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After the hurricane: Economic adversity, bank offices, and community banks

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ABSTRACT

Community banks have been in decline for decades in the U.S. yet are valuable because they often provide small business lending that larger banks avoid. This study may shed light on whether a severe economic contraction following a natural disaster, such as that due to the COVID-19 pandemic, will further contribute to that decline, using data on hurricanes followed by economic contraction or growth. For the analysis, U.S. counties hit by severe hurricanes between 2004 and 2012 are identified and differentiated according to whether there was substantial employment decline from the year prior to the year after the hurricane. Bank offices in these counties are tracked for seven years in terms of stayers, leavers, and new offices owned by community or large banks. The results reveal that areas with substantial employment decline are associated with higher rates of persistence and new openings among the community banks. Where hurricanes were followed by less severe contraction or economic growth, larger banks held an advantage in terms of both persistence and new offices. It is suggested that the value of soft information held by community banks is enhanced by severe adversity.

1. Introduction

Community banks in the U.S. are relatively small, and have experienced a decades-long decline in both absolute numbers and market share [1,2]. There is a powerful argument to be made in terms of economic hardship serving to weed out community banks more quickly as stronger banks are better positioned to survive, and on-line banking expands [3]. U.S. evidence on bank mergers after the financial collapse supports this logic, with community banks tending to disappear through mergers with larger banks [4]. The analysis here asks whether that weeding process occurs in areas both affected by a major hurricane and followed by a slow-down in economic activity.

Why should anyone be concerned about the future of community banks? An extensive body of research suggests that these small banks develop personal relationships with clients, thereby gaining access to ‘soft information’ regarding the quality of prospective loans [1,2,5]. That soft information in turn allows community banks to engage in ‘relationship banking,’ making profitable loans that larger banks would reject due to a shortfall of soft information. Specifically, community banks tend to focus on small-business lending, and typically lose that focus as they become larger [6,7]. An implication of this argument is that, to the extent a natural disaster followed by an economic slowdown tends to reduce the prevalence of community banks, small business lending will tend to dry up at precisely the time it is arguably most needed.

To address this issue, the analysis presented below takes a relatively unique data set covering the seven most severe hurricanes from 2004 to 2012. For each hurricane, bank offices are tracked for seven years, using data spanning 2004 to 2019. The offices are divided into those in areas where economic activity contracts substantially in the year following the hurricane, and those without such a contraction. We are specifically interested in the following questions. First, do patterns of office closures and post-hurricane new offices favor large banks in areas with contracting economic activity? Second, are there readily observable factors that could have predicted office disappearance among community banks in those areas? Third, do banks that sustain or expand offices in those areas rely heavily on operations in other areas?

2. Background

Research on the economic effects of natural disasters tends to focus on the question of whether economic growth is positive or negative after
the disaster, and the factors associated with growth. One key factor is the type and severity of the disaster. At the broadest level, Skidmore and Toya [8] find that climactic disasters, such as tsunamis, floods, hurricanes, or extreme heat, cold or snow, are correlated with long-run growth, while geologic disasters, including earthquakes, volcanic eruptions, and landslides, are correlated with long-run decline. They suggest that forecasting for climactic disasters (e.g., hurricanes) tends to be superior to forecasting for geologic disasters (e.g., earthquakes), allowing for greater preparation and evacuations if needed in the climactic case.

It is not only the predictability, but also the severity of disasters that influences post-disaster growth. Loayza et al. [9] find that mild or moderate disasters can promote growth while severe disasters are related to decline, using a per capita measure of people harmed as the severity index.

There are at least two factors that may enhance growth post-disaster. A Keynesian effect is related to public-sector recovery expenditures that have positive multiplier effects due to increases in employment and spending on supplies in the local area. A second factor is the productivity effect, whereby outdated capital is replaced with capital incorporating up-to-date technologies. Skidmore and Toya [8] find evidence supporting the productivity effect. Hallegatte and Dumas [10] also find supporting the productivity effect, but conclude that the Keynesian effect is more substantial in the sense that, if public sector recovery expenditures are not sufficient for the need, economic decline will occur. Relatedly, Loayza et al. [9] find evidence suggesting that disasters tend to be followed by growth in developed nations, but decline in less-developed nations, consistent with the Keynesian effect. Also consistent with that effect, Raschky [11] finds that pre-disaster per capita Gross Domestic Product (GDP) mitigates death rates and improves post-disaster economic growth, as does governmental stability.

Turning to studies specifically concerning hurricanes, Strobel [12] developed a measure of local wind damage as an indicator of severity, and found it was significantly associated with reductions in the growth rate. Given the sample was limited to Central American and Caribbean nations, it is possible that public expenditures for recovery were low, limiting the potential for a Keynesian effect to generate post-hurricane growth.

A number of studies analyze post-disaster economic activity for specific hurricanes. For example, the 10-month effect of Hurricane Katrina (in 2005) on the New Orleans, Louisiana, labor market involved the net loss of more than 90,000 jobs and $2.9b in lost wages [13], while Hurricane Iniki, that hit the Hawaiian island of Kauai in 1992, was found to generate a net 18-year decline in population, employment and aggregate personal income, in a comparison with other Hawaiian islands [14]. On the other hand, following Hurricane Bret in 1999, the Corpus Christi, Texas, labor market improved due to economic recovery activity [15]. Somewhat differently, a 10-quarter analysis of the effects of Hurricane Hugo in 1989, on the South Carolina economy, revealed minimal changes in income, but net losses of wealth [16].

A different body of literature utilizes natural disaster as an exogenous shock that increases demand for credit in the affected areas due to recovery efforts, or the Keynesian effect including both public sector expenditures and insurance pay-outs [17]. Using U.S. data, Cortez and Strahan [17] found that large banks (above $2b in assets) were able to satisfy increased loan demand in affected areas without reducing lending elsewhere, while such reductions were found with smaller banks. That finding suggests that larger banks are in a stronger position to meet loan demand in affected areas. However, the sample was limited to multi-market banks, and single-market banks may behave differently.

Although community banks are traditionally defined by asset size, there is an alternative. The Federal Deposit Insurance Corporation or FDIC [18] developed a novel measure which, in addition to asset size, considers foreign assets, specialist bank types, total loans and assets as well as the loan to asset ratio, and the number and location of bank offices. For simplicity, we instead follow Marsh [19] and Smoluk [20] by continuing to classify community banks as having up to $1b in total assets. This measure, while imperfect, is both transparent and has been utilized in the vast majority of community bank studies [1,2,5-7].

A substantial body of literature finds that community banks engage in “relational banking,” gathering and using soft information on the lending risks associated with various clients [2]. As a result, community banks hold a minority of bank assets but have historically and continue to provide a majority of small business loans [6,7,21].

Specifically, community banks and other small financial institutions may have more soft information on clients, so be in a better position to identify lending risks after a hurricane. Berg and Schrader [22] find evidence supporting this logic in terms of micro-lender behavior after hurricanes in Ecuador: credit demand uniformly rose, but clients having a personal relationship with the micro-lender were more likely to have that demand met. More directly Cortez [23] finds evidence that U.S. banks already heavily invested in areas subsequently hit by hurricanes in 2005 were more likely to expand lending in the area, and that areas with such banks recovered more quickly.

Community banks might also have an advantage in terms of utilizing the Small Business Administration (SBA) disaster loan program. That program provided more than $15 trillion in disaster relief lending between 2000 and 2014 [24]. While 83% of those loans went to home owners [24], much of the substantial remainder went to small businesses. In turn, community banks should have had an advantage in terms of utilizing the program given their history of small business lending.

The analysis here takes changes in post-hurricane economic activity, as measured by employment change, as an exogenous indicator of hurricane severity, and asks how banks respond to more or less adverse post-hurricane conditions in terms of offices within counties. If community banks have an advantage in terms of soft information (e.g. Ref. [5]), that advantage may be particularly valuable in circumstances where an adverse event has occurred, with economic activity slowing for an extended period, such that levels of lending risk are high. Where economic activity and lending expand post-hurricane, lending risk may be lower, thereby reducing the value of soft information. Of course, employment change is not entirely exogenous, as disadvantaged communities may experience greater economic adversity for any given hurricane, and that possibility is explored in a descriptive analysis below.

3. Data

Data on natural disasters in the U.S. from 2002 to 2019 were provided by the Centre for Research on the Epidemiology of Disasters [25]. Those data include figures for economic losses, and 10 of the 11 events with the most severe losses were hurricanes (the Camp Fire is also on the list). The sample was limited to the 7 hurricanes occurring between 2004 and 2012, so that 7 years of post-hurricane data are available.

For each of the hurricanes, information on counties affected by each hurricane was collected by CRED, resulting in a total of 342 counties spread across 14 mainly coastal states. These hurricane affected areas are then matched by county and state to data on bank office locations from the FDIC’s Summary of Deposits (SOD) data for 2003 to 2019 [36]. Those data are measured at the end of the 2nd quarter each year (i.e. June 30). The relevant hurricanes each occurred in months ranging from August to November, so data just before each hurricane are available.

Note that a total of 5171 bank offices were affected by Hurricane Sandy in 2012, but 1085 were also affected by earlier hurricanes. The earliest hurricane is used for the analysis, yielding a sample of 15,901 initial bank offices located in areas hit by a hurricane a few months later.

To identify counties in areas adversely affected by each hurricane, a ratio is created for average annual county employment from the year after the hurricane divided by the same figure from the year before the hurricane using the Local Area Unemployment Statistics (LAUS) data [26]. Calling the labor force ‘Emp,’ with the two-year change symbolized by ‘EmpΔ,’ and subscribing time with ‘t,’ the change is calculated...
EmpΔ = (Emp_{t+1} / Emp_{t})

for each year. To correct for any nationwide trends, such as declining employment around the post-financial collapse recession [27], EmpΔ is regressed linearly against a series of year dummy variables, and the residual is used for the analysis. Not surprisingly, given the emphasis of some prior studies on an expansion of credit demand due to hurricanes, the mean of this variable, as of the year of each hurricane (hence labeled ‘year 0’), is estimated at 0.020, such that on average employment in hurricane-affected areas rises by 2% above the national pattern for those same years.

Those economically positive effects are not of relevance to understanding economic adversity, so the sample is divided according to whether EmpΔ for the year the hurricane occurred dropped by at least 3% or did not, with the prior accounting for approximately 4.5% of the entire sample. Given the specific figure is arbitrary, splits at 1% and 5% are considered as alternatives.

To understand the economic and demographic characteristics of these two types of hurricane-affected areas in year 0, the data were merged at the county level with the 2003 Small Area Income and Poverty Estimates (SAIPE) [28], that provides estimates of poverty and median household income. Figures on the proportion of non-Hispanic African Americans, and of Hispanics, is available at the county level using the CDC Wonder data search engine [29], and these are also merged with the other data. That data is available for the combined 2010–2018 period, so may not be entirely representative of pre-hurricane characteristics.

FDIC bank call report data, provided by SNL data, for the 2nd quarter of each year, are merged with the SOD data using the FDIC certificate number for each bank [36]. Banks are classified as either large banks or community banks, with the latter having less than $1b in assets, measured in 2019 dollars, just before the hurricane. Note that bank offices are traced over time but, due to mergers and acquisitions, some bank offices initially related to community banks are transferred to larger banks, and vice-versa.

4. Methods

The analysis begins with a description of the bank offices in the adversely affected hurricane areas in contrast to those less adversely impacted. For year 0, information is provided on each of the 7 hurricanes in terms of total damage and bank offices in the adversely versus less adversely affected areas. Detail is gained by placing those two types of offices in specific states.

To understand whether the areas adversely affected were at a disadvantage before the hurricanes, the average poverty rate in counties served by bank offices is compared across the two groups (SAIPE data), as is the proportion of non-Hispanic African Americans and Hispanics in the relevant counties (CDC Wonder data), and the percentage of counties which are urban.

The next two analyses address our first research question: do patterns of pre-existing office closures and post-hurricane new offices favor large banks in areas with contracting economic activity? First, offices that existed in year 0 are tracked continuously for up to 7 years post-hurricane to find rates of disappearance. Those rates are compared across offices owned by community banks or larger banks, and for the adversely affected subsample (i.e., employment decrease of at least 3%), compared to other offices in hurricane-affected areas. Second, new offices are identified that appear initially in years 1–7 and split by community bank status to ascertain which type of bank is expanding more rapidly post-hurricane. Again, that analysis is performed separately for the adversely affected subsample and for others.

To address the second research question, concerning whether bank or location characteristics predict office disappearance among community banks, those bank offices are split according to whether they lasted at least 3 years post-hurricane, or instead disappeared. For those two groups, standard bank financials are reported, including return on investment (ROA), assets measured in 2019 dollars (using the CPI-U from the U.S. Bureau of Labor Statistics), the percentage of non-performing loans (NPL), and the Tier 1 risk-based capital ratio, which is the measure of bank capitalization used under current regulatory requirements [30]. Additionally, the percentage of lending accounted for by commercial real estate (CRE) is reported, given high levels of CRE lending were associated with bank failures after the financial collapse [31,32]. Additionally, the Herfindahl Index is reported for each bank, given it is a traditional inverse indicator of competition [33]. Finally, the four county descriptors are added for poverty, African American, Hispanics, and urban status.

A final analysis concerns our third research question: do banks that sustain or expand offices in those areas rely heavily on operations in other areas? To do so, we ascertain the reliance of continuing community bank offices in areas adversely affected on deposits from either areas affected less adversely by a hurricane, or not affected by a hurricane. Cortez and Strahan [17] suggest that such reliance might prove useful in providing funds for lending in adversely affected areas. The relevant analysis compares the number of offices and average deposits per office owned by community banks that do or do not have offices in the adversely affected area for at least 3 years. Additionally, the total deposits from the three types of areas, and number of relevant banks, are compared.

For the initial analyses of office continuation and for new offices, results are replicated using the 1% and 5% cut-offs for EmpΔ, with results provided in Appendices. For the comparison of bank financials, parallel figures are provided only for the subsamples with employment declines of at least 1% or 5%, given the figures for increasing employment are not much affected by the changing cut-offs.

5. Results

The descriptive analysis begins with figures provided in Table 1. Almost half (49.4%) of offices in counties experiencing substantial employment decline are associated with Hurricane Katrina, which also generated the most substantial economic damage ($125b), but that same hurricane only accounted for 15.5% of offices in counties experiencing employment growth or lesser decline. Hurricane Ivan accounts for more than 20% of offices in counties experiencing employment decline of at least 3%, but that same hurricane accounts for over 30% of offices in the least affected counties. Hurricane Sandy accounts for just under 12% of offices in the adversely affected counties, but more than a quarter of the offices in lesser affected areas.

Table 2 provides geographic information regarding bank offices and states. For offices in counties adversely affected, the state of Mississippi is most highly represented, accounting for over 46% of offices, followed by Alabama, Connecticut, Texas, and North Carolina. The most prevalent offices among those less adversely affected are in Florida, with over 26% of offices, followed by New Jersey, New York, Texas and Alabama. Excepting Connecticut, Northeastern states experienced less economic adversity, as did Florida, suggesting rebuilding efforts may have been more robust in those states. Surprisingly, although Louisiana had 1000 offices affected by four different hurricanes (Ike, Ivan, Katrina and Rita), relatively few bank offices were in counties adversely affected in terms of employment. One hurricane, Katrina, however, accounted for all but one of the adversely affected offices in Mississippi (Hurricane Ike
large bank offices disappeared is approximately 8% points lower, while community bank offices disappeared at almost twice the rate.

Considering new offices opened in the years after a hurricane, figures for areas experiencing employment decreases are presented in Table 5. In marked contrast to the larger initial number of large bank offices (Table 3), the community banks opened more new offices after a hurricane in these hard hit areas.

This pattern is weakened if the cut-off is loosened from at least a 3% employment decline to a 1% decline (see Appendix Table 5), but remains with a stricter cut-off of at least a 5% decline (see Appendix Table 6).

Figures parallel to those found in Table 5, but for the areas less severely affected in terms of employment decline, are reported in Table 6. The pattern for large and community banks is reversed, with large banks opening more than twice as many new offices, compared to community banks, for the 7-year period.

It is possible that the effects found in Table 3 thru 6 are mistakenly being attributed to hurricanes, instead of the previously existing adverse conditions in terms of poverty and median income existing in the adversely affected areas. As a check, changes in bank office status for large and community banks, across the adversely affected and less adversely affected, for the year before (year −1) through the year of the hurricane (year 0), were generated (see Appendix Table 7). Those results uniformly find net growth of bank offices across both the different areas and different types of banks, suggesting the hurricanes had a negative effect.

A comparison of bank- and county-level characteristics, for community banks having offices in adversely affected areas before a hurricane, with offices either disappearing in less than 3 years later, or surviving longer, is provided in Table 7. Beginning with the adversely affected areas, the average return on assets (ROA) pre-hurricane, was more than twice as large for the offices that stayed compared to those who left. The stayers tended to be somewhat larger than those that left, more than twice as large for the offices that stayed compared to those that left. The stayers tended to be somewhat larger than those that left, more than twice as large for the offices that stayed compared to those that left.

Note that these counties account for well over half of bank offices in adversely affected areas (see Table 2).

Table 3 begins the analysis of the first research question by providing figures for the number of offices in continuous operation starting just before the hurricane hit, using the sample with employment declining by at least 3%. In that year, large banks operated around 453 offices, which shrank gradually to 331 as of year 7, for a 27% loss. Community banks began with around three-quarters the number of offices, and shrank that number by 16% as of year 7. This pattern of community bank offices having around a 10% point advantage over time is reversed with the less strict 1% cut-off for employment decline (see Appendix Table 3), but holds at a lower level for the stricter 5% cut-off (see Appendix Table 4).

Parallel figures for offices in areas hit by hurricanes but without large declines in the employment are provided in Table 4. The rate at which community banks having offices in adversely affected areas before a hurricane, with offices either disappearing in less than 3 years later, or surviving longer, is provided in Table 7. Beginning with the adversely affected areas, the average return on assets (ROA) pre-hurricane, was more than twice as large for the offices that stayed compared to those who left. The stayers tended to be somewhat larger than those that left, and with around one-third less in terms of non-performing loans (NPL). Using the Tier 1 ratio, stayers were on a sounder equity basis, and slightly less invested in commercial real estate before the hurricane. It is notable that the Herfindahl index, an inverse measure of competition, is higher among the stayers, suggesting that some degree of monopoly

| State     | Empl. decline at least 3% (percent of total) | Empl. growth or decline <3% (percent of total) |
|-----------|---------------------------------------------|-----------------------------------------------|
| Alabama   | 92 (11.6)                                   | 1249 (8.3)                                    |
| Connecticut | 95 (11.7)                                 | 729 (4.8)                                    |
| Florida   | 54 (6.8)                                    | 4012 (26.5)                                  |
| Georgia   | 4 (0.5)                                     | 770 (5.1)                                    |
| Louisiana | 29 (3.7)                                     | 972 (6.4)                                    |
| Maryland  | 7 (0.1)                                     |                                              |
| Missouri | 8 (1.0)                                      |                                              |
| Mississippi | 370 (46.6)                               | 325 (2.2)                                    |
| North     | 71 (8.9)                                     | 603 (4.0)                                    |
| Carolina  | 2569 (17.0)                                  |                                              |
| New Jersey | 2519 (16.7)                               |                                              |
| New York | 1361 (9.0)                                   |                                              |
| Total     | 794                                         | 15,116                                       |
Table 5  
New offices each year after hurricane, employment decline at least 3%.

| Years after hurricane | Large bank owned offices | Community bank offices |
|-----------------------|--------------------------|------------------------|
| 1                     | 6                        | 7                      |
| 2                     | 6                        | 14                     |
| 3                     | 3                        | 8                      |
| 4                     | 8                        | 15                     |
| 5                     | 5                        | 10                     |
| 6                     | 9                        | 2                      |
| 7                     | 8                        | 6                      |
| Total                 | 45                       | 62                     |

Table 6  
New offices each year after hurricane, employment increase or decrease <3%.

| Years after hurricane | Large bank owned offices | Community bank offices |
|-----------------------|--------------------------|------------------------|
| 1                     | 583                      | 255                    |
| 2                     | 521                      | 272                    |
| 3                     | 616                      | 291                    |
| 4                     | 766                      | 262                    |
| 5                     | 559                      | 139                    |
| 6                     | 763                      | 214                    |
| 7                     | 364                      | 90                     |
| Total                 | 4172                     | 1523                   |

power was beneficial.

For banks in less adverse circumstances, patterns across survivors and non-survivors are similar for ROA, assets, NPL, the Tier 1 ratio, commercial real estate, and the Herfindahl index. In other words, the bank-level correlates of staying and leaving are not linked to the extent of post-Hurricane economic adversity.

In terms of county characteristics, although the adversely affected areas generally have higher rates of poverty, African Americans, and rural location, there are only limited connections between those characteristics and survival. Indeed, the only notable pattern is that urban bank offices were more likely to be closed.

Considering offices confronting adversity using the 1% or 3% cut-off, the patterns are similar, except that stayers have slightly higher levels of commercial real estate and are more urban under the 5% cut-off, although that sample only covers 11 bank offices (see Appendix Table 8).

Turning to the third research question, results for the reliance of community banks on external deposits are provided in Table 8. Beginning with average deposits per office, and the number of such offices, in the top half of the table, the largest offices in terms of deposits are found in the areas that were adversely affected, and that pattern holds for all three years. However, the number of offices is almost equally split between areas adversely and less adversely affected by the hurricane, with relatively few offices in unaffected areas.

Total deposits from each area, and the number of banks represented, is provided in the bottom half of the table. Approximately half of all deposits are held in offices that were adversely affected, and the distribution does not change substantially over the three-year period. Out of 111 banks represented, 58 had offices in hurricane areas that were less adversely affected, and 24 had offices outside of the hurricane area. There is an overlap of 9 between the latter two categories, such that 38 of the banks (just over one-third) had no deposits held external to the area of adverse effects.

By way of comparison, parallel figures for banks that initially had offices in the adversely affected communities but did not within three years of the hurricane, are provided in Table 9. As of year zero, almost three-quarters of relevant offices were not in the area that was adversely affected, and that proportion rose to over five-sixths by year two. Further, deposits from the adversely affected offices averaged around half the size (or less) relative to offices in other areas. Turning to the banks in the bottom half of the table, deposits were relatively small for the adversely affected areas, and shrank by almost two-thirds over the time period, with a net expansion of deposits elsewhere. In terms of the number of banks, as of year zero, there were 11 relevant banks, but 9 had deposits elsewhere, and the number of banks fell by half in the two year period.

The results in Table 9 raise the question of whether the banks simply abandoned the adversely affected areas, or instead merged or failed. A check of FDIC records (using the bankfind search engine at https://research2.fdic.gov/bankfind/index.html) revealed that 2 of the 11 banks failed, 1 continued operations elsewhere, and 8 merged with other banks.

Together, results presented in Tables 7–9 suggests that community banks on a sound financial footing, with a heavy representation in adversely affected communities (as measured by deposits) were most likely to grow and maintain a presence in those communities in the post-hurricane period.

6. Discussion

The results here suggest that community banks may have an advantage in the face of substantial and on-going economic adversity. In communities where employment shrank by at least 3% points relative to the national average, community banks closed fewer offices as a proportion of existing offices and opened more new offices, compared to larger banks. The more expected results – favoring large banks in terms of both fewer office closures and more new offices – is indeed found, but only where economic activity rebounded more quickly.

There are at least four potential explanations for this phenomenon. First, as argued in the background section, community banks gather ‘soft information’ from prospective and actual borrowers, and that

Table 7  
Community bank performance and characteristics, comparison across offices which did and did not stay at least 3 years after hurricane.

|                   | Adversely affected | Less adversely affected |
|-------------------|--------------------|-------------------------|
|                   | Stay at least 3 yrs. | Leave <3 yrs. | Stay at least 3 yrs. | Leave <3 yrs. |
| ROA               | 1.20%              | .339%                   | 1.02%                   | .817%                   |
| Assets            | $421 m             | $254 m                  | $396 m                  | $449 m                  |
| NPL               | 1.08%              | 1.89%                   | .802%                   | .816%                   |
| Tier 1 ratio      | 16.0               | 15.3                    | 15.7                    | 12.0                    |
| Commercial real estate | 25.3%             | 26.4%                   | 30.9%                   | 37.5%                   |
| Herfindahl index  | .243               | .210                    | .158                    | .138                    |
| Poverty           | 17.1%              | 17.2%                   | 14.1%                   | 12.4%                   |
| African American  | 27.4%              | 26.8%                   | 18.8%                   | 16.1%                   |
| Hispanic          | 7.0%               | 6.2%                    | 14.8%                   | 17.5%                   |
| Urban             | 31.4%              | 38.8%                   | 81.4%                   | 92.0%                   |
| N                 | 311                | 18                      | 2764                    | 389                     |

Note: Assets measured in 2019 dollars.

Table 8  
Distribution of and total deposits among community banks remaining after hurricane.

|                | Year | 0 | 1 | 2 |
|----------------|------|---|---|---|
| Average office deposits (no. of offices) |
| Emp decline ≥3% | $33.3 m (315) | $36.4 m (319) | $37.7 m (326) |
| Emp increase or decline <3% | $26.0 m (314) | $28.3 m (322) | $29.1 m (335) |
| No hurricane | $26.7 m (100) | $26.7 m (104) | $27.5 m (111) |
| Total deposits from area (no. of banks) |
| Emp decline ≥3% | $10,500 m (111) | $11,600 m (111) | $12,300 m (111) |
| Emp increase or decline <3% | $8156 m (58) | $9114 m (60) | $9743 m (60) |
| No hurricane | $2665 m (24) | $2773 m (26) | $3053 m (26) |
Third, community banks may be stuck in their communities, with little choice except to remain or fail. This last explanation carries little weight, given two-thirds of the community banks who maintained offices throughout adversity also had offices elsewhere.

Fourth, as also mentioned in the background section, community banks may have a general advantage in terms of small business loans, so were better prepared to utilize SBA disaster loans after hurricanes. This argument cannot explain why the community banks did not have an advantage in both more and less adversely affected areas, unless SBA business loans were concentrated in those areas. A check of SBA disaster business lending after hurricane Katrina suggests otherwise. In our data, Katrina affected 36 counties in Louisiana and 49 in Mississippi, but only 3 counties in Louisiana, compared to 30 in Mississippi, were adversely affected. If SBA business lending associated with Katrina was associated with economic adversity, most funds should have gone to Mississippi, yet the Congressional Research Office reports that $1.6b in Katrina business loans (i.e. business loans plus EIDLs) went to Louisiana, with less than half that amount ($0.57b) going to Mississippi (calculations from Refs. [24]; p. 18).

Although bank consolidation in the U.S. has continued for decades, it is at least possible that severe economic adversity reveals an advantage for community banks. A testable hypothesis from this research is that the SBA Paycheck Protection Loans (PPP) launched during the COVID-19 pandemic [34] might yield lower rates of defaults for lending run through community banks. PPP loans were available from April 3 to June 30, 2020, which was a time of great uncertainty regarding both the shape of the pandemic and the future of the economy [35]. Unfortunately, it is too early to test that hypothesis. While that hypothesis has yet to be tested, this research is, we believe, the first to identify adverse circumstances where community banks outperform larger banks, and that advantage may appear in other circumstances as well.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

### Table 1
States and economic adversity by county characteristics, year 0, employment decline at least 3%

| State       | Poverty | African American | Hispanic | Urban |
|-------------|---------|------------------|----------|-------|
| Alabama     | 21.9%   | 49.1%            | 3.1%     | 0%    |
| Connecticut | 6.6%    | 5.5%             | 9.7%     | 100%  |
| Florida     | 11.8%   | 9.3%             | 22.0%    | 0%    |
| Georgia     | 23.5%   | 49.8%            | 2.0%     | 0%    |
| Louisiana   | 17.0%   | 27.7%            | 2.3%     | 66.7% |
| Maryland    |         |                  |          |       |
| Missouri    | 10.9%   | 2.2%             | 0.8%     | 0%    |
| Mississippi | 20.8%   | 42.9%            | 2.1%     | 23.3% |
| North Carolina | 14.1% | 9.7%             | 4.8%     | 33.3% |
| New Jersey  |         |                  |          |       |
| New York    |         |                  |          |       |
| Texas       | 18.2%   | 13.4%            | 11.5%    | 20.0% |
| Total N     | 1105    | 1105             | 1105     | 1105  |

Information may be particularly valuable in circumstances where an adverse event has occurred, such that levels of lending risk are high.

Background evidence on the counties adversely affected showed disproportionately high rates of poverty, low median income figures, and a high representation of African Americans. Therefore, it is reasonable to conclude that these communities were disadvantaged before the hurricane, such that lending risk may have already been above average, a claim that is supported by higher rates of NPL in year zero for the stayer bank offices in adversely affected areas (see Table 7). As a result, community banks in these areas may have developed information channels allowing risk mitigation both before and after the hurricane, consistent with higher ROA among stayers in the adversely affected areas (see Table 7). As a result, these particular community banks held soft information that may have increased in value after the hurricane. Further, the concentration of deposits in the adversely affected areas among stayer community banks (see Table 8) also suggests an informational advantage for these banks, and the claim that community banks maintain and utilize such an advantage through the gathering of soft information is one of the most well-established findings in the banking literature (e.g., Ref. [1, 2, 5]).

A second possibility is that large banks saw greater opportunities in hurricane-ravaged communities where economic activity rebounded relatively quickly, and moved to take a greater share of the market. The weakness in this argument is that the community banks which maintained offices in adversely affected areas, and added new ones, would likely not have done so without believing economic opportunities existed. And if those opportunities existed for community banks, why would they not exist for larger banks? The most plausible response takes us back to the value of soft information being enhanced by substantial economic adversity.

### Table 9
Distribution of and total deposits among community banks leavers after hurricane.

| Year | Average office deposits (no. of offices) | Total bank deposits from area (no. of banks) |
|------|------------------------------------------|---------------------------------------------|
|      | Emp decline ≥3%                          | $15.9 m (20)                              |
|      | Emp increase or decline <3%              | $143 m (13)                               |
|      | No hurricane                             | $12.6 m (9)                               |
|      | Emp decline ≥3%                          | $29.8 m (41)                              |
|      | Emp increase or decline <3%              | $35.3 m (34)                              |
|      | No hurricane                             | $37.3 m (45)                              |
|      | Emp decline ≥3%                          | $39.8 m (12)                              |
|      | Emp increase or decline <3%              | $39.6 m (13)                              |
|      | No hurricane                             | $30.9 m (8)                               |

| Year | Emp decline ≥3% | $318 m (11) | $168 m (9) | $114 m (5) |
|------|-----------------|-------------|------------|------------|
|      | Emp increase or decline <3% | $1,220 m (7) | $1,200 m (5) | $1,680 m (3) |
|      | No hurricane    | $477 m (2)  | $515 m (2)  | $247 m (1)  |

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Table 2
States and economic adversity by county characteristics, year 0, employment increase of decline <3%

| State          | Poverty | African American | Hispanic | Urban |
|----------------|---------|------------------|----------|-------|
| Alabama        | 16.2%   | 24.3%            | 3.6%     | 51.8% |
| Connecticut    | 7.1%    | 6.7%             | 11.3%    | 85.7% |
| Florida        | 13.9%   | 14.3%            | 13.3%    | 67.9% |
| Georgia        | 16.0%   | 27.8%            | 6.1%     | 46.7% |
| Louisiana      | 19.3%   | 31.9%            | 3.4%     | 54.1% |
| Maryland       | 9.4%    | 20.1%            | 5.6%     | 79.2% |
| Missouri       | 13.4%   | 3.6%             | 2.8%     | 20.8% |
| Mississippi    | 19.6%   | 39.7%            | 2.7%     | 19.2% |
| North Carolina | 14.7%   | 21.0%            | 7.1%     | 46.8% |
| New Jersey     | 8.6%    | 11.6%            | 16.6%    | 100%  |
| New York       | 12.0%   | 5.9%             | 7.5%     | 61.3% |
| Texas          | 16.8%   | 6.0%             | 34.9%    | 33.4% |
| **Total N**    | 16,182  | 16,182           | 16,182   | 16,182|

Table 3
Hurricane effects on pre-existing offices, employment decline at least 1%

| Years after hurricane | Large bank offices | Community bank offices |
|-----------------------|--------------------|------------------------|
| 0 (Pre-hurricane)     | 2638               | 882                    |
| 1                     | 2535               | 779                    |
| 2                     | 2445               | 750                    |
| 3                     | 2366               | 722                    |
| 4                     | 2302               | 683                    |
| 5                     | 2230               | 672                    |
| 6                     | 2181               | 625                    |
| 7                     | 2117               | 613                    |
| Proportional change yr 0–7 | -.197            | -.305                  |
| N                     | 18,814             | 5665                   |

Table 4
Hurricane effects on pre-existing offices, employment decline at least 5%

| Years after hurricane | Large bank offices | Community bank offices |
|-----------------------|--------------------|------------------------|
| 0 (Pre-hurricane)     | 253                | 188                    |
| 1                     | 248                | 182                    |
| 2                     | 242                | 178                    |
| 3                     | 227                | 171                    |
| 4                     | 219                | 156                    |
| 5                     | 205                | 154                    |
| 6                     | 190                | 147                    |
| 7                     | 182                | 144                    |
| Proportional change yr 0–7 | -.281            | -.234                  |
| N                     | 1766               | 1320                   |

Table 5
New offices each year after hurricane, employment decline at least 1%

| Years after hurricane | Large bank owned offices | Community bank offices |
|-----------------------|--------------------------|------------------------|
| 1                     | 67                       | 39                     |
| 2                     | 86                       | 48                     |
| 3                     | 56                       | 34                     |
| 4                     | 63                       | 48                     |
| 5                     | 53                       | 20                     |
| 6                     | 98                       | 47                     |
| 7                     | 55                       | 18                     |
| **Total**             | 478                      | 254                    |

Table 6
New offices each year after hurricane, employment decline at least 5%

| Years after hurricane | Large bank owned offices | Community bank offices |
|-----------------------|--------------------------|------------------------|
| 1                     | 4                        | 4                      |
| 2                     | 5                        | 7                      |
| 3                     | 3                        | 2                      |
| 4                     | 6                        | 8                      |
| 5                     | 4                        | 4                      |
| (continued on next page) |                         |                        |
Table 6 (continued)

| Years after hurricane | Large bank owned offices | Community bank owned offices |
|-----------------------|--------------------------|-----------------------------|
| 6                     | 4                        | 1                           |
| 7                     | 5                        | 4                           |
| Total                 | 31                       | 30                          |

Table 7
Office openings and closing in hurricane affected areas, years – 1, 0 and 1

| Emp decline at least 3% | Large bank owned offices | Community bank owned offices |
|-------------------------|--------------------------|-----------------------------|
| Offices year –1         | 447                      | 333                         |
| Closed year –1 to 0     | –8 (–1.8%)               | –3 (–0.9%)                  |
| Opened year –1 to 0     | +14 (+3.1%)              | +6 (+1.8%)                  |
| Offices year 0          | 453                      | 336                         |

Table 8
Community bank performance and characteristics, comparison across those who did and did not stay in adversely affected area at least 3 years after hurricane

| Emp decline at least 1% | Large bank owned offices | Community bank owned offices |
|-------------------------|--------------------------|-----------------------------|

Note: Assets measured in 2019 dollars.

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