Internet Appendix

Weathering an Unexpected Financial Shock: The Role of Cash Grants on Household Finance and Business Survival

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1 Data Appendix

1.1 Tornado Sample

As discussed in Section 2.1 of the main text, the tornado sample includes 34 individual tornadoes. All tornadoes in the sample have a Fujita (F) or Enhanced Fujita (EF) rating of a 4 or 5, and a map demarcating heterogeneous intensities within the tornado path. We use the Tornado History Project database (www.tornadohistoryproject.com) to form this sample. We restrict to the years 2002-2013, so as to match the period covered by our individual and business data. The Tornado History Project obtains data from the Storm Prediction Center's (SPC) historical tornado data files (www.spc.noaa.gov/wcm/#data). These data are maintained by the SPC, the National Centers for Environmental Protection, and the National Weather Service (NWS). The Tornado History Project reports 15,247 individual tornadoes from 2002-2013. Restricting to tornadoes with a F/EF rating rating of a 4 or 5 results in 87 tornadoes.

We further restrict tornadoes in the sample to have a detailed map denoting heterogeneous intensities within the tornado path. To our knowledge, there is no single database that contains damage maps for all tornadoes in the US. To locate the detailed maps we conducted an extensive search within local NWS office websites, and using more general web-based and archival searches. The search was conducted from from June 2013-August 2014.

The key feature of the NWS maps is that they are damage maps created by trained NWS employees who survey the on-the-ground damage. For example, the following link provides details on the May 22, 2011 Joplin, MO tornado: https://www.weather.gov/sgf/news_events_2011may22. The NWS has developed extensive manuals and computer software that relate observable damage to an EF rating. The first step involves documenting the severity of a damaged structure (e.g. detached house, mobile home, tree). The training manuals emphasize paying close attention to both a structure's materials and design, as well as, the state-level building codes. The NWS uses engineering models that relate the type of structure, the observed damage, and the under-

lying building codes to the range of wind speeds that would most-likely have caused the damage (Edwards et al. [2013]).

The US National Oceanic and Atmospheric Administration (NOAA) provides the following details to the questions "Who surveys tornado damage?" and "What's the criteria for the National Weather Service to do a survey?":

> *"This varies from place to place; and there are no rigid criteria. The responsibility for damage survey decisions at each NWS office usually falls on the Warning-Coordination Meteorologist (WCM) and/or the Meteorologist in Charge (MIC). Budget constraints keep every tornado path from having a direct ground survey by NWS personnel; so spotter, chaser and news accounts may be used to rate relatively weak, remote or brief tornadoes. Killer tornadoes, those striking densely populated areas, or those generating reports of exceptional damage are given highest priority for ground surveys. Most ground surveys involve the WCM and/or forecasters not having shift responsibility the day of the survey. For outbreaks and unusually destructive events–usually only a few times a year–the NWS may support involvement by highly experienced damage survey experts and wind engineers from elsewhere in the country. Aerial surveys are expensive and usually reserved for tornado events with multiple casualties and/or massive degrees of damage. Sometimes, local NWS offices may have a cooperative agreement with local media or police to use their helicopters during surveys."*

Source: https://www.spc.noaa.gov/faq/tornado/index.html#Damage

We include a tornado map in our sample if it contains exact locations of where the tornado hit at various F/EF intensities, and also have sufficient detail that it can be georeferenced using GIS software (ESRI ArcMap). We were able to obtain detailed damage maps for 35 of the 87 F/EF tornadoes. Many of the tornadoes for which we could not locate detailed maps occurred in very rural locations and directly hit few, if any, homes or built structures. It is likely that detailed maps were not created for these tornadoes. Regardless,

we would not be able to include most of these tornadoes in our sample because there would be insufficient credit bureau or business establishment data (in the Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP) and Infogroup's Historical Business Database, respectively).

Appendix Table 1 lists each of the 35 tornadoes. The table includes the date and location (closest city) of each tornado, and the following statistics provided by the Tornado History Project: fatalities, injuries, and estimated damage. The table also indicates whether each tornado was part of a Presidential Disaster Declaration, whether Public Assistance or Individual Assistance (cash grants) was allocated, and if the tornado is included in our balanced 18 tornado robustness sample. The Ferguson, MO tornado crosses state lines. We classify the Missouri tornado victims as receiving cash assistance and the Illinois tornado victims as not receiving cash assistance.

Our main sample includes 34 tornadoes. We exclude one tornado from the sample (the Wayne, NE tornado in Appendix Table 1). The Wayne, NE tornado has differing pre-tornado trends for the hit and nearby businesses (see Appendix Figure 3). The differing pre-trends violate our key difference-in-differences and triple-difference modeling assumption. Moreover, the difference for this tornado is large enough to alter the pre-trends for the entire group of no-cash tornadoes (see Appendix Figure 4). We drop the Wayne, NE tornado from both the business and household finance samples, so as to conduct our main analysis on the same sample of tornadoes.

1.2 GIS Data Processing

1.2.1 Tornado Maps

The goal of the GIS data processing is to use the detailed tornado maps to determine the list of census blocks that are hit by the tornado and the list of census blocks that are just outside the tornado path and located in the 0.5-1.5 mile buffer region. Further, we calculate the percent of each block that incurs each level of F/EF damage in the tornado path. We use the percent of each block hit by the various F/EF damage levels to calculate a weighted damage

intensity for every hit block. We also calculate the fraction of the block that is in the buffer region. We only include blocks in our nearby control sample if more than 50% is located in the buffer region. This restriction, along with the half mile gap between the tornado path and our buffer region, helps to ensure that no portion of a nearby control block is also hit by the tornado.

The first step in the GIS process is to georeference the exact location of the tornado path. Occasionally, the tornado maps are available as GIS shapefiles which, after projecting the shapefiles, provide the exact tornado location. More often, we georeference the tornado path location ourselves by adding a US highway/major/minor roads layer within the GIS software (ESRI ArcMap) on top of the tornado damage heterogeneity map. Geographic points are identified on the heterogeneous damage map such as intersections of highways and major/minor roads. The damage maps are then georeferenced by lining up the identified points on the map image with the same points on the US highway/major/minor roads layer.

Next, we calculate the portion of each block (if any) that incurs each level of tornado damage, and the proportion of each block (if any) that falls inside the buffer region. We do this by intersecting the 2000 US Census block shapefile corresponding to the state (or states) hit by each tornado with the georeferenced tornado map. We calculate a block-level weighted intensity measure for each block. The block-level intensity measure is defined as the sum: (0 * %EF0) + (1*%EF1) + ... + (5 * %EF5). Not all tornadoes have each damage level. Occasionally, the tornado maps will indicate EF0 damage, whereby the block is clearly located in the tornado path, but there is only minimal damage.

Finally, the block-level tornado information is exported to a .csv datafile. The exported GIS-calculated tornado information is then matched on census block fips number to the household finance and business datasets.

1.2.2 Appendix Figure 1 and Table 4

Appendix Figure 1 and Appendix Table 4 both use ZIP Code level FEMA Individual Assistance (cash grant) and SBA disaster loan data. We use the detailed georeferenced tornado damage maps discussed in Appendix Section 1.2.1 to

obtain the list of "hit" and "buffer" ZIP Codes. To do this, we overlay state-specific 2000 US Census TIGER/Line ZIP Code shapefiles onto each tornado map using Arc GIS. A hit ZIP Code is defined as one which intersects with any portion of the tornado path. For example, in Appendix Figure 1, the following ZIP Codes are hit: 64801, 64804, 64840, 64844. A buffer ZIP Code is one that intersects with the 0.5 to 1.5 mile buffer zone outside of the tornado path and does not intersect with the tornado path. In Appendix Figure 1, ZIP Codes 64841 and 64862 are buffer ZIP Codes. If a ZIP Code is within the buffer zone and the tornado path, we define it as hit.

Note that the ZIP Code definition for hit is different than the one we use for the block-level analysis in the paper. Census blocks are geographically much smaller than ZIP Codes. This allows us to have stricter definitions for hit and buffer areas in the empirical analysis. In the analysis, a hit block is one that is at least 50% in the tornado path, while a buffer (control) block is one that is at least 50% in the buffer zone.

1.3 Data Sources

This section lists information on all the data sources used in the paper. Further details provided in the paper.

1.3.1 Federal Emergency Management Agency (FEMA) Disaster Assistance

A governor of a US state that experiences a natural disaster must request a Presidential Disaster Declaration (PDD) in a written letter to their FEMA regional office. Disaster declarations occur at the county-level. The letter must contain a list of proposed counties and preliminary damage estimates. The regional office forwards a recommendation for whether to grant the request to FEMA headquarters. FEMA headquarters then makes an official recommendation to the US president, who decides whether or not to grant the request. In other words, the aim is to assist with "acts of God" that are of "such severity and magnitude that effective response is beyond the capacities of the state

and the affected local governments" (Daniels and Trebilcock [2006]; Disaster Relief Act [1974]).

The Federal Emergency Management Agency (FEMA) is the source of the Presidential Disaster Declaration, Public Assistance, and Individual Assistance data. The FEMA website (https://www.fema.gov/disasters) provides information on whether there is a Presidential Disaster Declaration following the storm that includes each tornado, and whether Public Assistance and Individual Assistance (cash grants) disaster aid is distributed. The publicly available information on the website is typically provided at the disaster-level (and occasionally the county-level).

The Individual Assistance data we use are from a Freedom of Information Act Request (FOIA). FEMA typically discloses either disaster-level or county-level information. We submitted a FOIA (No. 2015-FEFO-00159) in December 2014 for block-level Individual Assistance information. We received the FOIA information in January 2019. However, due to confidentiality considerations, FEMA provided 5-digit ZIP Code level information (rather than block-level). The information includes: disaster declaration number, ZIP Code, earliest application approval date, total number of housing grants, total amount of housing assistance, total number of other needs assistance (ONA) grants, and total amount of ONA. The information was provided for 23 of the 25 tornadoes in our full sample that are part of Presidential Disaster Declarations with Individual Assistance. We do not have ZIP Code level cash grant information for the 2008 Waterloo, Iowa and 2008 Ridgeville, Georgia tornadoes. We are happy to share all of the FOIA Individual Assistance data.

Appendix Table 4 shows summary statistics for the level of SBA disaster loans awarded to the hit and nearby ZIP Codes following a tornado.

1.3.2 Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP)

The credit and debt information is from the Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP). The consumer credit panel was first created via a collaboration between researchers at the Federal Reserve Bank

of New York and Equifax, a credit repository company. The panel is updated quarterly, and runs from 1999Q1 to the present. Lee and van der Klaauw [2010] provide a comprehensive summary of the information included in the CCP. We are not able to post or share these data due to confidentiality concerns and a strict user agreement.

The CCP consists of a random sample of the population that has a social security number conditional on having a credit history. We use the "primary" CCP sample that does not include other linked household members. Our sample consists only of individuals that are 21 and older in the quarter of the tornado, since individuals do not typically enter the CCP until they are 18 years old and we require them to be in the sample for 12 quarters prior to the tornado.

All dollar denominated variables are in real 2010 dollars. We winsorize the 99th percentile of all dollar denominated stock variables (balances and credit limits) in each quarter so that our estimates are not driven by the presence of extremely large debt balances or credit limits.

Appendix Table 3 panel A shows the means of the key CCP variables separately for individuals hit and nearby to cash and no-cash tornadoes. A comparison between columns (2) and (5) shows that individuals hit by a tornado with cash assistance have lower median income, a higher poverty rate, lower home ownership, and own less valuable homes (conditional on owning a home). The lower total debt is due largely to lower home debt. This highlights a potential concern with our estimation approach. There are still differences in the *levels* of some variables at the time of the tornado. Existing debt balances could, for example, impact the ability to adjust to the financial shock. As manuscript highlights, this motivates our robustness "Balanced Panel" of 18 tornadoes. The Equifax Risk Score (TM), for example, is identical between individuals hit by cash and no-cash tornadoes in the Balanced Sample (see Appendix Table 14).

Information on Particular Credit Variables

1. **Small Business Association (SBA) loans** are not reported to Equifax.

2. The **Equifax Risk Score** is a trademarked measure of consumer credit risk and ranges from 280-850. A higher score indicates a higher measure of creditworthiness.

3. Bank and retail card accounts (i.e. **credit cards**) cover all types of issuers: banks, bankcard companies, national credit card companies, credit unions, and savings & loan associations, as well as department store and other retail credit cards.

4. The CCP data include a quarterly **foreclosure** variable that indicates whether an individual had a foreclosure in the past seven years. We do not use this variable to examine how offering cash assistance following a tornado affects quarterly foreclosure rates. The reason is due to a combination of three factors: our sample size, the fact that new quarterly foreclosures are very uncommon, and that we need to use an inexact proxy to identify changes in foreclosure.

   Overall, the fraction of our sample that has the foreclosure flag equal to one in the quarter before a tornado ranges from 0.017 to 0.022 across the hit and nearby groups. To measure the rate of new foreclosures we calculate the quarterly change in this foreclosure flag. We proxy the quarterly foreclosure rate as quarterly changes in the fraction of individuals with the foreclosure flag equal to one. This proxy is inexact because it will not reflect a new foreclosure if an individual had a foreclosure within the past seven years. This quarterly change in foreclosure is equal to 1 for between 0.1% and 0.9% of the sample in the quarter before the tornado (Appendix Table 3)

   Appendix Figure 2 shows our measure of quarterly foreclosure rates for the four groups in our sample relative to when a tornado hit. The average

foreclosure rate is approximately 0.002 across the groups and is an order of magnitude smaller than the (seven year) sample means reported in the CCP for our sample. Moreover, the foreclosure rate proxy is zero for at least one quarter for each of the four groups, and equal to zero for the majority of quarters for the hit group without access to cash assistance. Overall, we interpret Appendix Figure 2 as evidence that we do not have enough power to estimate changes in foreclosures using the seven year foreclosure flag in our setting.

1.3.3 Infogroup's Historic Business Database

We use business establishment data from the Infogroup's Historic Business Database. The Infogroup compiles this information by first identifying business establishments through numerous sources, including: county-level public sources, utility connects and disconnects, real estate tax assessor data, yellow and white pages, and web research. Infogroup then calls every establishment in the US every year. An independent audit by the College of Information Science & Technology at the University of Nebraska at Omaha found the database similar to, and on many dimensions, of higher quality than other private establishment-level datasets such as the National Establishment Time-Series dataset (College of Information Science & Technology at the University of Nebraska [2017]).

The Infogroup establishment data are based on surveys. As such, the number of employees and level of sales could involve misreporting. However, whether an establishment exists is not based on a survey response. Throughout the manuscript we emphasize the survival of establishments for this reason. The sales data are only discussed in the last results subsection (Manuscript Section 4.2.3). We are not able to post or share these data due to a strict user agreement.

1.3.4 National Weather Service (NWS)

The tornado maps are created by the National Weather Service. To our knowledge, there is no single location that includes all of the NWS maps with sub-tornado path F/EF ratings. We collected the tornado maps used in this study over the time period June 2013-August 2014 via archival and internet searches. We are happy to share all of the NWS geocoded map data.

1.3.5 Small Business Administration (SBA)

There are several ways to make SBA disaster loans available, including: a Governor Certification Declaration for businesses and an Administrative Declaration for individuals (SBA [2015]). SBA disaster loans are available to both individuals (households) and businesses. Individuals can apply for up to $240 thousand, while businesses can apply for up to $2 million (SBA [2018]). Loan amounts are based on verified losses (i.e. building damage, personal property, business property). Small businesses can also receive loans based on "economic injury" (e.g. documented income loss). Loan applicants do not need collateral, but must demonstrate credit worthiness. Not all applications are approved.

Annual Small Business Administration disaster loan data are publicly available at the 5 digit ZIP Code level separately for home and business loans. We downloaded the data directly from the SBA website https://www.sba.gov/offices/headquarters/oda/resources/1407821 (FY 2001-2013). The SBA information includes dollar amounts for: real estate loss, content loss, real estate loans, content loans, and (for businesses) economic injury loans.

Appendix Table 4 shows that total verified losses are higher for loan applicants in areas hit by cash assistance tornadoes. However, the average amount of approved loans is lower for cash assistance tornadoes (e.g. $1.32 million vs. $1.41 million for home loans). One explanation is that, by law, the amount of SBA disaster loans allocated are reduced dollar for dollar based on the receipt of IA cash grants (SBA [2011]). By contrast, the total verified business loss and total approved business loans are both higher for establishments hit by tornadoes with cash assistance. This table is referenced in manuscript

Section 2.2.

1.3.6 Tornado History Project

The Tornado History Project, http://www.tornadohistoryproject.com, is a searchable database that archives all reported US tornadoes from 1950-2017. The underlying source of the tornado information is the Storm Prediction Center's (SPC) historical tornado data file (https://www.spc.noaa.gov/wcm/#data). The Storm Prediction Center is part of the National Weather Service and the National Centers for Environmental Prediction. Tornado cost, casualty, and maximum intensity information are from the Tornado History Project.

1.3.7 US Decennial Census

We use two sources of data from the US Census. First, are the demographic and socioeconomic information from the 2000 decennial census. These data are used as part of a pre-tornado comparison between hit and nearby populations. The means of key Census variables are displayed in Appendix Table 3. Second, are 2000 decennial census block shapefiles. We use the shapefiles in the GIS data processing.

1.3.8 Voting Information

We collect county level vote share data from uselectionatlas.org. For each PDD county, we calculate the average share of the two party (Democratic and Republican) vote that the losing party receives across the 1996, 2000, and 2004 presidential elections. We use these data to calculate the "Electoral Competitiveness of State" (see Appendix Table 2).

2 Cost per Job Calculation

Manuscript Section 5 follows Brown and Earle [2017] and calculates a rough measure for the cost per created or retained job. We use the following equation

to calculate the cost:

$$Cost\ Per\ Job\ =\ \frac{Total\ IA\ Costs}{Total\ Jobs\ Created} \tag{1}$$

2.1 Total Jobs Created

Total Jobs Created (denominator of Appendix Equation 1) is estimated from the employment results for establishments that have three or fewer employees (see Manuscript Table 5 panel C, column 2). The estimated employment gains are then multiplied by the total number of employees in the year before a tornado to determine the number of jobs created by the cash grants. We use total employment at establishments with three or fewer employees located in blocks that are hit by a cash tornado the following year as the baseline level of employment. We estimate that 963 jobs were created.

2.2 Cost Per Job

2.2.1 Baseline Calculation

Our baseline cost per job calculation only considers direct IA program costs. We define direct IA program costs as the sum of the total IA grant dollars and the total FEMA administrative costs related to running the IA program.

Our baseline calculation follows Brown and Earle [2017] who use administrative data to examine two large SBA (non-disaster) business loan programs. Brown and Earle [2017] estimate the causal effect of SBA business loans on employment and calculate the cost per created job. The authors consider two costs (loan defaults and administrative expenses) and report the cost of a job created as $25,450 (2010$) using the employment estimate from their preferred model. The authors are careful to emphasize that their calculation does not include, among other considerations, the effect of increased employment on the government budget from tax revenue and reduced unemployment benefits.

We calculate total IA grant dollars by summing the amount of Individual Assistance allocated for the entire Presidential Disaster Declaration area in

Appendix Table 13 panel A. We restrict the calculation to ZIP Codes hit by a tornado in Appendix Table 13 panel B. The amount of cash assistance to hit ZIP Codes still overstates cash assistance to the damaged tornado blocks.

We calculate total FEMA administrative costs using a Government Accountability Office (GAO) report on FEMA's state-level obligations for major disasters declared during fiscal years 2004 through 2013 (GAO [2014], Table 8). We first estimate the amount of FEMA administrative overhead for every IA dollar. The numerator in Equation 2 is an estimate of the total FEMA administrative expense to run the IA program for each state. The total expenditure categories include Public Assistance, Individual Assistance, Mission Assignment, and Hazard Mitigation. We divide these IA-related administrative costs by the total IA dollars in the state to obtain a state-by-state administrative cost per IA grant dollar.

$$Admin\ Dollar\ Per\ IA\ Dollar = \frac{Admin\ Costs * (\frac{IA}{TotalExpenditures})}{IA} \tag{2}$$

Each state's administrative cost per IA grant dollar is then multiplied by the state's total amount of IA grant dollars. For example, if a state allocated \$10 million in IA grants and we estimate that it costs \$0.2 dollars in administrative overhead for every \$1 IA dollar spent, then we would estimate a total administrative cost of \$2 million for that state.

The baseline total Individual Assistance program costs for our sample is \$233.28 million. We divide the baseline IA cost by our jobs estimate to obtain our baseline cost per job (Appendix Table 13, Panel A, Column 1) .

2.2.2 More Comprehensive Calculations

Appendix Table 13 columns 2-5 provide rough estimates of the net job cost inclusive of other program costs and fiscal externalities (e.g. Bastian and Jones [2019]; Hendren [2016]).

Appendix Table 13 column 2 considers administrative cost savings from issuing fewer SBA disaster loans. FEMA is prohibited from duplicating ben-

efits between the Individual Assistance and SBA programs (SBA [2011]). We assume that in the absence of the cash grants that an equal dollar amount of SBA disaster loans would have been distributed to disaster victims. Using Brown and Earle [2017] (pages 1074-1075) we calculate that recipients default on roughly 8% of SBA loan dollars (18.9 billion out of 230 billion). Therefore, for each IA grant dollar distributed, we estimate a cost savings of $0.08 due to foregone defaults under the SBA program. These administrative cost savings are subtracted from our baseline total costs when calculating the cost per job.

Appendix Table 13 column 3 considers federal tax revenue raised from the additional jobs. We use two primary data sources to estimate the additional tax revenue. The first data source are state level salary estimates for each state and year in our sample from the Bureau of Labor Statistics Quarterly Census of Employment and Wages (Bureau of Labor Statistics [2019]). Specifically, we use the "average annual pay" for the "Total, all industries" group. Second, we use the National Bureau of Economic Research (NBER) income tax calculator for "US Federal Marginal Income Tax Rates: Tax Rate on Wage Income" (National Bureau of Economic Research [2019]). We use these two data sources to calculate the average federal tax an employee would pay (i.e. federal taxes per employee per year). We sum the estimated federal tax revenue across states and years. We use the number of employees at small establishments in cash-tornado hit blocks for each state in the year before the tornado as the state-by-year specific level of employment. The total federal tax revenue is subtracted from our baseline total costs when calculating the cost per job.

Appendix Table 13 column 4 considers federal cost savings from lower unemployment benefits due to fewer unemployed workers. Evidence in the Manuscript suggests that the difference between cash and no-cash disaster blocks is largely due to "retained" jobs rather than "new" jobs. Thus, the cash grants mostly aid in preventing job loss. Unemployment insurance benefits are paid by states. The federal government typically pays only for the administrative costs of running the unemployment insurance programs up to 26 weeks (Stone and Chen [2014]). The federal government can extend unemployment benefits beyond 26 weeks. We do not factor any extended federal

unemployment benefits into our calculation. The total estimated federal costs to administer the unemployment insurance program is subtracted from our baseline total costs when calculating the cost per job. Here are the steps we use to calculate the cost savings from reduced unemployment benefits:

(1) We calculate the average length of unemployment from 2002-2013 as 25.54 weeks using data from the Federal Reserve (FED [2019]).

(2) We use an estimate for the cost in administration overhead per-person, per-week for the federal government to run the unemployment program (Whittaker et al. [2019], page 1). Using the FY2020 proposed budget, the document states that for every 100,000 person increase in average weekly claims above the baseline amount, $28.6 million in funding would be available. We use this statistic to calculate an administrative cost of $286 allocated per person per week (i.e. $28,600,000 / 100,000 more weekly claims).

(3) Our estimate for the total unemployment savings to the federal government is: Total Jobs Created * 25.54 weeks * $286

Appendix Table 13 column 5 presents cost per job estimates when cost savings from columns 2-4 are added together and then subtracted from our baseline total costs.

3 Supporting Analysis

3.1 Main Samples

This section provides supporting analysis for the main household finance and business establishment samples that include 34 tornadoes. The tables and figures in this section are directly referenced in the manuscript.

Appendix Figure 1 shows the total amount of Individual Assistance cash grants received for each ZIP Code in the vicinity of the May 22, 2011 Joplin, MO tornado. The majority of the tornado path and nearly all of the most

highly damaged areas occur in a single ZIP Code (64804). More than $12 million is provided to residents in this ZIP Code. Nevertheless, the tornado only hits 9.95% of the land area of the ZIP Code. Some residents in portions of the ZIP Code farther away from the tornado path likely experienced minor storm-related damage and receive cash assistance. As evidence for this, all of the ZIP Codes surrounding the tornado path have non-zero levels of cash assistance. The majority of these ZIP Codes (colored light blue in the figure) receive much smaller levels of total cash grants, ranging from $408 to $301,382. This figure is referenced in manuscript Section 2.2.

Appendix Figure 2 plots quarter to quarter changes in the foreclosure rate, as proxied by the fraction of each group with the seven year foreclosure flag equal to one. The four groups are individuals hit and nearby to Cash and No-cash tornadoes, respectively. The vertical line indicates the last quarter before a tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census. Foreclosure is referenced in manuscript Section 4.1.2.

Appendix Figure 3 plots the trends in the number of establishments and employment in blocks hit by and nearby to a tornado. The difference between this figure and Manuscript Figure 5 is that the no-cash tornado trends are plotted only for the Wayne, NE tornado. The Wayne, NE tornado is omitted from the main 34 tornado sample due to divergent pre-tornado business trends. This figure is referenced in manuscript Section 3.

Appendix Figure 4 shows the trends in the number of establishments and employees for establishments located in hit Census blocks at the time of a tornado, and for establishments near to, but outside the tornado path. The difference between this figure and Manuscript Figure 5 is that the no-cash tornado trends include hit and control blocks from the Wayne, NE tornado. This figure is referenced in manuscript Section 3.

Appendix Figure 5 shows the distribution of establishments by employment size for the 34 tornado sample analyzed in Manuscript Table 5. This figure is referenced in manuscript Section 4.2.2.

Appendix Figure 6 shows the hit minus nearby difference for new quar-

terly auto loans and log sales for retail and service establishments. We plot the differences separately for cash and no-cash tornadoes, after first taking the mean residuals from a regression that controls for calendar time. The left panel shows that the difference in new vehicle loans for hit and nearby individuals oscillates around zero for the entire time period with two exceptions: an increase for the cash group right after the tornado, and a year-long decrease for the no cash group beginning two quarters post-tornado. The right panel shows a pattern in retail and service establishment sales that mirrors the survival and employment plots in Manuscript Figure 5. Sales plummet for hit retail and service establishments in neighborhoods with no cash assistance.

Appendix Table 1 shows summary information for all 35 tornadoes in our full sample. The 35 tornadoes are the subset of the 87 Fujita or Enhanced Fujita 4 and 5 tornadoes that struck the US between 2002-2013 which have detailed damage path maps. Manuscript Section 2.1 and Appendix Section 1.1 provide more details.

Appendix Table 2 provides summary information for the tornadoes in our main sample. We reference the table in Manuscript Section 2.2.

Appendix Table 3 shows the means of key variables from three data sources. The means are calculated separately for individuals hit and nearby to cash and no-cash tornadoes. Panels A-C show information from the CCP, Census, and Infogroup, respectively. We reference the table in both Manuscript Section 2 and Appendix Section 1.3.

Appendix Table 4 shows summary statistics for the level of SBA disaster loans awarded to the hit and nearby ZIP Codes following a tornado. This table is referenced in Manuscript Section 2.2.

Appendix Tables 5-7 show difference-in-differences estimates for individual debt, financial distress, and migration using the CCP. We separately estimate the model for cash and no-cash tornadoes for each dependent variable. These tables are referenced in Manuscript Section 4.1.

Appendix Table 8 shows difference-in-difference model results for home debt conditional on whether an individual affected by a tornado (either hit or nearby) moved or stayed in the same census block following the tornado, and

by type of home debt. Columns 1-2 only include individuals who move (for at least one quarter) at any point during the three years following the tornado. Columns 3-4 only include individuals who do not move. Our main measure of home debt includes both mortgage debt and home equity debt. Columns 5-6 only consider mortgage debt, while columns 7-8 only consider home equity debt. This table is referenced in Manuscript Section 4.1.1.

Appendix Tables 9 and 10 show survival and employment triple difference estimates for establishments in each of the "1 digit" industries that we pool together in the non-manufacturing category (Manuscript Table 5). These tables are referenced in Manuscript Section 4.2.2.

Appendix Table 11 shows our regression estimates for the number and dollar amount of new auto loan originations, and for retail and establishment sales. These results are referenced in Section 4.2.3. Note that, unlike our other CCP dollar debt variables, we do not winsorize at the 99% level. The reason is that the new dollar loan variable is a flow variable with a median of $0. A decision to winsorize would affect a large fraction of the non-zero values. Nevertheless, the regression results are similar regardless of the decision to winsorize.

Appendix Table 12 shows triple difference heterogeneity estimates for new car loans and new car loan balances. The model is estimated separately on two groups of individuals (lower and upper terciles) based on available credit (panel A), Equifax Risk Score (panel B), and age (panel C). We do not winsorize the new auto loan variable at the 99% level. The reason is that the new dollar loan variable is a flow variable with a median of $0. A decision to winsorize would affect a large fraction of the non-zero values.

Appendix Table 13 shows our cost per job estimates. These results are referenced in Manuscript Section 5 and Appendix Section 2.

3.2 Robustness

Appendix Tables 14-24 show robustness analysis for the household finance and migration outcomes (Manuscript Tables 1 - 3), and for the business outcomes

(Manuscript Tables 4 and 5). We estimate two alternative specifications for each outcome. First, we show results from the balanced tornado sample, selected to minimize the difference in the CCP debt and financial variables for individuals hit by cash and no-cash tornadoes. Second, we estimate the model on the full sample that includes the Wayne, NE tornado that is dropped from our preferred sample due to differing pre-trends. These results are referenced throughout the manuscript including Sections 3, 4.1.5, and 4.2.4.

Appendix Figures 7-10 show event study household finance and migration outcomes for the two alternative specifications.

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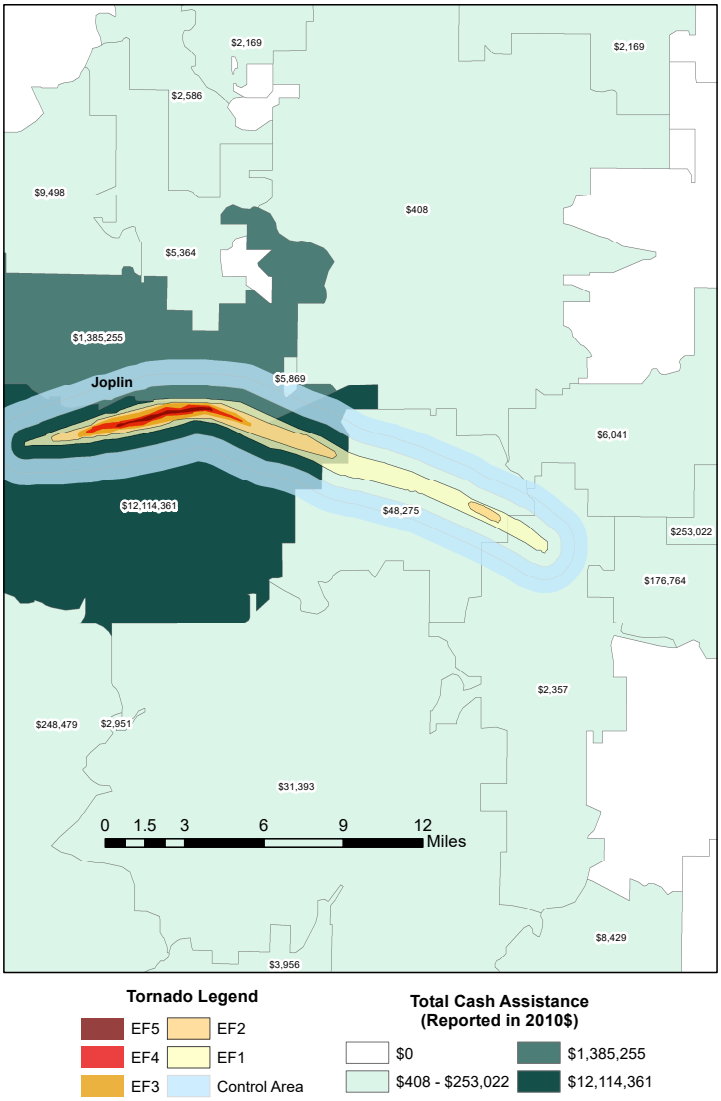
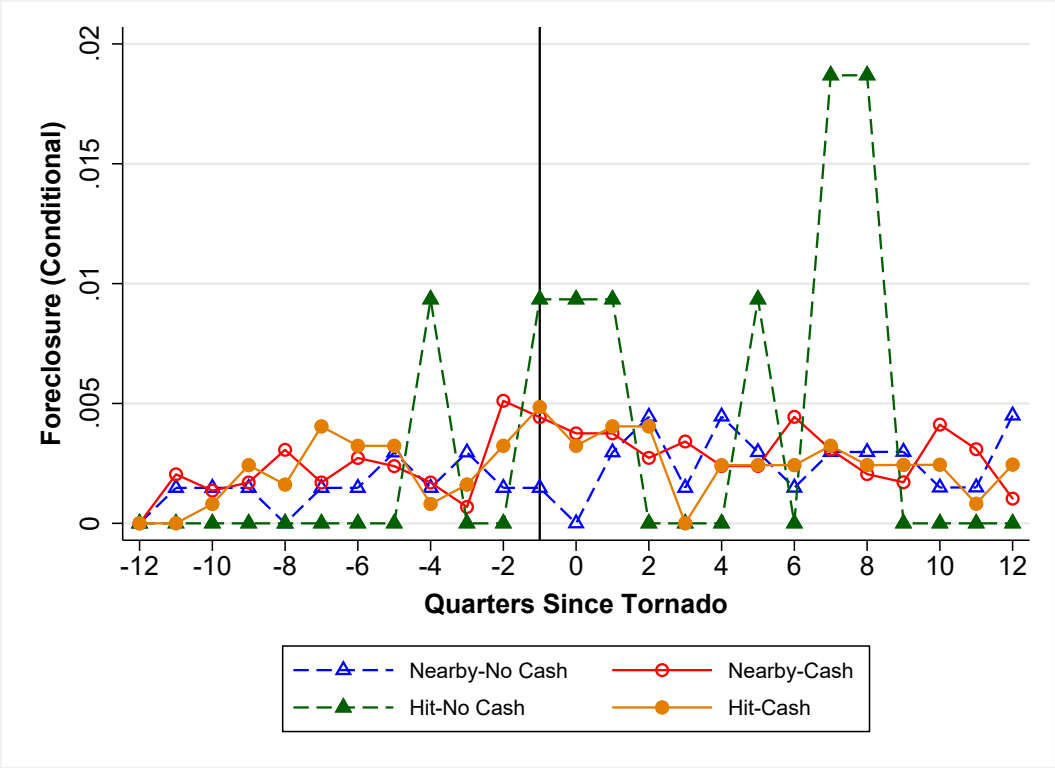
5 Figures and Tables

Figure 1: **Individual Assistance Cash Grants for the Presidential Disaster Declaration that includes the Joplin, MO 2011 Tornado**



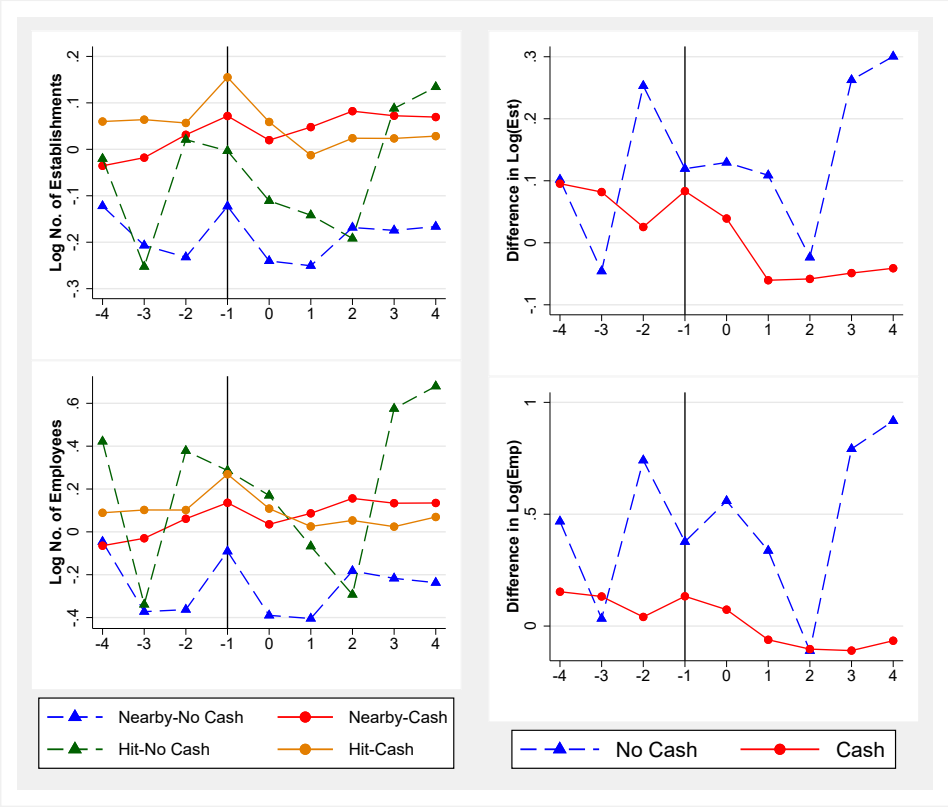
The figure plots the tornado path and 0.5-1.5 tornado buffer region for the EF5 tornado that struck near Joplin, MO on May 22, 2011. The figure also displays the total amount of Individual Assistance cash grants received for each ZIP Code. The Individual Assistance data are from a Freedom of Information Act Request (No. 2015-FEFO-00159) submitted in December 2014 and received in January 2019. Due to confidentiality considerations, FEMA provided 5-digit ZIP Code level information (rather than block-level). Sources: Federal Emergency Management Agency, National Weather Service, US Census.

Figure 2: **Trends in New Foreclosures**



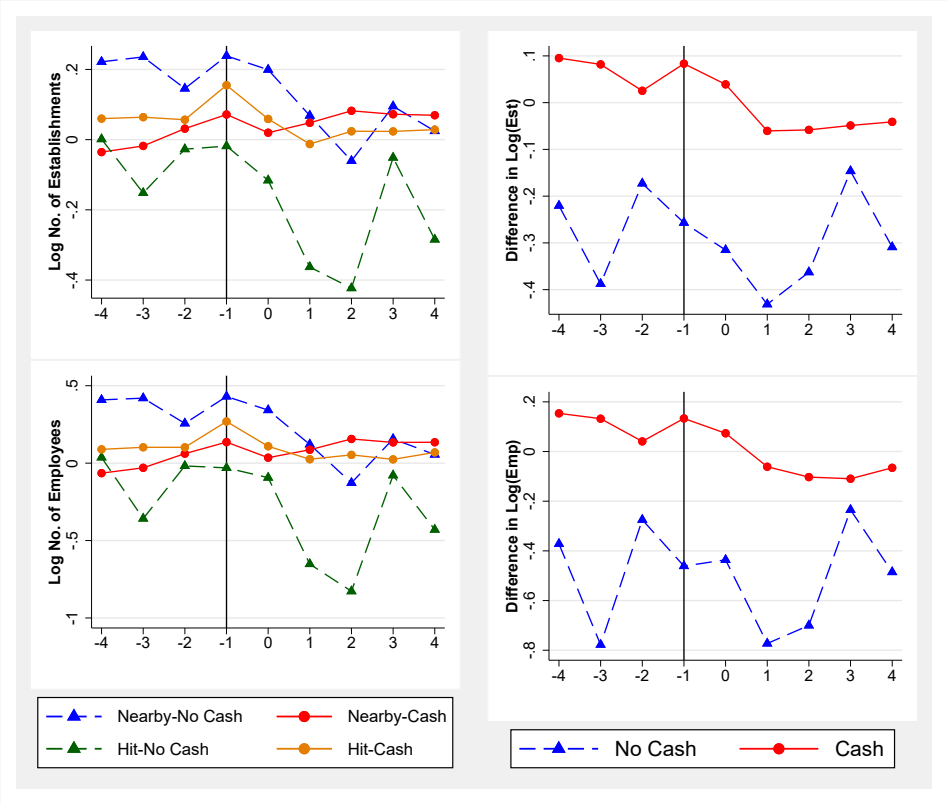
The figure plots quarter to quarter changes in the foreclosure rate, as proxied by the faction of each group with the seven year foreclosure flag equal to one. The four groups are: non-hit residents who lived in the 0.5 to 1.5 mile buffer area around the tornadoes that did not receive cash grants (dashed blue triangles), hit residents who lived in the damage path of tornadoes that did not receive cash grants (dashed green triangles), non-hit residents who lived in in the buffer areas of the tornadoes that did receive cash grants (solid red circles), and hit residents from tornadoes that received cash grants (solid orange circles). The vertical line indicates the last quarter before a tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Figure 3: **Trends in Business Outcomes for the Sample of Cash Tornadoes and the No-cash Wayne, NE Tornado Excluded from the Main Sample**



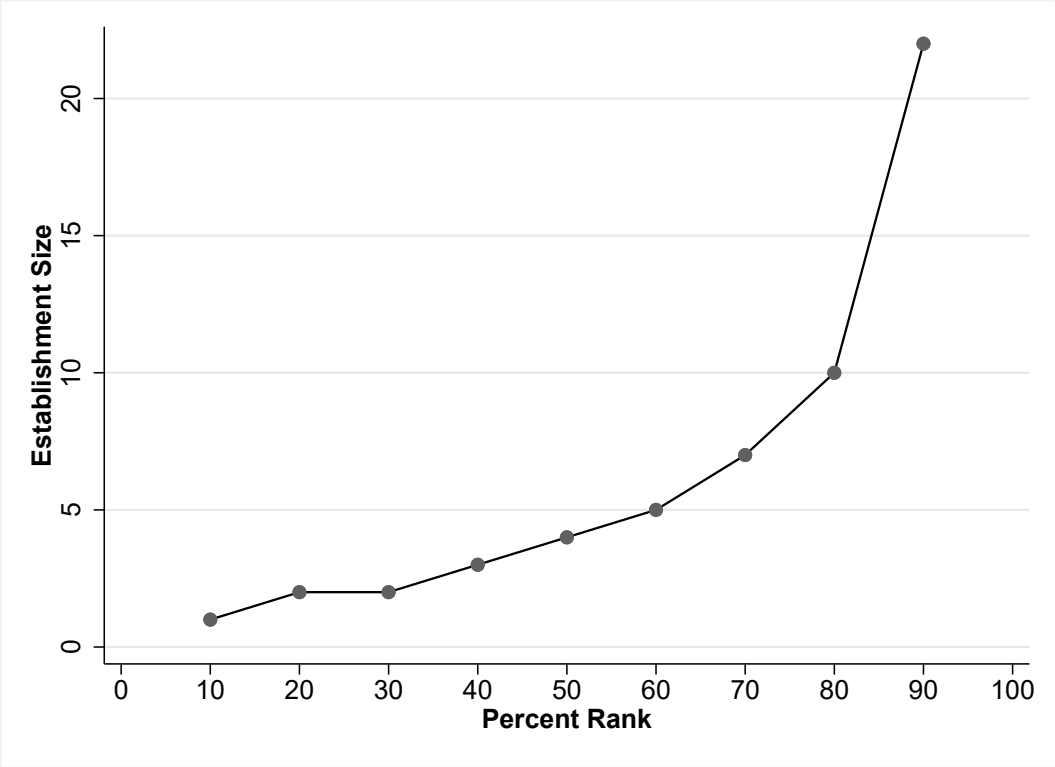
The figure shows the trends in the number of establishments and employees for establishments located in hit Census blocks at the time of a tornado, and for establishments near to, but outside the tornado path. The difference between this figure and Manuscript Figure 5 is that the no-cash tornado trends are plotted only for the Wayne, NE tornado. The Wayne, NE tornado is omitted from the main sample. The cash tornado observations are identical to those plotted in Manuscript Figure 5. Manuscript Section 4.2 provides more details. Sources: Infogroup Historic Business Database, National Weather Service, US Census.

Figure 4: **Trends in Business Outcomes, 35 Tornado Sample Including the Wayne, NE Tornado**



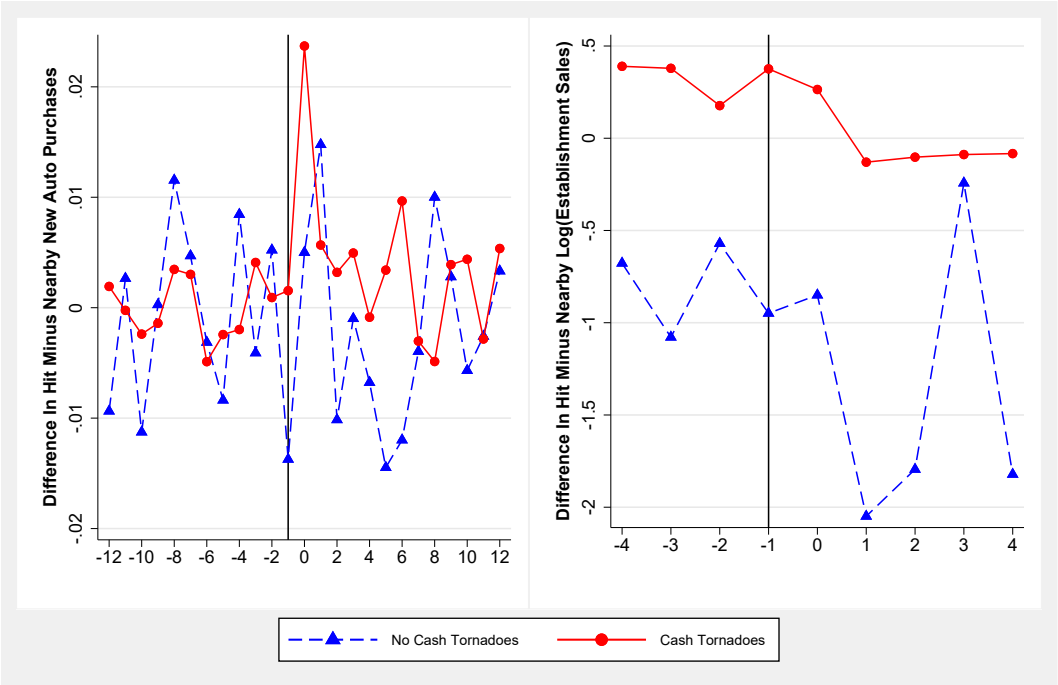
The figure shows the trends in the number of establishments and employees for establishments located in hit Census blocks at the time of a tornado, and for establishments near to, but outside the tornado path. The difference between this figure and Manuscript Figure 5 is that the no-cash tornado trends include hit and control blocks from the Wayne, NE tornado. Manuscript Section 4.2 provides more details. Sources: Infogroup Historic Business Database, National Weather Service, US Census.

Figure 5: **Distribution of Establishment Size by Number of Employees**



This figure shows the distribution of establishments by employment size for the 34 tornado sample analyzed in Manuscript Table 5. Sources: Infogroup Historical Database, National Weather Service

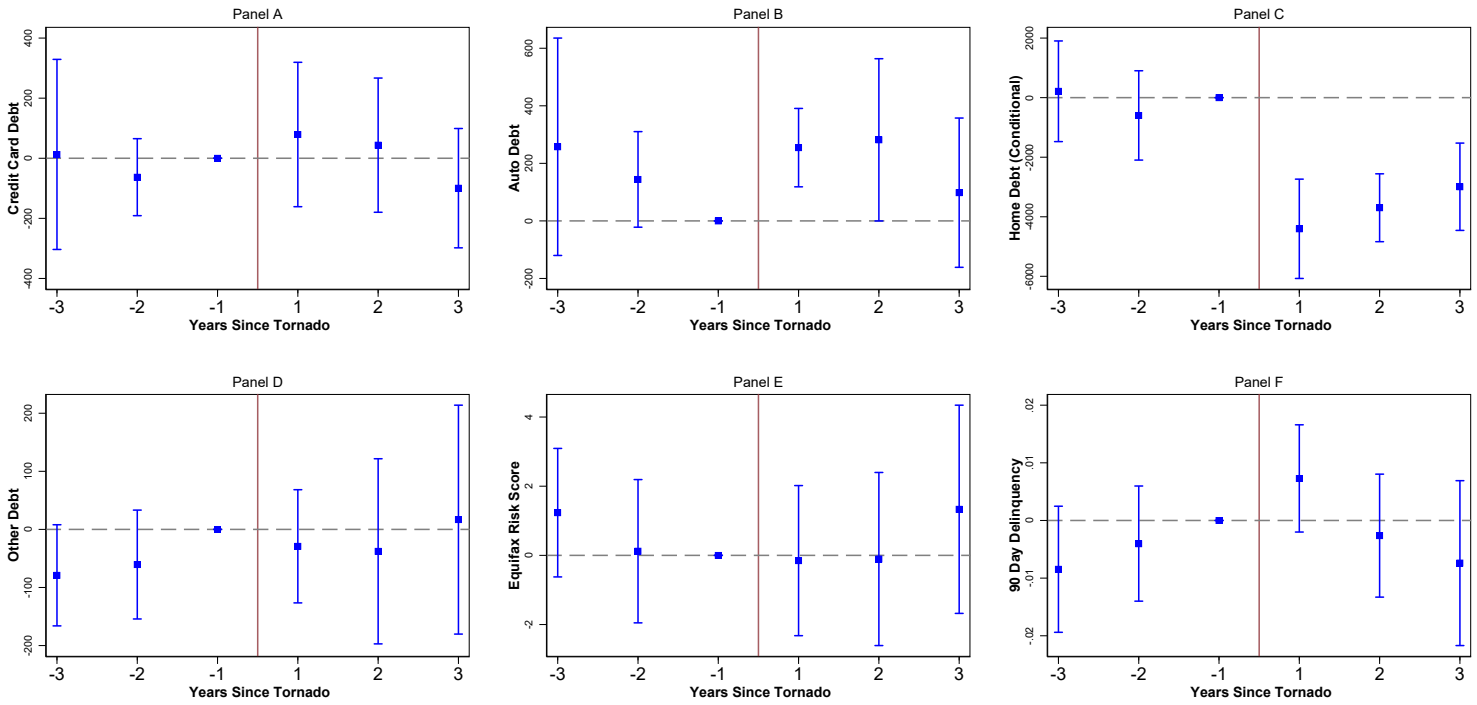
Figure 6: **Trends in Motor Vehicle Purchases and Business Establishment Sales**



The figure shows trends in the hit minus nearby difference for new quarterly auto loans and establishment-level log sales. We plot the differences separately for cash and no-cash tornadoes, after first taking the mean residuals from a regression that controls for calendar time. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), Infogroup Historic Business Database, National Weather Service, US Census.

Figure 7: **Yearly Event Study Analysis of Debt and Financial Wellbeing**

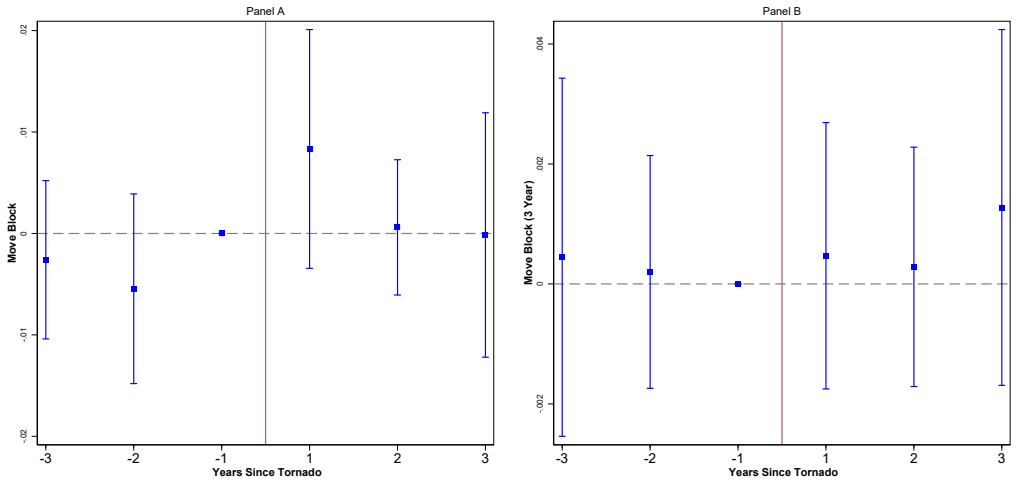
18 Tornado Balanced Sample



The figure shows yearly event study estimates and 95% confidence intervals for the outcomes in Manuscript Figure 3. The difference is that this figure shows results from an event study model that uses the 18 tornado balanced sample. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Figure 8: **Yearly Event Study Analysis of Block Migration**

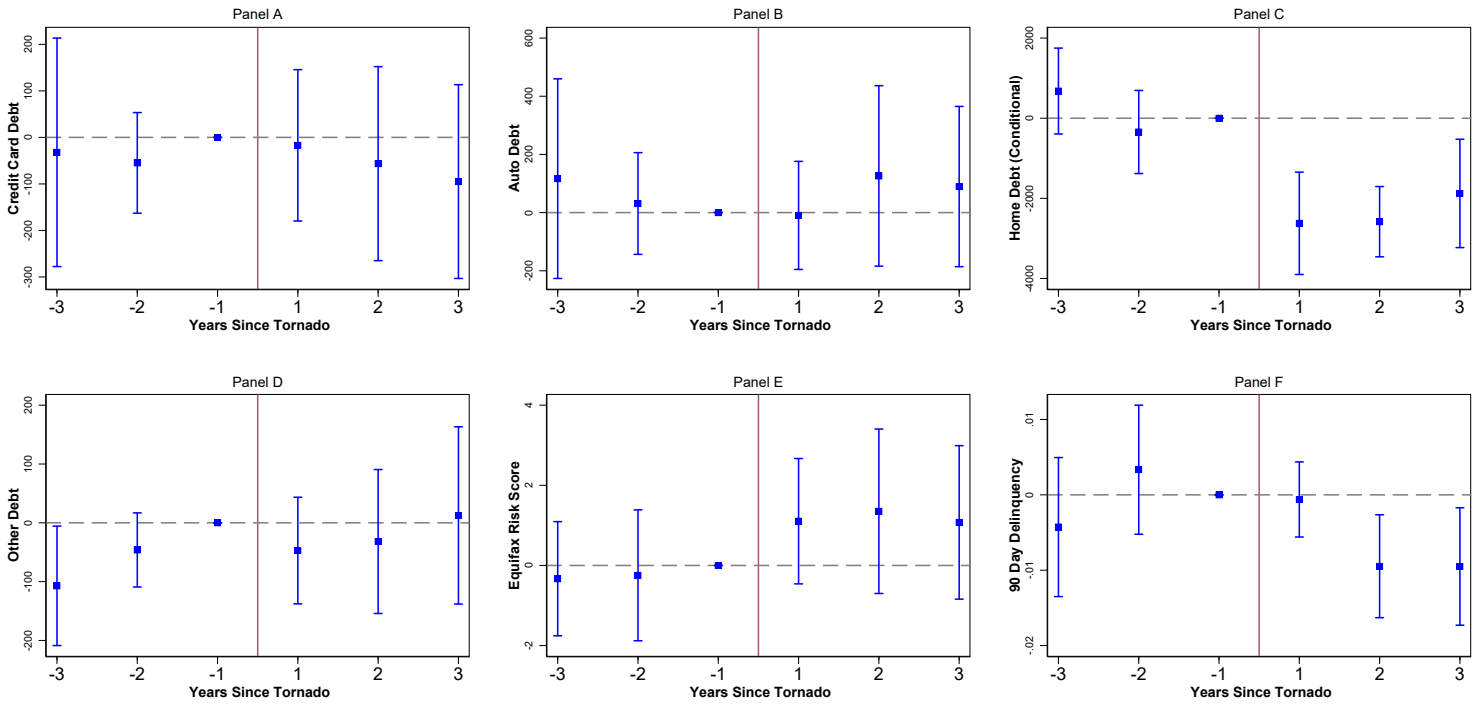
18 Tornado Balanced Sample



The figure shows yearly event study estimates and 95% confidence intervals for the same migration outcomes as in Manuscript Figure 4. The difference is that this figure shows results from an event study model that uses the 18 tornado balanced sample. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Figure 9: **Yearly Event Study Analysis of Debt and Financial Wellbeing**

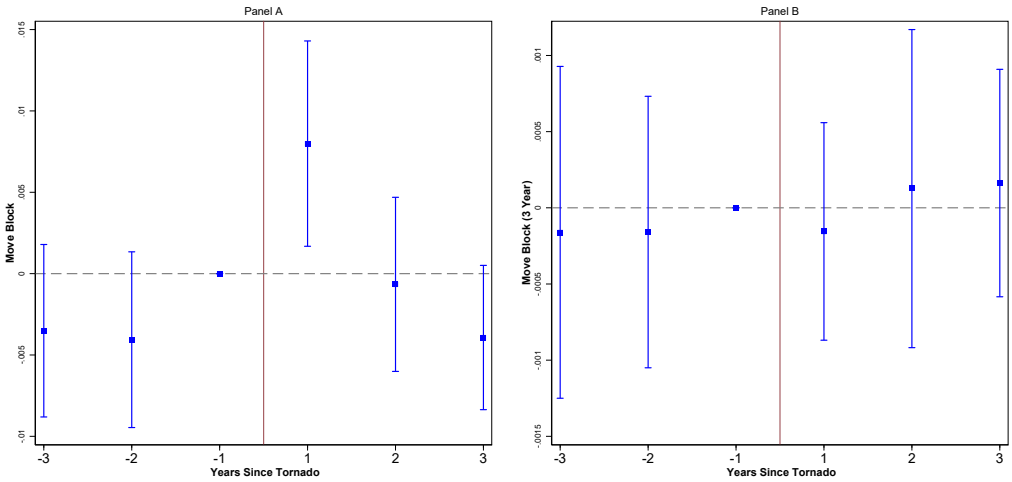
35 Tornado Sample



The figure shows yearly event study estimates and 95% confidence intervals for the outcomes in Manuscript Figure 3. The difference is that this figure shows results from estimating the event study model on the sample of 35 tornadoes that includes the Wayne, NE tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Figure 10: **Yearly Event Study Analysis of Block Migration**

35 Tornado Sample



The figure shows yearly event study estimates and 95% confidence intervals for the same migration outcomes as in Manuscript Figure 4. The difference is that this figure shows results from estimating the event study model on the sample of 35 tornadoes that includes the Wayne, NE tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 1: **Location, Damage, and Federal Assistance Information for All 35 Tornadoes**

Date of Tornado	Nearby City	Tornado F/EF	Fatalities	Injuries	Casualties	Estimated Damage (Millions)	Presidential Disaster Declaration	Public Assistance	Individual Assistance	Included In Balanced Sample
4/28/2002	La Plata, MD	4	3	122	125	$124.00	Y	Y	Y	Y
11/10/2002	Van Wert, OH	4	4	17	21	$30.00	Y	N	Y	N
5/4/2003	Jackson, TN	4	11	86	97	$40.00	Y	Y	Y	N
5/8/2003	Moore, OK	4	0	134	134	$370.00	Y	Y	Y	N
5/22/2004	Lincoln, NE	4	1	38	39	$160.22	Y	Y	Y	Y
3/1/2007	Enterprise, AL	4	9	50	59	$250.00	Y	Y	Y	N
5/4/2007	Greensburg, KS	5	11	63	74	$250.00	Y	Y	Y	N
2/6/2008	Moulton, AL	4	4	23	27	---	N	N	N	Y
2/6/2008	Flat Rock, AL	4	1	12	13	$2.00	N	N	N	Y
5/11/2008	Ridgeville, GA	4	0	9	9	$12.50	Y	Y	N	Y
5/25/2008	Waterloo, IA	5	9	70	79	$100.30	Y	Y	Y	N
6/11/2008	Manhattan, KS	4	0	0	0	$66.00	Y	Y	N	Y
2/10/2009	Ardmore, OK	4	8	0	8	$3.00	Y	Y	Y	Y
4/10/2009	Murfreesboro, TN	4	2	58	60	$100.00	Y	Y	N	Y
6/5/2010	Millbury, OH	4	7	28	35	$102.40	N	N	N	Y
11/29/2010	Winnfield, LA	4	0	0	0	$0.75	N	N	N	Y
4/22/2011	Ferguson, MO	4	0	5	5	$30.00	Y	Y	Y	N
4/27/2011	Chattanooga, TN	4	20	335	355	$68.25	Y	Y	Y	N
4/27/2011	Tuscalousa, AL	4	64	1,500	1,564	$2,450.00	Y	Y	Y	N
4/27/2011	Huntsville, TN	5	72	145	217	$1,290.00	Y	Y	Y	N
4/27/2011	Birmingham, AL	4	22	85	107	$366.76	Y	Y	Y	Y
4/27/2011	Chattanooga, TN	4	1	0	1	$0.03	Y	Y	Y	N
4/27/2011	Fort Payne, AL	5	25	0	25	$0.15	Y	Y	Y	Y
4/27/2011	Hamilton, AL	5	23	137	160	$14.40	Y	Y	Y	Y
4/27/2011	Cullman, AL	4	6	48	54	---	Y	Y	Y	N
5/22/2011	Joplin, MO	5	158	1,150	1,308	$2,800.10	Y	Y	Y	N
5/24/2011	Booneville, AR	4	4	27	31	$9.08	Y	Y	Y	N
3/2/2012	Crittenden, KY	4	4	8	12	$20.50	Y	Y	Y	Y
5/15/2013	Decordoya, TX	4	6	54	60	$143.00	N	N	N	Y
5/19/2013	Norman, OK	4	2	10	12	---	Y	Y	Y	N
5/20/2013	Moore, OK	5	24	212	236	$2,000.00	Y	Y	Y	N
10/4/2013	Sergeant Bluff, IA	4	0	0	0	$2.01	N	N	N	Y
10/4/2013	Wayne, NE	4	0	15	15	$0.50	Y	Y	N	N
11/17/2013	Peoria, IL	4	3	125	128	$935.23	Y	N	Y	Y
11/17/2013	New Minden, IL	4	2	2	4	---	Y	N	Y	Y

The table shows summary information for all 35 tornadoes in our full sample. The 35 tornadoes are the subset of the 87 Fujuti or Enhanced Fujita 4 and 5 tornadoes that struck the US between 2002-2013 which have detailed damage path maps. The Ferguson, MP tornado crosses the state line. A portion of the tornado is in Illinois where individuals did not receive cash assistance. Manuscript Section 2.1 and Appendix Section 1.1 provide more details. Sources: Tornado History Project, National Weather Service, Small Business Administration, US Census.

Table 2: **Tornado Damage Characteristics**

Panel A: Overall Sample Characteristics	
Total Number of Tornadoes	34
Individual Assistance (Cash Grants)	25
Tornado Damage Severity	
F5/EF5 Tornadoes	7
F4/EF4 Tornadoes	27
States hit by Tornado	15

Panel B: Characteristics by Assistance Status

	Cash Assistance Mean (Median)	No Cash Assistance Mean (Median)
Disaster-Level		
Number of Counties in Disaster Declaration	34.8 (23)	7.1 (0)
Percent State Counties in Disaster Declaration	42.8 (29)	6.8 (0)
Electoral Competitiveness of State	42.6 (41.9)	43.9 (44.1)
Tornado-Level		
Tornado F/EF Rating	4.3 (4)	4.0 (4)
Number of Damaged Blocks	381 (233)	58 (45)
Estimated Tornado Damage (Millions $)	513 (150)	53 (40)
Fatalities	19 (8)	2 (1)
Casualties	178 (59)	23 (13)
Block-Level		
Average Block F/EF Rating	1.39 (1.44)	0.84 (0.70)
Average Tornado Damage per Block (Millions $)	1.43 (0.60)	1.25 (0.48)

Tornadoes occur from 2002-2013. Damages in 2010$. *Electoral Competitiveness* follows Reeves [2011] and measures the 2-way voteshare of the losing political party at the mid-point of our sample (2007) averaged over 3 presidential elections (2004, 2000, and 1996). Sources: Federal Emergency Management Agency, Tornado History Project, US Census, uselectionatlas.org

Table 3: **Comparative Statistics for Individuals and Business Establishments Hit by and Nearby to a Tornado**

	(1)	(2)	(3)	(4)	(5)	(6)
Tornado Type:	Cash Assistance			No Cash Assistance		
Census Block:	Overall	Hit	Nearby	Overall	Hit	Nearby
	Panel A: CCP Variables					
Debt Balances						
Credit Card	2,636	2,411	2,732	2,925	3,216	2,887
Auto	3,207	3,143	3,235	3,695	3,816	3,679
Home	22,644	24,176	21,984	28,302	37,601	27,079
Other	1,193	1,300	1,147	1,219	989	1,249
Total	29,680	31,030	29,097	36,142	45,622	34,895
Financial Health						
Equifax Risk Score	671	672	671	696	705	695
90 Day Past Due	0.21	0.21	0.22	0.16	0.15	0.16
Foreclosure Flag	0.005	0.005	0.004	0.003	0.009	0.001
Migration						
Move From Block	0.057	0.054	0.058	0.075	0.037	0.079
Move From County	0.024	0.025	0.024	0.044	0.027	0.046
	Panel B: Census Variables					
Economic						
Median Income	49,382	48,325	49,836	55,321	72,003	53,149
Poverty Rate	0.13	0.13	0.12	0.11	0.06	0.11
Fraction Owner Occupied	0.73	0.74	0.73	0.71	0.85	0.69
Median Home Value	100,478	99,320	100,977	118,135	151,820	113,749
Socioeconomic						
Fraction College Degree	0.17	0.17	0.18	0.25	0.33	0.24
Fraction African American	0.22	0.19	0.23	0.06	0.05	0.06
Fraction Hispanic	0.02	0.02	0.02	0.03	0.02	0.03
Fraction Age 65+	0.13	0.13	0.13	0.12	0.10	0.12
	Panel C: Business Establishments					
Number of Establishments	2.0	2.1	2.0	3.1	3.0	3.1
Number of Employees	25	23	26	33	44	31
Manufacturing Employment Share	0.05	0.05	0.05	0.04	0.04	0.04
CCP Observations	17,959	5,401	12,558	3,368	388	2,980
Number of Blocks	6,346	1,949	4,397	1,050	118	932
Number of Establishment Blocks	15,627	4,944	10,683	2,139	365	1,774

Panel A shows CCP variable means from the quarter before a tornado for individuals residing in hit or nearby (control) blocks at the time of the tornado. Panel B shows 2000 US Census block group information for the same hit and nearby blocks as in Panel A. Panel C shows block-level business establishment information for the year before a tornado for the same blocks as in Panel A. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), Infogroup Historic Business Database, National Weather Service, US Census.

Table 4: **Small Business Administration Loans Summary Statistics**

Hit ZIP Code Statistic:	Mean (Median)	Mean(Median)
Panel A: Cash versus No Cash Tornadoes		
	Cash Tornado	**No Cash Tornado**
Home Loans		
Total Verified Loss (1,000 $)	4,211 (701)	3,051 (170)
Total Approved Loans (1,000 $)	1,321 (266)	1,414 (132)
Per-Capita Approved Loans	297 (37)	344 (12)
Business Loans		
Total Verified Loss (1,000 $)	1,886 (68)	1,567 (0)
Total Approved Loans (1,000 $)	490 (0)	436 (0)
Per-Establishment Approved Loans ($)	3,138 (0)	2,394 (0)
Panel B: High versus Low Tornado Damage		
	F3 or Greater	**Less than F3**
Home Loans		
Total Verified Loss (1,000 $)	8,913 (3170)	1,042 (212)
Total Approved Loans (1,000 $)	2,807 (1014)	409 (80)
Per-Capita Approved Loans	649 (132)	85 (18)
Business Loans		
Total Verified Loss (1,000 $)	4,048 (352)	483 (20)
Total Approved Loans (1,000 $)	1008 (28)	163 (0)
Per-Establishment Approved Loans ($)	5,895 (300)	1,373 (0)

The SBA loan data are discussed in Manuscript Section 2.2 of the Manuscript. Sources: National Weather Service, Small Business Administration, US Census.

Table 5: **Household Finance Difference-in-Differences Estimates for Consumer Debt**

Dependent Variable:	Credit Card		Home Conditional		Auto		Other	
Tornado Type:	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Pooled								
After Tornado x Hit	-108	-20	-1,958	4,097	143	-195	-6	1
	(67)	(142)	(1,235)	(1,207)	(88)	(229)	(72)	(134)
Dependent Variable Mean	$2,411	$3,216	$66,371	$79,341	$3,143	$3,816	$1,300	$989
R-Squared	0.014	0.010	0.088	0.049	0.004	0.003	0.008	0.007
Observations	416,242	80,466	104,078	19,524	416,242	80,466	416,242	80,466
Panel B: Continuous Damage								
After Tornado x Hit	-59	-50	-877	2,048	65	23	11	-15
	(35)	(66)	(231)	(345)	(32)	(73)	(22)	(45)
Dependent Variable Mean	$2,411	$3,216	$66,371	$79,341	$3,143	$3,816	$1,300	$989
R-Squared	0.014	0.010	0.088	0.050	0.004	0.003	0.008	0.007
Observations	416,242	80,466	104,078	19,524	416,242	80,466	416,242	80,466
Panel C: Binned Damage Levels								
After Tornado x Low	-34	300	-575	4,776	65	-360	-20	184
	(79)	(181)	(1,503)	(2,410)	(121)	(352)	(72)	(135)
Dependent Variable Mean	$2,287	$3,161	$68,614	$82,372	$3,148	$3,280	$1,362	$719
After Tornado x Medium	-93	-595	-4,013	-2,315	186	-168	-47	-342
	(118)	(278)	(1,107)	(1,440)	(111)	(367)	(90)	(214)
Dependent Variable Mean	$2,532	$3,671	$65,659	$84,443	$3,429	$4,407	$1,320	$1,366
After Tornado x High	-407	248	-2,697	19,308	333	613	129	210
	(278)	(98)	(1,090)	(1,597)	(199)	(300)	(80)	(62)
Dependent Variable Mean	$2,611	$1,957	$59,365	$55,090	$2,527	$4,606	$1,033	$1,117
R-Squared	416,242	80,466	104,078	19,524	416,242	80,466	416,242	80,466
Observations	0.014	0.011	0.088	0.052	0.004	0.003	0.008	0.007

This table presents difference-in-difference (DD) estimates for the four consumer debt outcomes we analyze using a triple difference model in the Manuscript (Table 1, columns 1-4). The DD estimates represent the pre- to post-tornado difference in debt outcomes for hit individuals as compared to non-hit individuals in the 1-mile tornado buffer region. The table displays DD estimates separately for cash and no-cash tornadoes. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 6: **Household Finance Difference-in-Differences Estimates for Financial Health**

Dependent Variable:	Equifax Risk Score		90 Day Delinquency	
Tornado Type:	Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)
Panel A: Pooled				
After Tornado x Hit	-0.1	-1.2	-0.002	-0.007
	(0.8)	(3.5)	(0.005)	(0.020)
Dependent Variable Mean	671.7	704.7	0.207	0.149
R-Squared	0.019	0.017	0.001	0.001
Observations	412,458	79,981	416,242	80,466
Panel B: Continuous Damage				
After Tornado x Hit	-0.1	-1.1	-0.000	0.004
	(0.3)	(1.0)	(0.002)	(0.004)
Dependent Variable Mean	671.7	704.7	0.207	0.149
R-Squared	0.019	0.017	0.001	0.001
Observations	412,458	79,981	416,242	80,466
Panel C: Binned Damage Levels				
After Tornado x Low	-0.1	2.9	0.001	-0.040
	(0.8)	(3.0)	(0.006)	(0.025)
Dependent Variable Mean	672.6	703.9	0.209	0.147
After Tornado x Medium	0.7	-7.0	-0.009	0.041
	(1.0)	(4.1)	(0.007)	(0.017)
Dependent Variable Mean	672.7	698.8	0.206	0.180
After Tornado x High	-1.7	-2.3	0.006	0.004
	(1.8)	(1.4)	(0.008)	(0.010)
Dependent Variable Mean	666.4	729.0	0.206	0.051
R-Squared	0.019	0.017	0.001	0.002
Observations	412,458	79,981	416,242	80,466

This table presents difference-in-difference (DD) estimates for the two financial health outcomes we analyze using a triple difference model in the Manuscript (Table 1, columns 5-6). The DD estimates represent the pre- to post-tornado difference in debt outcomes for hit individuals as compared to non-hit individuals in the 1-mile tornado buffer region. The table displays DD estimates separately for cash and no-cash tornadoes. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 7: **Migration Difference-in-Differences Estimates**

Dependent Variable:	Move From Block		Move From County		Move From Block		Move From County	
Duration:	1 Quarter				3 Years			
Tornado Type:	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Pooled								
After Tornado x Hit	0.0019	-0.0054	0.0004	-0.0037	0.0003	0.0006	0.0001	0.0008
	(0.0028)	(0.0020)	(0.0013)	(0.0033)	(0.0002)	(0.0010)	(0.0001)	(0.0005)
Dependent Variable Mean	0.054	0.037	0.025	0.027	0.001	0.000	0.001	0.002
R-Squared	0.006	0.008	0.002	0.004	0.000	0.001	0.000	0.001
Observations	638,414	125,218	638,414	125,218	638,414	125,218	638,414	125,218
Panel B: Continuous Damage								
After Tornado x Hit	0.0013	-0.0019	0.0001	-0.0012	0.0002	0.0001	0.0001	0.0002
	(0.0015)	(0.0008)	(0.0004)	(0.0007)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Dependent Variable Mean	0.054	0.037	0.025	0.027	0.001	0.000	0.001	0.002
R-Squared	0.006	0.008	0.002	0.004	0.000	0.001	0.000	0.001
Observations	638,414	125,218	638,414	125,218	638,414	125,218	638,414	125,218
Panel C: Binned Damage Levels								
After Tornado x Low	0.0016	-0.0058	0.0010	-0.0067	-0.0000	0.0010	0.0002	0.0009
	(0.0023)	(0.0056)	(0.0016)	(0.0078)	(0.0002)	(0.0018)	(0.0001)	(0.0004)
Dependent Variable Mean	0.048	0.045	0.022	0.030	0.000	0.000	0.000	0.004
After Tornado x Medium	0.0006	-0.0072	-0.0009	-0.0007	0.0004	-0.0008	0.0002	0.0005
	(0.0034)	(0.0034)	(0.0016)	(0.0034)	(0.0005)	(0.0006)	(0.0004)	(0.0010)
Dependent Variable Mean	0.059	0.036	0.026	0.030	0.003	0.000	0.002	0.000
After Tornado x High	0.0053	0.0038	0.0008	0.0033	0.0009	0.0024	-0.0001	0.0010
	(0.0089)	(0.0019)	(0.0037)	(0.0013)	(0.0005)	(0.0002)	(0.0006)	(0.0001)
Dependent Variable Mean	0.067	0.000	0.033	0.000	0.001	0.000	0.001	0.000
R-Squared	0.006	0.008	0.002	0.004	0.000	0.001	0.000	0.001
Observations	638,414	125,218	638,414	125,218	638,414	125,218	638,414	125,218

This table presents difference-in-difference (DD) estimates for the migration outcomes we analyze using a triple difference model in the Manuscript (Table 2). The DD estimates represent the pre- to post-tornado difference in migration rates for hit individuals as compared to non-hit individuals in the 1-mile tornado buffer region. The table displays DD estimates separately for cash and no-cash tornadoes. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 8: **Difference-in-differences Estimates for Home Debt by Whether an Individual Moved Following a Tornado and by Type of Home Debt**

	Moved		Stayed		1st Mortgage Debt		Home Equity Debt	
Tornado Type:	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Pooled								
After Tornado x Hit	-704	5,884	-2,251	3,683	-1,897	4,288	-220	-752
	(2,659)	(3,378)	(1,286)	(1,872)	(1,200)	(1,323)	(127)	(211)
Dependent Variable Mean	$67,177	$100,224	$65,997	$72,293	$61,958	$72,925	$3,802	$6,086
R-Squared	0.060	0.021	0.119	0.088	0.079	0.050	0.022	0.010
Observations	26,661	4,850	77,417	14,674	104,078	19,524	104,078	19,524
Panel B: Continuous Damage								
After Tornado x Hit	-328	3,932	-1,099	1,218	-846	2,724	-101	-680
	(775)	(1,082)	(376)	(373)	(273)	(381)	(52)	(91)
Dependent Variable Mean	$67,177	$100,224	$65,997	$72,293	$61,958	$72,925	$3,802	$6,086
R-Squared	0.060	0.023	0.120	0.087	0.079	0.052	0.022	0.013
Observations	26,661	4,850	77,417	14,674	104,078	19,524	104,078	19,524
Panel C: Binned Damage Levels								
After Tornado x Low	297	3,840	-723	5,169	-490	2,692	-154	539
	(2,771)	(4,788)	(1,409)	(2,977)	(1,368)	(3,099)	(136)	(301)
Dependent Variable Mean	$75,862	$126,117	$66,288	$72,998	$63,787	$74,295	$4,095	$7,144
After Tornado x Medium	-1,270	-7,376	-5,436	-113	-4,202	-1,507	-203	-497
	(2,647)	(2,716)	(1,624)	(1,537)	(1,223)	(1,673)	(183)	(1,140)
Dependent Variable Mean	$62,269	$102,202	$67,708	$77,094	$61,690	$81,450	$3,604	$3,293
After Tornado x High	-1,658	35,727	-2,412	8,785	-2,194	25,817	-504	-6,001
	(4,183)	(3,560)	(1,749)	(1,414)	(1,246)	(1,484)	(306)	(268)
Dependent Variable Mean	$58,591	$57,428	$60,049	$53,531	$55,566	$44,964	$3,110	$10,126
R-Squared	0.060	0.027	0.120	0.088	0.079	0.054	0.022	0.017
Observations	26,661	4,850	77,417	14,674	104,078	19,524	104,078	19,524

Columns 1-2 only include individuals who move (for at least one quarter) at any point during the three years following the tornado. Columns 3-4 only include individuals who do not move. Columns 5-6 only consider mortgage debt, while columns 7-8 only consider home equity debt. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 9: **Triple Difference Estimates for the Number of Establishments, "1 Digit" SIC Non-manufacturing Industries**

Industry:	Agriculture, Forestry, Fishing	Mining	Construction	Transportation	Wholesale/ Distributors	Retail	Finance, Insurance, Real Estate	Service	Public Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Pooled Model									
Cash Tornado x Post x Hit	0.010	-0.001	0.063	0.014	0.008	0.041	0.034	0.082	0.004
	(0.009)	(0.002)	(0.036)	(0.015)	(0.010)	(0.023)	(0.019)	(0.042)	(0.011)
R-Squared	0.457	0.471	0.489	0.486	0.461	0.571	0.553	0.560	0.526
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977
Panel B: Continuous Model									
Cash Tornado x Post x Hit	0.004	-0.001	0.022	0.007	-0.003	0.003	0.006	0.002	-0.008
	(0.003)	(0.001)	(0.004)	(0.005)	(0.001)	(0.011)	(0.010)	(0.015)	(0.007)
R-Squared	0.457	0.471	0.489	0.486	0.461	0.571	0.553	0.560	0.526
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977
Panel C: Binned Model									
Cash Tornado x Post x Low	0.013	-0.001	0.069	0.016	0.016	0.060	0.047	0.117	0.013
	(0.011)	(0.002)	(0.044)	(0.019)	(0.013)	(0.033)	(0.024)	(0.057)	(0.010)
Cash Tornado x Post x Med	0.011	-0.002	0.063	0.017	-0.024	-0.002	0.010	0.021	-0.041
	(0.005)	(0.002)	(0.016)	(0.007)	(0.008)	(0.050)	(0.014)	(0.034)	(0.036)
Cash Tornado x Post x High	-0.002	-0.002	0.050	0.046	-0.018	-0.011	-0.034	-0.042	-0.009
	(0.009)	(0.002)	(0.014)	(0.051)	(0.006)	(0.033)	(0.023)	(0.054)	(0.007)
R-Squared	0.457	0.471	0.489	0.486	0.461	0.571	0.553	0.560	0.526
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977

The table shows triple difference estimates for establishments in each of the "1 digit" industries that we pool together in the non-manufacturing business category (see Manuscript 4.2.2 and Table 5). Excluded from the pooled non-manufacturing category and from this table are public administration businesses (SIC 91-97) and non-classified businesses (SIC 99). Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historical Database, National Weather Service, US Census.

Table 10: **Triple Difference Estimates for Employment, "1 Digit" SIC Non-manufacturing Industries**

Industry:	Agriculture, Forestry, Fishing	Mining	Construction	Transportation	Wholesale/ Distributors	Retail	Finance, Insurance, Real Estate	Service	Public Sector
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Pooled Model									
Cash Tornado x Post x Hit	0.021	-0.009	0.104	0.046	0.021	0.071	0.033	0.128	0.015
	(0.018)	(0.008)	(0.057)	(0.025)	(0.026)	(0.052)	(0.028)	(0.073)	(0.029)
R-Squared	0.472	0.436	0.496	0.496	0.462	0.564	0.541	0.554	0.522
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977
Panel B: Continuous Model									
Cash Tornado x Post x Hit	0.001	-0.003	0.030	0.034	-0.000	-0.004	0.003	-0.000	-0.013
	(0.007)	(0.002)	(0.007)	(0.023)	(0.003)	(0.020)	(0.015)	(0.027)	(0.018)
R-Squared	0.472	0.436	0.496	0.496	0.462	0.564	0.541	0.554	0.522
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977
Panel C: Binned Model									
Cash Tornado x Post x Low	0.027	-0.008	0.128	0.038	0.038	0.115	0.048	0.180	0.032
	(0.023)	(0.008)	(0.076)	(0.033)	(0.035)	(0.066)	(0.031)	(0.091)	(0.029)
Cash Tornado x Post x Med	0.011	-0.008	0.064	0.046	-0.030	-0.044	-0.007	0.067	-0.067
	(0.012)	(0.007)	(0.028)	(0.018)	(0.019)	(0.078)	(0.026)	(0.063)	(0.078)
Cash Tornado x Post x High	-0.003	-0.007	0.024	0.328	-0.025	-0.044	-0.038	-0.074	-0.011
	(0.016)	(0.006)	(0.031)	(0.317)	(0.014)	(0.067)	(0.032)	(0.098)	(0.020)
R-Squared	0.472	0.436	0.496	0.496	0.462	0.564	0.541	0.554	0.522
Observations	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977	141,977

The table shows triple difference employment estimates for establishments in each of the "1 digit" industries that we pool together in the non-manufacturing business category (see Manuscript 4.2.2 and Table 5). Excluded from the pooled non-manufacturing category and from this table are public administration businesses (SIC 91-97) and non-classified businesses (SIC 99). Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historical Database, National Weather Service, US Census.

Table 11: **Triple Difference Estimates for Auto Purchases, and Business Establishment Sales**

Dependent Variable:	New Auto Purchases	New Auto Balance	Log(Establishment Sales)
	(1)	(2)	(3)
Panel A: Pooled			
Cash Tornado x Post x Hit	0.005	46	0.484
	(0.003)	(61)	(0.308)
Dependent Variable Mean	0.034	$355	
R-squared	0.001	0.000	0.520
Observations	533,175	533,175	141,977
Panel B: Continuous Damage			
Cash Tornado x Post x Hit	0.002	17	0.425
	(0.001)	(27)	(0.122)
Dependent Variable Mean	0.034	$355	
R-squared	0.001	0.000	0.492
Observations	533,175	533,175	141,977
Panel C: Binned			
Cash Tornado x Post x Low	0.006	55	0.586
	(0.003)	(60)	(0.389)
Dependent Variable Mean	0.033	$343	
Cash Tornado x Post x Medium	-0.001	-47	0.520
	(0.006)	(105)	(0.328)
Dependent Variable Mean	0.036	$374	
Cash Tornado x Post x High	0.018	313	0.237
	(0.004)	(62)	(0.269)
Dependent Variable Mean	0.034	$357	
R-squared	0.001	0.000	0.520
Observations	533,175	533,175	141,977

The table shows triple difference estimates for new car loans, new car loan balances, and retail and service establishment sales. The model includes individual and quarter fixed effects. Only the triple difference coefficients of interest are reported. The pooled coefficients in panel A consider a block as hit if more than 50% of the block is inside the tornado path. The binned coefficients in panel B are estimated separately for individuals in blocks with low (F/EF < 1), medium (F/EF ≥ 1 & < 3), and high (F/EF ≥ 3) damage. Dependent variable means are for the last quarter before a tornado. We do not winsorize the new auto loan variable at the 99% level. The reason is that the new dollar loan variable is a flow variable with a median of $0. A decision to winsorize would affect a large fraction of the non-zero values. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), Infogroup Historic Business Database, National Weather Service, US Census.

Table 12: **Triple Difference Estimates for Auto Purchase by Credit Availability**

Dependent Variable:	**New Auto Purchases** (1)	**New Auto Balance** (2)
Panel A: Available Credit		
Low Available Credit		
Cash Tornado x Post x Hit	0.005	44
	(0.001)	(12)
Dependent Variable Mean	0.017	$146
Observations	171,850	171,850
High Available Credit		
Cash Tornado x Post x Hit	0.001	5
	(0.002)	(34)
Dependent Variable Mean	0.037	$410
Observations	184,325	184,325
Panel B: Credit Score		
Low Equifax Credit Score		
Cash Tornado x Post x Hit	0.006	102
	(0.003)	(59)
Dependent Variable Mean	0.025	$224
Observations	171,400	171,400
High Equifax Credit Score		
Cash Tornado x Post x Hit	0.001	-10
	(0.001)	(26)
Dependent Variable Mean	0.031	$366
Observations	170,250	170,250

The table shows triple difference heterogeneity estimates for new car loans and new car loan balances. The model is estimated separately on two groups of individuals (lower and upper terciles) based on available credit (panel A), Equifax Risk Score (panel B), and age (panel C). We do not winsorize the new auto loan variable at the 99% level. The reason is that the new dollar loan variable is a flow variable with a median of $0. A decision to winsorize would affect a large fraction of the non-zero values. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 13: **Cost per Job Retained or Created**

Model:	**Baseline**	**Baseline + SBA Savings**	**Baseline + Federal Tax Revenue**	**Baseline + Unemployment Savings**	**Baseline + (2)-(4)**
	(1)	(2)	(3)	(4)	(5)
Panel A: All Zips					
Cost Per Job ($1,000)	$242	$223	$225	$235	$198
Panel B: Hit Zips					
Cost Per Job ($1,000)	$108	$100	$91	$101	$75

This table calculates the cost per job retained or created by establishments in damaged blocks where residents have access to cash grants. We use the employment estimates for small businesses (Table 5, panel C). Panel A considers the total cash assistance provided to individuals living in any disaster county in the state. Panel B considers cash assistance to individuals living in ZIP codes hit by a tornado. Typically, a tornado only hits a small fraction of the ZIP code. The baseline calculation in column (1) only includes the direct and administrative costs for the grants. Column (2) adds the estimated administrative cost savings to the SBA program to our baseline calculation. Column (3) adds the estimated tax revenue to our baseline calculation. Column (4) adds the estimated federal government unemployment insurance savings to our baseline calculation. Column (5) is our most comprehensive calculation and includes the estimated SBA and unemployment savings, as well as, the estimated tax revenue. Sources: Brown and Earle [2017], Bureau of Labor Statistics, Federal Emergency Management Agency, Federal Reserve Bank of St. Louis, Government Accountability Office, Infogroup Historic Business Database, National Bureau of Economic Research, National Weather Service, US Census, Whittaker et al. [2019].

Table 14: **Comparative Statistics for Individuals and Business Establishments Hit by and Nearby to a Tornado**

18 Tornado Balanced Sample

	(1)	(2)	(3)	(4)	(5)	(6)
Tornado Type:	Cash Assistance			No Cash Assistance		
Census Block:	Overall	Hit	Nearby	Overall	Hit	Nearby
	Panel A: CCP Variables					
Debt Balances						
Credit Card	2,967	2,582	3,040	2,925	3,216	2,887
Auto	3,559	3,722	3,528	3,695	3,816	3,679
Home	27,391	31,766	26,555	28,302	37,601	27,079
Other	1,124	1,323	1,086	1,219	989	1,249
Total	35,041	39,394	34,209	36,142	45,622	34,895
Financial Health						
Equifax Risk Score	703	705	703	696	705	695
90 Day Past Due	0.16	0.16	0.16	0.16	0.15	0.16
Foreclosure Flag	0.007	0.000	0.008	0.003	0.009	0.001
Migration						
Move From Block	0.067	0.052	0.070	0.075	0.037	0.079
Move From County	0.030	0.036	0.028	0.044	0.027	0.046
	Panel B: Census Variables					
Economic						
Median Income	57,141	58,927	56,807	55,321	72,003	53,149
Poverty Rate	0.08	0.09	0.08	0.11	0.06	0.11
Fraction Owner Occupied	0.82	0.84	0.82	0.71	0.85	0.69
Median Home Value	115,350	117,371	114,973	118,135	151,820	113,749
Socioeconomic						
Fraction College Degree	0.16	0.20	0.15	0.25	0.33	0.24
Fraction African American	0.02	0.02	0.02	0.06	0.05	0.06
Fraction Hispanic	0.01	0.01	0.01	0.03	0.02	0.03
Fraction Age 65+	0.13	0.13	0.13	0.12	0.10	0.12
	Panel C: Business Establishments					
Number of Establishments	2.0	1.9	2.1	3.1	3.0	3.1
Number of Employees	27	27	28	33	44	31
Manufacturing Employment Share	0.04	0.04	0.04	0.04	0.04	0.04
CCP Observations	2,083	328	1,755	3,368	388	2,980
Number of Blocks	800	140	660	1,050	118	932
Number of Establishment Blocks	3,901	1,005	2,896	2,139	365	1,774

Panel A shows CCP variable means from the quarter before a tornado for individuals residing in hit or nearby (control) blocks at the time of the tornado. Panel B shows 2000 US Census block group information for the same hit and nearby blocks as in Panel A. Panel C shows block-level business establishment information for the year before a tornado for the same blocks as in Panel A. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), Infogroup Historic Business Database, National Weather Service, US Census.

Table 15: **Household Finance Triple Difference Estimates**

18 Tornado Balanced Sample

Dependent Variable:	Credit Card	Home (Conditional)	Auto	Other	Equifax Risk Score	90 Day Delinquency
	(1)	(3)	(4)		(5)	(6)
Panel A: Pooled						
Cash Tornado x Post x Hit	-39	-9,292	511	78	0.4	0.0322
	(222)	(2,965)	(254)	(175)	(4.3)	(0.0214)
Dependent Variable Mean	$2,582	$66,661	$3,722	$1,323	705.0	0.1565
R-squared	0.011	0.064	0.003	0.008	0.017	0.001
Observations	129,178	34,203	129,178	129,178	128,497	129,178
Panel B: Continuous Damage						
Cash Tornado x Post x Hit	40	-3,228	60	41	-0.1	0.0043
	(96)	(637)	(87)	(61)	(1.3)	(0.0055)
Dependent Variable Mean	$2,582	$66,661	$3,722	$1,323	705.0	0.1565
R-squared	0.011	0.064	0.003	0.008	0.017	0.001
Observations	129,178	34,203	129,178	129,178	128,497	129,178
Panel C: Binned						
Cash Tornado x Post x Low	-463	-6,952	931	-48	1.9	0.0606
	(419)	(3,379)	(442)	(154)	(3.3)	(0.0264)
Dependent Variable Mean	$2,484	$58,811	$3,927	$1,770	686.9	0.1736
Cash Tornado x Post x Medium	687	-14,850	393	353	5.5	-0.0202
	(555)	(5,971)	(546)	(363)	(5.3)	(0.0286)
Dependent Variable Mean	$2,566	$72,288	$3,668	$998	699.2	0.1800
Cash Tornado x Post x High	-314	-16,940	-682	-156	-8.3	0.0363
	(639)	(3,481)	(669)	(109)	(3.9)	(0.0242)
Dependent Variable Mean	$2,810	$74,714	$3,373	$860	751.2	0.0870
R-squared	0.011	0.067	0.003	0.008	0.018	0.002
Observations	129,178	34,203	129,178	129,178	128,497	129,178

The table shows triple difference estimates for the same outcomes as in Manuscript Table 1 using the 18 Tornado Balanced Sample. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 16: **Block and County Migration Estimates**

18 Tornado Balanced Sample

Dependent Variable:	Move From Block	Move From County	Move From Block	Move From County
Duration:	1 Quarter		3 Years	
	(1)	(2)	(3)	(4)
Panel A: Pooled				
Cash Tornado x Post x Hit	0.0174	0.0052	-0.0001	-0.0011
	(0.0087)	(0.0051)	(0.0010)	(0.0007)
Dependent Variable Mean	0.0524	0.0357	0.0000	0.0024
R-squared	0.008	0.004	0.001	0.001
Observations	192,758	192,758	192,758	192,758
Panel B: Continuous Damage				
Cash Tornado x Post x Hit	0.0060	0.0017	0.0001	-0.0001
	(0.0028)	(0.0013)	(0.0004)	(0.0003)
Dependent Variable Mean	0.0524	0.0357	0.0000	0.0024
R-squared	0.008	0.004	0.001	0.001
Observations	192,758	192,758	192,758	192,758
Panel C: Binned Damage Levels				
Cash Tornado x Post x Low	0.0142	0.0090	-0.0003	-0.0009
	(0.0129)	(0.0101)	(0.0018)	(0.0007)
Dependent Variable Mean	0.0463	0.0324	0.0000	0.0000
Cash Tornado x Post x Medium	0.0273	0.0047	0.0009	-0.0007
	(0.0089)	(0.0069)	(0.0011)	(0.0014)
Dependent Variable Mean	0.0472	0.0315	0.0000	0.0079
Cash Tornado x Post x High	0.0045	-0.0080	-0.0013	-0.0022
	(0.0117)	(0.0036)	(0.0030)	(0.0005)
Dependent Variable Mean	0.0779	0.0519	0.0000	0.0000
R-Squared				
Observations	7,724	7,724	7,724	7,724

The table shows triple difference estimates for whether an individual hit by a tornado moves from their census block or county. Columns (1) and (2) define a move as being for (at least) one quarter, while columns (3) and (4) define a move as being for (at least) three years. The sample and econometric models underlying the estimates in this table are the same as those for Manuscript Table 2, except that the sample in this table is the 18 Tornado Balanced Sample. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 17: **Household Finance Triple Difference Estimates - Heterogeneity**

18 Tornado Balanced Sample

Dependent Variable:	Credit Card	Home (Conditional)	Auto	90 Day Delinquency	Move from Block	Move from Block (3 Year)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Available Credit						
Low Available Credit						
Cash Tornado x Post x Hit	43	-7,932	187	-0.0260	0.0086	0.0004
	(57)	(5,901)	(184)	(0.0167)	(0.0029)	(0.0009)
Dependent Variable Mean	$112	$45,432	$1,074	0.2647	0.0714	0.0000
Observations	30,297	3,192	30,297	30,297	49,177	49,177
High Available Credit						
Cash Tornado x Post x Hit	-74	-5,445	140	0.0083	0.0098	0.0005
	(111)	(999)	(95)	(0.0037)	(0.0032)	(0.0005)
Dependent Variable Mean	$3,666	$65,593	$4,027	0.0567	0.0226	0.0000
Observations	54,817	21,132	54,817	54,817	78,674	78,674
Panel B: Credit Score						
Low Equifax Credit Score						
Cash Tornado x Post x Hit	315	-2,423	263	-0.0169	0.0042	-0.0006
	(142)	(3,447)	(279)	(0.0175)	(0.0083)	(0.0004)
Dependent Variable Mean	$1,240	$67,350	$3,155	0.5303	0.0926	0.0000
Observations	30,372	4,133	30,372	30,372	46,888	46,888
High Equifax Credit Score						
Cash Tornado x Post x Hit	147	-4,924	159	-0.0000	0.0084	0.0003
	(87)	(893)	(73)	(0.0001)	(0.0022)	(0.0005)
Dependent Variable Mean	$1,871	$66,848	$2,791	0.0000	0.0181	0.0000
Observations	54,437	18,227	54,437	54,437	76,133	76,133
Panel C: Age						
Young						
Cash Tornado x Post x Hit	-179	1,586	407	-0.0161	-0.0065	-0.0005
	(175)	(1,677)	(175)	(0.0114)	(0.0063)	(0.0003)
Dependent Variable Mean	$2,342	$70,316	$4,290	0.2088	0.0727	0.0000
Observations	42,894	7,617	42,894	42,894	67,357	67,357
Old						
Cash Tornado x Post x Hit	-63	-2,329	-216	0.0191	0.0101	0.0004
	(108)	(1,544)	(132)	(0.0057)	(0.0017)	(0.0006)
Dependent Variable Mean	$2,021	$61,984	$2,216	0.0957	0.0268	0.0000
Observations	43,372	10,067	43,372	43,372	66,478	66,478

The table shows triple difference estimates for the same outcomes as in Manuscript Table 3 using the 18 Tornado Balanced Sample. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 18: **Household Finance Triple Difference Estimates**

35 Tornado Sample

Dependent Variable:	Credit Card	Home (Conditional)	Auto	Other	Equifax Risk Score	90 Day Delinquency
	(1)	(3)	(4)		(5)	(6)
Panel A: Pooled						
Cash Tornado x Post x Hit	-67	-4,067	264	12	2.1	0.0024
	(233)	(1,856)	(241)	(140)	(3.2)	(0.0155)
Dependent Variable Mean	$2,411	$66,371	$3,143	$1,300	671.7	0.2073
R-squared	0.013	0.079	0.003	0.007	0.018	0.001
Observations	498,731	123,868	498,731	498,731	494,436	498,731
Panel B: Continuous Damage						
Cash Tornado x Post x Hit	-22	-2,186	20	31	1.3	-0.0052
	(92)	(576)	(76)	(48)	(0.9)	(0.0035)
Dependent Variable Mean	$2,411	$66,371	$3,143	$1,300	671.7	0.2073
R-squared	0.013	0.079	0.003	0.007	0.018	0.001
Observations	498,731	123,868	498,731	498,731	494,436	498,731
Panel C: Binned						
Cash Tornado x Post x Low	-239	-3,703	325	-191	-1.2	0.0337
	(294)	(2,472)	(372)	(142)	(3.0)	(0.0199)
Dependent Variable Mean	$2,287	$68,614	$3,148	$1,362	672.6	0.2085
Cash Tornado x Post x Medium	473	598	291	373	8.0	-0.0507
	(353)	(2,348)	(415)	(228)	(4.0)	(0.0166)
Dependent Variable Mean	$2,532	$65,659	$3,429	$1,320	672.7	0.2058
Cash Tornado x Post x High	-778	-19,478	-294	-153	1.4	-0.0001
	(306)	(2,411)	(295)	(92)	(2.3)	(0.0108)
Dependent Variable Mean	$2,611	$59,365	$2,527	$1,033	666.4	0.2059
R-squared	0.013	0.080	0.003	0.007	0.018	0.001
Observations	498,731	123,868	498,731	498,731	494,436	498,731

The table shows triple difference estimates for the same outcomes as in Manuscript Table 1 using the 35 tornado sample that includes the Wayne, NE tornado. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 19: **Block and County Migration Estimates**

35 Tornado Sample

Dependent Variable:	Move From Block	Move From County	Move From Block	Move From County
Duration:	1 Quarter		3 Years	
	(1)	(2)	(3)	(4)
Panel A: Pooled				
Cash Tornado x Post x Hit	0.0083	0.0053	-0.0006	-0.0008
	(0.0036)	(0.0033)	(0.0009)	(0.0005)
Dependent Variable Mean	0.0537	0.0247	0.0011	0.0006
R-squared	0.006	0.003	0.000	0.000
Observations	766,357	766,357	766,357	766,357
Panel B: Continuous Damage				
Cash Tornado x Post x Hit	0.0035	0.0018	-0.0001	-0.0001
	(0.0016)	(0.0008)	(0.0002)	(0.0002)
Dependent Variable Mean	0.0537	0.0247	0.0011	0.0006
R-squared	0.006	0.003	0.000	0.000
Observations	766,357	766,357	766,357	766,357
Panel C: Binned Damage Levels				
Cash Tornado x Post x Low	0.0086	0.0089	-0.0012	-0.0008
	(0.0053)	(0.0072)	(0.0017)	(0.0004)
Dependent Variable Mean	0.0476	0.0219	0.0003	0.0000
Cash Tornado x Post x Medium	0.0083	0.0007	0.0008	-0.0005
	(0.0046)	(0.0036)	(0.0008)	(0.0010)
Dependent Variable Mean	0.0587	0.0258	0.0026	0.0015
Cash Tornado x Post x High	0.0044	-0.0011	-0.0019	-0.0014
	(0.0091)	(0.0040)	(0.0005)	(0.0006)
Dependent Variable Mean	0.0666	0.0333	0.0011	0.0011
R-Squared				
Observations	(0.0141)	(0.0176)	(0.000267)	(0.000303)

The table shows triple difference estimates for whether an individual hit by a tornado moves from their census block or county. Columns (1) and (2) define a move as being for (at least) one quarter, while columns (3) and (4) define a move as being for (at least) three years. The sample and econometric models underlying the estimates in this table are the same as those for Manuscript Table 2, except that the sample in this table is the 35 tornado sample that includes the Wayne, NE tornado. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 20: **Household Finance Triple Difference Estimates - Heterogeneity**

35 Tornado Sample

Dependent Variable:	Credit Card	Home (Conditional)	Auto	90 Day Delinquency	Move from Block	Move from Block (3 Year)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Available Credit						
Low Available Credit						
Cash Tornado x Post x Hit	21	-319	180	-0.0107	0.0028	0.0003
	(57)	(988)	(64)	(0.0076)	(0.0016)	(0.0007)
Dependent Variable Mean	$238	$55,950	$1,526	0.3150	0.0524	0.0004
Observations	152,665	13,505	152,665	152,665	247,600	247,600
High Available Credit						
Cash Tornado x Post x Hit	-192	-4,991	47	0.0036	0.0092	0.0001
	(130)	(977)	(93)	(0.0038)	(0.0031)	(0.0004)
Dependent Variable Mean	$4,523	$67,656	$3,797	0.0391	0.0453	0.0019
Observations	171,572	68,051	171,572	171,572	264,103	264,103
Panel B: Credit Score						
Low Equifax Credit Score						
Cash Tornado x Post x Hit	81	1,149	191	-0.0411	-0.0012	-0.0004
	(74)	(1,359)	(214)	(0.0091)	(0.0021)	(0.0002)
Dependent Variable Mean	$1,556	$57,003	$2,497	0.5249	0.0713	0.0005
Observations	161,786	21,446	161,786	161,786	246,814	246,814
High Equifax Credit Score						
Cash Tornado x Post x Hit	-6	-4,218	-9	0.0004	0.0065	0.0001
	(98)	(918)	(75)	(0.0004)	(0.0025)	(0.0004)
Dependent Variable Mean	$2,090	$72,028	$2,747	0.0000	0.0313	0.0005
Observations	166,884	55,595	166,884	166,884	246,788	246,788
Panel C: Age						
Young						
Cash Tornado x Post x Hit	-167	1,099	195	-0.0186	-0.0039	-0.0006
	(128)	(1,099)	(130)	(0.0076)	(0.0021)	(0.0002)
Dependent Variable Mean	$1,697	$73,944	$3,279	0.2894	0.0723	0.0010
Observations	168,821	27,162	168,821	168,821	255,680	255,680
Old						
Cash Tornado x Post x Hit	9	-1,471	-243	0.0023	0.0053	-0.0001
	(93)	(713)	(123)	(0.0063)	(0.0024)	(0.0004)
Dependent Variable Mean	$2,372	$53,070	$2,378	0.1066	0.0345	0.0013
Observations	163,858	39,299	163,858	163,858	263,168	263,168

The table shows triple difference estimates for the same outcomes as in Manuscript Table 3 using the 35 tornado sample that includes the Wayne, NE tornado. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Federal Reserve Bank of New York Consumer Credit Panel / Equifax (CCP), National Weather Service, US Census.

Table 21: **Estimates for the Number of Businesses Establishments and Employees**

18 Tornado Balanced Sample

Model:	Triple Difference		Difference-In-Difference			
Dependent Variable:	Log (Establishments)	Log (Employment)	Log(Establishments)		Log(Employment)	
Tornado Type:			Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Pooled						
Cash Tornado x Post x Hit	0.175	0.288	0.012	-0.163	0.014	-0.255
	(0.102)	(0.176)	(0.026)	(0.051)	(0.050)	(0.092)
R-squared	0.517	0.509	0.504	0.516	0.493	0.510
Observations	48,169	48,169	31,208	16,961	31,208	16,961
Panel B: Continuous Damage						
Cash Tornado x Post x Hit	0.038	0.051	-0.029	-0.067	-0.060	-0.094
	(0.032)	(0.063)	(0.011)	(0.021)	(0.020)	(0.041)
R-squared	0.516	0.508	0.504	0.516	0.493	0.510
Observations	48,169	48,169	31,208	16,961	31,208	16,961
Panel C: Binned Damage Levels						
Cash Tornado x Post x Low	0.195	0.320	0.040	-0.158	0.067	-0.249
	(0.118)	(0.202)	(0.028)	(0.058)	(0.053)	(0.107)
Cash Tornado x Post x Medium	0.058	0.032	-0.124	-0.178	-0.241	-0.213
	(0.113)	(0.230)	(0.059)	(0.076)	(0.113)	(0.140)
Cash Tornado x Post x High	0.144	0.414	-0.074	-0.208	-0.156	-0.468
	(0.121)	(0.420)	(0.063)	(0.088)	(0.112)	(0.266)
R-Squared	0.517	0.509	0.504	0.516	0.493	0.510
Observations	48,169	48,169	31,208	16,961	31,208	16,961

The sample and econometric models underlying the estimates in this table are the same as those for Manuscript Table 4, except that the sample in this table is the 18 Tornado Balanced Sample. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historic Business Database, National Weather Service, US Census.

Table 22: **Heterogeneity in Business Establishment Triple Difference Estimates by Industry, Age, and Size**

18 Tornado Balanced Sample

Dependent Variable:	(1) **Log(Establishments)**	(2) **Log(Employment)**
	Panel A: Establishment Industry	
Non-Manufacturing		
Cash Tornado x Post x Hit	0.039	0.056
	(0.032)	(0.063)
R-squared	0.517	0.508
Manufacturing		
Cash Tornado x Post x Hit	-0.001	-0.008
	(0.004)	(0.014)
R-squared	0.477	0.477
	Panel B: Establishment Age	
New (1 year or less)		
Cash Tornado x Post x Hit	-0.011	-0.020
	(0.007)	(0.012)
R-squared	0.356	0.303
Existing (4 years or more)		
Cash Tornado x Post x Hit	0.036	0.056
	(0.023)	(0.053)
R-squared	0.510	0.502
	Panel C: Establishment Size	
Small (≤ 3 Employees)		
Cash Tornado x Post x Hit	0.037	0.037
	(0.021)	(0.028)
R-squared	0.498	0.485
Large (≥ 7 Employees)		
Cash Tornado x Post x Hit	-0.008	-0.011
	(0.015)	(0.038)
R-squared	0.538	0.533

The samples and econometric models underlying the estimates in this table are the same as those for Manuscript Table 5, except that the sample in this table is the 18 Tornado Balanced Sample. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historic Business Database, National Weather Service, US Census.

Table 23: **Estimates for the Number of Businesses Establishments and Employees**

35 Tornado Sample

Model:	Triple Difference		Difference-In-Difference			
Dependent Variable:	Log (Establishments)	Log (Employment)	Log(Establishments)		Log(Employment)	
Tornado Type:			Cash	No-Cash	Cash	No-Cash
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Pooled						
Cash Tornado x Post x Hit	0.141	0.231	-0.002	-0.122	-0.014	-0.203
	(0.095)	(0.155)	(0.014)	(0.047)	(0.026)	(0.087)
R-squared	0.560	0.555	0.559	0.518	0.549	0.513
Observations	143,337	143,337	125,016	18,321	125,016	18,321
Panel B: Continuous Damage						
Cash Tornado x Post x Hit	0.015	0.014	-0.026	-0.032	-0.048	-0.044
	(0.034)	(0.058)	(0.005)	(0.019)	(0.009)	(0.036)
R-squared	0.561	0.555	0.559	0.518	0.549	0.513
Observations	143,337	143,337	125,016	18,321	125,016	18,321
Panel C: Binned Damage Levels						
Cash Tornado x Post x Low	0.192	0.319	0.047	-0.128	0.066	-0.220
	(0.104)	(0.174)	(0.015)	(0.053)	(0.030)	(0.100)
Cash Tornado x Post x Medium	0.069	0.027	-0.060	-0.111	-0.116	-0.098
	(0.090)	(0.177)	(0.025)	(0.074)	(0.046)	(0.137)
Cash Tornado x Post x High	-0.011	0.099	-0.127	-0.069	-0.209	-0.210
	(0.115)	(0.278)	(0.027)	(0.088)	(0.052)	(0.190)
R-Squared	0.561	0.555	0.559	0.518	0.549	0.513
Observations	143,337	143,337	125,016	18,321	125,016	18,321

The sample and models underlying the estimates in this table are the same as those for Manuscript Table 4, except that this table shows results from the 35 tornado sample that includes the Wayne, NE tornado. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historic Business Database, National Weather Service, US Census.

Table 24: **Heterogeneity in Business Establishment Triple Difference Estimates by Industry, Age, and Size**

35 Tornado Sample

Dependent Variable:	(1) **Log(Establishments)**	(2) **Log(Employment)**
Panel A: Establishment Industry		
Non-Manufacturing		
Cash Tornado x Post x Hit	0.015	0.011
	(0.034)	(0.061)
R-squared	0.560	0.552
Manufacturing		
Cash Tornado x Post x Hit	-0.004	-0.011
	(0.003)	(0.009)
R-squared	0.513	0.519
Panel B: Establishment Age		
New (1 year or less)		
Cash Tornado x Post x Hit	-0.013	-0.023
	(0.009)	(0.016)
R-squared	0.379	0.317
Existing (4 years or more)		
Cash Tornado x Post x Hit	0.013	0.029
	(0.023)	(0.036)
R-squared	0.538	0.534
Panel C: Establishment Size		
Small (≤ 3 Employees)		
Cash Tornado x Post x Hit	0.022	0.021
	(0.022)	(0.029)
R-squared	0.544	0.529
Large (≥ 7 Employees)		
Cash Tornado x Post x Hit	-0.009	-0.019
	(0.012)	(0.029)
R-squared	0.570	0.528

The samples and econometric models underlying the estimates in this table are the same as those for Manuscript Table 5, except that this table shows results from the 35 tornado sample that includes the Wayne, NE tornado. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by tornado. Sources: Infogroup Historic Business Database, National Weather Service, US Census.