomes or datasets, both at the local level and at the bank level. Second, I conduct a series of placebo tests exploiting the instances in which winners are randomly assigned, but the prize remains unclaimed, the winner chooses the annuity option, or the winner lives in a state other than where the winning ticket was sold.[8] I find no statistically significant effects from these specific shocks. To provide additional evidence to support the empirical design, I exploit the geographical variation in the data to estimate the impact of the jackpot shock on deposits in different markets, and I only find a positive impact on deposits in the jackpot winner's location. In addition, I find that the impact of a jackpot shock on deposits and lending is greater for the larger jackpot prizes.[9]

This paper is related to several distinct literatures. First, I contribute to the literature that studies how banks integrate local credit markets. In an integrated banking system, local economies can be shielded from credit supply shocks by importing capital from other markets. Cortés and Strahan (2017) find that banks move capital toward markets that experience an increase in credit demand in response to natural disasters and away from other markets (especially those without a branch presence).[10] However, Loutskina and Strahan (2015) find that

[7]Another potential mechanism is the free cash flow hypothesis, which states that financial frictions can constrain empire-building managers from overinvesting (Jensen, 1986). However, the evidence is inconsistent with this channel. For example, loan losses only occur in banks exposed to shocks and in states in which Section 109 presumably constrains the most, but the free cash flow hypothesis should be independent of the host ratio rule from Section 109.

[8]The jackpot winner can choose between an annuity or a cash option. The annuity option is paid in 30 installments over 29 years.

[9]Also, the estimates are robust to different specifications for the treatment variable, alternative geographical units of analysis, among others.

[10]Cetorelli and Goldberg (2012) provide evidence that multinational banks shift funds between parent banks and their affiliates in diverse foreign markets to overcome liquidity shocks.

financial integration, fostered by the growth of securitization, amplified the housing price shocks during the housing boom when banks moved funds from low-appreciating housing markets and into high-appreciating housing markets within their own branch networks. Chakraborty et al. (2018) find evidence consistent with the movement of capital away from commercial lending and into mortgage lending during the housing boom. I contribute to this literature by showing that although banks move capital across markets, funds are, to a greater extent, allocated to the states that provide the funds (i.e., winner states) and that part of the current regulation drives the importance of state boundaries for fund mobility.

This paper is particularly close to that of Gilje et al. (2016), who find that banks that were exposed to exogenous increases in inflows from shale oil booms increased mortgage lending in nonshale locations, but only in markets with a branch presence. My paper supports the finding of Gilje et al. (2016). I show that banks, in response to an increase in funding availability, expand their loan originations across markets. However, I also show that, to a greater extent, funds are allocated to states where the jackpot shock occurs (in markets both with and without branches) and that Section 109 has an important effect on the role state boundaries play in capital mobility. The distortions to the flow of capital documented here are particularly important, because they imply that part of the regulatory framework diminishes the improvements in the integration of lending markets made by the banking deregulations of the past 30 years and the growth of securitization.

Second, this paper also relates to the large literature that studies the effects of the deregulation of the banking industry that started in the 1980s. Eliminating geographic restrictions on bank expansions came with many benefits. For example, deregulation positive affected the banking industry by reducing noninterest costs and loan losses (Jayaratne and Strahan, 1998; Black and Strahan, 2001). It also favorably affected the economy by increasing entrepreneurial activity (Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009), increasing economic growth (Jayaratne and Strahan, 1996), reducing economic volatility (Morgan et al., 2004; Demyanyk et al., 2007) and tightening the distribution of income (Beck et al., 2010). I contribute to this literature by providing the first evidence that part of the 1994 Interstate Act (Section 109) has an important, negative effect on the flow of capital across markets and, as a consequence, weakens the diversification that financial integration provides and potentially reduces efficiency in capital allocations.

Third, this paper also relates to a much broader literature studying the productivity differences across countries due to misallocation of capital and labor (see, e.g., Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009; Banerjee and Moll, 2010; Buera et al., 2011; Bartelsman et al., 2013; Asker et al., 2014; Hsieh and Klenow, 2014). Recent work shows that capital appears to be misallocated (within a sector) in developing countries, but not in the United States (Whited and Zhao, 2016). This paper contributes to this literature by offering suggestive evidence that capital might be misallocated in the United States and that part of the distortions to capital mobility are a consequence of the regulatory framework.[11]

This paper is organized as follows: Section 1 provides some background on U.S. lotteries, and Section 2 provides details about the data sources. Section 3 explains the research design, and Section 4 presents my main findings. Sections 5 and 6 elaborate on the mechanism of and the consequences of a funding shock, respectively. Section 6 provides additional robustness checks. Section 7 concludes.

1 U.S. Jackpot Lottery Games

There is no national lottery in the United States. The introduction of government-sponsored lotteries began in Puerto Rico, a territory of the United States, in 1934, followed by New Hampshire in 1964. Currently, lotteries are established in 44 states, the District of Columbia, and Puerto Rico. Powerball and Mega Millions are two U.S. jointly shared jackpot games offered in 44 states. The six remaining non-participating states do not operate state lotteries by law.[12] Figure 1 shows those states that offer both Mega Millions and Powerball as of June 2013.

[11] This paper is also related to the literature that documents the bank lending channel (e.g., Peek and Rosengren, 1997; Kashyap and Stein, 2000; Campello, 2002; Ashcraft, 2006; Loutskina, 2011; Schnabl, 2012). Some research examines the link between shocks to the liability side of banks' balance sheets and lending to firms (Khwaja and Mian, 2008; Paravisini, 2008; Plosser, 2014; Gilje et al., 2016; Gilje, 2017; Iyer and Peydro, 2011). I contribute to this literature by providing novel evidence on how funding shocks transmit across different lending markets and the speed at which banks respond to these shocks.

[12] On October 13, 2009, the Powerball and the Mega Millions consortium signed an agreement to allow U.S. lotteries to sell both games, thereby no longer requiring exclusivity. The expansion occurred on January 31, 2010, as 10 Mega Millions member states began selling Powerball tickets for their first drawing on February 3, 2010. The day before this, 23 Powerball members began offering Mega Millions tickets for their first drawing on February 2, 2010. Throughout 2010, Arizona, Colorado, Maine, Montana, Nebraska, Oregon, and South Dakota started offering Mega Millions. Louisiana joined Mega Millions in 2011. Alabama, Alaska, Hawaii, Mississippi, Nevada, and Utah do not have state lotteries.

[INSERT FIGURE 1 HERE]

Powerball is a shared jackpot game. It is coordinated by the Multi-State Lottery Association (MUSL), a non-profit organization formed by an agreement among various state lotteries. Powerball's current minimum advertised jackpot is $40 million in the form of an annuity. There is no maximum jackpot for the Powerball. The jackpot increases when no jackpot ticket is sold. In Powerball, winning numbers are drawn as follows: a drawing machine randomly draws five white balls from 59 numbered white balls, and another drawing machine randomly draws one red ball from 35 numbered red balls. The jackpot is won by matching all five white balls in any order along with the red "powerball." The odds of winning the jackpot are 1 in 175,223,510.[13]

Mega Millions has a minimum jackpot of $15 million in the form of an annuity. In Mega Millions, five white balls are drawn randomly from a machine loaded with 75 numbered white balls, and a single gold "mega ball" is drawn randomly from a machine loaded with 15 numbered gold balls. Players can win the jackpot by matching all six winning numbers in a single drawing. The current odds of winning the jackpot are 1 in 258,890,850.

The jackpot winner can choose between an annuity and a cash option. The annuity option is paid in 30 installments over 29 years. The cash option is a lump-sum payment that is the approximate present value of the 30 installments. If a player chooses the cash option, then the lottery will pay the entire cash amount to the winner, less income tax withholding amounts as required by federal and state laws. The winner has between 90 days to one year to claim the prize depending on the state lottery. After that period, the prize becomes unclaimed.

To claim a jackpot, players must verify that the ticket is actually a winning ticket at the lottery headquarters in their state. There is normally a 15-day waiting period before a prize can be paid.[14] This waiting period allows all participating states to balance their sales and prize amounts and arrange for funds to enable the payout. However, this waiting period depends on individual states' lotteries. For example, California requires a waiting period of 6 to 8 weeks after the jackpot winner submits a claim.[15] After a valid claim is submitted, the lottery pays

[13] Currently, each ticket costs $2. Prior to January 15, 2012, the games cost $1 each.

[14] The date at which the winner claims the prize can be extracted from the dates of lottery press releases.

[15] I gathered data on the various waiting periods from conversations with representatives of more than half of the U.S. state lotteries. In some cases, if winners claim the prize after two weeks, they can receive the jackpot in their bank account the following day. I contacted all the state lotteries, and, for states that did not reply, I assume a 15-day waiting period depending on the date the winner claimed the prize and the date of the game.

the winner. If winners choose the lump-sum payment, they receive the prize minus withheld taxes. In addition, payment methods vary by state. Based on my conversations with lottery representatives, more than half of state lotteries offer a wire transfer to remit prize money to winners. Some also offer to pay by check, which in most states, is mailed to the winner. The lottery representatives' prior is that winners deposit the winnings in their existing bank accounts in their respective cities.[16] Finally, according to lottery representatives, winners usually buy their tickets close to where they live. However, one can be visiting a state that is not their home state and still play the lottery in that state. Fortunately, the data about the winner's state of residence is usually available in the lottery press releases.

All, except for five, state lotteries have laws that require them to release, on request, the winners' names and cities of residence; the location of the retailer who sold the winning ticket; the game title; the drawing date; and the amount won.[17] Sometimes there are multiple winners in different states, and, in those cases, all winners share the prize equally.

2 Data

The U.S. lotteries jackpot winners' dataset is hand-collected. It is derived from different public sources and complemented with data from my discussions with representatives from various state lotteries.[18] The dataset contains the data of all jackpot winners for the period from 2002 to 2013 for Mega Millions and for the period from 2003 to 2013 for Powerball.[19] The dataset includes whether the prize was claimed; whether the winner chose the cash option or the annuity option; the date of the game; the date when the prize was claimed; the approximate date the winner received the prize; the name and city of residence; the ZIP code of the retailer; and federal and state tax rates, among other information.

[16]This prior can be tested at the local level (see section 4.2.1).

[17]Delaware, Kansas, Maryland, North Dakota, Ohio, and South Carolina allow the winner to remain anonymous (i.e., they are not required to release the ticket buyer's name). However, these states reveal the name and location of the retailer who sold the winning ticket as well as information about the winning game, date of sale, and the prize amount.

[18]I contacted all the state lotteries that offer both Powerball and Mega Millions and other industry representatives (e.g., North American Association of State & Provincial Lotteries (NASPL)). I received responses from 23 state lotteries.

[19]May 2002 is the starting date of Mega Millions, because this is when the current game name and format (game matrix and prize amounts) were introduced. In the case of Powerball, 2003 is the earliest year for which I could gather all the data for jackpot winners.

To study the impact of the jackpot money as a shock in the supply of funding, I exploit data from the Summary of Deposits (SOD), which is the annual survey of branch office deposits for all Federal Deposit Insurance Corporation (FDIC)-insured institutions. The SODs provide the branch office deposits as of June 30 of every year.[20] The sample begins in 1999, three years before the first jackpot shock, and ends in 2013.

The lending data come from the Community Reinvestment Act (CRA) disclosure and from the aggregate reports from the Federal Financial Institutions Examination Council (FFIEC). The CRA requires that banks above a certain asset threshold report small business lending each year and by Census tract. Prior to 2005, the asset threshold was $250 million and is adjusted with the consumer price index (CPI).[21] CRA disclosure reports provide data by bank, county, CBSA, and year. The CRA provides data of the total dollar amount of small business loan origination, defined as loans under $1 million. I use the data from 1999 to 2013.

It is worth noting that looking at the impact of the funding shock on small business lending is of interest because if firms have costless access to external capital markets, then their functioning should be insensitive to the shocks experienced by capital providers. And the literature acknowledges that banks have an important role in mitigating frictions (asymmetric information) in particular for small firms (e.g., Cole, 1998; Berger and Udell, 1995; Hoshi et al., 1990; Brevoort et al., 2010).

Lastly, to complement the CRA data, I use the Report of Condition and Income or Call Report for the period between 1999 and 2013.

2.1 Jackpot Winners Descriptive Statistics

Table 1 shows a summary of the statistics related to the jackpot winners over the period from 2002 to 2013 for Mega Millions (MM) and 2003 to 2013 for Powerball (PB) (up to June 2013). The 303 jackpot winners are almost evenly split between MM (157) and PB (146). These winners are located across 41 states, from the 43 states that offered the games during the time period. PB has jackpot winners in 39 states, and MM has winners in 16. In addition, the winners are spread across 212 counties and 298 ZIP codes.

[20] To estimate the deposits at the CBSA level, I sum all the branch deposits in each CBSA-year.

[21] The asset threshold from 2013 is $1.186 billion. In addition, 86% of total lending in this market comes from these banks (Greenstone et al., 2014).

[INSERT TABLE 1 HERE]

Figure 2 is a map of the United States with shading for those counties in which there was a jackpot winner over the period of the dataset. Of the 303 jackpot winners, 282 (93.07%) chose the cash option, and the remaining 21 (6.93%) chose the annuity option or failed to claim their winnings. Most of the winners (274 or 90.43%) bought their winning tickets in their states of residence. The mean jackpot prize was $46.56 million (in 2013 dollars) after tax withholdings. The mean prize is similar between the two games: $45.53 million for MM and $47.46 million for PB (see Appendix Table 1). Finally, in the full years in the sample (2003–2012), the winners are also evenly distributed over this period, with 27.9 jackpot winners per year between both games (see Appendix Table 1).

[INSERT FIGURE 2 HERE]

Appendix Table 2 reports the summary statistics on CBSA average pre-treatment characteristics from 1994 to 2001 depending on whether the CBSA was home to a jackpot winner. Since each lottery ticket has an equal chance of winning, the probability of selling a winning ticket is a linear function of lottery sales. And, most likely, lottery sales are higher in locations with greater populations. Thus, not surprisingly, CBSAs with winners have larger populations. However, there does not seem to be a difference in other demographic characteristics and previous deposit growth. To further assess whether there are pre-treatment differences, Appendix Table 3 presents a series of randomization checks. Column 1 reports results from an OLS regression of a jackpot winner indicator on demographic characteristics and deposit growth. Column 2 shows the results of using log(prize) instead of a winner dummy. As expected, only population is associated with receiving the jackpot shock. None of the other variables are significantly related to the jackpot shock. A joint F-test of the hypothesis that all coefficients, excluding the variable population, are equal to zero have a p-value of 0.60 in column 1 and 0.59 in column 2. These results support that the jackpot shock is randomly assigned.

3 Research Design

The ideal experiment to estimate the impact of funding shocks is to randomly assign funds across banks in different locations. The quasi-experimental design that this paper exploits, which is a close alternative to the ideal experiment, is jackpot lottery winners from Powerball and Mega Millions. This is based on the observation that having a jackpot winner in a specific local area and time is a completely random shock, conditional on the sales of lottery tickets.

At the bank level, I exploit banks' exposure to the winner's location (i.e., the winner's ZIP code). The winners' addresses are not made publicly available for security reasons, but the address of the retailer who sold the winning ticket is. I take advantage of the fact that players usually live close to where they buy their lottery tickets, according to discussions with lottery representatives. Therefore, I exploit the fact that it is plausibly exogenous that the bank has a presence (branch) in the winners' ZIP code, conditional on bank size.[22] This is because the greater the bank size, the higher the chances of being treated in the setting. Thus, conditional on bank size, the exposure to the winner's shock is plausible exogenous.[23] In particular, I estimate the jackpot winners' exposure effect using the number of branches in the winner's ZIP code in the year prior to the win.[24] Also, using the bank's share of branches in the year prior to the winner's ZIP code provides similar results.[25] Finally, the empirical strategy allows tracing the windfall shock throughout banks' internal capital markets, by providing data on the location and timing of lenders exposed to the shock.

I estimate the effect of banks' exposure to the jackpot shock using a difference-in-differences estimator that compares outcomes among the banks with no exposure to the jackpot shock (the control group) and the banks with exposure to the jackpot shock (the treatment group) before

[22]It is also plausible that the bank has a prior relationship with the winner. For example, one state lottery provides this tip in their Winner's Handbook for what winners can do with their winnings: "Your current bank is a good place to start."

[23]In section 4.2, I show that this seems to be the case, since the estimates of the impact of exposure to the jackpot shock, after just controlling for the lag of bank size (assets), are unaffected by the inclusion of a set of other (lag) bank controls.

[24]The estimates using banks' exposure to the winner's location might be underestimating the effect and can be considered a lower bound of the true causal effect, since there could be cases in which the winners' ZIP code is not the same as the retailer's ZIP code, though I only focus on those cases in which the winners chose the cash option and live in the same state where the winning ticket was bought (using data available in the lottery press releases).

[25]The appendix shows these findings.

and after, using data from the Call Report. The empirical specification is as follows:

$$\triangle log(outcome_{it}) = \alpha_i + \alpha_t + \beta\, number\, branches_i \times post_{it} + \gamma' X_{it-1} + \varepsilon_{it}, \tag{1}$$

where the dependent variable is the log change of deposit (or loans) for bank i at quarter t; α_i and α_t are bank and quarter fixed effects; and X is a vector of bank-level characteristics. $number\, branches_i$ is an intensity of treatment variable of exposure to the jackpot shock and is the number of branches bank i has the year prior to the jackpot shock in the winners' ZIP code, in those cases in which jackpot winners chose the cash option and reside in the state where the winning ticket was sold, and zero otherwise. $post_{it}$ is an indicator variable that takes the value of one if quarter t falls on or after the quarter of the jackpot shock for bank i, and zero otherwise. The coefficient of interest is β, which measures the causal effect of banks' exposure to the jackpot shock. I report the standard errors clustered at the bank level to account for serial correlation and robustness to heteroskedasticity. Finally, an interesting feature of the Call Report is that the data are quarterly, a fact that allows me to exploit the data on the estimated dates on which the winners received their prizes.

The identifying assumption is that in the absence of the jackpot shock, the deposits and lending of the bank are exposed to the jackpot shock, and those with no exposure to the shock would have evolved in parallel. To partially test the identifying assumption of the analysis, in section 4.2, I present evidence to support the validity of the parallel trend assumption by showing that the outcomes for the treatment and control groups move together in the period prior to the jackpot shock. In addition, the quasi-experimental setting allows for different falsification tests to further test the identifying assumption. In particular, I exploit the cases in which there is a (randomly assigned) winner but a prize remains unclaimed, the winner chose the annuity option (i.e., 1/30 of the jackpot prize is paid when claiming the award), or the winner lives in a state other than the one in which the winning ticket is sold.

To learn about banks' internal capital allocation, I exploit the geographical variation in small business lending data in the CRA. In this case, the empirical design compares, within a given time period and CBSA, the lending behavior of banks with exposure to the jackpot shock to that of other banks with no exposure.[26] The specification is as follows:

[26] The estimates are qualitatively similar at the county-level, instead of the CBSA-level.

$$log(small\, lending_{ijt}) = \alpha_{jt} + \beta_1\, number\, branches_i + \beta_2\, number\, branches_i \times post_{it} + \gamma' X_{it-1} + \varepsilon_{ijt}, \quad (2)$$

where the outcome variable is small business lending for bank i in CBSA j in year t; α_{jt} is a vector of CBSA-by-year fixed effects; and X is a vector of bank characteristics similar to equation 1. $number\, branches_i$ is the number of branches bank i has the year prior to the jackpot shock in the winners' ZIP code, in those cases in which jackpot winners chose the cash option and reside in the state where the winning ticket was sold, and zero otherwise, and $post_{it}$ is an indicator variable that takes the value of one if year t falls on or after the year of the jackpot shock for bank i and zero otherwise. The coefficient of interest in this specification (β_2) measures the effect of banks' exposure to the jackpot shock on small business lending. The standard errors are clustered at the bank level to account for serial correlation. In addition, the battery of fixed effects control for any observable and unobservable time-varying effect at the CBSA level, including demand-side effects that affect the lending behavior of all banks within a given CBSA year. In addition, it is worth stating that the use of loan originations as the outcome variable in equation 2 is similar in spirit to using changes in total loans outstanding as a dependent variable, because the outcome is a flow variable in this case (Greenstone et al., 2014). Finally, to study how far the funding shock travels within the bank, I add interaction terms between the "tratment variable" (jackpot exposure variable interacted with the post dummy) and an indicator variable denoting whether the loan is made within the winning state, among others, to the specification in equation 2.

As a first stage of the effects of exposure to the jackpot shock on deposit, I exploit geographical variation of the SOD. Specifically, I estimate the regression of the following form:

$$\triangle log(deposits_{ijt}) = \alpha_{jt} + \beta_1\, number\, branches_i + \beta_2\, number\, branches_i \times post_{it} + \gamma' X_{it-1} + \varepsilon_{ijt}, \quad (3)$$

where the dependent variable is the log change of deposit for bank i in CBSA j in year t; α_{jt} is a vector of CBSA-by-year fixed effects; and X is a vector of bank characteristics similar to equation 1 and 2.[27] In addition, the definitions of both $number\, branches_i$ and $post_{it}$ are similar

[27] The estimated effects for deposits are similar with a specification with CBSA and year FE: $\triangle log(deposits_{ijt}) = \alpha_j + \tau_t + \beta_1\, number\, branches_i + \beta_2\, number\, branches_i \times post_{it} + \gamma' X_{it-1} + \varepsilon_{ijt}$.

to those used in equation 2. Standard errors are clustered at the bank level.

4 Empirical Findings

4.1 Descriptive Statistics

Table 2 reports the summary of the statistics related to bank level exposure to the jackpot winners over the period from 2002 to 2013. Overall, 641 banks are exposed to the jackpot shock, defined as having at least one branch in the winners' ZIP code in the year prior to the win, and 10,280 banks have no exposure to the shock. The average number of branches is 1.51, and the median is 1 branch. The average share of the branches in the winners' ZIP code is 18.2%, and the median is 12.5%.

[INSERT TABLE 2 HERE]

In terms of the bank level covariates, there seems to be difference in size (log(assets)) between both groups of banks, as expected. This is because, as previously mentioned, the greater the bank size, the higher are the chances of being exposed to the shock. For the other covariates, there seems to be a slight difference in the equity ratio variable. However, in section 4.2, I show that the estimates, after controlling for the lag of bank size, are unaffected by the inclusion of other bank covariates.

4.2 Main Results

This section presents the estimates of the effect of exposure to the shock on deposits and lending at the bank-CBSA-year level, bank-year level, and local level. In addition, I report the results of a leads and lags analysis to test for the evidence of pre-trends for the different specifications. I also exploit the geographical variation in the SOD and CRA data sets (1) as a falsification test in the case of deposits and (2), most importantly, to study how funding shocks propagate throughout banks' entire organization. Additional checks on the empirical design are in section 7.

4.2.1 Impact of the Jackpot shock on Deposits and Lending

To precisely quantify the effect of exposure to the jackpot shock on deposits, Table 3 presents estimates from the specification given by equation 3. The first column reports estimates from a baseline specification that includes the exposure to the shock variable (number of branches), the interaction of exposure to the shock variable and the post indicator, CBSA by year fixed effects, and bank size (log of bank assets) as a control. The coefficient estimate on the number of branches variable interacted with the post dummy implies that exposure to the jackpot shock leads to an average increase in deposits of 1.56 (0.0103*1.513) percentage points, a 19.48% increase from the mean (0.080), relative to banks with no exposure to the shock. Column 2 reports the estimate when including other bank controls. The point estimate is relative similar, a finding that supports the notion that conditional on banks' size, exposure to the jackpot shock is plausibly randomly assigned.

[INSERT TABLE 3 HERE]

To test the hypothesis of pre-trends in the data, Panel B of Table 3 reports the results from the specification given by equation 3 augmented with leads and lags variables. The coefficients on the lead variables are all insignificant at conventional test levels. In the year of exposure to the shock, deposits increase by an average of 1.66 percentage points, a 20.80% increase from the mean. These findings suggest that there are no pre-existing trends in the data, thereby providing partial support to the validity of the parallel trends assumption required for identification in the research design.

An additional robustness test on the empirical design, I exploit the geographical variation in the SOD data to estimate the impact of exposure to the shock in the winner CBSA and other CBSAs. We should expect the impact on deposits to be in the winner's CBSA, not in the non-treated CBSAs. I estimate a version of equation 3 interacted with winners' and non-winners' CBSA indicators. Table 3 Panel B, column 2, shows that, as expected, the positive impact on deposits is only in the winners' CBSA and also that the estimates are substantially lower and not significant in the other CBSAs.

As a further robustness check on the previous results, I estimate the impact of exposure from the specification given by equation 1 at the bank level. I use the Call Report data and exploit the quarterly frequency of the data and the exact quarter in which I estimate that the winner claims and deposits the prize. Panel A of Appendix Table 4 reports the parameters of interest. Across specifications, the estimates are precise and highly stable. Column 1 reports that exposure to the jackpot shock leads to a 0.77 average quarterly percentage point increase in deposits, a 58% increase relative to the mean (0.0132). Columns 2 reports the estimate in which the outcome variable is total loans. Exposure to jackpot shocks leads to an increase in loans of 0.65 percentage points, a 46% increase relative to the mean (0.0142). To test for the identifying assumption in the Call Report data, Panel B presents the specification in equation 1, which is augmented with leads and lags. In all cases, the estimates of exposure to shock leads variables are all insignificant and therefore reject the hypothesis of pre-existing trends.

The Call Report analysis also allows me to study how fast the funding shock is deployed in lending. Interestingly, column 2 of Panel B shows a positive credit supply impact in the first two quarters of treatment, whereas in the third quarter, the shock effect disappears. Panel B also reports the effect of the shock on real estate and C&I lending in columns 3 and 4. Loan origination increases in both categories of loans in the quarter of the shock. Interestingly, these results suggest that banks have marginal lending opportunities in both types of lending. Finally, the lack of evidence of pre-existing trends for this dataset also supports that the dates in which the winners claim their prize are reasonably well estimated.

Subsequently, I estimate the effect of the jackpot shock on small business lending at the bank-CBSA level using the CRA data and the specification in equation 2. The advantage of this empirical exercise is twofold. First, it allows me to show that increases in lending from the jackpot shock are not driven by demand-side effects. Recall that equation 2 allows controlling for any unobservable time-varying effect at the CBSA level. Second, and most importantly, it allows me to trace the windfall shock throughout banks' internal capital markets.

Panel A of Table 4 reports the parameters of interest from the specification given in equation 2. Column 1 shows that a one-standard-deviation change in exposure to the shock variable (number of branches) leads to an 14.93% (0.174*0.825) increase in small business loan originations. A possible explanation for this result is that these types of loans are harder to securitize. Thus, if the bank has marginal lending opportunities that are profitable, the jackpot shock induces a higher increase in this loan category. Additionally, column 2 reports that, similar to previous findings, including other bank controls does not affect the point estimates.

[INSERT TABLE 4 HERE]

As before, to test for pre-trends in the CRA data, Panel B, column 1, reports coefficients of the specification given in equation 2 augmented with leads and lags. The coefficients of the lead variables are insignificant, thereby rejecting the hypothesis of pre-trends in the data. In addition, the jackpot shock leads to a significant increase in lending in the year of the shock; that is, the shock effect is not persistent, a finding consistent with the previous results of the timing in the increase in lending in the Call Report data.

Lastly, in Appendix Table 5 I estimate the impact of the jackpot shock at the local level (CBSA). In particular, this analysis allows me to test the hypothesis of whether jackpot winners on average deposit their prizes at banks in their respective CBSAs. This is the prior of state lottery representatives. To do this, I use a difference-in-differences estimator at the CBSA level. I find that the jackpot shock leads to a significant increase in deposits (4.05%).[28] In addition, in Appendix Table 5, the estimates show that the jackpot shock positively affects small business lending at the CBSA level (3.71%).[29] As the table shows, these findings are robust to different specifications of the treatment variable.[30] The estimates at the CBSA level support the hypothesis that lottery winners, on average, deposit their winnings at banks in their respective CBSAs, and it also provides support for the empirical design of exploiting banks' exposure to the winner's location.

Overall, the estimates in these different datasets and specifications provide evidence that exposure to jackpot shocks have an economic and significant increase on deposits and loan origination at the bank level. In addition, I do not find evidence of pre-trends in the different outcomes, either at the local level or at the bank level. Deposits positively affect the jackpot

[28]In an untabulated test, I find that the jackpot shock does not have a significant effect on deposits and small business lending for CBSAs with a population above 500,000.

[29]In addition, in Appendix Table 5, Panel B, I find support for the identifying assumption for this analysis by, as before, there is no evidence of pre-existing trends for deposits and loan origination. Also, exploiting the multiple falsification tests provided by the setting (unclaimed and annuity prizes and winners from a different state) and finding no significant changes in deposits and lending in these instances.

[30]In an untabulated test, I test whether the increase in lending at the local level is driven by demand due to an increase in public state spending from the taxes collected on winners. To do so, I exploit the difference in state taxes, and I find no difference in the effect of the shock on the states that collect taxes relative to the states that do not.

winner's location only. These results provide support for the empirical design.[31]

4.2.2 Banks' Reallocation of Capital at Work

The evidence presented in the previous section suggests that the windfall shock potentially leads to an increase in lending across different markets. However, are the effects heterogeneous across locations? Recall that in a frictionless world, funds flow in such a way that the marginal product of capital is equated across every project within the firm. But there exist frictions (e.g., informational asymmetries) that can impede from achieving the first best. In this section, I further explore how far the funding shock travel within the banks' internal capital markets.

As a starting point to study the banks' internal capital allocation, I estimate the effect of exposure to the shock in the winner CBSA and non-winner CBSAs. To do so, I continue exploiting the annual small business lending panel from the CRA and estimate a version of the specification given in equation 2 and interacted with winners' and non-winners' CBSA indicators. Table 4, Panel B, column 2, shows the findings. Lending for both set of CBSAs significantly increases; however, the increase in lending in the winner CBSA is almost seven times the growth in the non-winner CBSAs, and the estimates are significantly different. The finding of growth in lending outside the winners' CBSA, in particular, provide further support that the increase in loan origination is not driven by demand factors. Most importantly, the finding shows that banks redistribute capital to different lending markets.

Subsequently, I estimate the effect of exposure to the shock, both within and outside of the winner's state. The state boundaries are of interest, because they are featured in the banking regulation (e.g., Section 109 of the Interstate Banking and Branching), and they also can be part of banks' internal organizational boundaries.[32] To this end, I estimate augmented versions of the baseline specification in equation 2 with winner and non-winner state indicators. Table 5 presents the results. The control variables are the same as those used in Panel B of Table 4. Column 1 of Table 5 reports that the jackpot shock effect is around five times significantly higher in the winner's state relative to the other states, whereas the funding shock estimate in states

[31] A follow-up question for the finding is whether the shock's effect differs by bank size. To this end, I estimate the baseline specification from a split analysis of whether banks are below or above the 90th percentile in size. Appendix Table 6 reports the results. The effect of the shock is concentrated in banks below the 90th percentile of the asset distribution.

[32] In the next section I elaborate on this potential channel.

other than the winner's state is positive but imprecise.

[INSERT TABLE 5 HERE]

Given the previous findings about the greater lending in the winner CBSAs, a natural question is whether the increase in loan origination in the winner's state is mostly due to the increase in the winner's CBSA and not in the other CBSAs within the same state. Column 2 shows the baseline specification interacted with separate indicators for the winner's CBSA and other CBSAs in the same state; both coefficients are economic and statistically significant. In particular, they show a significant increase in lending within the winner's state in the non-treated CBSAs. Thus, these results show that, to a greater extent, funds are allocated to states where the jackpot shock occurs.

Previous research has shown that banks reallocate capital across branches (Gilje et al., 2016). This leads to the following question: how far does the windfall shock travel in the banks' markets with and without a local unit? Panel A of Table 6 reports the estimates of the baseline specification from a split analysis of whether or not banks have branches in their respective CBSA. Similar to Gilje et al. (2016), I find that the funding shock impact on loan origination is greater in those locations in which banks have a local unit. Panel B of Table 6 reports the estimates of equation 2 interacted with the winner's state dummy for markets with and without a local unit. Column 1, shows that the funding shock impact is greater within the winner's state. Interestingly, column 2 also reports an increase in loan origination within the winner's state in those locations without branches. Thus, the funding shock impact is higher in the winner's state regardless of whether banks have a local unit.

[INSERT TABLE 6 HERE]

A follow-up question to this section's findings is whether lending behavior, following the funding shock, differs in the out-of-state markets compared with the in-state markets. The out-of-state markets are those in which the CBSA is in a state different from the bank's home state. For state banks, the home state is the state that chartered the bank, and, for national banks, it is the state in which the main office of the bank is located. This question is of interest since banks face specific regulations in their out-of-state markets. In particular, Section 109 of the

Riegle–Neal Interstate Banking and Branching Efficiency Act of 1994 requires some deposits to be lent locally.

To test whether the lending response to the funding shock differs depending on the market, I estimate the jackpot shock effect by separating the sample into in-state and out-of-state markets. Panel A of Table 7 reports the results. Column 1 shows, on average, a strong positive effect on lending in the out-of-state markets. On the other hand, for the in-state markets, column 2 shows no evidence that exposure to the jackpot shock affects loan originations.

[INSERT TABLE 7 HERE]

Subsequently, to further study the bank's internal capital allocation, similar as before, I look at the effect on lending in the winner's state depending on the market (i.e., in-state vs. out-of-state). In this case, I estimate the specification in equation 2 interacted with winner's state indicators for the split analysis on the in-state and out-of-state markets. Panel B of Table 7 presents the results. The first column shows that the increase in small- business lending comes from the CBSAs in the winner's state in the case of the out-of-state markets. However, interestingly, column 2 reports no effect on loan origination in the winner's state for the in-state markets.

The previous findings show that even though banks distribute capital across markets, funds are allocated in a relative greater extent to the markets that provide the funds (i.e., winners' states). In addition, as previously mentioned, I find a positive significant effect of the jackpot shock at the local level (CBSA) on small business lending. This raises a question about the efficiency of the capital allocation. In particular, local loan growth is potentially unlikely to be first best (e.g., the odds are low that the marginal project just happens to be in the winner's CBSA). Frictions in the bank market could potentially drive inefficient allocation of capital. In addition, understating the drivers of distortions to the flow of capital is a first-order question.

5 Potential Mechanisms

The findings in the previous sections, including the greater increase in lending following the funding shock in the winner's state and also in the out-of-state markets, provide initial support, as I further elaborate below, for Section 109 as the driver of these capital allocations. In this section, I continue exploring this regulatory channel and other potential mechanisms.

5.1 Regulatory Pressure Channel: Section 109

Section 109 prohibits a bank from establishing or acquiring branches outside its home state, primarily for deposit production, unless the bank is "reasonably helping to meet the community's credit needs." Section 109 applies to any bank that has a branch of its bank controlled by an out-of-state bank. It also provides a two-step test for determining "compliance": the first step is to conduct a loan-to-deposit (LTD) ratio test to measure the lending and deposit activities of a bank's covered interstate branches and then compare the bank's statewide LTD ratio with the host state's LTD ratio.[33] If the bank's statewide LTD ratio is at least one-half of the relevant host state's LTD ratio, the bank passes the evaluation. The second step, which is necessary if a bank fails the LTD ratio test, is to determine whether the bank is meeting the credit needs of the communities served within the host state. This step requires reviewing a bank's activities, such as its lending activity and its performance under the CRA. Finally, if a bank fails both steps of the evaluation, sanctions may be imposed: closing the interstate branch in the host state and prohibiting the bank from opening a new branch in that state.

Giving that Section 109 applies to banks with local units in their out-of-state markets. An additional test of this channel is that the increase in lending, following the funding shock, should be greater in out-of-state markets with a local unit. Appendix Table 7 reports the estimates from a split analysis of whether banks have branches in their respective out-of-state (and in-state) markets. Column 1 shows a significant increase in loan origination in out-of-state markets with branches, while column 2 shows no evidence of growth in out-of-state market without a unit.

To continue testing this channel, I exploit the yearly variation across states in the LTD ratio. Every year, the Board of Governors of the Federal Reserve System, the FDIC, and the Office of the Comptroller of the Currency (OCC) publish the host states' LTD ratios that these agencies then use to determine compliance with Section 109.

I estimate the effect of exposure to the windfall shock, depending on whether the market

[33] The host state is the state in which a covered interstate branch is established or acquired. Also, the host state LTD ratio relates to all banks that have that state as their home state and is the ratio of banks' total loans in their host state to their total deposits.

is out of state or in state, and exploit the across-state variation in the LTD ratio. To do so, I estimate the specification in equation 2 interacted with an indicator for whether the winner's state is below or above the median of the LTD ratio for each subsample (i.e., out-of-state and in-state markets).

Table 8 reports the results. Column 1 shows the results for the out-of-state markets. There is a significant difference on the effect from exposure to the deposit shock on the winner's states below and above the median of the host ratio.[34] In particular, the increase in lending is greater in the winner's state in which the host ratio is higher than the median, relative to the growth in lending in those winner's states below the median. Interestingly, column 2 shows no significant differences for the in-state markets. The difference between markets above and below is not significant because of the imprecise estimates in the markets below the median of the host ratio.

[INSERT TABLE 8 HERE]

These findings provide further support for the regulatory channel as one of the drivers of greater allocation of capital in the states that receive the funds. The story in this case is that the LTD ratio constraint, keeping everything else constant, could bind in those states above the median. This would pressure banks to allocate a greater amount of capital where the funds are raised (in this case the winner's state). However, this regulatory channel should matter only in the out-of-state markets, and not the in-state markets, which is also consistent with the above results.

5.2 Optimal Decentralization Channel

Previous research has shown that when soft information is important (e.g., small-business lending), some level of decentralization in lending is optimal (Stein, 2002). In particular, the advantage of decentralization, as an organizational design, is that it strengthens the research incentives of line managers. In the case of full decentralization, line managers have the power to allocate

[34] The Wald test in this case is the following: let β_1 and β_2 denote the first and second coefficient of Table 8, respectively. To test $H_0 : \beta_1 - \beta_2 = 0$, the Wald statistic is: $W = (\beta_1 - \beta_2)^2 \{Var(\beta_1) + Var(\beta_2) - 2Cov(\beta_1, \beta_2)\}^{-1} \sim \chi^2$ under H_0. For the first regression, we have: $W = (0.5006 - 0.3878)^2 \{0.0088 + 0.0113 - 2(0.0087)\}^{-1} = 4.59$ with p-value 0.0322. For the second regression, we have: $W = (0.3130 - 0.0366)^2 \{0.0380 + 0.0571 - 2(0.0197)\}^{-1} = 1.37$ with p-value 0.2425.

their unit's funds as they see fit, and thus they know that their research efforts will not be wasted.[35]

Similarly, it can be the case that frictions, such as information asymmetries, lead banks to optimally assign lending discretion to local managers to induce efforts for fundraising deposits: an "eat what you kill" model of branch banking.

The previous section's findings of the increase in lending in the winner's CBSA and the winner's state following exposure to the deposit shock are consistent with this channel.[36] For example, local managers (in the winner's CBSA) could have discretion to allocate the funds, or regional managers (in the winner's state) could have the power to assign capital to their state.

However, if this is the case, then why is the increase in lending greater in those winners' states where the host ratio is above the median? Decentralization of the lending decision should be independent of the state's host ratio, and thus there should be no significant differences in lending across states depending on the Section 109 test. Therefore, the evidence so far seems consistent with a regulatory pressure mechanism.

On the other hand, the greater allocation of capital within the winner's state can be simply due to proximity to the treated branches. Specifically, bank units located closer to borrowers are more likely to lend to informationally difficult borrowers, such as small business (Petersen and Rajan, 2002). Because of the soft information component, even though the distance between lenders and small firms has increased over time, borrowers' information potentially still needs to be collected by lenders, and credit decisions have to be made close to where the information is gathered (i.e., lenders potentially have to be local).

Consequently, because of optimal organization design, local managers can have discretion in lending, and because of the soft information required for these types of loans, lending decisions are local. Therefore, this channel suggests a test. The increase in loan origination should be concentrated on CBSAs closer to where the shock happens (i.e., the winner's CBSA).

To test this, I estimate versions of the baseline specification, which is given by equation 2, by interacting exposure to the jackpot shock with separate indicators for the winner's CBSA

[35] In contrast, line managers who work inside a large hierarchy, ex ante, perform less research, because somebody can decide that investment opportunities are better elsewhere in the firm.

[36] Unfortunately, there is no lending data at the branch level. Thus, I cannot test for whether the lending comes from the branch exposed to the jackpot shock.

and other CBSAs in the winner's state, similar to Table 5. In addition, I interact the last one with an indicator for whether the CBSA is above or below the median distance to the winner's CBSA. The idea of the test is to examine whether the effect on lending depends on distance the market is from the winner's CBSA (i.e., where the bank was exposed to the shock). Under this channel, we should expect the increase in lending to be greater in CBSAs close to where the shock happened.

Table 9 presents the results. To simplify the presentation, I omit the estimates of the effect of the shock in the winner's CBSA and present the estimates of the effect within the winner's states depending on how close they are to the winners' CBSAs. Column 1 reports the estimates for all the markets. Markets closer to and farther away from the winner's CBSA experience on average a positive, significant increase in small business lending. Most importantly, the difference between both is not significant. Columns 2 and 3 show the estimates for a similar specification for markets with and without branches, respectively. In both cases, there is a positive effect on lending following exposure to the funding shock for both CBSAs close to and far away from the winner's CBSA, and, similarly, the difference between both is not significant. Therefore, the evidence is inconsistent with the prediction of the optimal decentralization channel.

[INSERT TABLE 9 HERE]

6 Consequences of Funding Shocks

The results in the previous section suggest that the greater allocation of capital in the winner's state following the shock seems to be driven in part by Section 109. However, how does this regulatory friction affect banks' loan performance? This section presents estimates of the effect of funding shocks on loan performance. One data limitation issue is that there is no loan performance data at the bank-CBSA-year level; thus I must resort to data at the bank-year level from the Call Report.

I estimate the effect of exposure to the jackpot shock on two measures of loan performance: the ratio of non-performing loans to total loans and the charge-off to total loans (Campello, 2002; Loutskina, 2011; Gilje et al., 2016). In addition, I estimate the two empirical specifications using yearly data from the Call Report. The first one is the specification in equation 1 which is augmented with leads and lags variables for the two loan performance outcomes, and the second one uses the non-performing loans (or charge-off) in the outcome variable in a specification similar to that in equation 1.

Panel A of Table 10 reports the results for the ratio of non-performing loans in year t+1 to total loans in year t in column 1, and the charge-off in year t+1 to total loans in year t, respectively. In both cases, exposure to the winners' jackpot shock deteriorates the loan performance one year after.

To further study the dynamics of the effect, Panel B of Table 10 reports the estimates of the specification in equation 1 with leads and lags variables. In both outcome variables, there is a spike in the year of exposure to the shock. However, the effect is not persistent; after the third year, there is no effect of the shock on loan performance. In addition, there is no evidence of pre-trends for both performance variables. Interestingly, both findings in this section are consistent with an increase in lending only in the year following exposure to the jackpot shock.

[INSERT TABLE 10 HERE]

Is Section 109 the driver of the increase in non-performing loans? Unfortunately, the data do not allow me to test whether the deterioration of the loan portfolio comes from the increase in lending in the winner's state. To partially test for the impact of Section 109 on loan performance, I create an indicator for whether the bank has exposure to the jackpot shock in an out-of-state market and another indicator for whether this market is above the median in the host ratio. Finally, I interact these variables with the exposure to the jackpot shock variable.

Table 11 reports the estimates. Column 1 shows the results for the non-performing loans in year t+1 to total loans in year t. Banks that have exposure to the shock in an out-of-state market and in states above the median of the host ratio have an increase in non-performing loans one year after. In contrast, banks that have exposure in out-of-state markets but in states below the median in the host ratio test experience no deterioration in loan performance. Column 2 reports the results for charge-off in year t+1 to total loans in year t and the result are similar to column 1. Exposure to the shock in out-of-state markets leads to a deterioration of loan performance only in those instances in which the bank has exposure in states above the median in the host ratio.

[INSERT TABLE 11 HERE]

What other mechanisms can explain deterioration in the loan performance? The free cash flow hypothesis, or the agency problem hypothesis, asserts that financial frictions can constrain empire-building managers from overinvesting, which could negatively impact a bank's credit risk (Jensen, 1986; Stulz, 1990; Hart and Moore, 1995). Thus, the increase in non-performing loans can be consistent with this channel. However, the greater deterioration in loan performance from exposure in out-of-state markets and in states above the median in the host ratio does not support this hypothesis, since the agency problems should be independent of the host ratio.

In addition, if the friction comes from local managers, we should expect that the increase in non-performing loans would come, on average, from those markets far away from the bank's headquarters, a scenario that could be more difficult to monitor. However, there is also an increase in non-performing loans in those states with exposure to deposit shocks from in-state markets (i.e., the winner's CBSA is in the same state as the bank's headquarters). Thus, the evidence is inconsistent with this channel.

Another hypothesis that can account for the increase of non-performing loans is simply that the bank funds its marginal projects and then continues to fund other loans (e.g., riskier loans) with lower profitability (at least in the short term).[37] This hypothesis can explain the growth on average in the non-performing loans for the banks that received the shock in an in-state market.

This section shows that the shock leads to a deterioration of loan performance in the year of the shock. However, this worsening in the loan portfolio is not persistent. Finally, I find partial support for Section 109 as at least one of the drivers of these findings.

7 Additional Robustness Checks

7.1 Placebo Tests: Non-cash and Out-of-State Winners

As a further test of the identifying assumption underlying the estimates provided in Section 4.2.1, I conduct a placebo test for the impact of exposure to the jackpot shock on deposits and

[37] Banks may accept short-term losses when lending to new borrowers in order to obtain informational rents later (Petersen and Rajan, 1995). However, I cannot test for the impact of whether the borrower is new or had a prior relationship with the bank on loan performance.

loan origination. The quasi-experimental setting allows for the following falsification test: there are instances in which prizes go unclaimed, winners chose the annuity option, or winners lives in a state other than where the winning ticket was sold. In all these cases, we should not expect banks with exposure to these events to have an effect on the deposits or lending. Exploiting the instances of non-cash and out-of-state winners, I then replicate the empirical specifications 3 and 2. Table 12 reports the results. The estimates for both deposits and small business lending are insignificant and far lower that the estimates in Table 3 and Table 4. These findings support the identifying assumption of parallel trends.

[INSERT TABLE 12 HERE]

7.2 Exposure to Large versus Small Jackpot Prizes

In the analysis so far, any exposure to a jackpot winner, in the instances in which jackpot winners chose the cash option and reside in the state where the winning ticket was sold, is coded as a "treatment." Arguably, the effect of the jackpot shock should be greater for larger prizes. To examine this hypothesis, I interact exposure to the winners' jackpot shock variable in equations 3 and 2 with two dummies indicating whether the jackpot prize is above or below the median in the sample period, respectively. Table 12 presents the results. As shown, exposure to the jackpot shock has a greater and significant impact on deposit and loan origination when the bank is exposed to a prize that is above the median.

7.3 Alternative Definition of Banks' Exposure to the Jackpot Shock

As a final robustness check, recall that the analysis at the bank level exploits the bank's exposure to the winner's location (winner's ZIP code), and the main specification uses the bank's number of branches in the year prior to the win in the winner's ZIP code as a measure of exposure to the jackpot shock. Appendix Table 8 reports the estimates for deposits and small business lending in specifications 3 and 2, using instead the bank's share of branches in the year prior to the win in the winner's ZIP code. In addition, Appendix Table 9 reports the results for deposits and total loans, from the Call Report data, using the share of branches as exposure to the shock.

Both tables report estimates that are qualitatively similar to those reported above.[38]

8 Conclusion

Banking regulations can affect the level and the volatility of economic growth, among other things, by improving the flow of capital across the economy and thus integrating local credit markets. The analysis in this paper explores how multistate banks reallocate funds, following windfall shocks, and the potential mechanism that affects capital mobility. To this end, I exploit a new source of quasi-experimental variation in banks' funds availability in the case of jackpot lottery winners. The setting, which provides shocks in 41 states, allows me to trace funding shocks throughout banks' entire multistate organization and analyze the speed at which banks respond to these shocks. In addition, it provides different tests of the empirical design by, for example, looking at the impact of unclaimed prizes, and exploiting the prize amounts, to study whether effects are greater when the jackpot prize is larger.

I find evidence of an increase in deposits and in lending as a result of jackpot shocks. In particular, banks increase their loan originations in the same quarter as the shock. Funds are reallocated to different lending markets; however, the allocation of credit is considerably greater in states that provide the funds. I also find that Section 109 of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 negatively affects capital mobility and potentially affects whether funds are allocated to the right investment projects.

Previously, banking deregulation removed restrictions on banks' ability to expand across geographical markets. Most of the literature has uncovered large benefits to both the industry and the economy following this expansion. However, this paper highlights distortions, which are generated by the current regulation, that can reduce capital mobility and thus, potentially, diminish improvements in the efficiency of capital allocation associated with more fully integrated lending markets.

[38]In untabulated tests, I also test the hypothesis of pre-trends in these different dataset and outcomes using the variable share of branches, and I reject the hypothesis of pre-existing trend in all the instances.

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Figure 1 States Offering Mega Millions and Powerball Lotteries

This figure depicts those states (shaded gray) offering Mega Millions (MM) or Powerball (PB) lotteries as of June 2013.

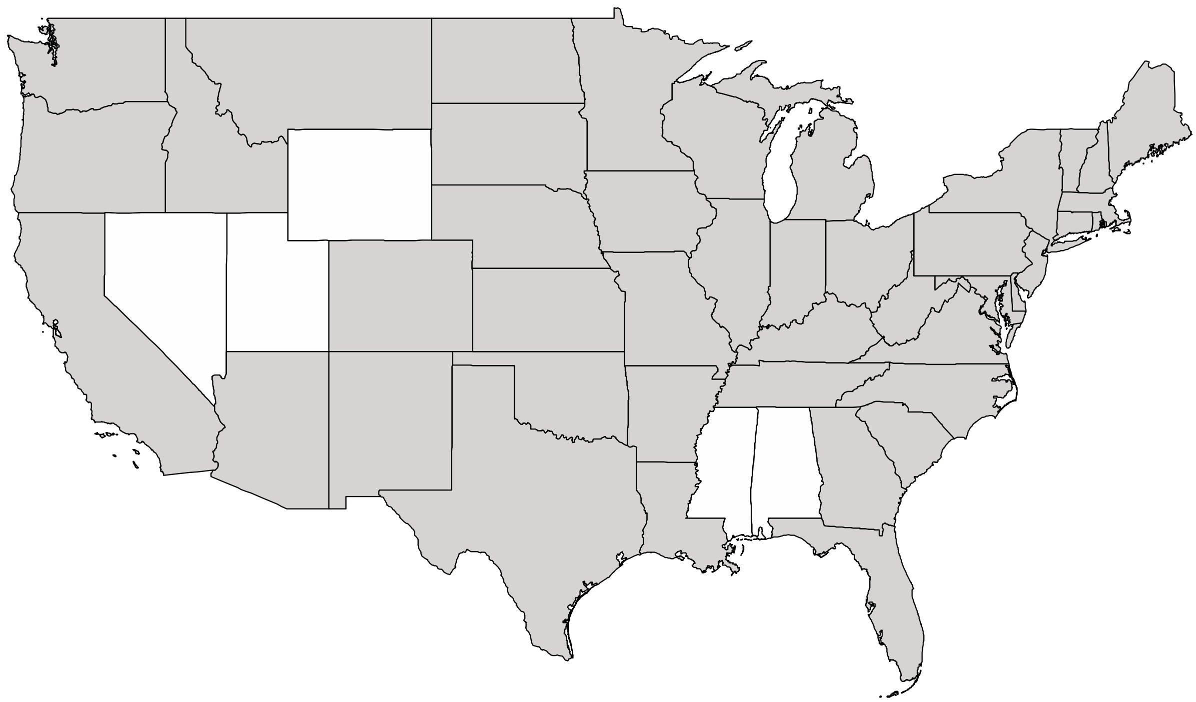

Figure 2 Mega Millions and Powerball Jackpot Winners by County, 2002–2013

This figure depicts counties that had a Mega Millions (MM) or Powerball (PB) jackpot winner between 2002 and 2013. Counties highlighted in red are the treated counties in the sample period.

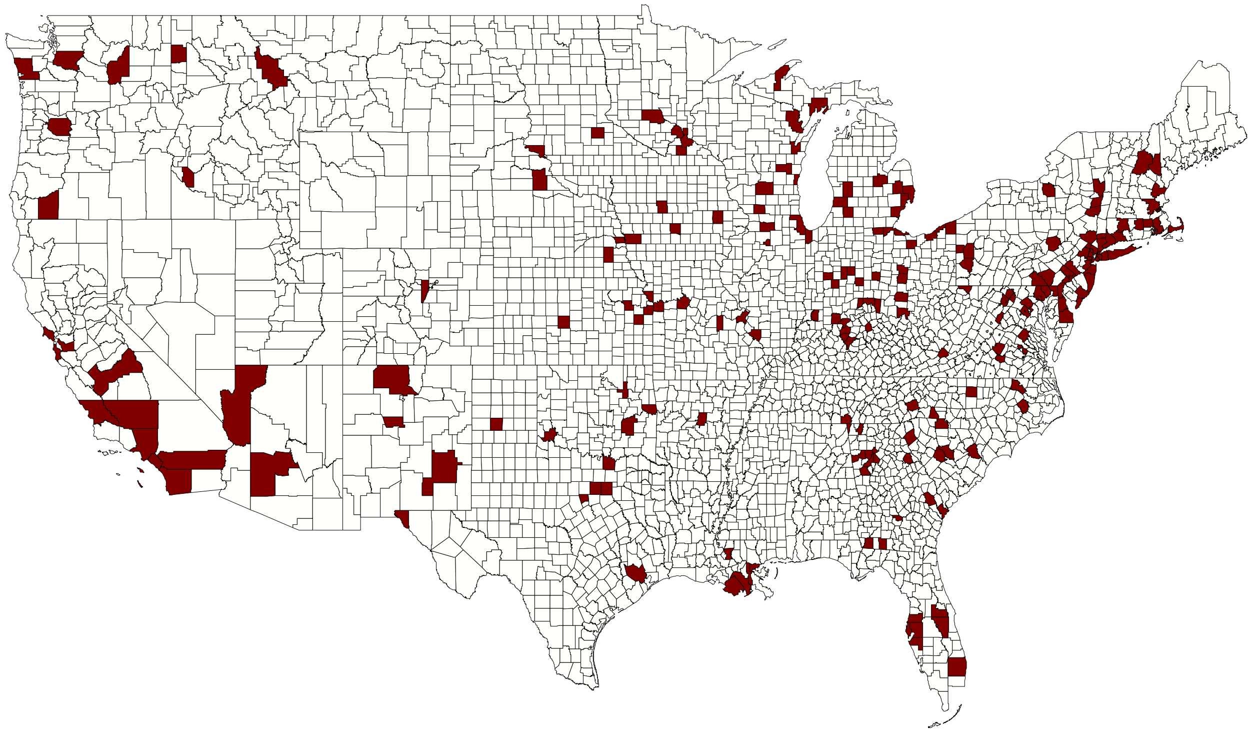

Table 1 Summary Statistics for Jackpot Winners

This table presents summary statistics for the sample of U.S. lottery jackpot winners. The dataset was compiled from different public sources and complemented by information collected from discussions with representatives from various state lotteries. The dataset contains all jackpot winners from 2002 to 2013 for Mega Millions and from 2003 to 2013 for Powerball. *Non-cash (Annuity or Unclaimed)* is a variable that reports the instances in which the prize was unclaimed or the winner choose the annuity option. *Same state* is a variable that reports the instances in which the winner lives in the state where the winning ticket was sold. After-tax prize amounts are converted to real 2013 dollars using the Consumer Price Index for All Urban Consumers (CPI-U).

No. of States w/ Both Lotteries	43
w/ Mega Millions	43
w/ Powerball	43
No. of Jackpot Winners	303
Mega Millions	157
Powerball	146
No. of States w/ Winners	41
w/ Mega Millions	16
w/ Powerball	39
No. of CBSA w/ Winners	144
w/ Mega Millions	68
w/ Powerball	96
No. of Counties w/ Winners	212
w/ Mega Millions	96
w/ Powerball	127
No. of ZIP Codes w/ Winners	298
w/ Mega Millions	154
w/ Powerball	145
Type of Prize	
Cash	282
Non-cash (Annuity or Unclaimed)	21
Winner's State of Residence	
Same State	274
Different State	29
Prize Amounts (in 2013 After-Tax $)	
Mean	46,558,420
25th Percentile	17,410,626
75th Percentile	67,221,904

Table 2 Bank-Level Exposure to Jackpot Shocks: Summary Statistics

This table presents summary statistics for banks with and without branches in the winner's ZIP codes. In Panel A, the unit of analysis is the bank-year; in Panel B, the unit of analysis is the bank-CBSA-year; and in Panel C, the unit of analysis is the bank-quarter. *Number of Branches in the Winner's ZIP Code* is the bank's number of branches located in the winner's the ZIP code and *Share of Branches in the Winner's ZIP Code* is the bank's share of branches located in the winner's ZIP code. The sample period is from 1999 to 2013. Branch data in Panel A are from the Summary of Deposits (SOD). Small business loan origination data in Panel B are from the Federal Financial Institutions Examination Council (FFIEC). Deposit growth data in Panel B are from the SOD. Bank characteristics data in Panel C are from the Call Report. Standard deviations are in brackets.

Panel A: Bank-Year	Exposed			Non-exposed		
	Mean	Median	SD	Mean	Median	SD
Number of Branches in the Winner's ZIP Code	1.513	1.000	0.917	-	-	-
Share of Branches in the Winner's ZIP Code	0.182	0.125	0.177	-	-	-
Number of Banks		641			10,280	
No. of Banks-Years		5,852			82,345	

Panel B: Bank-CBSA-Year	Exposed	Non-exposed
Deposit Growth	0.118	0.082
	[0.562]	[0.509]
log(Small Business Loan Originations)	9.030	5.807
	[2.090]	[2.244]

Panel C: Bank-Quarter	Exposed	Non-exposed
log(Assets)	12.232	11.111
	[1.404]	[1.328]
Equity/Assets	0.099	0.109
	[0.034]	[0.048]
ROA	0.005	0.005
	[0.009]	[0.010]
Deposit Growth	0.0133	0.0132
	[0.0651]	[0.0911]
Total Loans Growth	0.0143	0.0135
	[0.0659]	[0.0855]

Table 3 Effect of the Jackpot Shock on Deposits at the Bank Level

This table reports estimates of the effect of the jackpot shock on deposits. Data are from the SOD from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the change in the log(deposits). Panel A reports the estimates of the effect of exposure to the jackpot shock on deposits. Panel B reports the results from the specification augmented with leads and lags variables. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Number of Branches (-3 yr, -2 yr)* equals the number of branches the bank has in the winner's ZIP code if the bank-year observation is recorded between 3 and 2 years before the jackpot shock. *Number of Branches (-2 yr, -1 yr)*, *Number of Branches (-1 yr, 0 yr)*, *Number of Branches (0 yr, 1 yr)*, *Number of Branches (1 yr, 2 yr)*, and *Number of Branches (2 yr, 3 yr)* are similarly defined. *Winner's CBSA* is an indicator variable that equals 1 if the jackpot shock occurs in CBSA j and 0 otherwise. *Non-winner's CBSA* is an indicator variable that equals 1 for other CBSAs and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported in Panel B). For simplicity, the coefficient of *Number of Branches* is not reported in Panel B. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	△ log(Deposits)	
	(1)	(2)
Number of Branches	0.00678	0.00514
	(0.00565)	(0.00625)
Number of Branches *x* Post	0.0103***	0.00880**
	(0.00302)	(0.00377)
log(Assets) $_{t-1}$	-0.0135***	-0.0111***
	(0.00128)	(0.00153)
$\text{Equity}_{t-1}/\text{Assets}_{t-1}$		0.734***
		(0.156)
ROA_{t-1}		-1.267***
		(0.392)
CBSA *x* Year FE	Yes	Yes
Observations	187,844	187,844
R-squared	0.083	0.088

Panel B	△ log(Deposits)	
	(1)	(2)
Number of Branches (-3 yr, -2 yr)	0.00481	
	(0.0147)	
Number of Branches (-2 yr, -1 yr)	-0.0112	
	(0.00932)	
Number of Branches (0 yr, 1 yr)	0.0110***	
	(0.00389)	
Number of Branches (1 yr, 2 yr)	-0.0113	
	(0.00831)	
Number of Branches (2 yr, 3 yr)	-0.00162	
	(0.0115)	
Number of Branches *x* Post *x* Winner's CBSA		0.0164***
		(0.00591)
Number of Branches *x* Post *x* Non-winner's CBSA		0.00470
		(0.00330)
Wald Tests of Coefficients (p-value)		0.0355
Controls	Yes	Yes
CBSA *x* Year FE	Yes	Yes
Observations	187,844	187,844
R-squared	0.088	0.089

Table 4 Effect of the Jackpot Shock on Small Business Lending at the Bank Level

This table reports estimates of the effect of the jackpot shock on small business loan originations. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as loans less than $1 million. Panel A reports the estimates of the effect of exposure to the jackpot shock on small business lending. Panel B reports the results from the specification augmented with leads and lags variables. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Number of Branches (-3 yr, -2 yr)* equals the number of branches the bank has in the winner's ZIP code if the bank-year observation is recorded between 3 and 2 years before the jackpot shock. *Number of Branches (-2 yr, -1 yr)*, *Number of Branches (-1 yr, 0 yr)*, *Number of Branches (0 yr, 1 yr)*, *Number of Branches (1 yr, 2 yr)*, and *Number of Branches (2 yr, 3 yr)* are defined in the same manner. *Winner's CBSA is* an indicator variable that equals 1 if the jackpot shock occurs in CBSA j and 0 otherwise. *Non-winner's CBSA* is an indicator variable that equals 1 for other CBSAs and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported in Panel B). For simplicity, the coefficient of *Number of Branches* is not reported in Panel B. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches	0.0265	0.0330
	(0.138)	(0.126)
Number of Branches *x* Post	0.181***	0.174***
	(0.0608)	(0.0589)
$\log(\text{Assets})_{t-1}$	0.138***	0.159***
	(0.0386)	(0.0350)
$\text{Equity}_{t-1}/\text{Assets}_{t-1}$		2.291***
		(0.727)
ROA_{t-1}		3.062
		(2.237)
CBSA *x* Year FE	Yes	Yes
Observations	359,955	359,955
R-squared	0.145	0.149

Panel B	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches (-3 yr, -2 yr)	-0.142	
	(0.283)	
Number of Branches (-2 yr, -1 yr)	0.0395	
	(0.274)	
Number of Branches (0 yr, 1 yr)	0.207***	
	(0.0681)	
Number of Branches (1 yr, 2 yr)	-0.0741	
	(0.0838)	
Number of Branches (2 yr, 3 yr)	-0.116	
	(0.109)	
Number of Branches *x* Post *x* Winner's CBSA		1.169***
		(0.155)
Number of Branches *x* Post *x* Non-winner's CBSA		0.151**
		(0.0633)
Wald Tests of Coefficients (p-value)		0.0000
Controls	Yes	Yes
CBSA *x* Year FE	Yes	Yes
Observations	359,955	359,955
R-squared	0.149	0.152

Table 5 Funding Shocks and Lending: Winner's State versus Other States

This table reports estimates of the effect of the jackpot shock on small business loan originations in the winner's state and non-winner's state to study how far the funding shock travels. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. Number of Branches is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. Post is an indicator variable that equals 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. Winner's State is an indicator variable that equals 1 if the jackpot shock occurs in state s and 0 otherwise. Non-winner's State is an indicator variable that equals 1 in states other than the winner's state and 0 otherwise. Winner's CBSA is an indicator variable that equals 1 if the jackpot shock occurs in CBSA j and 0 otherwise. Non-winner's CBSA is an indicator variable that equals 1 for other CBSAs and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post x Winner's State	0.509***	
	(0.0836)	
Number of Branches x Post x Non-winner's State	0.0981	0.0981
	(0.0815)	(0.0814)
Number of Branches x Post x Non-winner's CBSA x Winner's State		0.446***
		(0.0821)
Number of Branches x Post x Winner's CBSA		0.722***
		(0.105)
Wald Tests of the First Two Coefficients (p-value)	0.0000	0.0000
Wald Tests of the Second and Third Coefficients (p-value)		0.0000
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	359,955	359,955
R-squared	0.150	0.151

Table 6 Funding Shocks and Lending: Markets with and without a Local Unit

This table reports estimates of the effect of the jackpot shock on small business loan originations in markets with and without a local unit (i.e., branch). Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equals 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Winner State's* is an indicator variable that equals 1 if the jackpot shock occurs in state s and 0 otherwise. Markets with branches are those in which a bank has at least one branch. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post	0.263***	0.125
	(0.0721)	(0.0783)
Subsamples	Branches	No Branches
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	180,731	179,224
R-squared	0.159	0.132

Panel B	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post	0.137*	0.0462
	(0.0814)	(0.0901)
Number of Branches x Post x Winner's State	0.395***	0.434***
	(0.0848)	(0.0902)
Subsamples	Branches	No Branches
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	180,731	179,224
R-squared	0.166	0.134

Table 7 Funding Shocks and Lending: Out-of-State versus In-State Markets

This table reports estimates of the effect of the jackpot shock on small business loan originations in out-of-state and in-state markets. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Winner State's* is an indicator variable that equals 1 if the jackpot shock occurs in state s and 0 otherwise. Out-of-state markets are those in which the CBSA is in a different state from the bank's home state. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post	0.178***	0.0649
	(0.0687)	(0.0654)
Subsamples	Out-of-State	In-State
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	309,208	50,747
R-squared	0.162	0.368

Panel B	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post	0.0699	0.0361
	(0.0802)	(0.0785)
Number of Branches x Post x Winner's State	0.402***	0.0554
	(0.0884)	(0.132)
Subsamples	Out-of-State	In-State
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	309,208	50,747
R-squared	0.167	0.368

Table 8 Funding Shocks, Lending, and Section 109

This table reports estimates of the effect of the jackpot shock on small business loan originations in out-of-state and in-state markets interacted with the states' loan-to-deposit ratio dummy. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Winner State's* is an indicator variable that equals 1 if the jackpot shock occurs in state s and 0 otherwise. *Non-winner State's* is an indicator variable that equals 1 in states other than the winner's state and 0 otherwise. Under Section 109, the bank is subject to a loan-to-deposit ratio test, in which the bank's statewide operations are compared to the host state's loan-to-deposit ratio. *Host Ratio >50%* is a dummy variable that equals 1 if the state is above the median of the loan-to-deposit (LTD) ratio across states in year t and 0 otherwise. Out-of-state markets are those in which the CBSA is in a different state from the bank's home state. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches *x* Post *x* Winner's State *x* Host Ratio >50%	0.501***	0.313
	(0.0937)	(0.195)
Number of Branches *x* Post *x* Winner's State *x* Host Ratio <50%	0.388***	0.0366
	(0.106)	(0.239)
Number of Branches *x* Post *x* Non-winner's State *x* Host Ratio >50%	0.0588	0.263
	(0.0497)	(0.169)
Number of Branches *x* Post	0.0437	-0.180
	(0.0970)	(0.148)
Wald Tests of the First Two Coefficients (p-value)	0.0322	0.2425
Subsamples	Out-of-State	In-State
Controls	Yes	Yes
CBSA *x* Year FE	Yes	Yes
Observations	309,208	50,747
R-squared	0.167	0.368

Table 9 Distance to the Jackpot Shock and Lending

This table reports estimates of the effect of the jackpot shock on small business loan originations in markets close to and far away from the winner's CBSA. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Winner's State* is an indicator variable that equals 1 if the jackpot shock occurs in state s and 0 otherwise. *Non-winner's State* is an indicator variable that equals 1 in states other than the winner's state and 0 otherwise. *Distance <50%* is a dummy variable equal to one if CBSA j is below the median distance to the winner's CBSA, and 0 otherwise. Markets with branches are those in which a bank has at least one branch. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, coefficients of the *Number of Branches* and the *Number of Branches x Post x Winner's CBSA* are not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	log(Total Amount of Small Business Loans)		
	(1)	(2)	(3)
Number of Branches x Post x Non-winner's CBSA x Winner's State x Distance <50%	0.482***	0.516***	0.402***
	(0.0842)	(0.104)	(0.0629)
Number of Branches x Post x Non-winner's CBSA x Winner's State x Distance >50%	0.433***	0.460***	0.386***
	(0.0841)	(0.0951)	(0.0683)
Number of Branches x Post x Non-winner's CBSA x Non-winner's State	0.0982	0.137*	0.0466
	(0.0813)	(0.0813)	(0.0900)
Wald Tests of the First Two Coefficients (p-value)	0.2493	0.2536	0.7119
Subsamples	-	Branches	No Branches
Controls	Yes	Yes	Yes
CBSA x Year FE	Yes	Yes	Yes
Observations	359,955	180,731	179,224
R-squared	0.151	0.168	0.135

Table 10 Effect of the Jackpot Shock on Non-performing Loans

This table reports estimates of the effect of the jackpot shock on non-performing loans. Data are from the Call Report from 1999 to 2013. Each column reports a separate regression at the bank level, where the dependent variables are the non-performing loans to total loans and charged off to total loans, respectively. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold), and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Number of Branches (-3 yr, -2 yr)* equals the number of branches the bank has in the winner's ZIP code if the bank-year observation is recorded between 3 and 2 years before the jackpot shock. *Number of Branches (-2 yr, -1 yr)*, *Number of Branches (-1 yr, 0 yr)*, *Number of Branches (0 yr, 1 yr)*, *Number of Branches (1 yr, 2 yr)*, and *Number of Branches (2 yr, 3 yr)* are similarly defined. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). All specifications include bank and year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	Non-performing Loans$_{t+1}$ / Total Loans$_t$	Charge-off$_{t+1}$ / Total Loans$_t$
	(1)	(2)
Number of Branches x Post	0.00140**	0.000345*
	(0.000674)	(0.000185)
Controls	Yes	Yes
Bank FE	Yes	Yes
Year FE	Yes	Yes
Observations	101,992	101,992
R-squared	0.211	0.417

Panel B	Non-performing Loans/ Total Loans	Charge-off / Total Loans
	(1)	(2)
Number of Branches (-3 yr, -2 yr)	-0.000900	-0.000186
	(0.000643)	(0.000278)
Number of Branches (-2 yr, -1 yr)	0.000407	-0.000083
	(0.000679)	(0.000329)
Number of Branches (0 yr, 1 yr)	0.00125*	0.000621**
	(0.000659)	(0.000311)
Number of Branches (1 yr, 2 yr)	0.00136**	0.000681
	(0.000646)	(0.000418)
Number of Branches (2 yr, 3 yr)	0.000674	0.000293
	(0.000494)	(0.000291)
Controls	Yes	Yes
Bank FE	Yes	Yes
Year FE	Yes	Yes
Observations	101,992	101,992
R-squared	0.216	0.430

Table 11 Section 109 and Non-performing Loans

This table reports estimates of the effect of the jackpot shock on non-performing loans interacted with dummies of jackpot exposure in out-of-state markets and states' loan-to-deposit ratio dummies. Data are from the Call Report from 1999 to 2013. Each column reports a separate regression at the bank level, where the dependent variables are the non-performing loans to total loans and charge off to total loans, respectively. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Out-of-State* is a dummy variable equal to 1 if bank i bank has exposure to the jackpot shock in an out-of-state market and 0 otherwise. *Host Ratio >50%* is an indicator variable equal to 1 if bank i has exposure to the jackpot shock in a state that is above the median of the loan-to-deposit (LTD) ratio and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). All specifications include bank and year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	Non-performing Loans$_{t+1}$ / Total Loans$_t$	Charge-off$_{t+1}$ / Total Loans$_t$
	(1)	(2)
Number of Branches x Post	0.00185***	0.000340*
	(0.000515)	(0.000199)
Number of Branches x Post x Out-of-State	-0.00182	-0.00146***
	(0.00123)	(0.000436)
Number of Branches x Post x Out-of-State x Host Ratio >50%	0.00257*	0.00198***
	(0.00138)	(0.000733)
Controls	Yes	Yes
Bank FE	Yes	Yes
Year FE	Yes	Yes
Observations	101,992	101,992
R-squared	0.211	0.417

Table 12 Additional Robustness Tests: Effect of Non-cash Jackpot Winners and Large Prizes

This table reports estimates of the effect of the non-cash jackpot winners and large prizes on deposits and small business loan originations. Data are from the SOD and the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variables are the change of log(deposits) and the log(total small business loan originations), respectively. Panel A reports the estimates of the effect of exposure to the non-cash jackpot shock on deposits and small business lending. Panel B reports the results of exposure of the jackpot shock for different prize amounts. *Number of Branches (Non-cash or Out-of-State)* is the number of branches bank i has the year prior to the shock in the winner's ZIP code in the instances in which the prize was unclaimed, the winner chooses the annuity option, or the winner lives in a state other than where the winning ticket was sold and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Prize >50%* is a dummy variable that equals 1 if jackpot prize is above the median of the prizes in the sample period and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, coefficients of the *Number of Branches (Non-cash or Out-of-State)* in Panel A and the *Number of Branches (Non-cash or Out-of-State)* in Panel B are not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	△ log(Deposits) (1)	log(Total Amount of Small Business Loans) (2)
Number of Branches (Non-cash or Out-of-State) x Post	0.00244	0.0537
	(0.00763)	(0.0522)
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	187,844	359,955
R-squared	0.088	0.147

Panel B	△ log(Deposits) (1)	log(Total Amount of Small Business Loans) (3)
Number of Branches x Post x Prize >50%	0.0114***	0.213***
	(0.00334)	(0.0731)
Number of Branches x Post x Prize <50%	0.00773	0.0846
	(0.00739)	(0.0596)
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	187,844	359,955
R-squared	0.088	0.150

Appendix

Appendix Table 1 Characteristics of Jackpot Winners

This table presents summary statistics for the sample of U.S. lottery jackpot winners. The dataset was compiled from different public sources and complemented by information from discussions with representatives from various state lotteries. The dataset contains all jackpot winners for the period from 2002 to 2013 for Mega Millions and for the period from 2003 to 2013 for Powerball. After-tax prize amounts are converted to real 2013 dollars using the Consumer Price Index for All Urban Consumers (CPI-U).

Panel A		
		After-Tax Prize Amount ($)
Mega Millions	Mean	45,533,748
	25th Percentile	17,303,170
	75th Percentile	65,716,448
Powerball	Mean	47,458,128
	25th Percentile	17,410,626
	75th Percentile	69,431,248

Panel B		
	Year	No. of Winners
	2002	9
	2003	28
	2004	24
	2005	24
	2006	24
	2007	33
	2008	25
	2009	31
	2010	30
	2011	29
	2012	31
	2013	15

Appendix Table 2 Treated and Non-treated CBSAs: Pre-treatment Covariates

This table presents summary statistics of pre-treatment covariates for treated and non-treated CBSAs. Data are from the SOD from 1999 to 2013, the FFIEC from 1999 to 2013, and the U.S. Census from 1999 to 2013. The standard deviation is provided in brackets.

CBSAs Pre-treatment Characteristics	Treated	Non-treated
log(Population)	13.247	11.239
	[1.039]	[0.960]
% White	0.785	0.802
	[0.145]	[0.184]
% Male	0.489	0.493
	[0.009]	[0.016]
% Over Age 45	0.347	0.358
	[0.048]	[0.052]
log(Income per Capita)	10.200	10.034
	[0.172]	[0.168]
Deposit Growth	0.026	0.020
	[0.049]	[0.163]

Appendix Table 3 Treated and Non-treated CBSAs: Randomization Test

This table reports estimates of the randomization test of the jackpot shock. The sample includes the CBSA average pre-treatment characteristics from 1994 to 2001. Data are from the SOD, the FFIEC, and the U.S. Census. The unit of analysis is CBSA. Each column reports a separate regression, where the dependent variables are a jackpot winner dummy and the log(prize after taxes), respectively. Column 1 reports the estimates from an OLS regression of a jackpot winner indicator on demographic characteristics and deposit growth. Column 2 shows the results of using log(prize) instead of the jackpot winner dummy. *Winner* is a dummy equal to 1 in those CBSAs with jackpot winners who choose the cash option and who reside in the state where the winning ticket was bought and 0 otherwise. *log(Prize)* is the amount won after federal and state taxes converted to real 1999 dollars using the Consumer Price Index for All Urban Consumers (CPI-U). Robust standard errors are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	Winner (1)	log(Prize) (2)
% White	0.0317	0.371
	(0.0484)	(0.508)
% Over Age 45	0.0291	0.395
	(0.174)	(1.794)
% Male	-0.174	-1.099
	(0.356)	(3.618)
Deposit Growth	-0.00260	-0.0198
	(0.0266)	(0.268)
log(Income per Capita)	0.0589	0.575
	(0.0620)	(0.659)
log(Population)	0.122***	1.281***
	(0.0120)	(0.129)
Join F-test (excluding population)	0.601	0.589
Observations	853	853
R-squared	0.255	0.259

Appendix Table 4 Effect of the Jackpot Shock on Deposits and Lending at the Bank Level

This table reports estimates of the effect of the jackpot shock on deposits and total loans. Data are from the Call Report from 1999 to 2013. The unit of analysis is bank by quarter. I exclude all bank-quarters with missing information on total assets, total loans, or liquid funds. To construct the variables, I exclude the acquiring bank data from the quarters before and after a merger using bank mergers data from the Federal Reserve Bank of Chicago. To ensure that outliers are not driving the results, I eliminate all bank-quarters with asset growth over the last quarter in excess of 60%, those with total loan growth exceeding 150%, and those with total loans-to-asset ratios below 10%. In the analysis of C&I lending, I omit all banks that have less than 5% of their loan portfolio in C&I to avoid distortions from banks that have only negligible amounts of C&I lending. Each column reports a separate regression at the bank level. Panel A reports estimates of the effect of exposure to the jackpot shock on deposits and total loans. Panel B reports results from the specification augmented with leads and lags variables. *Number of Branches* is the number of branches bank i has the year prior to the shock in the winner's ZIP code and 0 otherwise. *Post* is an indicator variable equal to 1 if quarter t falls on or after the quarter of the shock for bank i and 0 otherwise. *Number of Branches (-6 mo, -3 mo)* equals the number of branches the bank has in the winner's ZIP code if the bank-quarter observation is recorded from 6 to 3 months before the jackpot shock. *Number of Branches (-3 mo, 0 mo)*, *Number of Branches (0 mo, 3 mo)*, *Number of Branches (3 mo, 6 mo)*, and *Number of Branches (6 mo, 9 mo)* are similarly defined. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). All specifications include bank and year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	△ log(Deposits) (1)	△ log(Total Loans) (2)
Number of Branches x Post	0.00509***	0.00407***
	(0.00155)	(0.00109)
Controls	Yes	Yes
Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	448,023	448,023
R-squared	0.135	0.217

Panel B	△ log(Deposits) (1)	△ log(Total Loans) (2)	△ log(Real Estate Loans) (3)	△ log(C&I Loans) (4)
Number of Branches (-6 mo, -3 mo)	0.00242	0.00257	0.00214	-0.000844
	(0.00148)	(0.00255)	(0.00198)	(0.00201)
Number of Branches (-3 mo, 0 mo)	0.00162	0.00174	-0.00120	0.000557
	(0.00281)	(0.00137)	(0.00182)	(0.00241)
Number of Branches (0 mo, 3 mo)	0.00537***	0.00404***	0.00338**	0.00420***
	(0.00181)	(0.00135)	(0.00138)	(0.00132)
Number of Branches (3 mo, 6 mo)	0.00141	0.00294**	0.00279**	-0.000278
	(0.00125)	(0.00133)	(0.00134)	(0.00122)
Number of Branches (6 mo, 9 mo)	0.00102	0.000804	0.00140	0.00213
	(0.00103)	(0.000989)	(0.00132)	(0.00133)
Controls	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Observations	448,023	448,023	448,023	426,318
R-squared	0.135	0.217	0.142	0.121

Appendix Table 5 Effect of the Jackpot Shock on Deposits and Small Business Lending at the CBSA Level

This table reports estimates of the effect of the jackpot shock on deposits and small business loans. Data are from the SOD from 1999 to 2013 and the FFIEC from 1999 to 2012. Each column reports a separate regression at the CBSA level, where the dependent variables are the log(deposits) and the log(total small business loan originations), defined as loans less than $1 million. Panel A reports the estimates of the effect of exposure to the jackpot shock on deposits and small business lending. Panel B reports the results from the specification augmented with leads and lags variables and the non-cash jackpot winners' effects. *Winner* is a dummy variable denoting whether the CBSA has a jackpot winner who choose the cash option and who reside in the state where the winning ticket was bought and equals 1 if the year of observation falls on or after the year of the jackpot shock. *log(Prize)* is the amount won in 1999 dollars after withholding federal and state taxes. Prize/Deposits equals the ratio of the amount won in CBSA i and year t over deposits in CBSA i and the year before the treatment. *Winner (Non-cash or Out-of-State)* is an indicator for whether the CBSA has a jackpot winner in the instances in which the prize was unclaimed, the winner chooses the annuity option, or the winner lives in a state other than where the winning ticket was sold and equals 1 if the year of observation falls on or after the year of the jackpot shock. *Winner (-2 yr, -1 yr)* is a dummy variable equal to 1 if the CBSA-year observation is recorded from 2 to 1 years before the jackpot shock. *Winner (-1 yr, 0 yr)*, *Winner (0 yr, 1 yr)*, and *Winner (1 yr, 2 yr)* are similarly defined. The CBSA characteristics include the lagged log(population), % white, % male, % over age 45, and income per capita (not reported). All specifications include CSBA and year fixed effects. Robust standard errors, clustered at the CBSA level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Panel A	log(Deposits)			log(Total Amount of Small Business Loans)		
	(1)	(2)	(3)	(4)	(5)	(6)
Winner	0.0313***			0.0371**		
	(0.0119)			(0.0148)		
log(Prize)		0.00326***			0.00359**	
		(0.00118)			(0.00140)	
Prize / Deposit			0.828**			1.304*
			(0.413)			(0.789)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
CBSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,802	11,802	11,802	10,916	10,916	10,916
R-squared	0.989	0.989	0.989	0.967	0.967	0.964

Panel B	log(Deposits)		log(Total Amount of Small Business Loans)	
	(1)	(2)	(3)	(4)
Winner (-2 yr, -1 yr)		0.00739		0.0277
		(0.0205)		(0.0179)
Winner (-1 yr, 0 yr)		0.00792		0.00696
		(0.0205)		(0.0161)
Winner (0 yr, 1 yr)		0.0327**		0.0412**
		(0.0139)		(0.0164)
Winner (1 yr, 2 yr)		0.0285		0.0228
		(0.0217)		(0.0275)
Winner (Non-cash or Out-of-State)	-0.00803		-0.0101	
	(0.0238)		(0.0222)	
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
CBSA FE	Yes	Yes	Yes	Yes
Observations	11,802	11,802	10,916	10,916
R-squared	0.989	0.989	0.967	0.967

Appendix Table 6 Effect of Funding Shocks and Banks' Size

This table reports estimates of the effect of the jackpot shock on small business loan originations and banks' size. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as loans less than $1 million. Column (1) excludes banks with assets above the 90th percentile of the size distribution. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p $<$ 0.1; **p $<$ 0.05; ***p $<$ 0.01.

	log(Total Amount of Small Business Loans)	
	(1)	(2)
Number of Branches x Post	0.166**	0.131
	(0.0658)	(0.110)
Subsamples	Below 90th	Above 90th
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	326,947	33,008
R-squared	0.121	0.611

Appendix Table 7 Funding Shocks and Lending: Out-of-State Markets with and without a Local Unit

This table reports estimates of the effect of the jackpot shock on small business loan originations in markets with and without a local unit (i.e., branch) and in out-of-state and in-state markets. Data are from the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variable is the log(total small business loan originations), defined as less than $1 million. *Number of Branches* is the number of branches bank i has the year prior to the jackpot shock in the winner's ZIP code (in the cases in which winners choose the cash option and reside in the state where the winning ticket was sold), and 0 otherwise. *Post* is an indicator variable equal to 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. Markets with branches are those in which a bank has at least one branch. Out-of-state markets are those in which the CBSA is in a different state from the bank's home state. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). For simplicity, the coefficient of *Number of Branches* is not reported. All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	log(Total Amount of Small Business Loans)			
	(1)	(2)	(3)	(4)
Number of Branches *x* Post	0.243***	0.0936	0.168**	-0.0666
	(0.0733)	(0.0793)	(0.0684)	(0.0985)
Subsamples	Out-of-State & Branches	Out-of-State & No Branches	In-State & Branches	In-State & No Branches
Controls	Yes	Yes	Yes	Yes
CBSA *x* Year FE	Yes	Yes	Yes	Yes
Observations	160,208	149,000	20,523	30,224
R-squared	0.176	0.156	0.397	0.352

Appendix Table 8 Effect of the Jackpot Shock on Deposits and Lending: An Alternative Definition of Banks' Jackpot Exposure (SOD and CRA)

This table reports estimates of the effect of the jackpot shock on small business loan origination. Data are from the SOD and the FFIEC from 1999 to 2013. Each column reports a separate regression at the bank-CBSA level, where the dependent variables are the change of log(deposits) and the log(total small business loan originations), respectively. *Share of Branches* is the share of branches in the winner's ZIP code bank i has the year prior to the shock (in the cases in which jackpot winners choose the cash option and reside in the state where the winning ticket was sold), and 0 otherwise. *Post* is an indicator variable that takes the value of 1 if year t falls on or after the year of the jackpot shock for bank i and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). All specifications include CBSA by year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

	△ log(Deposits) (1)	log(Total Amount of Small Business Loans) (2)
Share of Branches	0.0499	1.809*
	(0.0421)	(0.955)
Share of Branches x Post	0.0713***	0.766**
	(0.0246)	(0.390)
Controls	Yes	Yes
CBSA x Year FE	Yes	Yes
Observations	187,844	359,955
R-squared	0.087	0.144

Appendix Table 9 Effect of the Jackpot Shock on Deposits and Lending at the Bank Level: An Alternative Definition of Banks' Jackpot Exposure (Call Report)

This table reports estimates of the effect of the jackpot shock on deposits and total loans. Data are from Call Report from 1999 to 2013. The unit of analysis is bank by quarter. Each column reports a separate regression at the bank level, where the dependent variables are the change of log(deposits) and the change of log(total loans). *Share of Branches* is the share of branches in the winner's ZIP code bank i has the year prior to the shock (in the cases in which jackpot winners choose the cash option and reside in the state where the winning ticket was sold) and 0 otherwise. *Post* is an indicator variable equal to 1 if quarter t falls on or after the quarter of the shock for bank i and 0 otherwise. Bank characteristics include the lagged log(assets), return on assets (ROA), and equity/assets (not reported). All specifications include bank and year fixed effects. Robust standard errors, clustered at the bank level, are in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

	△ log(Deposits) (1)	△ log(Total Loans) (2)
Share of Branches x Post	0.0315***	0.0334***
	(0.00887)	(0.00594)
Controls	Yes	Yes
Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	448,023	448,023
R-squared	0.137	0.217