Tale of Two Storms: Neighborhood Racial Change After Hurricanes Sandy and Harvey

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We use the case of Hurricane Sandy and Hurricane Harvey to test how extreme climate events drive neighborhood racial change and how impacts vary in settings with different socioeconomic characteristics and exposures to past flooding risk. Using data on neighborhood characteristics, mortgage applications, and inundation after the storms, we show that in both New York City and Harris County, Texas, population and housing units actually increased more in the neighborhoods with more severe flooding. In addition, the share of residents who are White declined more in hard-hit neighborhoods, especially those outside the flood zone where residents would have had less information about flood risk prior to the storm. In New York, we also see a relative decline in income among mortgage applicants in flooded areas outside the flood zone, especially in low-income neighborhoods. Effects are generally more muted in Harris County, perhaps because flooding had been historically more common.

Keywords: neighborhood change, racial change, hurricanes, extreme flooding, climate risk

Extreme weather events are increasing in frequency and severity, threatening cities throughout the world. These events are likely to shape residential decisions in the short- and long-term and, in turn, affect the trajectory of urban neighborhoods. To be clear, neighborhoods change all the time, but damaging storms may affect both the nature and the pace of the change, including shifts in racial composition. Most directly, storms may accelerate change that was already happening by heightening turnover and thereby opening up more opportunities for racial change. But extreme events can also change the entire course of a neighborhood. The physical damage caused by a storm and the new information about flood risk it provides, may reduce housing prices and rents, making hard-hit neighborhoods more affordable to households of color. Storms may also lead to reductions in homeownership, which could generate racial change given that a disproportionate share of renters are Black or Hispanic. Specifically, in

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the wake of a storm, investors may buy up homes to serve as rentals, as rents may not fall as much as prices. Additionally, in the face of depressed prices, homeowners may choose to rent out their homes rather than sell them when they move.

All of these effects will be larger in areas that were not previously understood to be at risk of flooding and storm damage and where the storm event makes the risk much more salient. Finally, these effects may be especially pronounced in lower-income areas, where there are fewer resources to rebuild or less optimistic expectations about the ability to insure against future risks.

We use the case of two major hurricanes to examine whether and how extreme climate events affect neighborhood racial change in different contexts. Hurricane Sandy made landfall along the eastern seaboard in late October 2012 and inflicted over $19 billion in damage in New York City alone. Five years later, Hurricane Harvey hit Harris County in Texas and caused nearly $16 billion in residential damage within the Houston city limits. Research shows that Hurricane Sandy greatly reduced property values and had more modest impacts on rents (Ellen and Meltzer 2024; Harwood 2026; Ortega and Taşpınar 2018). There is less research on the market effects from Hurricane Harvey, but Carolyn Kousky and colleagues (2020) find that the storm was associated with increased mortgage delinquencies among more damaged homes and, in the long run, among homes less likely to have flood insurance prior to the event.

In this article, we build on existing research to explore the implications for racial change in hard-hit neighborhoods after extreme storms. We examine three key questions. First, how does storm-induced inundation affect migration into and out of neighborhoods, and specifically, how does the storm change the racial composition of hard-hit neighborhoods? Second, how do migration patterns differ for renters versus homeowners? Third, how do these patterns vary with the income and resources available in the neighborhoods?

To answer these questions, we rely on census tract data from the American Community Survey (ACS), as well as mortgage application information from the Home Mortgage Disclosure Act (HMDA) datasets. We overlay flood zone maps with spatially detailed information on storm surge heights. Our models examine the neighborhood population and composition changes in the years after the storm, while controlling for the perceived risk prior to the storms, as reflected in the flood zone boundaries.

We contribute to several strands of literature. First, we contribute to work on climate migration. A number of studies examine the degree to which extreme weather events accelerate migration away from high-risk counties and regions and document the patterns of return for those initially displaced after the disaster (Besbris et al. 2026, this issue; Elliott et al. 2026, this issue; Fussell et al. 2010, 2017, 2023; Boustan et al. 2020; Sastry and Gregory 2019; Schultz and Elliott 2013; Groen and Polivka 2010). But little of this research focuses at the neighborhood level as we do, and little of it distinguishes between homeowners and renters or focuses on migration into the risky areas (Fussell and Harris 2014; Fussell 2018; Ma and Smith 2020). Furthermore, we use microdata on mortgage applicants from HMDA rather than the credit panels that are used in related studies, which are often more limiting in identifying residential tenure (Billings et al. 2022; McConnell et al. 2021).

Second, we contribute to research on the impact of storms on neighborhoods. A growing body of research studies the impact of extreme events on local housing markets, focusing mostly on how localized storm surges affect property values (Ellen and Meltzer 2024; Bin and Landry 2013; Bin and Polasky 2004; Hallstrom and Smith 2005; Ortega and Taşpınar 2018; Harwood 2026). But far fewer studies make the connection between those housing market changes and the demographic trajectories of hard-hit neighborhoods.

Finally, we build most directly on a small, but rich, body of literature that examines how the income and demographics of neighborhoods change after storms (Lee 2017, 2020; Hong et al. 2021; Wyczalkowski et al. 2019; Elliott 2015). Existing articles focus on changes in neighborhood poverty rates in cities and counties where storms hit, or the demographic profiles of those that migrate out of and into those communities. However, most studies have not exploited spatial variation in flooding and destruction

across neighborhoods within those cities and counties. Our models take advantage of this very localized spatial variation. Specifically, we study the impact of storm surges experienced by particular neighborhoods, controlling for preexisting knowledge of risk (as proxied by flood zone designation). We also test whether impacts are greater outside the flood zone, where flooding represented more of an information shock.

THEORY AND BACKGROUND

If damage is severe enough, natural disasters can accelerate out-movement from neighborhoods and trigger sustained decline and disinvestment (Lee 2020; Zhang 2012). Sustained decline can also happen even with residents staying in place, if they lack the resources to rebuild (Hong et al. 2021). John R. Logan and colleagues (2016) use the term "segmented resilience" to describe the tendency for residents with the means and capacities to be the ones that escape disaster-torn communities; those with fewer financial and social networks to leverage are left in place.

Physical damage from storms can also make a neighborhood less attractive to individuals with more resources. Beyond the direct effects of any damage, storms can provide new information to the market that an area is at heightened risk of future disasters (Ellen and Meltzer 2024; Billings et al. 2022; Rhodes and Besbris 2022). Both damage and information can cause sustained declines in property values. In fact, studies consistently show that extreme events, like hurricanes, drive real estate prices down in affected areas (Harwood 2026; Ellen and Meltzer 2024; Bin and Landry 2013; Bin and Polasky 2004; Hallstrom and Smith 2005; Ortega and Taşpınar 2018).

These price declines make neighborhoods more affordable and open up communities and home-ownership to individuals who were previously unable to afford them (Ellen and Meltzer 2024; Ratnadiwakara and Venugopal 2020; Santiago-Bartolomei et al. 2022; Pais and Elliott 2008). In this way, affected neighborhoods could attract lower income and more racially diverse households after the disaster. Alternatively, the price declines and damage can also invite redevelopment (Curtis et al. 2020; Fussell 2015). This is consistent with Jeremy F. Pais and James R. Elliott's (2008) "recovery machines," where progrowth interests take advantage of the postdisaster moment to redevelop for growth and change (Besbris et al. 2026). If people are myopic, new, higher-income residents may be attracted to recently renovated or constructed homes.

Severe storms may also produce shifts in tenure that, in turn, generate demographic changes. Specifically, the new information about risk provided by storms is likely to have a larger and more sustained impact on property values than on rents (Harwood 2024), as renters will generally care far less than owners about the risk of a 100-year storm. As rent-to-price ratios rise, investors may disproportionately buy up properties in the wake of a storm, leading to reductions in homeownership. Similarly, if prices are depressed, departing owners may rent out their homes rather than immediately selling them. The increased number of rentals may invite more households of color to move into an area, given their disproportionately high rates of renting.

Further, there are reasons to expect heterogeneity in impacts across city and neighborhood contexts. Storms and other extreme weather events may produce less of an impact in cities with histories of such events. In those cities, an individual storm may not provide much additional information about risks. Even before the storm, people may have already known which neighborhoods were most likely to be affected and incorporated this knowledge into their residential choices and willingness to pay for homes.

In our two cities, the perception of risk before the storms likely varied. There is evidence that past flooding as an indicator of future risk was downplayed in the Houston area (Rhodes and Besbris 2022). In addition, the city had seen more storms in the past than New York City had leading up to Sandy, and more than half of the city's neighborhoods were at least partially in the flood zone, where flooding was presumably more expected. We argue that Hurricane Sandy came as more of a shock, at least to neighborhoods outside the flood zone. In other words, we expect Sandy to have had larger impacts than Harvey, especially in locations outside of the flood maps in place at the time.

Finally, markets may have less confidence in the pace of recovery in lower-income neighborhoods and communities of color, in part because their residents are not as well-positioned to repair damage as those with more financial resources and more resilient structures (Park and Franklin 2023; Rhodes and Besbris 2022; Hong et al. 2021; Wyczalkowski et al. 2019; Lee 2017; Finch et al. 2010; Donner and Rodríguez 2008; Cutter et al. 2003; Chappell et al. 2007). As a result, such neighborhoods may be more likely to see property abandonment, sustained damage, and reduced property values (Ma and Smith 2020). Dalbyul Lee (2020) finds that lower-income neighborhoods see larger increases in poverty rates after disasters. And using cell phone data, Boyeong Hong and colleagues (2021) find socioeconomic and racial disparities in evacuation and mobility responses across neighborhoods, which is consistent with Fussell's work on post-Katrina migration (for example, Fussell 2015). These findings provide support for theories of "differential recovery" (Finch et al. 2010), or the expectation that trajectories of recovery are influenced by pre-disaster vulnerabilities that are uneven across places (Fussell 2015). That said, Christopher K. Wyczalkowski and colleagues (2019) find more recovery and change over the long-run in lower-income census tracts in counties hit by storms in the Houston area, which they argue may result from active speculation as property values fall. But they do not use any data on variations in storm surge across neighborhoods, which may mediate the degree of damage and therefore determine the resources needed for recovery.[1]

DATA

We exploit the granularity and fifteen-year time span of our data to tease out the persistence and nature of neighborhood racial change after Hurricanes Sandy and Harvey. To investigate neighborhood change, we created longitudinal census tracts with consistent boundaries from 2010 to 2022. In most cases, changes in census tract geographies between years, if they happened at all, involved a clear split of a 2010 census tract. However, in a few cases, the changes were more complicated, with, for example, two adjacent 2010 census tracts divided into three 2020 census tracts. In eleven of these more complicated cases in Harris County, we aggregate contiguous census tracts that were affected by the change across the years to form one geographic area that is consistent across 2010 and 2020. For ease of exposition, we will simply refer to our consistent-boundary neighborhoods as census tracts. Note that census tracts are much more consistent across decades in New York City, but we also create neighborhoods in New York City with consistent boundaries between 2010 and 2020.[2]

We draw on similar data for the New York City and Houston (Harris County) study areas. First, in order to capture flooding risk before the hurricane events, we have flood maps that were in effect leading up to each of the storms. These are the 100-year maps issued by the Federal Emergency Management Agency (FEMA). Since census tracts do not fit neatly within the flood zone boundaries, we calculate the share of the census tract that lies within the 100-year flood zone, and for the preferred analyses, designate a census tract as inside the flood zone if more than 20 percent of its area is within the 100-year boundary.[3]

Second, we have continuous raster-level information on the surge heights from both storms to understand the variation in flooding across census tracts. FEMA uses high-water

1. Although we cannot test it here, disaster recovery programs may also shape these neighborhood dynamics. Neighborhoods that are able to attract outside capital will be able to repair damage more quickly. The investment in reconstruction will also signal that the neighborhood will recover, or even improve. This may reduce the risk of vacancy and abandonment, preserve neighborhood demand, and accelerate recovery.

2. The analysis of homebuyers uses only the New York City census tracts with consistent boundaries between 2000 and 2010. This constitutes over 95 percent of the census tracts in New York City.

3. We conduct sensitivity analyses, discussed later in the article, to test for changes in the outcome of interest using different thresholds to classify tracts as inside the flood zone.

marks and surge sensor data to interpolate surge levels. FEMA reports surge levels for 1-square-meter cells in Manhattan, Brooklyn, Queens, and Staten Island and for 3-square-meter cells in the Bronx. In Harris County, we accessed data through the Hurricane Harvey Flood Data Collections and HydroShare (Arctur 2023), which provides the gridded depth at a horizontal resolution of 3 meters. We use these data to calculate census tract-level average surge levels. Figure 1, panels A and B show the variation in surge heights across tracts in New York City and Harris County, overlaid with the 100-year flood map boundaries discussed above. Note that we use estimated surge heights rather than FEMA's assessment of property damage. The two measures are highly correlated, but surge heights are more clearly exogenous and not affected by the underlying structural quality of buildings. In New York City, we classify census tracts into three groups: no surge; low-surge (2 feet or less); and high-surge (more than 2 feet).[4]

In Harris County, table 1 shows that all census tracts in the county saw some level of surge during Hurricane Harvey. Thus, the reference group in Harris County is tracts that saw a modest level of flooding rather than no flooding, as in New York City. Specifically, we classify Harris County tracts into three categories, low-surge (1 foot or less), moderate-surge (1 to 2 feet), and high-surge (more than 2 feet).[5]

Third, we have a host of demographic and economic characteristics of the neighborhoods from the ACS five-year data for three windows (2008–2012, 2013–2017, and 2018–2022) and HMDA for the years 2006–2022. These variables capture the racial composition, income, population, number of households and housing units, recent movement into the neighborhood, housing values, rents, and the prevalence of owners and renters.

We use five-year ACS data at the census tract level to compare initial conditions and changes in economic, housing, and demographic characteristics across census tracts with different degrees of storm surge. Because we can classify tracts as inside or outside the flood zones, and also by average storm surge, we can document change among neighborhoods with similar risk exposures leading up to the storm and isolate any changes due to the storm itself. We can also distinguish between racial changes among homeowners and renters since the ACS data include counts of renters and homeowners by race in each census tract. In New York City, we use the 2008–2012 five-year window to capture baseline characteristics of census tracts prior to the storm, which hit the city at the end of October 2012. We then use the 2013–2017 and 2018–2022 five-year windows to capture short- and longer-term neighborhood change after the storm. For Hurricane Harvey, which hit Harris County at the end of September 2017, we can only observe short-run changes. Specifically, we use 2008–2012 and 2013–2017 five-year ACS data to capture baseline neighborhood conditions and 2018–2022 five-year ACS data to capture post-storm changes. Note that when exploring heterogeneity across different types of neighborhoods, we use baseline ACS data to categorize neighborhoods as low-income or high-income depending on whether their mean income is above or below the citywide (New York City) or countywide (Harris County) median.

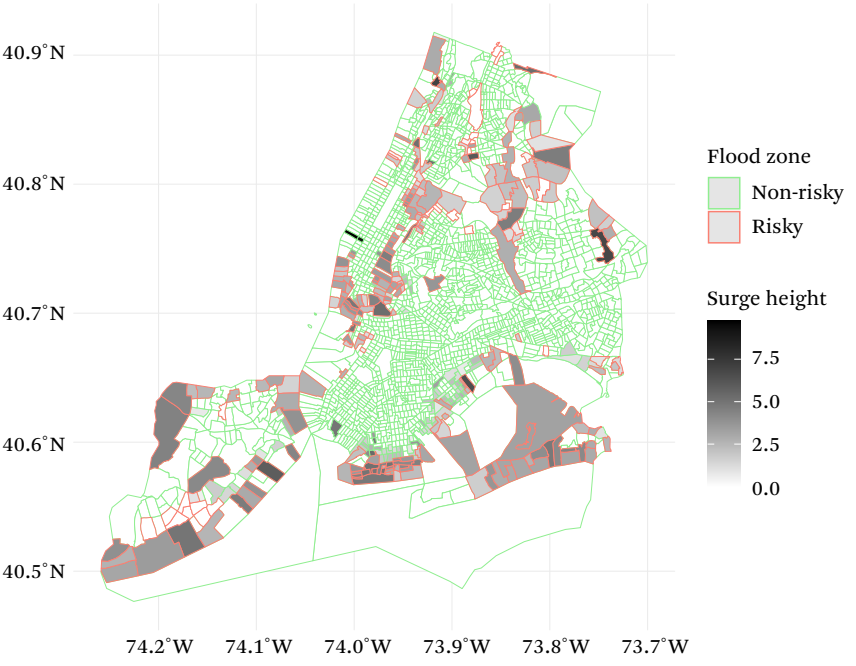
We use HMDA data to study changes in the demographics of new entrants and specifically home purchasers in hard-hit areas after the storm. The HMDA data in both counties include the date of the application, the census tract of the property, the loan amount, and the mortgage applicant's race, income, and sex. For our analysis in New York City, we use applications from 2009–2017 and for our analysis in Harris County we use applications from 2012–2022.

4. FEMA documents that at roughly 18 inches of flooding, homeowners are at a higher risk of high cost damage to systems like electrical and HVAC (FEMA 2023).

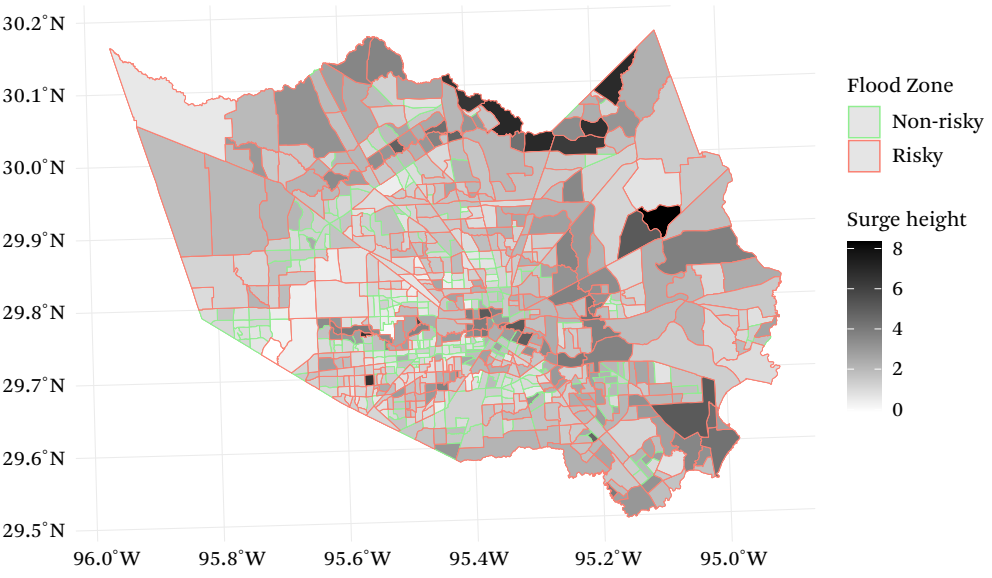
5. While a lower threshold of 6 inches would be closer to the no flooding reference category in New York City, the set of tracts that saw less than 6 inches of flooding is too small to produce precise estimates. We do replicate the baseline analyses using a lower threshold for the low-surge category in Harris County and the results are materially consistent with the 1 foot cutoff we use. These results are available from the authors on request.

Figure 1. Average Surge Height and Flood Zone Designation by Census Tract

Panel A. New York City



Panel B. Harris County



Source: FEMA 100-year flood map boundaries and surge heights; *Hurricane Harvey Flood Data Collections* [dataset] (Arctur 2023).
Note: The optimal way to view this figure is in color. We refer readers of the print edition of this article to https://www.rsfjournal.org/content/12/4/77 to view the color version.

Table 1. Share and Number of Census Tracts by Surge Height and Flood Zone

	New York City			Harris County		
	Outside FZ	Inside FZ	Total	Outside FZ	Inside FZ	Total
High surge	0.04	0.57	0.11	0.16	0.45	0.31
	[82]	[164]	[246]	[60]	[176]	[236]
Moderate surge	0.03	0.18	0.05	0.59	0.47	0.53
	[65]	[51]	[116]	[222]	[186]	[408]
Low surge	0.01	0.04	0.02	0.26	0.08	0.16
	[29]	[11]	[40]	[97]	[30]	[127]
No surge	0.91	0.20	0.81	0.00	0.00	0.00
	[1,699]	[60]	[1,759]	[0]	[0]	[0]
N	1,875	286	2,161	379	392	771

Source: Authors' calculations based on the larger sample of tracts used in the ACS analyses.
Note: Cell entries report shares; bracketed values report the number of census tracts. FZ = flood zone. High surge tracts have more than 2 feet of inundation; moderate surge tracts have between 1 foot and 2 feet; low surge tracts have less than 1 foot of water.

EMPIRICAL APPROACH

Our identification strategy relies on data on both the severity of storm inundation (which proxies for storm damage) and pre-storm risk (as measured by flood zone designation). We assume that after controlling for the salience of flood risk before the hurricane, any variation in surge heights is conditionally random in the context of fine-grained locational (census tract) and temporal (year) controls. Therefore, we can obtain credible estimates of effects on neighborhood-level demographic change after the storm event.

Figure 1, panels A and B show that flooding was concentrated in certain areas of the study counties, but at a more local level the flooding was somewhat unpredictable and varied substantially, creating exogenous variation in storm exposure across neighboring areas. For example, surge levels varied considerably across neighboring city blocks and within census tracts, as well as across the flood zone boundary. High, low, and no surge blocks and parcels are often contiguous, creating plausibly exogenous "treatment" and "comparison" groups across small geographic areas. This is the kind of variation we leverage to identify the impact of each storm.

We first use the ACS data to assess whether the storm appeared to change the total population, racial composition, tenure, or income in neighborhoods heavily affected by the storm (flooding) compared to nearby neighborhoods that were unaffected (or, in the case of Harris County, less affected) using the following general equation:

$$tracttrait_{nt} = highsurge_{nt} \times post_t + lowsurge_{nt} \times post_t + floodzone_{nt} \times post_t + \gamma_g + \delta_t + \varepsilon_{nt} \quad (1)$$

where the outcome $tracttrait_{nt}$ is one of the following variables for census tract n at time t: population, number of households, number of housing units, homeownership rate, mean income, share of the population by race (non-Hispanic White, non-Hispanic Black or Hispanic), share homeowners, median housing value, and median gross rent. We can also separately observe the White share of homeowners and renters. Here, γ_n is a census tract fixed effect and δ_t controls for the three years of the ACS samples (2008–2012, 2013–2017, 2018–2022). Note that variation across the surge categories is absorbed in the census tract fixed effects.[6]

6. We run all regressions with alternative geographic controls, including county-by-year (for New York City) and Public Use Microdata Area (PUMA)-by-year (for Harris County), both with and without census tracts fixed effects. The results are consistent across all of these specifications.

We then turn to the HMDA data to examine whether exposure to the storm changed the income and racial composition of new mortgage applicants looking to purchase homes in affected neighborhoods. In both locations, we estimate the following general equation:

$$appchar_{int} = highsurge_{nt} \times post_t + lowsurge_{nt} \times post_t + + \gamma_n + GEO_p \times \sigma_t + \varepsilon_{int} \quad (2)$$

where $appchar_{int}$ is either the log of the applicant's income, or an indicator for whether the applicant is Black or Hispanic. Our baseline models of applicant race control for the applicant's income since it is heavily correlated with race, but results are very similar without the inclusion of applicant income. We include census tract fixed effects, (γ_n) and either county-by-year or PUMA-by-year fixed effects ($GEO_p \times \sigma_t$), for New York City and Harris County, respectively, to remove variation due to geographic differences or time. New York City applications span 2009–2017, and those from Harris County span 2012–2022.

We stratify the samples and estimate the above regressions by whether the census tract is considered inside or outside the flood zone, and whether its average household income is above or below the median of the sample (designated as high-income or low-income).

RESULTS

As context for our regression results, table 1 highlights some important differences between the two locations in our study. First, New York City and Harris County had different exposures to flooding risk prior to the hurricanes. About half of the census tracts in Harris County were in the FEMA-designated flood zone leading up to Hurricane Harvey, while just over 13 percent of tracts in New York City were in the flood zone.

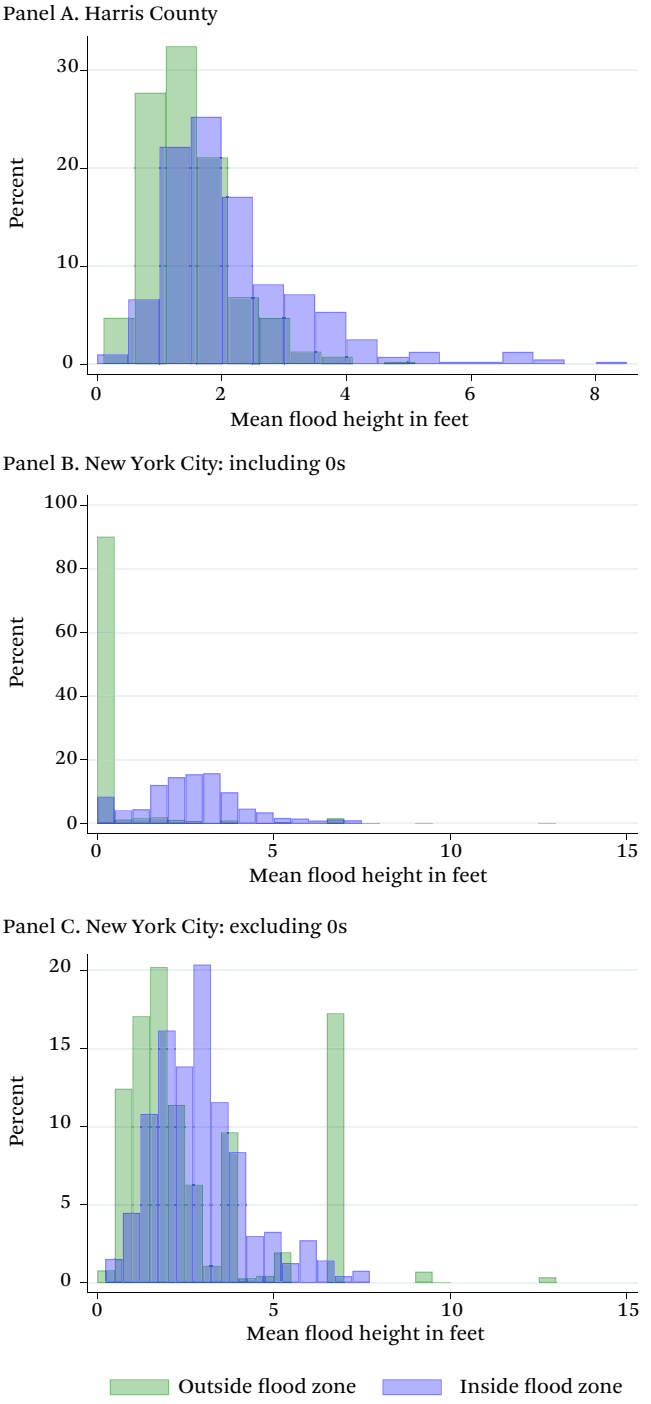
Second, the storm flooded the two locations in very different ways. Figure 2 shows that an overwhelming number of tracts in New York City saw no flooding, including many tracts that were inside the flood zone. Harris County, on the other hand, experienced some amount of flooding in every tract. As conveyed in table 1, among the tracts that saw flooding, its intensity was greater in New York City (with the most flooded tracts in the high-surge category). In Harris County, the number of tracts that saw less than 2 feet of water (low- and moderate-surge combined) is more than double the number of tracts with more than 2 feet. Overall, 11 percent of tracts in New York City experienced high surges compared to 31 percent in Harris County.

Finally, table 1 illustrates some degree of mismatch in both locations between where the flood maps predicted flooding would take place and where the waters actually surged. To be clear, areas in the flood zone were more likely to see flooding: 45 percent of Harris County tracts classified as inside the flood zone actually experienced severe flooding of more than 2 feet, while this share was 57 percent in New York City. Outside of the flood zone, about 4 percent of tracts in New York City and 16 percent in Harris County experienced high levels of inundation (more than 2 feet). For both places, close to 60 percent of the tracts that saw at least 1 foot of water were inside the designated flood zones.

We also note that there are demographic differences across the two locations that might matter (see online appendix tables A.1 and A.2).[7] In New York City, the majority of households rent their homes, whereas Harris County has more homeowners. Rents, housing prices, and average incomes tend to be higher in New York City and vacancy rates lower, suggesting a tighter housing market. The racial demographics are also different: Harris County is more evenly comprised of White, Black and Hispanic residents (New York City is slightly whiter and less Hispanic). Within cities, we see few differences in demographics between neighborhoods with different flood risk exposure. In Harris County, the neighborhoods inside the flood zone that experienced the highest inundation tend to be more populated, slightly whiter, and higher-income. In New York City, those neighborhoods tend to have higher rentership rates and slightly higher White and Latino resident shares.

7. The online appendix can be found at https://www.rsfjournal.org/content/12/4/77/tab-supplemental.

Figure 2. Average Surge Distribution by Flood Zone Designation



Source: FEMA 100-year flood map boundaries and surge heights; *Hurricane Harvey Flood Data Collections* [dataset] (Arctur 2023).
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Do Hard-Hit Areas See More Population Changes After the Storm?

We consider several dimensions of population change after the storm, including the number of residents, housing units, and racial composition. We explore these outcomes separately for New York City and Harris County.

New York City

One might expect that in the wake of a severe storm, people would migrate away from hard-hit neighborhoods. Table 2 shows that just the opposite happened in New York City in the years following Hurricane Sandy. After the storm, census tracts that experienced both high and low levels of surge saw a growth in the number of households and residents compared to neighborhoods that saw no surge. While there is some evidence of population and household growth in severely flooded areas outside the flood zone, this growth is evident inside the flood zone across low and high inundation levels.

We think much of this relative growth, especially inside the flood zone, was driven by new multifamily development. In the decade between 2010 and 2020, new multifamily housing (including city-subsidized housing) was disproportionately created in the flood zone (Furman Center for Real Estate and Urban Policy 2017). Areas in the flood zone offered large plots of available land that were zoned for multifamily development, some of it planned before the storm. This may have been particularly true in areas that saw high levels of flooding.[8] An analysis of the change in total housing units over this time period provides support for this hypothesis (see table 3). The housing stock grew more in harder-hit areas. An examination of building permits (see online appendix table A.5) suggests that much of this development was planned before the storm. The coefficients on all the post-storm indicators are insignificant (and the coefficient on *low-surge × post* is negative), so the storm itself does not appear to have caused this new construction.

As hypothesized, we also see significant racial change in the wake of the storm. In particular, we see a relative reduction in the share of residents who are non-Hispanic White in high- and low-surge neighborhoods (table 4). We note that the largest and most significant decline in the share of non-Hispanic White residents is outside the flood zone among tracts with lower heights of inundation. Perhaps surprisingly, this racial change is not linked to changes in neighborhood income. For New York City, we only see substantial reductions in neighborhood mean income inside the flood zone, and only in neighborhoods that saw low levels of flooding. In neighborhoods outside the flood zone, we see some weak evidence of increases in income.

Harris County

We see similar patterns of population growth in Harris County. Again, neighborhoods with higher surge levels saw an increase in population after the storm (table 2). Analyses of housing units (see table 3) also confirm a relative growth in the housing stock in hard-hit areas, though the effects are only significant inside the flood zone in high-surge areas. In terms of racial change, we see no significant changes in the percentage of residents who are White in hard-hit neighborhoods after the storm in Harris County. Table 4 shows some weak evidence of a decline in income, however, at least in moderate-surge neighborhoods.

In sum, both storms seem to have induced population and housing growth in the most severely flooded neighborhoods. The storms also seem to have led to some compositional changes in hard-hit neighborhoods: a decline in the share of residents who are White in New York City and, more tentatively, a decline in income in Harris County. While we observe a growth in population in hard-hit areas both inside and outside the flood zone in New York City, the racial change appears to be more concentrated outside the flood zone, where information about risk would have been less salient prior to the storm.

8. For example, Hudson Yards, a massive development located near the Hudson River in midtown Manhattan, was planned prior to Sandy. We run analyses (not shown here) without Manhattan and the magnitude of the effects attenuates, suggesting that development planned before the storm contributed at least partially to the post-Sandy growth.

Table 2. Analysis of Neighborhood Population and Total Number of Households

	(1) Total Population Full Sample	(2) Total Population Outside Flood Zone	(3) Total Population Inside Flood Zone	(4) Number of HHs Full Sample	(5) Number of HHs Outside Flood Zone	(6) Number of HHs Inside Flood Zone
New York City						
Flood zone post	16.737			29.587		
	(86.983)			(31.437)		
High surge post	222.652**	245.361*	322.111*	104.651***	116.938**	134.213**
	(97.317)	(139.130)	(170.048)	(37.143)	(54.707)	(56.605)
Low surge post	160.229***	60.967	409.849**	59.490**	23.015	146.692**
	(60.662)	(58.271)	(174.507)	(24.652)	(26.076)	(58.774)
Constant	3,851.389***	3,751.260***	4,461.769***	1,445.568***	1,399.660***	1,725.818***
	(8.550)	(7.346)	(41.528)	(3.496)	(3.150)	(15.921)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	6,647	5,714	933	6,647	5,714	933
Houston						
Flood zone post	262.322**			34.707		
	(126.759)			(45.619)		
High surge post	393.859**	20.974	517.954*	111.056*	−37.047	184.574*
	(161.636)	(128.556)	(283.885)	(59.248)	(62.267)	(100.603)
Moderate surge post	138.104	240.669**	13.554	42.551	68.987	27.239
	(107.626)	(114.365)	(247.781)	(44.280)	(50.378)	(91.866)
Constant	5,307.988***	5,219.855***	5,393.199***	1,832.549***	1,833.298***	1,831.824***
	(38.688)	(38.337)	(66.267)	(13.079)	(14.979)	(21.176)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	2,313	1,137	1,176	2,313	1,137	1,176

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.
Note: Standard errors in parentheses. HHs = households. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 3. Analysis of Total Number of Housing Units in Neighborhood

	(1) Number of Units Full Sample	(2) Number of Units Outside Flood Zone	(3) Number of Units Inside Flood Zone
New York City			
Flood zone post	13.426		
	(42.139)		
High surge post	153.366***	186.694**	149.168**
	(56.378)	(91.073)	(61.687)
Low surge post	69.425***	31.492	136.195**
	(25.735)	(23.404)	(59.707)
Constant	1,591.614***	1,540.658***	1,902.451***
	(4.070)	(3.667)	(18.744)
Tract FE	X	X	X
Year FE	X	X	X
N	6,647	5,714	933
Houston			
Flood zone post	42.506		
	(45.656)		
High surge post	120.885**	−30.012	183.037*
	(59.703)	(60.759)	(101.608)
Moderate surge post	28.720	63.181	−4.858
	(45.044)	(51.734)	(92.032)
Constant	2,075.739***	2,077.393***	2,074.140***
	(13.087)	(14.499)	(21.488)
Tract FE	X	X	X
Year FE	X	X	X
N	2,313	1,137	1,176

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.
Note: Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Racial and Income Changes Among Mortgage Applicants

A key question is how the composition of people buying homes in hard-hit neighborhoods (and taking on the flood risk) changes after severe storms. Using HMDA data on mortgage applicants, we can identify any changes in the race of the marginal homebuyer that could be masked by the net changes documented in the ACS data. These results for New York City are shown in table 5, and event study plots are displayed in online appendix figure A.1.[9]

The probability that a mortgage applicant identifies as Black or Hispanic increases after the storm in areas with any degree of flooding, and this increase is concentrated in census tracts outside the flood zone.[10] Further, the average income of applicants in neighborhoods expe-

9. The event-study figures allay any concerns that our study period might be contaminated by the onset of COVID-19; there are no changes in trends post-2020.

10. Note that this pattern holds up when restricting the HMDA sample to households receiving mortgages and buying homes, rather than the larger pool of applicants.

Table 4. Analysis of Average Household Income and White Population Share

	(1) Average HH Income Full Sample	(2) Average HH Income Outside Flood Zone	(3) Average HH Income Inside Flood Zone	(4) Share White Full Sample	(5) Share White Outside Flood Zone	(6) Share White Inside Flood Zone
New York City						
Flood zone post	2,656.233			0.004		
	(2,162.805)			(0.005)		
High surge post	2,530.933	2,297.287	−3,038.108	−0.014**	−0.010	−0.011
	(2,140.524)	(2,531.437)	(4,782.800)	(0.006)	(0.007)	(0.010)
Low surge post	−676.673	2937.212*	−12077.847**	−0.013**	−0.020***	0.002
	(1,705.983)	(1,736.049)	(4,958.590)	(0.006)	(0.006)	(0.013)
Constant	66,101.341***	65,920.590***	67,222.974***	0.335***	0.320***	0.425***
	(319.152)	(320.261)	(1188.612)	(0.001)	(0.001)	(0.002)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	6,454	5,600	854	6,570	5,669	901
Houston						
Flood zone post	100.453			−0.006		
	(1,491.599)			(0.005)		
High surge post	−965.311	−1,547.563	−331.728	−0.002	−0.001	0.005
	(2,701.845)	(3,679.001)	(4,284.812)	(0.008)	(0.010)	(0.015)
Moderate surge post	−3,960.127*	−4,063.777	−3,532.068	0.006	0.002	0.016
	(2,400.081)	(2,963.738)	(3,995.563)	(0.006)	(0.007)	(0.014)
Constant	71,117.363***	66,928.190***	75,176.388***	0.328***	0.324***	0.332***
	(465.481)	(694.923)	(622.357)	(0.001)	(0.002)	(0.002)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	2,298	1,131	1,167	2,313	1,137	1,176

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.

Note: Standard errors in parentheses. HHs = households. FE = fixed effects.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 5. Analysis of Mortgage Applicant's Race in New York City

Applicant Is Black or Hispanic	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone	(4) Outside Flood Zone Low Income	(5) Outside Flood Zone High Income
Income	−0.01***	−0.01*	−0.01***	−0.02***	−0.01**
	(0.002)	(0.004)	(0.002)	(0.003)	(0.002)
High surge × post = 1	0.03***	0.01	0.04***	0.06***	0.01
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Low surge × post = 1	0.04***	0.02	0.06***	0.08***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	−0.002	0.17	−0.07	−2.65	0.82
	(0.66)	(1.19)	(0.81)	(1.96)	(0.88)
Tract FE	X	X	X	X	X
Year-by-Borough FE	X	X	X	X	X
N	279,276	56,292	222,984	133,245	89,739

Source: Authors' calculations based on HMDA 2009–2017.
Note: Robust standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

riencing low and high surges declines after the storm, again concentrated among neighborhoods outside the flood zone (table 6).

We confirm that this shift in the racial and ethnic identities of the mortgage applicants is not due to a change in the number of applicants in the hard-hit areas. As shown in table 7, there is no significant change in the number of applicants outside the flood zone. Notably, the number of applicants declines in the hardest hit areas inside the flood zone, suggesting lower turnover in the owner-occupied stock. This re-

Table 6. Analysis of Mortgage Applicant's Income in New York City

Log Applicant Income	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone	(4) Outside Flood Zone Low Income	(5) Outside Flood Zone High Income
High surge × Post = 1	−0.02	0.01	−0.10***	−0.13***	−0.05
	(0.01)	(0.03)	(0.02)	(0.03)	(0.04)
Low surge × Post = 1	−0.04**	0.00	−0.07***	−0.08***	−0.04
	(0.01)	(0.04)	(0.02)	(0.03)	(0.03)
Constant	4.13***	3.18	4.56**	1.25	5.93**
	(1.57)	(2.17)	(2.05)	(2.33)	(2.84)
Tract FE	X	X	X	X	X
Year-by-Borough FE	X	X	X	X	X
N	345,379	70,052	275,327	161,006	114,321

Source: Authors' calculations based on HMDA 2009–2017.
Note: Low-income census tracts have average household income below the median of the sample. Robust standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

duction is also consistent with any population increase being driven by multifamily rental development.

In Harris County, we similarly see an increase in the probability that a mortgage applicant is Black or Hispanic in high-surge neighborhoods outside the flood zone, though we don't see impacts in neighborhoods experiencing more moderate levels of flooding (See Table 8.)

In contrast to New York City, we see no significant impacts on applicant income in hard-hit neighborhoods either inside or outside the flood zone (table 9). Table 10 confirms that the change in applicant composition is not driven

Table 7. Analysis of Number of Mortgage Applicants per Census Tract in New York City

	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone
High × post = 1	−11.450**	−17.070***	0.274
	(5.311)	(5.474)	(5.379)
Low × post = 1	3.350	6.141	0.707
	(3.261)	(6.820)	(2.390)
Flood zone = 2 × post = 1	−6.920*		
	(4.046)		
Tract FE	X	X	X
Year-by-Borough FE	X	X	X
N	376,937	75,823	301,114

Source: Authors' calculations based on HMDA 2009–2017.
Note: Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 8. Analysis of Mortgage Applicant's Race (Black or Hispanic) in Harris County

Applicant is Black or Hispanic	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone	(4) Outside Flood Zone Low Income	(5) Outside Flood Zone High Income
Income	−0.075***	−0.079***	−0.070***	−0.075***	−0.068***
	(0.004)	(0.005)	(0.006)	(0.006)	(0.007)
High surge × post = 1	−0.003	−0.011	0.034***	0.034	0.022**
	(0.008)	(0.012)	(0.009)	(0.022)	(0.009)
Moderate surge × post = 1	0.005	0.010	0.005	−0.008	0.002
	(0.006)	(0.013)	(0.006)	(0.014)	(0.006)
Risky × post = 1	0.000				
	(0.006)				
Constant	0.785***	0.800***	0.764***	0.949***	0.711***
	(0.017)	(0.022)	(0.025)	(0.026)	(0.032)
Tract FE	X	X	X	X	X
Year-by-PUMA FE	X	X	X	X	X
N	877,078	494,619	382,459	87,289	295,169

Source: Authors' calculations based on HMDA 2012–2022.
Note: Low-income census tracts have average household income below the median of the sample. Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 9. Analysis of Mortgage Applicant's Income in Harris County

Log Applicant Income	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone	(4) Outside Flood Zone Low Income	(5) Outside Flood Zone High Income
High surge × post = 1	0.002	0.009	−0.013	−0.058**	−0.015
	(0.010)	(0.020)	(0.014)	(0.027)	(0.016)
Moderate surge × post = 1	0.008	0.011	0.009	−0.036*	0.012
	(0.008)	(0.019)	(0.009)	(0.018)	(0.011)
Risky × post = 1	−0.001				
	(0.006)				
Constant	4.527***	4.549***	4.494***	4.255***	4.569***
	(0.003)	(0.009)	(0.003)	(0.007)	(0.004)
Tract FE	X	X	X	X	X
Year-by-PUMA FE	X	X	X	X	X
N	1133,507	642,046	491,461	111,773	379,687

Source: Authors' calculations based on HMDA 2012–2022.
Note: Low-Income census tracts have average household income below the median of the sample. Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 10. Analysis of Number of Mortgage Applicants per Census Tract in Harris County

	(1) Full Sample	(2) Inside Flood Zone	(3) Outside Flood Zone
High surge × post = 1	−1.990	53.765	16.881
	(49.057)	(52.891)	(13.565)
Moderate surge × post = 1	27.912	92.568	21.063***
	(29.918)	(92.377)	(7.447)
Risky × post = 1	22.400		
	(51.344)		
Tract FE	X	X	X
Year-by-PUMA FE	X	X	X
N	1,213,983	688,622	525,361

Source: Authors' calculations based on HMDA 2012–2022.
Note: Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

by changes in the number of applicants in the hardest hit areas. We do, however, observe increases in mortgage applications in the more moderately flooded areas outside the flood zone.

How Do Patterns Differ in Low-Income and High-Income Neighborhoods?

The patterns of change observed thus far reflect averages for neighborhoods of all income levels. But we expect that patterns might vary with neighborhood income. For example, property owners in higher-income neighborhoods will generally have more resources to rebuild after the storm. Further, the income of a neighborhood may signal greater resilience and potentially attract more investment. For both these reasons, we expect to see more demographic churn, and more long-lasting change, in lower

income neighborhoods, at least among homebuyers who are investing in the future of a neighborhood.

New York City

As expected, when looking at racial change among homebuyers using the HMDA data, we see greater effects on racial change among homebuyers in low-income neighborhoods as compared to higher income areas. Among areas outside the flood zone, where significant effects were observed, we see that the increased probability that applicants identify as Black or Hispanic is concentrated in low-income neighborhoods (see online appendix figure A.1). Similarly, we find the most significant decrease in income of applicants in low-income neighborhoods outside the flood zone (table 6).

Harris County

For Harris County, we do not see clear differences in impacts on mortgage applicants' race by neighborhood income. While the coefficient on *high-surge* × *post* is only statistically significant for high-income neighborhoods, the point estimate is actually larger for low-income tracts. However, we only observe declines in applicant income in hard-hit areas in low-income neighborhoods outside the flood zone. We see no change in higher income neighborhoods.

In sum, in New York City, hard-hit neighborhoods see increases in home purchases by households of color, and those increases are driven by low-income neighborhoods outside the flood zone. We do not see these same differences by neighborhood income in Harris County. We think part of the explanation for the differences in income patterns is that the hard-hit high-income neighborhoods in New York City are considerably higher income than those in Harris County. In New York City, the hard-hit neighborhoods include some of the highest income areas in Manhattan. Investors and potential purchasers were likely very confident that any damage in these areas would be quickly repaired and that demand would remain strong. The above median income, hard-hit neighborhoods in Harris County were closer to the median and may have been viewed as more vulnerable, or, at best, similar in terms of their economic resilience.

ROBUSTNESS CHECKS

We test the robustness of our main results in several ways. First, to confirm that the differences we observe across the flood zones are not just numerically meaningful, but also statistically significant, we run regressions on the pooled sample of neighborhoods and interact the surge height variables that vary by flood zone. The results from fully interacted (rather than stratified) regressions are largely consistent with the stratified ones.[11]

Second, we test whether results in New York City are driven by Manhattan, since it has distinct demographics and housing markets from the other four boroughs of the city and most cities across the country. To test this, we estimate similar regressions excluding Manhattan. The results are generally unchanged when Manhattan is excluded from the sample.[12]

Third, for a subset of the outcomes, we conduct supplemental regressions to account for the different sizes of census tracts across our two sample cities. On average, census tracts are about ten times larger in Harris County than New York City. For the cases where the census tract intersects the flood zone boundary, we assign the census tract as inside the flood zone if 20 percent or more of its land area is inside the zone. While we have applied this designation consistently across New York City and Harris County, some portion of the homes located in tracts that are partially in the flood zone are likely to be much further from the flood zone boundary in Harris County (compared to those in New York City tracts) and therefore at lower risk. To address this discrepancy in risk exposure, we reestimate some of the baseline regressions for three subsamples of tracts according to the share of overlap with the flood zone: those with less than 20 percent of land area in the flood zone, those with between 20 percent and 50 percent of land area in the flood zone, and those with a majority of land in the flood zone. These re-

11. These results are available from the authors on request.

12. These results are available from the authors on request.

sults are displayed in online appendix tables A.3 and A.4.

In New York, we see population and housing unit growth both in hard-hit tracts that are partially in the flood zone and those that are mostly in the flood zone. In Harris County, the growth is concentrated in hard-hit tracts that are only partially in the flood zone, perhaps suggesting that people are moving to areas that they do not perceive to be at as much of a future risk. It remains surprising, however, that population and housing units are disproportionately growing even in these neighborhoods.

EXPLORING MECHANISMS

Disentangling mechanisms is challenging, but our results provide some suggestive evidence. First, the fact that the racial change and income declines are more pronounced outside the flood zone (at least for incoming homebuyers) suggests that the new information provided by the storms about flood risk may have triggered the population shifts. Prior to these storms, residents in the flood zone (and potential future residents) would have already had salient information about the risk of future flooding, in part because of the requirement that home purchasers buy flood insurance when obtaining a mortgage for a property inside the flood zone. But the storm provided new, potentially shocking, information about flood risks to neighborhoods lying outside the official flood zone, and this helps to explain the larger impacts on homebuying in those neighborhoods.

More generally, the fact that Hurricane Sandy led to more significant racial changes than Hurricane Harvey also suggests that new information about risk is an important channel. In Houston, given the history of repeated storms and flooding and the higher probability of living in or near a flood zone, residents were probably more aware of the risks. So Harvey provided little in the way of new information. Consider that about half of the population in Harris County lives inside the flood zone, compared to about 11 percent in New York City. The more modest impacts in Harris County, especially for the ACS outcomes, may reflect the fact that we can observe only short-term responses. In Harris County, we only have access to one five-year window of data after the storm, as compared to two in New York City.

In addition to information, another potential channel is changes in homeownership. As noted earlier, storms may also induce changes in housing tenure, which could in turn generate changes in racial composition given racial disparities in homeownership. We examine this possibility in table 11. Counter to theoretical expectations, we see no significant change in the share of households who own their homes in high- or low-surge tracts relative to those that had no flooding. This holds true in both cities. So we see little evidence that shifts in tenure explain the racial change that we observe. That also means that despite our theoretical predictions about rising investor demand as sales prices decrease more than rents after the storms, we see no change in homeownership rates in hard-hit neighborhoods. It does not appear, that is, that the storms invited more investors to purchase small buildings or more generally encouraged the conversion of owner-occupied buildings to rental properties.

We also explore changes in the racial composition of homeowners and renters, to understand if change is being driven more by owners or renters. As shown in table 12, we see no significant change in the share of homeowners who are White in surge areas in New York City. Yet HMDA data show that after the storm, the marginal homebuyer in flooded neighborhoods had a lower income and was more likely to be Black or Hispanic (controlling for income). This suggests that homeowners of color were both more likely to enter the hardest hit neighborhood after a storm and more likely to sell their homes, resulting in no net change in the racial composition of homeowners.[13] As for renters, we see a significant decline in the White share of renters in high-surge neighborhoods, at least outside the flood

13. When we stratify the sample by neighborhoods that are majority White or majority Black and Hispanic residents (not shown here), the patterns observed for the full sample persist across both strata. Therefore, the increase in the prevalence of Black and Hispanic homeowners is not concentrated in more racially homogeneous neighborhoods.

Table 11. Analysis of the Neighborhood Owner Occupied Rate

	(1) Full Sample	(2) Outside Flood Zone	(3) Inside Flood Zone
New York City			
Flood zone post	−0.013		
	(0.010)		
High surge post	0.003	−0.004	0.017
	(0.009)	(0.009)	(0.026)
Low surge post	−0.008	−0.008	0.003
	(0.008)	(0.008)	(0.026)
Constant	0.368***	0.370***	0.353***
	(0.001)	(0.001)	(0.005)
Tract FE	X	X	X
Year FE	X	X	X
N	6,496	5,627	869
Houston			
Flood zone post	0.012*		
	(0.007)		
High surge post	−0.006	0.002	−0.007
	(0.009)	(0.013)	(0.012)
Moderate surge post	−0.002	−0.004	0.001
	(0.008)	(0.010)	(0.014)
Constant	0.560***	0.540***	0.580***
	(0.002)	(0.002)	(0.003)
Tract FE	X	X	X
Year FE	X	X	X
N	2,308	1,132	1,176

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.
Note: Standard errors in parentheses. FE = fixed effects.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

zone, where information about the storm's risk was less readily available.

As in New York City, we do not observe any significant change in the White share of homeowners in surge areas after Hurricane Harvey, again suggesting that in hard-hit neighborhoods outside the flood zone, homeowners of color were more likely both to enter and to leave neighborhoods. Contrary to New York City, we see an increase in the percentage of renters who are White in moderate surge neighborhoods that are outside of the flood zone.

Another mechanism is reduced prices and enhanced affordability (which may be driven by the new information about risk). In both cities, we see evidence of reductions in home prices in hard-hit neighborhoods outside the flood zone (table 13), consistent with prior research (Ellen and Meltzer 2024). The magnitude is always larger outside the flood zone, with median reported home values in surge neighborhoods falling by roughly $60,000 relative to neighborhoods that saw no storm surge in New York City. In Harris County, the estimated impacts are somewhat smaller, as expected given lower house price levels. These lower home prices appear to open up more opportunities for homebuyers of color to purchase homes in the hard-hit neighborhoods. Again, since we see little evidence of net changes in the racial composition of homeowners in either city from the ACS, homeowners of color may have been not only more likely to enter a hard-hit neighborhood in the wake of a storm, but also more likely to

Table 12. Analysis of Percentage White, Homeowners and Renters

	Percent White, Homeowners			Percent White, Renters		
	(1) Full Sample	(2) Outside Flood Zone	(3) Inside Flood Zone	(4) Full Sample	(5) Outside Flood Zone	(6) Inside Flood Zone
New York City						
Flood zone post	0.000			0.010		
	(0.013)			(0.011)		
High surge post	−0.005	0.001	0.011	−0.020*	−0.026**	−0.027
	(0.013)	(0.016)	(0.025)	(0.010)	(0.013)	(0.024)
Low surge post	−0.002	−0.019	0.043	−0.001	0.010	−0.028
	(0.012)	(0.013)	(0.029)	(0.009)	(0.011)	(0.025)
Constant	0.414***	0.397***	0.528***	0.345***	0.331***	0.440***
	(0.002)	(0.002)	(0.006)	(0.002)	(0.002)	(0.005)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	6,330	5,508	822	6,484	5,620	864
Houston						
Flood zone post	−0.001			0.000		
	(0.009)			(0.010)		
High surge post	−0.013	−0.029	0.001	0.005	0.014	−0.033
	(0.013)	(0.022)	(0.019)	(0.015)	(0.021)	(0.024)
Moderate surge post	−0.000	−0.001	0.007	0.014	0.033**	−0.034
	(0.010)	(0.012)	(0.019)	(0.014)	(0.017)	(0.023)
Constant	0.462***	0.464***	0.459***	0.320***	0.308***	0.331***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	2,275	1,113	1,162	2,305	1,131	1,174

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.

Note: Standard errors in parentheses. FE = fixed effects.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 13. Analysis of Median Neighborhood Housing Values and Median Gross Rent

	(1) House Value Full Sample	(2) House Value Outside Flood Zone	(3) House Value Inside Flood Zone	(4) Gross Rent Full Sample	(5) Gross Rent Outside Flood Zone	(6) Gross Rent Inside Flood Zone
New York City						
Flood zone post	48,269.082**			15.367		
	(19839.904)			(28.516)		
High surge post	−37,879.918**	−58,179.039***	7,163.449	42.519	53.063	48.479
	(19009.534)	(20091.000)	(44950.969)	(30.612)	(40.798)	(55.213)
Low surge post	−53,412.797***	−56,069.152***	−15,590.229	14.508	11.336	26.595
	(15051.977)	(15179.031)	(46253.615)	(27.922)	(32.035)	(62.597)
Constant	655,753.825***	657,442.379***	644,510.632***	1,523.534***	1,527.046***	1,495.708***
	(3071.219)	(3059.695)	(11954.510)	(4.171)	(4.209)	(16.285)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	5,981	5,223	758	6,366	5,564	850
Houston						
Flood zone post	−10,352.181*			15.840		
	(5709.120)			(17.645)		
High surge post	−25,028.004**	−37,253.267**	−2,743.716	−16.838	−10.501	−22.871
	(11,908.125)	(17,544.704)	(15,013.692)	(27.601)	(41.612)	(50.996)
Moderate surge post	−39,058.127***	−45,944.467***	−17,823.434	−1.906	−1.151	−5.400
	(10,949.094)	(13,871.966)	(14,279.585)	(22.482)	(24.178)	(51.138)
Constant	198,263.589***	196,843.974***	199,632.661***	1,169.270***	1,159.975***	1,178.301***
	(2,221.803)	(3,107.992)	(3,166.508)	(5.742)	(8.458)	(7.791)
Tract FE	X	X	X	X	X	X
Year FE	X	X	X	X	X	X
N	2,239	1,097	1,142	2,273	1,118	1,155

Source: Authors' calculations based on ACS 2008–2012, 2013–2017, and 2018–2022.

Note: Standard errors in parentheses. FE = fixed effects.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

leave. This might be due to a lack of resources to repair the storm damage.

Table 13 also shows that in contrast to home prices, we see no evidence in either city of reductions in median rents, again consistent with past research (Harwood 2026). So increased rental affordability cannot explain the racial change we see among renters in the two cities.

In sum, our analyses rule out some mechanisms (like changes in tenure and rental affordability), but provide suggestive evidence that other mechanisms might drive the observed compositional changes. New information about risk and declining home prices appear to play an important role. Notably, our results suggest that the storms both increased the entry of homeowners of color and also increased exits, leading to little net change in racial composition.

DISCUSSION AND CONCLUSION

Extreme climate events can cause severe flooding and structural damage, but they can also shape the economic and demographic trajectories of the affected areas. We use the cases of two of the most severe storms in recent US history, Hurricanes Sandy and Harvey, to understand the nature of racial change in hard-hit neighborhoods. We use flood zone designation to capture information about flood risk leading up to the storms and then fine-grained variation in how the storm waters actually surged to measure the impacts, while controlling for preexisting knowledge of risk.

We find some similarities across New York City and Harris County. First, in both places, population and housing units increase in the neighborhoods that saw more severe inundation. So while we might expect large storm surges to reduce construction and to drive people away from these areas given the new information about their risk, we see precisely the opposite. In the years after the storm, the total number of housing units grows more in neighborhoods that saw high storm surge than in those that saw little or no surge. Therefore, not only are people moving into those areas, but investment and development may be supporting that trend as well. That said, it appears that much of the new development started prior to the storms (most certainly in New York City).

In addition, there are signs of racial change in both locations: the share of residents who are White goes down (although more notably in New York City) in hard-hit neighborhoods. In both places, the racial change and income declines among incoming homebuyers are more pronounced outside the flood zone, suggesting that the new information provided by the storms about flood risk may have triggered the population shifts.

There are also important differences across the two locations and storms. The racial change is more pronounced in New York City, manifesting for both owners and renters, and is concentrated outside of the flood zone in New York City, where residents would have had less information about the flooding risk before the storm. The more muted impacts in Harris County may also be explained by information. While Sandy and Harvey were both severe and devastating, Sandy came earlier and was a more novel event. Residents of New York City were truly unprepared for the storm surge induced by Sandy, and therefore the new information about risk was very salient. Furthermore, most of the neighborhoods in New York City were not in a designated flood zone, suggesting that people were even more unaware of the potential risks from the storm. Harvey, on the other hand, came in the wake of other major storms and hit a county in which half of the neighborhoods were in a FEMA-designated flood zone. Therefore, the new information about risk from the storm may not have been as meaningful.

In sum, we find that extreme weather events, like Hurricanes Sandy and Harvey, can indeed induce neighborhood change. We show that the damage (and perhaps newly learned risk) decreases the value of homes. While this economic shock harms the owners of those homes, it may also open up buying opportunities for households who could not previously afford homes in those neighborhoods. But while lower prices may increase access to homeownership, they come with heightened risks of future flooding and damage. This pattern is consistent with James R. Elliott and colleagues' (2026) revolving

door of risk, in which the burden of climate risk gets passed along as homeowners in risky areas sell their homes to new residents. Our results suggest that homebuyers of color are being disproportionately exposed to that risk.

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