Exit After Violence: Household Migration and the Economic Costs of Mass Shootings

Abstract

We examine household out-migration as a channel through which mass shootings affect local financial and business conditions. Using a stacked difference-in-differences design, we find that affected counties experience persistent net household out-migration, driven primarily by increased outflows and concentrated in interstate moves. Local bank deposits decline shortly after a shooting, while the number of Small Business Administration loans falls and loan spreads increase. Over a longer horizon, entrepreneurship and the number of medium and large establishments decline, whereas business bankruptcy filings rise. The timing of these effects indicates that household departures first, financial disruptions shortly thereafter, and business deterioration later. This is consistent with household out-migration transmitting public-safety shocks to significant and persistent economic costs for affected communities.

JEL classification: J01, J61

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I. Introduction

Mass shootings are discrete, localized events, yet their consequences for affected communities may persist long after the immediate disruption has passed. Recent studies show that mass shootings have lasting effects on students' human capital and early-career outcomes (Cabral, Kim, Rossin-Slater, Schnell and Schwandt, 2026) and weaken employment, earnings, and business activity in affected communities (Brodeur and Yousaf, 2025). However, less is known about the channels through which a discrete episode of violence generates persistent local economic consequences. In this paper, we focus on household out-migration as one such channel and study its implications for local financial and business conditions.

Household migration represents a natural transmission channel because residents can respond to a deterioration in perceived public safety by leaving the affected community. A mass shooting may reduce the amenity value of a location by heightening concerns about safety, quality of life, and the possibility of future violence (Soni and Tekin, 2025). Consistent with such behavioral responses, Chiong, Kim and Kim (2025) document reductions in local foot traffic, customer dwell time, and retail spending following mass shootings. Household out-migration may shrink the local deposit base and customer base, potentially reducing credit availability, demand for goods and services, and incentives for business formation and investment. These effects may ultimately alter the composition and survival of local businesses. Establishing this sequence is empirically challenging, however, because deteriorating employment and business conditions could themselves induce out-migration. We therefore examine the timing of migration, financial conditions, and business outcomes surrounding each incident.

To examine household out-migration as a potential channel, we combine data on 69 U.S. mass shootings with county-level information on migration, bank deposits, small-business lending, entrepreneurship, establishments, and business bankruptcies. Our sample spans 2003 to 2022. We employ a stacked difference-in-differences design to examine the timing of geographic, financial, and business adjustments surrounding each incident. Our first set

of findings suggests that mass shootings significantly increase household out-migration from affected counties. Net out-migration rises by approximately 2.4 households per 1,000 households following a shooting, corresponding to about 140 households in the average county in our sample. This change is driven primarily by an increase in gross household outflows rather than a decline in household inflows. Gross out-migration increases by approximately 1.6 households per 1,000 households, corresponding to about 93 additional household departures in the average affected county. Dynamic results show that the effect on migration begins in the event year and remains elevated for at least three years. Thus, the results reveal a persistent household exit from affected communities rather than a temporary effect.

The geographic composition of migration further indicates that households cross meaningful relocation frictions following a mass shooting. The increase in out-migration is more pronounced in moves to other states: interstate outflows rise by approximately 0.9 households per 1,000 households, compared with an estimated increase of 0.7 households per 1,000 for moves within the same state. This result is notable given the strong home-state bias in U.S. mobility documented by Wilson (2026). Households do not simply relocate within the surrounding area; a substantial portion leave the state altogether. More granular county-to-state migration flows yield a similar pattern, showing increased departures from affected counties but little evidence of a corresponding decline in arrivals.

Together, these findings establish persistent household out-migration, particularly across state borders, as an important response to mass shootings. We next consider whether household departures are driven by an immediate deterioration in local labor-market conditions. If job displacement were the primary cause of migration, layoffs or unemployment should increase before or alongside household outflows. Using WARN data, we find little evidence of an immediate or persistent increase in mass layoffs following a shooting. Baseline estimates also show no significant average changes in county employment or unemployment rates. In the dynamic analysis, household out-migration begins in the event year and peaks in the first post-event year, whereas the decline in the employment rate appears later. These patterns

suggest that observable job displacement is unlikely to be the primary force that drives the initial migration response.

We further examine whether the migration response varies systematically with the characteristics of the shooting and the affected community. We find that out-migration is significantly stronger following more severe incidents, as measured by the number of fatalities, and following shootings that receive greater public attention, as measured by Google Search Intensity. These findings are consistent with households responding more strongly when the public-safety shock is more severe and visible. We also find larger migration responses in Democratic-leaning counties, particularly Democratic-leaning counties located in Republican states. This pattern suggests that household responses to public-safety shocks vary with the local political environment, potentially reflecting differences in safety perceptions, preferred policy responses, or both.

We then examine the local financial conditions after mass shootings. Local bank deposits decline by approximately 3.5% in the event year and 4.4% in the first post-event year, before the estimated effect attenuates. Small-business credit conditions also deteriorate in the early post-event period. The number of SBA-backed loans falls by approximately 5.4% in the first year following a shooting, while average SBA loan spreads increase by approximately 19 basis points. The average post-treatment estimates for deposits and SBA lending are not statistically significant, indicating that these effects are concentrated in the early post-event period rather than uniformly persistent throughout the event window. Taken together, the results are consistent with an early disruption in local financial conditions accompanying household out-migration.

Business outcomes adjust over a longer horizon. County-level entrepreneurship declines by approximately 4.1% following a mass shooting. The decline begins in the event year, becomes larger in the first post-event year, and persists through the end of the event window. Although we find no significant average change in the total number of establishments, the composition of local business activity changes. Establishments with 20 to 49 employees

and those with at least 50 employees decline persistently, while the decline among establishments with fewer than 20 employees is temporary. Formal business distress emerges with an additional lag. Total business bankruptcy filings and Chapter 7 filings increase on average following a shooting, and the dynamic estimates show that total, Chapter 7, and Chapter 11 filings rise significantly in the third post-event year. The results therefore reveal a gradual deterioration in entrepreneurship, larger establishments, and business survival rather than an immediate contraction in all dimensions of local business activity.

Taken together, the findings reveal distinct adjustment horizons following a mass shooting. Household departures begin immediately and remain elevated for at least three years. Deposit and small-business credit disruptions are concentrated in the early post-event period. Entrepreneurship and medium- and large-sized establishments weaken over a longer horizon, while formal business distress appears with a substantial lag. This sequencing is consistent with household out-migration as an important channel through which a public-safety shock may contribute to subsequent changes in local financial and business conditions.

Our paper contributes to the growing literature on the economic consequences of mass shootings and violent public tragedies. Brodeur and Yousaf (2025) document declines in employment, earnings, and establishments and emphasize the roles of pessimism, mental health, and media attention. Gill and John (2025) show that mass shootings weaken local housing markets. They interpret the effect as belief-driven demand responses and find little evidence that contemporaneous population reallocation or mortgage-credit contraction explains the housing-market response. Chordia, Jeung and Pati (2025) document higher municipal-bond spreads and lower liquidity and show that perceived credit risk can affect local-government borrowing costs even where contemporaneous fiscal fundamentals change little. García and Li (2023) find lower FinTech credit demand, higher interest rates, weaker borrower quality, and lower repayment rates, emphasizing psychological disruption and borrower composition. We document a complementary channel operating through realized household departures. Severe mass shootings are followed by persistent out-migration, particularly across state

borders, as well as early changes in local deposits and business credit and longer-horizon changes in entrepreneurship, establishment composition, and business distress.

Second, our paper contributes to the literature on local financial development and capital formation. Prior research shows that access to local finance affects entrepreneurship, business creation, and economic growth (Guiso, Sapienza and Zingales, 2004). Bank deposits constitute an important source of funding for lending, and deposit inflows can expand banks' lending capacity across markets through branch networks and internal capital markets (Gatev and Strahan, 2006; Gilje, Loutskina, and Strahan, 2016; Cortés and Strahan, 2017). We connect this literature to household location choice by showing that persistent household departures following mass shootings are accompanied by an early contraction in local deposits, fewer SBA-backed loans, and higher borrowing costs. The sequencing of these effects is consistent with household mobility transmitting a public-safety shock through changes in both the local customer base and the funding environment for local businesses. Our paper therefore extends evidence on the financial consequences of mass shootings by linking household migration to local deposits, business credit, entrepreneurship, and business survival.

Third, our paper contributes to the literature on household migration and location choice. Existing studies emphasize wages, employment opportunities, housing costs, local amenities, and moving costs as determinants of migration (Bartel, 1979; Stark and Bloom, 1985; Borjas, Bronars and Trejo, 1992; Chen and Rosenthal, 2008; Kennan and Walker, 2011; Wilson, 2021). This literature also documents a long-run decline in U.S. interstate mobility and substantial home-state bias (Molloy, Smith and Wozniak, 2011; Wilson, 2026). We identify severe public-safety shocks as an understudied determinant of geographic mobility and show that the resulting household departures are concentrated in interstate moves despite these frictions. Our analysis also differs from Deb and Gangaram (2021), who examine whether students exposed to school shootings relocate in adulthood. We instead study contemporaneous household migration from affected counties and show how this response is associated with subsequent local financial and business adjustment.

The remainder of the paper proceeds as follows. Section II describes the data and empirical design. Section III presents the empirical results. Section IV concludes.

II. Data and Methodology

A. Mass Shooting

We compile a dataset of U.S. mass shootings covering the period from 2006 to 2022. The primary source is the USA Today Mass Killings Database, which aggregates information from multiple sources, including media reports, FBI records, arrest reports, medical examiner records, court documents, and correctional records. The database provides detailed incident-level information, including geographic location, numbers of fatalities and injuries, offender and victim characteristics, and weapon-related information.

Because definitions of mass shootings vary across studies, we follow the FBI definition and classify an incident as a mass shooting when four or more victims are killed by firearms, excluding the perpetrator. We further restrict the sample to random mass shooting incidents with no clearly identifiable targeted motive. Specifically, we exclude shootings associated with drug trafficking, gang activity, and family-related incidents in which all victims are members of the perpetrator's family. This restriction focuses on incidents that are largely random in nature. Finally, our sample includes 69 mass shooting incidents in 65 counties.

B. County Economics and Migration Data

County Business Pattern Survey Data To measure local business activity, we obtain county-level establishment data from the County Business Patterns (CBP) program, following prior literature (Forman, Goldfarb and Greenstein, 2012; Deryugina, 2017). The CBP survey is an annual dataset that provides subnational economic data for establishments with paid employees and employment size. This series includes the number of establishments, employment, and payroll information. We use these data to capture changes in local business

activities. We use total employment, average annual wage, and the number of establishments as our primary measures of county business activity following mass shooting incidents. To examine heterogeneity by establishment size, we aggregate CBP's published employment-size categories into small (1–19 employees), medium (20–49 employees), and large (50 or more employees) establishments.

Business Formation Data We obtain county-level business formation data from the U.S. Census Bureau's Business Formation Statistics (BFS). The BFS tracks business application activity and the progression from initial applications to realized business formations. BFS provides a timely measure of entrepreneurial activity and serves as an early indicator of future business creation. We use these data to examine how mass shooting incidents affect new business formation at the local level. We use number of new business formations in a county as our proxy for entrepreneurship.

Local Bank Deposits To proxy for local deposit activity, we utilize detailed bank branch-level data (Summary of Deposits) from The Federal Deposit Insurance Corporation (FDIC). Following Lin (2020) and Gilje (2019), we aggregate deposits of branches by county using the Summary of Deposits data from the FDIC. The SOD provides annual information on deposits held at individual bank branches across the United States. We aggregate branch-level deposits to the county level to capture local household and business deposit balances following mass shooting incidents. We use the natural logarithm of total deposits (in million) at local bank branches in a county to measure local deposit activity.

Small Business Loan Following the literature (Huang, 2025; Hackney, 2023; Yi, 2023), we use data from the SBA 7(a) loan program, the largest federal loan-guarantee program for small businesses. The program provides financing to eligible small businesses for a wide range of purposes, including working capital, equipment purchases, business expansion, and debt refinancing, with a maximum loan amount of $5 million. The program primarily serves credit-constrained small businesses that are unable to obtain financing from conventional lenders on reasonable terms. To be eligible, borrowers must demonstrate a reasonable prospect of

repayment and meet the SBA's size and other program requirements.

We obtain data on local small business loan application from the U.S. small business administration. The dataset provides information on small business loan applications and approvals, allowing us to examine how mass shooting incidents affect access to credit and financing conditions for local businesses. Specifically, we measure small business loan activities using the number of SBA loan and the spread of the SBA loan. We use the difference between the interest rate of the SBA loan and 1-month LIBOR rate as the spread of the SBA loan. The interest rate information of the SBA loan is only available from 2008 onward.

Business Bankruptcy Filing Data We obtain county-level bankruptcy filings from the Administrative Office of the U.S. Courts. Specifically, we use Table F-5A, U.S. Bankruptcy Courts—Business and Nonbusiness Cases Filed, by Chapter of the Bankruptcy Code, and County. The table reports the number of bankruptcy cases filed in each county during a 12-month period. We use the annual data for the 12-month period ending December 31 of each year, available from 2013 onward. In this paper, we focus on business bankruptcy filings and construct three measures: the total number of business bankruptcy filings, Chapter 7 filings, and Chapter 11 filings. Chapter 7 generally involves liquidation of a business, whereas Chapter 11 allows financially distressed businesses to reorganize while continuing operations. These measures allow us to examine whether the adverse local economic effects of mass shootings ultimately translate into business financial distress and failure.

County Migration Data We capture county migration pattern using the migration data from the internal Revenue Service (IRS). The IRS migration data are constructed from year-to-year address changes reported on individual income tax returns and provide information on migration flows between U.S. counties. The data has been widely used in existing migration studies, e.g., Akee and Jones (2026); Howard (2020). We use these data to examine whether mass shooting incidents influence household relocation decisions and migration patterns. We construct three variables to measure the county migration patterns, i.e., net migration, outflow, and inflow. Outflow (inflow) is measured as the number of

households moving out of (to) a county scaled by the total number of households of the county. Net migration is measured as the difference of between outflow and inflow.

C. Empirical Strategy

To examine the effects of mass shooting incidents on local economic activity and household migration, we employ a stacked difference-in-differences (DID) research design. We identify 69 mass shooting incidents occurring in 65 U.S. counties between 2006 and 2020. For counties experiencing multiple incidents, we require consecutive events to be separated by at least six years to minimize contamination from overlapping treatment effects. For each treated county-event, we construct a control group consisting of counties located within 100 miles of the treated county that is in the same state and never experience a mass shooting during the sample period. This procedure leaves us with 1,001 unique control counties.

For each mass shooting event, we construct an event-specific sample consisting of the treated county and its matched control counties. We then stack all event-specific samples and examine a seven-year event window spanning three years before and three years after the incident year. The identifying assumption is that, absent a mass shooting incident, treated counties and nearby control counties would have followed parallel trends in economic and migration outcomes.

$$Y_{i,e,t} = \beta Treated_{i,e} \times Post_{e,t} + \bar{X}_{i,t} + \alpha_{i,e} + \lambda_{e,t} + \epsilon_{i,e,t}, \tag{1}$$

where index i denotes county, and t denotes year, and e represents mass shooting incident. The dependent variable, $Y_{i,t}$, represents county economic outcomes, such as total number of establishments, business formation, number of SBA loan, or county household migration outcomes, such as net migration (i.e., the difference between out-migration and in-migration), outflows, and inflows. $Treated_{i,e}$ is an indicator equal to one for the county that experiences mass shooting event e, and zero for matched control counties. $Post_{e,t}$ is an indicator equal

to one for years after the mass shooting incident and zero otherwise. The coefficient of interest, β, captures the average change in outcomes in treated counties relative to nearby control counties following a mass shooting incident. $\bar{X}_{i,t}$ is a vector of time-varying county characteristics, including population, income, and real GDP. $\alpha_{i,t}$ denotes county by event fixed effects, while $\lambda_{e,t}$ represents event by year fixed effects which control for common shocks affecting all counties within a given event stack in a particular year. Standard errors are clustered at the county level to account for serial correlation within counties over time.

D. Summary Statistics

Our sample spans from 2003 to 2022 and included 1043 counties in the U.S. We identify 69 mass shooting incidents, where the average fatality is 7 and median is 5. Table 1 reports the summary statistics of the sample. Most establishments are small businesses, with an average of 3,120 establishments employing fewer than 20 workers, compared with 326 establishments employing 20–49 workers and 196 establishments employing 50 or more workers.

Counties exhibit considerable variation in entrepreneurial activity and local money markets. The average county has 1,509 new business formations annually, although the median is 309, suggesting that business formation is concentrated in larger counties. Local bank deposits average $2.1 billion, with a median of $408 million. Counties receive an average of 34 SBA loans per year, and the average SBA loan spread is 5.62 percentage points.

Migration rates are relatively stable across counties. The average outflow is 73 per 1000 households, while the average inflow is 77 per 1000 households. Interstate migration accounts for a smaller share of population movement, with an average interstate outflow of 23 per 1000 households, compared with 50 for intrastate migration. Net migration (outflows-inflows) is negative on average. The average county has a population of 167,319 residents, a per capita income of $40,159, and real GDP of $9.17 billion. Politically, 23% of counties are Democratic-leaning, while 7% are Democratic-leaning counties located within Republican-leaning states.

III. Results

A. County Migration Pattern

A.1. County migration: baseline results

We first examine whether mass shootings affect household migration decisions. The dependent variables are county-level net migration, out-migration, and in-migration rates constructed from IRS migration data. Net migration is defined as the difference between out-migration and in-migration. We estimate Equation 1 using the same stacked difference-in-differences framework, fixed effects, control variables, and clustered standard errors at the county-level. The results are reported in Table 2.

Panel A reports the baseline estimates. We find that mass shootings lead to a significant increase in net migration. The coefficient on the interaction term in Column (1) indicates that net migration increases by 2.39 households per 1000 households following a mass shooting. The magnitude corresponds to 140 households net migration from a county on average in the sample. Regarding the underlying components, Column (2) shows that out-migration rises by approximately 1.59 households per 1000 households, corresponding to 93 households on average in the sample. While Column (3) indicates a negative effect on in-migration, although this coefficient is not statistically significant. These findings suggest that the increase in net migration is driven primarily by existing residents leaving affected communities rather than by a decline in arrivals.

Wilson (2026) documents a strong home-state bias in U.S. mobility. We examine whether households simply relocate within the surrounding area (e.g., intrastate moves) post mass shooting. To do so, we distinguish between interstate and intrastate migration and report the results in Panel B. The results indicate that the increase in out-migration is concentrated among households relocating to other states. The coefficient on the interaction term in Column (1) implies that interstate outflows increase by approximately one household per 1000 households following a mass shooting, corresponding to 58.6 households on average in

the sample. The coefficient is significant at a 1% level. Whereas migration within the same state is 0.7 households per 1000 households and the coefficient is significant at a 10% level. This pattern suggests that households are not simply relocating within the local area but move across state borders.

To assess the parallel-trends assumption and determine whether the effect is transitory or persistent, we conduct a dynamic stacked difference-in-differences analysis, and report the results in Table 3. First, we find little evidence of differential pre-trends, as the coefficients on the pre-event indicators are statistically insignificant. Following a mass shooting, net migration and out-migration increase immediately and persists for at least three years. Consistent with the baseline results in Table 2, the increase in net migration is driven almost entirely by higher outflows rather than lower inflows. Moreover, Panel B shows that the persistent increase in out-migration is driven by interstate moves.

Taken together, these findings provide evidence that mass shootings induce households to move out of the affected communities and that these migration responses are persistent rather than temporary.

A.2. County-state pair sample

In subsection III.A, we aggregate total out- and in-migration of a county in a year. Table 4 provides additional evidence using a county-state pair sample. This specification allows us to directly examine migration flows between affected counties and destination (origin) states. The results show that mass shootings significantly increase outflows from affected counties, while having no significant effect on inflows. The coefficient on Treated $\times$ Post in Column (1) indicates a substantial increase in household departures, whereas the corresponding coefficient in Column (2) is statistically insignificant. These findings reinforce the conclusion that the overall migration response is driven primarily by existing residents leaving affected communities rather than by a reduction in incoming households.

Overall, the evidence from Table 2 through Table 4 suggests that mass shootings induce

households to leave affected counties, particularly through interstate migration.

A.3. Does layoff explain household out-migration?

We argue that mass shootings induce local household out-migration, which in turn, imposes significant economic costs on local businesses. However, an alternative explanation for the observed increase in household out-migration is that layoffs in affected counties force workers to relocate following job losses. To evaluate this possibility, Table 5 examines county-level layoffs, employment rates, and unemployment rates following mass shootings. If labor market displacement were the primary driver of migration, we would expect persistent increases in layoffs and unemployment.

We obtain layoff data from the WARN database, the county-level employment and unemployment rates data from Bureau of Labor Statistics. We find little evidence supporting this hypothesis. The baseline stacked difference-in-differences estimates show no statistically significant changes in layoffs, employment rates, or unemployment rates following mass shootings. Dynamic stacked difference-in-differences estimates reveal no persistent increase in layoffs immediately after mass shooting tragedies. Employment rates decline modestly in the second year after the event. The overall evidence indicates that mass shootings do not generate immediate displacement in the labor market. The evidence in subsection III.A show that household out-migration begins in the event year and peaks in the first post-event year.

A.4. Heterogeneous effects of salience on county migration

In this section, we further examine whether the migration response varies systematically with the characteristics of the shooting and the affected community. We start examining whether the migration response depend on the severity and salience of the event. To test this conjecture, we examine heterogeneous effects using measures of shooting severity and public attention. Specifically, we interact the treatment effect with the number of fatalities and an

indicator for high Google Search Intensity (GSI). We construct GSI index using quarterly keywords search intensity in U.S. Designated Market Areas (DMA) and convert DMA codes to counties. The keywords include mass shooting, active shooter, gun violence, gun control, and shooting. We take average of the keyword search intensity and aggregate quarterly data to annual data. We report the results in Table 6.

Column (1) shows that migration responses are significantly stronger following more severe shootings. The positive coefficient on Treated × Post × Fatality indicates that a one-standard-deviation increase in fatalities increases net out-migration from the affected county by 1.66 households per 1,000 households (=6.75×0.246), corresponding to about 97 additional household departures in the average affected county. This result suggests that households respond more strongly when shootings impose greater human costs.

Column (2) examines heterogeneity based on public attention. We find that shootings associated with high Google search intensity generate substantially larger migration responses. The positive and statistically significant coefficient on Treated × Post × GSI (High) indicates that highly publicized shootings induce greater household out-migration from affected communities. In terms of the magnitude, mass shootings with high Google search intensity increase net out-migration by 4.51 households per 1,000 households, equivalent to approximately 264 additional net household departures from the average affected county.

Together, these findings suggest that migration responses depend not only on the occurrence of violence itself but also on the severity and visibility of the event.

A.5. County political ideology and migration

We next examine whether migration responses vary across communities with different political orientations. Political orientation may shape how households interpret and respond to mass shootings. Prior research shows that Democrats are more likely to attribute mass shootings to broader social and political conditions, whereas Republicans are more likely to attribute them to individual perpetrators (Haider-Markel and Joslyn, 2013). These differ-

ences in causal attribution may lead residents of Democratic-leaning communities to interpret a shooting as a signal of persistent community-level risk rather than as an isolated event. Consistent with this argument, mass shootings generate stronger emotional and attitudinal responses among Democrats (Sharkey and Shen, 2021; Frey and Kirk, 2021). We therefore predict that mass shootings produce a larger deterioration in perceived local safety—and, consequently, a stronger household out-migration response—in more Democratic-leaning counties.

Table 7 reports the results. In Column (1), we interact the treatment effect with an indicator for Democratic-leaning counties. The positive and significant coefficient on Treated $\times$ Post $\times$ Blue indicates that the increase in out-migration following a mass shooting is larger in Democratic-leaning counties than in other counties.

Prior research suggests that exposure to mass shootings increases support for stricter gun control policies (Yousaf, 2018; Markarian and Newman, 2025). When Democratic-leaning households reside in Republican-leaning states, their preferred policy response may be less likely to materialize. As a result, mass shootings may not only increase concerns about public safety but also intensify dissatisfaction with the local political environment, raising the incentive to relocate. Column (2) further focuses on Democratic-leaning counties located within Republican-leaning states, where we expect a stronger migration response to mass shootings. Consistent with our prediction, the coefficient on Treated $\times$ Post $\times$ Blue County in Red State is positive and statistically significant, suggesting that households in these communities are particularly likely to leave following a mass shooting. More importantly, the coefficient estimates indeed suggest an even stronger migration response in Democratic-leaning counties located within Republican-leaning states. These findings indicate that responses to public safety shocks vary across communities with different political preferences.

B. Local Business Activities

B.1. Local bank deposits

We document persistent household out-migration following mass shootings. If departing households transfer their savings and banking relationships to their new locations, these departures may reduce deposits held at branches in the affected county. Because deposits represent an important and relatively stable source of bank funding, a decline in the local deposit base may affect the funding environment for credit supplied to local households and businesses (Berlin and Mester, 1999; Gatev and Strahan, 2006; Gilje, Loutskina, and Strahan, 2016). We examine this potential channel using the aggregate county-level deposits, constructed from branch-level data in the FDIC Summary of Deposits. We estimate Equation 1 with county-by-event and event-by-year fixed effects and cluster standard errors at the county level. The results are reported in Table 8.

The baseline estimate in Column (1) suggests a decline of 3.7% in deposits following a mass shooting, while the t-statistics is -1.56 and the coefficient is not statistically significant at conventional levels. However, the dynamic analysis reveals a clearer pattern. Local deposits decline sharply in the event year and the first year thereafter, with reductions of 3.5% and 4.5%, respectively. It suggests that households and businesses experience reduced deposits and withdraw financial resources from affected communities after a mass shooting.

Importantly, the dynamic specification in Column (2) shows no evidence of significant pre-treatment trends, strengthening the causal interpretation of the results. The decline in deposits is consistent with a reduction in local capital supply and provides a potential mechanism linking mass shootings to weaker business activity. Given that bank deposits serve as an important funding source for local lending, a contraction in deposits may subsequently reduce credit availability for entrepreneurs and small businesses (Nguyen, 2019; Bonfim, Nogueira and Ongena, 2021).

B.2. Small business loan

We next study a natural follow-up question: whether mass shootings affect access to credit for local businesses. We focus on both the quantity and cost of SBA-backed small-business loans. The dependent variables are the number of SBA-backed loans and the average SBA loan spread in a county. We report the results in Table 9.

The baseline difference-in-differences estimates in Column (1) and (2) indicate no statistically significant change in the overall number of SBA loans or average loan spreads. However, the dynamic analysis reveals significant post-incident effects. The number of SBA loans declines by approximately 5.4% in the year following a mass shooting, suggesting a contraction in local small-business lending activity.

At the same time, borrowing costs increase substantially. SBA loan spreads increase by approximately 19 basis points in the first year after a shooting and persists thereafter. The increase in loan spreads indicates that lenders perceive greater risk and/or face tighter funding conditions in affected counties. Combined with the evidence on declining deposits in Table 8, these findings suggest that mass shootings reduce the availability of local capital while simultaneously increasing financing frictions for small business.

B.3. Entrepreneurship

The deterioration in local credit conditions may affect local entrepreneurship and business formation. We therefore examine whether mass shootings affect entrepreneurial activity in Table 10. The dependent variable is the number of county-level business formations obtained from the Census Bureau's Business Formation Statistics. We estimate Equation (1) using the same stacked difference-in-differences framework, fixed effects, controls, and county-level clustered standard errors as in the previous analyses.

Column (1) reports the baseline PPML estimates. The coefficient on the interaction term (Treated $\times$ Post) is -0.041, indicating that business formation declines by approximately 4.1% following a mass shooting. Economically, this estimate implies a reduction of

about 61 business applications in the average treated county after the event. This magnitude is economically meaningful and suggests that mass shootings discourage entrepreneurial activity in affected communities.

Column (2) presents dynamic estimates. We find no evidence of differential pre-trends, as the coefficients on the pre-event indicators are statistically insignificant. In contrast, entrepreneurship declines immediately in the year of the incident by 2.1%, which corresponds to 32 business applications. The coefficient is statistically significant at a 5% level. Business formation falls by 5.4% (significant at a 1% level) in the first year after the shooting and by 5.5% (significant at a 1% level) and 4.6% (significant at a 5% level) during the subsequent two years, respectively. The magnitudes of business formation reduction correspond to 82, 83, and 69 new business application in the three years.

These results suggest that mass shootings generate persistent and significant reductions in local entrepreneurial activity rather than temporary disruptions.

B.4. County establishments

We examine the effects of mass shootings on the number of business establishments in a county. The results are presented in Table 11. The dependent variables are the total number of establishments and establishments in different employment-size categories. Specifically, we aggregate CBP's published employment-size categories into small (1–19 employees), medium (20–49 employees), and large (50 or more employees) establishments. Since the dependent variables are county variable, we employ Poisson Pseudo Maximum Likelihood (PPML) regressions.

Panel A reports the baseline stacked difference-in-differences estimates. While we find no significant change in the total number of establishments following a mass shooting, important shifts occur in the composition of local business activity. Specifically, the number of establishments employing 20–49 workers declines by 1.2%, while establishments employing 50 or more workers decline by 0.9%.In contrast, we do not observe a statistically significant

average effect on establishments with fewer than 20 employees.

Panel B presents the dynamic difference-in-differences estimates, which provide a more detailed picture of how local business activity evolves following a mass shooting. Although the average treatment effect for small establishments is statistically insignificant in Panel A, the dynamic estimates reveal a temporary decline of approximately 0.4% in the first year after the incident. By contrast, the decline among medium-sized and large establishments emerges gradually and persists over time. Establishments with 20–49 employees decline by approximately 0.7% in the first post-event year and by about 1.4% and 1.5% in both the second and third years. Similarly, establishments with at least 50 employees decline by 0.9% and 0.8% in the first and second years and by 1.6% three years after the event. The coefficients in the years preceding the shooting are generally small and statistically insignificant, providing support for the parallel-trends assumption.

Taken together, the dynamic estimates suggest that mass shootings generate both short-run and long-run disruptions to local business activity. Small establishments appear to experience a temporary contraction immediately following the incident, whereas medium-sized and large establishments face more persistent declines.

B.5. Local Business Bankruptcies

The evidence thus far suggests that mass shootings weaken local economic activity along several margins. We document declines in local bank deposits, and tighter credit conditions for small businesses, reductions in entrepreneurship, contractions among medium-sized and large establishments in affected counties. We next examine whether the deterioration in local economic conditions following mass shootings eventually translates into business distress and failure.

Table 12 reports PPML regression estimates of the effects of mass shootings on the number of local business bankruptcy filings. Columns (1)–(3) examine total business bankruptcy filings and filings under Chapters 7 and 11, respectively, while Columns (4)–(6) report the

corresponding dynamic regression estimates.

The results indicate that mass shootings are followed by an increase in local business bankruptcy filings. In Column (1), the coefficient on $TreatedPost$ is 0.293 and statistically significant at the 10% level, corresponding to approximately a 34.0% increase in total business bankruptcy filings. The effect is particularly pronounced for Chapter 7 filings. The coefficient of 0.392 in Column (2) implies an approximately 48.0% increase in Chapter 7 filings and is statistically significant at the 5% level. In contrast, the estimated average effect on Chapter 11 filings is positive but statistically insignificant.

The event-time estimates further show that the increase in business bankruptcies occurs with a substantial lag. Following the event, bankruptcy filings do not increase immediately. Instead, the effects become positive and statistically significant three years after the shooting. At year $t+3$, the coefficients are 0.726, 0.821, and 0.663 for total, Chapter 7, and Chapter 11 filings, respectively, corresponding to increases of approximately 107%, 127%, and 94%. It is noteworthy that although the Chapter 11 coefficient at year $t-3$ is negative and statistically significant, the remaining pre-event coefficients are insignificant. More importantly, joint tests fail to reject the null that the pre-event coefficients are jointly equal to zero for total, Chapter 7, and Chapter 11 filings, with p-values of 0.789, 0.141, and 0.438, respectively.

These results suggest that the adverse effects of mass shootings accumulate over time before ultimately translating into formal business bankruptcy. The delayed increase in bankruptcy filings is consistent with the broader evidence of a gradual deterioration in local economic conditions following mass shootings. The declines in local deposits and small-business lending documented in the above sections may weaken firms' ability to withstand adverse local demand and financing conditions. Thus, bankruptcy appears to be a relatively late manifestation of local economic distress following a mass shooting. These dynamic patterns lend support to household out-migration mechanism that the increase in household out-migration is unlikely to be driven primarily by layoffs or employment losses after mass shootings.

C. Robustness Checks–Non-border counties

To address the concern that our results may be driven by cross-border migration between neighboring states, we exclude counties located along state borders and reestimate the baseline regressions. The results remain robust in Table A2. The coefficient on *Treated* $\times$ *Post* is positive and statistically significant for net outflow in Column (1), indicating that treated counties experience an increase in net population outflows following a mass shooting. Column (2) shows a significant increase in gross outflows, whereas the decline in inflows reported in Column (3) is not statistically significant at conventional levels. These findings suggest that the increase in net out-migration is primarily driven by residents leaving treated counties rather than by a reduction in people moving into them. Overall, the results confirm that the documented migration response is not attributable to treated counties' proximity to state borders.

IV. Conclusion

This paper examines the effects of mass shootings on local economic activity and household migration. Using a sample of 69 mass shooting incidents and a stacked difference-in-differences empirical design, we find that mass shootings weaken local economic conditions by reducing entrepreneurship, contracting local credit markets, and decreasing business activity. We identify household migration as an important mechanism. Following a mass shooting, affected counties experience higher net out-migration, driven primarily by increased household outflows. The migration response is stronger for more severe and highly media covered incidents.

Our findings suggest that household out-migration is not merely one consequence of mass shootings but an important mechanism through which violent shocks affect local economies. By increasing household departures from affected communities, mass shootings affect local capital formation, entrepreneurial activity, and economic development. This mechanism may

help explain a wide range of economic effects documented in prior studies, including declines in property values, reduced retail spending, weaker business activity, and higher borrowing costs. More broadly, our results highlight how violent shocks can alter the long-run economic trajectory of communities through household interstate mobility.

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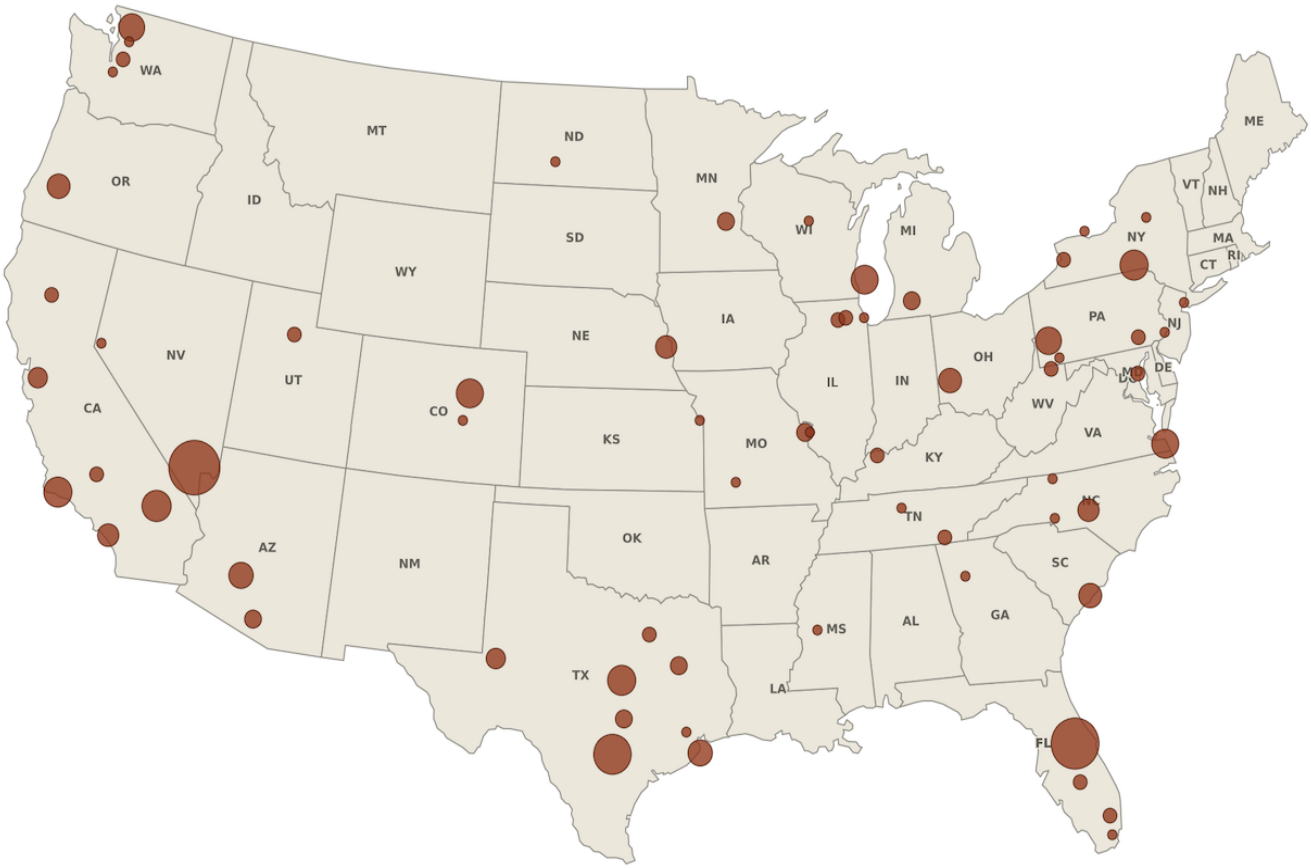
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Figure 1: Counties with mass shooting incidents



Notes: This map displays counties that experienced a mass shooting incident between 2006 and 2020. We restrict the sample to salient incidents with at least four fatalities. Circle area is proportional to the total number of fatalities in each county.

Table 1: Summary Statistics

Variable	Obs.	Mean	STD	P25	Median	P75
Panel A. County-Year Sample						
Per 1000 households						
Net migration (outflow−inflow)	9,699	-3.64	14.08	-9.61	-1	5
Outflow	9,705	73.32	21.70	58.77	69.37	83.47
Inflow	9,699	77.04	27.61	56.78	71.39	92.20
Outflow (different states)	9,611	23.38	12.68	14.58	20.19	28.77
Outflow (same states)	9,705	50.09	18.01	36.90	47.75	61.07
Number of households						
Total households	9,706	58644	131193	7915	18340	52468
Outflow households	9,705	4182	8556	544	1289	3781
Inflow households	9,699	4402	8776	558	1327	4083
Outflow households (different states)	9,611	1713	4224	140	377	1420
Outflow households (same states)	9,705	2486	4827	401	893	2301
Business Variables						
Establishments	9,706	3645	6937	491	1081	3139
Establishments (1–19 employees)	9,706	3120	5882	436	970	2696
Establishments (20–49 employees)	9,706	326	641	34	86	288
Establishments (≥50 employees)	9,706	196	417	17	45	160
Entrepreneur	9,489	1509	3608	140	309	1030
Local bank deposits (in million)	9,702	2136	5093	143	408	1406
Number of SBA loans	8,423	34.13	69.77	3.00	9.00	30.00
SBA loan spread	6,995	5.62	0.83	5.13	5.64	6.09
Chapter 7	5,519	1.73	3.83	0	0	2
Chapter 11	5,519	0.60	1.67	0	0	0
Bankruptcy_total	5,519	2.74	5.51	0	1	3
Fatalities	9,706	7.01	6.75	4	5	7
High Google search intensity	9,706	0.49	0.50	0	0	1
Population	9,706	167319	373415	24327	52256	151704
Per capita income	9,706	40160	12287	31851	37685	45232
Real GDP (in million)	9,706	9176	25700	810.24	1972	6361
Blue county	9,706	0.23	0.42	0	0	0
Blue county in red state	9,706	0.07	0.25	0	0	0
Layoff	7,316	173	512	0	0	82
Employed rate	9,706	93.73	2.59	92.20	94.37	95.72
Unemployed rate	9,706	6.28	2.59	4.28	5.63	7.80
Panel B. County-State-Year Sample						
Outflow per 1000 households	528,935	671.60	4340.17	0	0	0
Inflow per 1000 households	528,935	679.08	4339.47	0	0	0

Table 2: The Effects on Household Migration

This table reports the baseline OLS regression results on county migration. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

Panel A: Baseline difference-in-differences

	(1)	(2)	(3)
	Net migration		
VARIABLES	(Outflow-inflow)	Outflow	Inflow
Treated × Post	2.390***	1.588***	-0.848
	(2.83)	(3.08)	(-1.13)
LnReal GDP	-0.378	0.564	0.404
	(-0.20)	(0.41)	(0.23)
LnPer cap income	4.518	5.383	1.840
	(1.05)	(1.52)	(0.48)
LnPopulation	78.626***	12.329**	-54.152***
	(6.66)	(2.50)	(-4.64)
Constant	-914.157***	-127.830*	649.882***
	(-6.44)	(-1.92)	(4.71)
Observations	9,683	9,689	9,683
R-squared	0.783	0.960	0.959
County × Event FE	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes

Panel B: Outflows to same and different states

	(1)	(2)
VARIABLES	Different state	Same state
Treated × Post	0.932***	0.711*
	(2.64)	(1.90)
LnReal GDP	0.224	0.721
	(0.32)	(0.72)
LnPer cap income	2.345	0.712
	(1.46)	(0.31)
LnPopulation	11.020***	3.561
	(4.18)	(1.00)
Constant	-126.594***	-7.332
	(-3.58)	(-0.15)
Observations	9,594	9,689
R-squared	0.968	0.967
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 3: The Dynamic Effects on Household Migration

This table reports the dynamic OLS regression results on county migration. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

Panel A: Dynamic difference-in-differences

	(1)	(2)	(3)
	Net migration		
VARIABLES	(Outflow-inflow)	Outflow	Inflow
Treated × Event (t-3)	-0.724	0.046	0.131
	(-0.71)	(0.06)	(0.16)
Treated × Event (t-2)	-0.903	-0.051	0.390
	(-0.82)	(-0.07)	(0.54)
Treated × Event (t)	1.903**	1.428***	-0.786
	(2.00)	(2.63)	(-1.09)
Treated × Event (t+1)	1.926*	2.109**	-0.286
	(1.75)	(2.52)	(-0.31)
Treated × Event (t+2)	1.565	1.269*	-0.827
	(1.32)	(1.74)	(-0.82)
Treated × Event (t+3)	2.008*	1.536*	-0.809
	(1.74)	(1.79)	(-0.80)
LnReal GDP	-0.368	0.568	0.403
	(-0.19)	(0.41)	(0.23)
LnPer cap income	4.506	5.358	1.831
	(1.04)	(1.51)	(0.48)
LnPopulation	78.606***	12.324**	-54.148***
	(6.66)	(2.50)	(-4.64)
Constant	-913.920***	-127.563*	649.951***
	(-6.43)	(-1.91)	(4.71)
Observations	9,683	9,689	9,683
R-squared	0.783	0.960	0.959
County × Event FE	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes

Panel B: Outflows to different and same states

VARIABLES	(1) Different state	(2) Same state
Treated × Event (t-3)	0.297	-0.219
	(0.77)	(-0.43)
Treated × Event (t-2)	0.057	-0.154
	(0.13)	(-0.27)
Treated × Event (t)	0.882**	0.531
	(2.33)	(1.24)
Treated × Event (t+1)	1.227**	0.910
	(2.30)	(1.60)
Treated × Event (t+2)	0.907*	0.469
	(1.81)	(0.91)
Treated × Event (t+3)	1.196**	0.428
	(2.16)	(0.69)
LnReal GDP	0.224	0.725
	(0.32)	(0.73)
LnPer cap income	2.340	0.696
	(1.46)	(0.30)
LnPopulation	11.019***	3.556
	(4.18)	(1.00)
Constant	-126.527***	-7.159
	(-3.58)	(-0.15)
Observations	9,594	9,689
R-squared	0.968	0.967
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 4: Evidence from County-state Pair Sample

This table reports the baseline difference-in-differences OLS regression results on county migration using county-state pair sample. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

VARIABLES	(1) Outflow	(2) Inflow
Treated × Post	15.213***	4.970
	(3.27)	(0.91)
LnReal GDP	0.085	0.073
	(0.59)	(0.40)
LnPer cap income	15.338	27.909
	(0.53)	(0.76)
LnPopulation	145.141***	-159.477***
	(4.57)	(-2.95)
Constant	-1,096.971**	2,150.508***
	(-2.41)	(3.03)
Observations	528,605	528,605
R-squared	0.993	0.990
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
County-State Pair FE	Yes	Yes
Cluster at County-State pair	Yes	Yes

Table 5: The Effects on Local Employment

This table examines the effects of mass shooting on layoff and unemployment in affected counties using the difference-in-differences regressions. Layoff data is obtained from WARN database. Employment and unemployment rates are from BLS. Column (1) presents the Poisson-Pseudo Maximum Likelihood estimation results and the dependent variable is layoff count. Columns (2) and (3) report the OLS regression results. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Continuous variables are winsorized at the 1% and 99% level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

Panel A: Layoff baseline results

	(1)	(2)	(3)
VARIABLES	Layoff	Employed_rate	Unemployed_rate
Treated × Post	-0.040	-0.080	0.080
	(-0.58)	(-0.99)	(1.00)
LnReal GDP	1.016	-0.091	0.090
	(1.46)	(-0.48)	(0.48)
LnPer cap income	-0.581	0.175	-0.168
	(-0.57)	(0.51)	(-0.49)
LnPopulation	0.687	-1.306**	1.312**
	(0.60)	(-2.37)	(2.38)
Constant	-13.273	107.652***	-7.757
	(-0.97)	(15.40)	(-1.11)
Observations	4,704	9,690	9,690
R-squared		0.964	0.964
County × Event FE	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes

Panel B: Dynamic difference-in-differences

VARIABLES	(1) Layoff	(2) Employed_rate	(3) Unemployed_rate
Treated × Event (t-3)	0.014	-0.104	0.104
	(0.10)	(-1.22)	(1.22)
Treated × Event (t-2)	0.161	-0.007	0.007
	(1.07)	(-0.13)	(0.13)
Treated × Event (t)	0.192	-0.078	0.079
	(1.46)	(-1.16)	(1.18)
Treated × Event (t+1)	-0.016	-0.132	0.134
	(-0.13)	(-1.40)	(1.40)
Treated × Event (t+2)	-0.143	-0.147*	0.149*
	(-0.99)	(-1.65)	(1.68)
Treated × Event (t+3)	-0.005	-0.107	0.106
	(-0.03)	(-1.20)	(1.19)
LnReal GDP	1.039	-0.091	0.089
	(1.49)	(-0.48)	(0.47)
LnPer cap income	-0.393	0.177	-0.170
	(-0.38)	(0.52)	(-0.50)
LnPopulation	0.542	-1.307**	1.312**
	(0.47)	(-2.38)	(2.38)
Constant	-13.794	107.634***	-7.738
	(-1.01)	(15.40)	(-1.11)
Observations	4,704	9,690	9,690
R-squared		0.964	0.964
County × Event FE	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes

Table 6: The Heterogeneous Effects on Household Migration

This table reports the difference-in-differences OLS regression results on county migration. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

	(1)	(2)
VARIABLES	(Outflow-inflow)	
Treated × Post × Fatality	0.246*	
	(1.93)	
Treated × Post × Google Search Intensity (high)		4.514***
		(2.86)
Treated × Post	0.695	0.076
	(0.55)	(0.06)
LnReal GDP	-0.375	-0.382
	(-0.20)	(-0.20)
LnPer cap income	4.505	4.497
	(1.04)	(1.05)
LnPopulation	78.308***	78.439***
	(6.63)	(6.64)
Constant	-910.540***	-911.795***
	(-6.41)	(-6.42)
Observations	9,683	9,683
R-squared	0.784	0.784
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 7: The Heterogeneous Effects of Event County Ideology on Household Migration

This table examines the effect of political ideology of a county on the outflows after the salient mass shooting tragedies. The dependent variable is the number of outflow households over total households in a county. The independent variables of interest are the three way interaction between Treated × Post and a dummy variable for Democratic-leaning counties in column (1) and a dummy variable for Democratic-leaning counties in a Republican-leaning state in column (2). The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

	(1)	(2)
VARIABLES	Outflow	
Treated × Post × Blue	2.054**	
	(1.98)	
Treated × Post × Blue		3.524**
county in red state		(2.25)
Blue	-0.462	
	(-0.96)	
Treated × Blue	-2.801*	
	(-1.96)	
Post × Blue	-0.204	
	(-0.54)	
Blue county in red state		1.294
		(1.56)
Treated × Blue county in red state		-3.844**
		(-2.13)
Post × Blue county in red state		-1.516**
		(-1.98)
Treated × Post	0.624	1.112**
	(0.87)	(2.12)
LnReal GDP	0.555	0.447
	(0.40)	(0.32)
LnPer cap income	5.087	5.521
	(1.44)	(1.56)
LnPopulation	12.548**	12.079**
	(2.53)	(2.45)
Constant	-126.785*	-124.789*
	(-1.89)	(-1.87)
Observations	9,689	9,689
R-squared	0.960	0.960
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 8: The Effects on Local Bank Deposits

This table reports the OLS results of local bank deposits. The dependent variable is the natural logarithm of total deposits of bank branches in a county-year. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Lndep is winsorized at the 2nd and 98th percentiles due to the presence of extreme values in the lower tail consistent with measurement error. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

	(1)	(2)
VARIABLES	LnDeposits	
Treated × Post	-0.038	
	(-1.56)	
Treated × Event (t-3)		0.005
		(0.26)
Treated × Event (t-2)		-0.002
		(-0.09)
Treated × Event (t)		-0.036**
		(-2.26)
Treated × Event (t+1)		-0.046**
		(-2.16)
Treated × Event (t+2)		-0.040
		(-1.61)
Treated × Event (t+3)		-0.024
		(-0.59)
LnReal GDP	0.126*	0.126*
	(1.80)	(1.80)
LnPer cap income	0.230*	0.230*
	(1.91)	(1.91)
LnPopulation	1.192***	1.192***
	(5.30)	(5.30)
Constant	-11.297***	-11.301***
	(-4.01)	(-4.01)
Observations	9,686	9,686
R-squared	0.989	0.989
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 9: The Effects on Small Business Loan

This table reports the PPML and OLS regression results on SBA loans. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

VARIABLES	(1) Number of SBA loans	(2) SBA loan spread	(3) Number of SBA loans	(4) SBA loan spread
Treated × Post	-0.010	0.050		
	(-0.58)	(0.87)		
Treated × Event (t-3)			-0.012	0.135
			(-0.44)	(1.52)
Treated × Event (t-2)			-0.007	0.145
			(-0.30)	(1.61)
Treated × Event (t)			-0.037	0.094
			(-1.58)	(1.08)
Treated × Event (t+1)			-0.054**	0.190***
			(-2.28)	(2.59)
Treated × Event (t+2)			0.014	0.119
			(0.50)	(1.37)
Treated × Event (t+3)			0.026	0.145*
			(0.80)	(1.77)
LnReal GDP	-0.256***	0.201	-0.249***	0.198
	(-2.67)	(0.99)	(-2.59)	(0.98)
LnPer cap income	0.145	-0.063	0.122	-0.064
	(0.85)	(-0.15)	(0.71)	(-0.15)
LnPopulation	1.015***	0.720	1.059***	0.727
	(4.39)	(1.25)	(4.60)	(1.26)
Constant	-5.809*	-4.889	-6.270*	-4.922
	(-1.74)	(-0.64)	(-1.86)	(-0.64)
Observations	8,368	6,896	8,368	6,896
R-squared		0.573		0.573
County × Event FE	Yes	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes	Yes

Table 10: The Effects on Local Entrepreneurship

This table reports the Poisson Pseudo Maximum Likelihood difference-in-differences regression results of local county entrepreneurship. Since the county business formation data is only available after 2005, the sample period for this analysis is 2005 to 2022. The variable definition is in the Appendix. The dependent variable is the count of business application in a county-year. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

	(1)	(2)
VARIABLES	Business Formation	
Treated × Post	-0.041**	
	(-2.42)	
Treated × Event (t-3)		-0.005
		(-0.48)
Treated × Event (t-2)		-0.005
		(-0.76)
Treated × Event (t)		-0.021**
		(-2.07)
Treated × Event (t+1)		-0.054***
		(-3.03)
Treated × Event (t+2)		-0.055***
		(-3.05)
Treated × Event (t+3)		-0.046**
		(-2.55)
LnReal GDP	0.002	0.004
	(0.04)	(0.06)
LnPer cap income	0.242*	0.252*
	(1.69)	(1.77)
LnPopulation	1.097***	1.080***
	(4.76)	(4.65)
Constant	-8.446***	-8.352***
	(-2.66)	(-2.62)
Observations	9,474	9,474
County × Event FE	Yes	Yes
Year × Event FE	Yes	Yes
Cluster at County	Yes	Yes

Table 11: The Effects on Local Business (Number of Establishments)

This table reports the Poisson Pseudo Maximum Likelihood regression results. The sample period is 2003 to 2022. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

Panel A: Number of establishments – baseline difference-in-differences

	(1)	(2)	(3)	(4)
VARIABLES	N_est	N1_19	N20_49	N50_above
Treated × Post	-0.002	-0.001	-0.012***	-0.009**
	(-1.00)	(-0.53)	(-3.65)	(-2.35)
GDP Growth Rate	0.065***	0.058***	0.094***	0.171***
	(5.62)	(4.74)	(5.22)	(7.70)
LnPer cap income	0.051**	0.041*	0.118***	0.080***
	(2.22)	(1.66)	(4.50)	(2.93)
LnPopulation	0.828***	0.831***	0.767***	0.770***
	(19.03)	(18.18)	(13.78)	(13.81)
Constant	-3.137***	-3.123***	-5.967***	-7.382***
	(-5.61)	(-5.26)	(-8.04)	(-9.73)
Observations	9,690	9,690	9,690	9,663
County × Event FE	Yes	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes	Yes

Panel B: Number of establishments – dynamic difference-in-differences

VARIABLES	(1) N_est	(2) N1_19	(3) N20_49	(4) N50_above
Treated × Event (t-3)	0.001	-0.000	0.005	-0.001
	(0.29)	(-0.09)	(1.40)	(-0.35)
Treated × Event (t-2)	-0.000	-0.000	0.002	0.002
	(-0.04)	(-0.22)	(0.80)	(0.72)
Treated × Event (t)	-0.002	-0.001	-0.005	-0.004
	(-1.52)	(-1.15)	(-1.56)	(-1.30)
Treated × Event (t+1)	-0.005**	-0.004**	-0.007**	-0.009**
	(-2.44)	(-2.01)	(-1.98)	(-2.11)
Treated × Event (t+2)	-0.002	-0.002	-0.014***	-0.008*
	(-0.98)	(-0.58)	(-3.38)	(-1.78)
Treated × Event (t+3)	0.000	0.002	-0.015***	-0.016***
	(0.06)	(0.44)	(-2.85)	(-3.26)
GDP Growth Rate	0.065***	0.058***	0.093***	0.171***
	(5.64)	(4.76)	(5.25)	(7.70)
LnPer cap income	0.050**	0.041*	0.121***	0.084***
	(2.22)	(1.65)	(4.58)	(3.06)
LnPopulation	0.828***	0.833***	0.761***	0.764***
	(18.97)	(18.09)	(13.61)	(13.68)
Constant	-3.147***	-3.140***	-5.910***	-7.348***
	(-5.61)	(-5.26)	(-7.96)	(-9.66)
Observations	9,690	9,690	9,690	9,663
County × Event FE	Yes	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes	Yes

Table 12: The Effects on Business Bankruptcy

This table reports the Poisson Pseudo Maximum Likelihood difference-in-differences regression results of local county business bankruptcy. Since the county business bankruptcy data is only available since 2013, the sample period for this analysis is 2013 to 2022. The variable definition is in the Appendix. The dependent variable is the count of business bankruptcy count in a county-year. For the dynamic difference-in-differences regressions in Columns (4) to (6), the P-value of joint Wald test are 0.789, 0.141, and 0.438, respectively. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

VARIABLES	(1) Total	(2) Chapter 7	(3) Chapter 11	(4) Total	(5) Chapter 7	(6) Chapter 11
Treated × Post	0.293*	0.392**	0.205			
	(1.89)	(2.03)	(1.02)			
Treated × Event (t-3)				-0.635	-0.129	-0.953**
				(-1.28)	(-0.21)	(-1.97)
Treated × Event (t-2)				-0.221	-0.412	-0.242
				(-0.53)	(-0.68)	(-0.59)
Treated × Event (t)				-0.289	-0.159	-0.417
				(-0.99)	(-0.43)	(-1.04)
Treated × Event (t+1)				-0.310	-0.100	-0.407
				(-0.93)	(-0.22)	(-1.35)
Treated × Event (t+2)				0.213	0.372	0.035
				(0.66)	(0.98)	(0.10)
Treated × Event (t+3)				0.726**	0.821**	0.663**
				(2.29)	(2.00)	(2.09)
LnReal GDP	0.159	0.236	0.976	0.179	0.202	1.121
	(0.33)	(0.42)	(1.03)	(0.37)	(0.36)	(1.16)
LnPer cap income	-2.349*	-3.469**	-1.448	-2.536**	-3.579**	-1.790
	(-1.84)	(-2.39)	(-0.95)	(-1.97)	(-2.45)	(-1.16)
LnPopulation	1.539	1.652	0.876	1.817	1.785	1.251
	(0.97)	(0.92)	(0.36)	(1.15)	(1.00)	(0.52)
Constant	6.088	15.268	-10.276	4.437	15.400	-13.504
	(0.31)	(0.71)	(-0.37)	(0.23)	(0.72)	(-0.49)
Observations	4,370	4,070	2,959	4,370	4,070	2,959
County × Event FE	Yes	Yes	Yes	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes	Yes	Yes	Yes

Appendix A.

Table A1: Mass Shooting Incidents

Year	State	County	Fatality
2006	Arizona	Maricopa	4
2018	Arizona	Maricopa	6
2011	Arizona	Pima	6
2012	California	Alameda	7
2018	California	Kern	5
2011	California	Orange	8
2015	California	San Bernardino	14
2014	California	Santa Barbara	6
2006	California	Santa Barbara	7
2017	California	Tehama	5
2012	Colorado	Arapahoe	12
2007	Colorado	El Paso	4
2017	Florida	Broward	5
2019	Florida	Highlands	5
2010	Florida	Miami-Dade	4
2016	Florida	Orange	49
2010	Georgia	Cobb	4
2020	Illinois	Cook	4
2008	Illinois	De Kalb	5
2019	Illinois	Kane	5
2019	Kansas	Wyandotte	4
2008	Kentucky	Henderson	5
2018	Maryland	Anne Arundel	5
2016	Michigan	Kalamazoo	6
2012	Minnesota	Hennepin	6
2017	Mississippi	Yazoo	4
2020	Missouri	Greene	4
2008	Missouri	St Louis	6
2006	Missouri	St Louis City	4
2007	Nebraska	Douglas	8
2017	Nevada	Clark	60
2011	Nevada	Carson City	4
2019	New Jersey	Hudson	4

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Year	State	County	Fatality
2009	New York	Broome	13
2010	New York	Erie	5
2013	New York	Herkimer	4
2009	New York	Monroe	4
2020	North Carolina	Mecklenburg	4
2009	North Carolina	Moore	8
2009	North Carolina	Surry	4
2019	North Dakota	Morton	4
2019	Ohio	Montgomery	9
2015	Oregon	Douglas	9
2018	Pennsylvania	Allegheny	11
2018	Pennsylvania	Fayette	4
2006	Pennsylvania	Lancaster	5
2007	Pennsylvania	Philadelphia	4
2015	South Carolina	Charleston	9
2018	Tennessee	Davidson	4
2015	Tennessee	Hamilton	5
2015	Texas	Anderson	6
2009	Texas	Coryell	13
2016	Texas	Dallas	5
2019	Texas	Ector	7
2018	Texas	Galveston	10
2016	Texas	Harris	4
2007	Texas	Travis	6
2017	Texas	Wilson	25
2007	Utah	Salt Lake	5
2019	Virginia	Virginia Beach City	12
2012	Washington	King	5
2009	Washington	Pierce	4
2008	Washington	Skagit	6
2016	Washington	Skagit	5
2014	Washington	Snohomish	4
2011	West Virginia	Monongalia	5
2017	Wisconsin	Marathon	4
2020	Wisconsin	Milwaukee	5
2012	Wisconsin	Milwaukee	7

Table A2: Robustness Check: Excluding Border Counties

This table reports the robustness check of the baseline OLS regression results on county migration. The sample period is 2003 to 2022. We exclude all counties located along state borders, including both treated and control counties. The variable definition is in the Appendix. The fixed effects of the regressions are reported at the bottom of the table. T-statistics are in parentheses. Standard errors are clustered at the county level. Coefficients statistically significant at the 10%, 5%, and 1% levels are denoted by *, **, and ***, respectively.

VARIABLES	(1) (Outflow-inflow)	(2) Outflow	(3) Inflow
Treated × Post	3.444***	2.082***	-1.519
	(3.13)	(3.23)	(-1.63)
LnReal GDP	1.602	-0.854	-3.100
	(0.61)	(-0.45)	(-1.41)
LnPer cap income	8.527	12.431**	4.113
	(1.46)	(2.49)	(0.76)
LnPopulation	67.059***	20.131***	-30.246*
	(4.02)	(3.20)	(-1.96)
Constant	-866.978***	-264.761***	423.643**
	(-4.42)	(-3.09)	(2.34)
Observations	5,205	5,210	5,205
R-squared	0.805	0.958	0.958
County × Event FE	Yes	Yes	Yes
Year × Event FE	Yes	Yes	Yes
Cluster at County	Yes	Yes	Yes

Appendix B. Variable Definitions

Variables	Definitions	Sources
Treated	A dummy variable that equal one if a county experiences mass shooting incidents in a year; zero, otherwise.	USA Today
Post	A dummy variable that equals one in the year of mass shooting and three years after; zero in the preceding three years.	As above
Net migration (outflow−inflow)	The difference between out-migration and in-migration households over total households in a county.	IRS SOI tax stats Migration data
Outflow	The ratio of out-migration households over total households in a county.	As above
Inflow	The ratio of in-migration households over total households in a county.	As above
Outflow (different state)	The ratio of out-migration to different states households over total households in a county.	As above
Outflow (same state)	The ratio of out-migration to the same states households over total households in a county.	As above
Layoff	The number of people laid off in a county year.	WARN
Employed rate	Employment rate over total labor force of a county in a year.	BLS
Unemployed rate	Unemployment rate over total labor force of a county in a year.	BLS
Blue county	A dummy variable that equals one if the winning candidate is from Democratic party in a county in the last presidential election and zero, otherwise.	BallotPedia
Blue county in red state	A dummy variable that equals one if the winning candidate is from Democratic party in a county while the state is Republican -leaning in the last presidential election and zero, otherwise.	As above
Establishments	Total number of establishments in a county.	County Business Pattern Survey
Establishments (1–19 employees)	The number of establishments with 1–19 employees in a county.	As above
Establishments (20–49 employees)	The number of establishments with 20–49 employees in a county.	As above
Establishments (≥50 employees)	The number of establishments with more than 50 employees in a county.	As above

Business Formation	The number of new business applications in a county.	Census Business Formation Statistics
Local bank deposits (in million)	Total deposits in the bank branches in a county.	FDIC Summary of Deposits
LnDeposits	The natural logarithm of local bank branch deposits.	As above
Number of SBA loans	The number of small business loan approved in a county.	Small Business Administration
SBA loan spread	The average of the difference between SBA loan interest rates and 1-month LIBOR rate in a county.	As above
Chapter 7	The number of business chapter 7 bankruptcy filings in a county-year.	U.S. Courts
Chapter 11	The number of business chapter 11 bankruptcy filings in a county-year.	As above
Bankruptcy_total	The number of total business bankruptcy filings in a county-year.	As above
Fatalities	Number of victims killed in mass shooting incidents in a county.	USA Today
High Google search intensity	A dummy variable that equals one if a county's Google search intensity is above sample median and zero, otherwise.	Google Search Volume
Population	The population of a county in a year.	BEA
Per capita income	The per capita income of a county in a year.	As above
Real GDP ($1,000)	The real GDP of a county in a year.	As above
County-State-Year Sample		
Outflow/Total households×1000	The ratio of out-migration households per 1000 households in a county.	As above
Inflow/Total households×1000	The ratio of in-migration households per 1000 households in a county.	As above