All (Economic) Politics is Local:
Voting Responses to Localized Price Shocks during the Great Recession

September 8, 2024

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Abstract

The connection between individual and macroeconomic conditions and voting behavior is well-established. We contribute to the less resolved "spatial gap" in the literature that centers on how the localized economic conditions of where voters live influence their likelihood to vote. We test how space mediates the tension between voter mobilization and withdrawal in the face of economic shocks. We consider a scenario, the Great Recession, where economic shocks were quite localized and sudden, and compile an extensive dataset of all registered voters in the four-county Tampa metropolitan area between 2006 and 2015. Using sales prices and property characteristics from the tax assessor rolls, we estimate a neighborhood-level shock to housing values induced by the Great Recession. Results show that when we do not account for local neighborhood variation, the Great Recession is associated with a significant decrease in voter turnout. However, when we account for localized economic shocks, we find that residents in neighborhoods with negative price shocks were more likely to vote after the Recession, especially in non-local elections. In addition, the propensity to vote increases with the size of the negative price shock. There is some evidence that variation at the neighborhood level matters more than voter-level heterogeneity. The positive voting response is most profound in predominantly Black neighborhoods, and, to a lesser extent, in predominantly Hispanic and the lowest income neighborhoods. Increases in the propensity to vote are robust to models controlling for baseline economic vulnerabilities, such as localized unemployment, the weakness of the local housing market and exposure to sectors hit hardest by the Recession. The results indicate that dramatic and sudden changes in localized economic conditions can drive voting behavior, and in ways that are distinct from macroeconomic drivers. In addition, the housing asset channel appears to be a powerful one, which can induce significant voting responses at the national level apart from other localized economic drivers, especially among homeowners.

Keywords: Economic voting, Great Recession, Housing Prices, Neighborhoods

Acknowledgement

The authors gratefully acknowledge Ilker Aslantepe, Yijia Gao and Jamala Wallace for superior research assistance. All errors and omissions are our own.

1. Introduction

It has long been understood that economics inform voting behavior and decisions (Rees et al. 1962; Feldman 1982; Rosenstone 1982; Bowler and Donovan 1994; Cutler et al. 1999; Vigdor, 2004; Cheung and Cunningham, 2011). Economic circumstances can drive political participation through both the capacity to participate and the agitation to rectify an unfair distribution of resources (Brady 2004). Much of the research on economic voting, however, has focused either on macroeconomic conditions or on the economic circumstances of the voters themselves. We fill the "spatial gap" in the economic voting literature to understand how the localized economic conditions of where voters live influence their likelihood to vote. We consider a scenario, the Great Recession, where economic shocks were sudden and uneven across space. Furthermore, we operationalize the shocks using house prices, which should more cleanly reflect localized economic conditions than the commonly used employment-based measures.

Our theoretical framework posits that negative neighborhood economic shocks, being the shocks most visible and immediate to individuals, may induce a political response in one of two ways. First, the "mobilization" effect (Schlozman and Verba 1979) predicts that negative shocks increase political participation as voters place blame on their elected officials and go to the polls for redress. Second, the "withdrawal" effect (Martins and Veiga 2013) predicts that negative shocks decrease turnout as voters focus their attention on personal economic pressures (such as finding a job or paying their mortgage) as opposed to voting.

Further, we account for the role of space, or localized context, in mediating this tension between mobilization and withdrawal. We test how scale matters in both the economic shock driving voter participation and the nature of voter participation as the observed outcome from that shock. We can observe whether voter mobilization or withdrawal dominates and if that tension changes at different scales of economic shock and levels of election participation. We also test for heterogeneity across localized contexts to see if other features of the neighborhood, such as racial composition or housing market vulnerabilities, mediate the voter response.

We compile a novel dataset on registrants and voters in local, state and national elections for the Tampa, FL, metro area, over the course of a decade. These data were obtained from the state and

county boards of elections, and also contain a range of registrant-level characteristics like age, race, gender and party affiliation. We augment these data with information on demographics and housing markets from the U.S. Census and the Florida Department of Revenue to capture differences in localized socioeconomic conditions and housing-related shocks.

Our data possess four key features. First, we can follow the voting participation of registrants over time. Second, we document the number of local and national elections and measures on the ballots. Third, we can construct fine-grained geographies to capture localized economic circumstances. Finally, the sample is quite large (over 1,000,000 unique registrants in total), providing enough power for small-geography analyses to test for heterogeneity. There is meaningful variation across Florida, both geographically and temporally, with respect to baseline economic conditions and to how places weathered the recession.

We estimate a two-stage model to first estimate neighborhood-specific housing price changes and then use the predicted price changes in the second stage to estimate how a localized housing price shock affects the probability of voting (conditional on the "local-ness" of the elections and the characteristics of the individual voters). The crux of our analytical strategy exploits localized variation in housing price shocks and includes individual-level fixed effects. Therefore, we are absorbing any individual-level heterogeneity that could interfere with the economic channel of interest—the voters' neighborhood contexts.

Results show that, when we do not account for local neighborhood variation, the Great Recession is associated with a significant decrease in voter turnout. However, when control for neighborhood economic conditions, residents in areas with negative price shocks were *more* likely to vote after the Recession, especially in non-local elections. In addition, the propensity to vote increases with the size of the negative price shock. Analyses that control for the prevalence of more transient households suggest that the countervailing and mobilizing turnout effects from localized shocks are most pronounced among stable and homeowner households—in other words, households more permanently tied to their place of residence.

There is some evidence that variation at the neighborhood level matters more than voter-level heterogeneity, including race and party affiliation. The positive voting response is most profound

in predominantly Black and Hispanic neighborhoods, and in the lowest income neighborhoods. Increases in the propensity to vote are robust to models controlling for baseline economic vulnerabilities, such as localized unemployment, the weakness of the local housing market and exposure to sectors hit hardest by the Recession. There are however, indications that the more stable, owner-occupied sample that we analyze may behave differently than more mobile households. Voters in neighborhoods with more renters and more mobile households are less likely to turn out in the face of localized negative price shocks, suggesting that the ownership of a home may be an important channel. Altogether, we find that dramatic and sudden changes in localized economic conditions can drive voting behavior, and in ways that are distinct from macroeconomic drivers. In addition, the housing asset channel appears to be a powerful one that can induce significant voting responses apart from other localized economic drivers.

The paper proceeds as follows. Section 2 provides a brief summary of the literature on how economic shocks affect political participation. Section 3 describes the framework for the analysis, and Section 4 outlines the novel data set that we construct and use. Section 5 presents the econometric methodology. Section 6 discusses the results and Section 7 concludes.

2. Prior Literature

Our paper builds on several strands of literature, at the intersection of economics and voting. Most directly, we fill a "spatial gap" in the economic voting literature that has mostly focused on either macroeconomic conditions or individual economic circumstances when explaining voter behavior. A common theme running throughout the economic voting literature is that the prevalence and proximity of information on economic circumstances can influence how voters behave.

Economic voting in response to macro conditions is known as 'sociotropic' behavior. There is a longstanding body of literature that shows that macroeconomic circumstances can affect both the likelihood of voting and the nature of those votes (Weatherford 1978, 1983; Markus 1988; Kinder et al. 1989; Lewis-Beck and Paldam 2000; Wlezien et al. 1997; Lewis-Beck 1990; Ragusa and Tarpey 2016; Aha et al. 2023). The literature has developed around understanding the heterogeneity of these responses. For example, the importance of national economic conditions is mediated by whether or not an incumbent politician is on the ballot (Hansford and Gomez 2015;

Evans and Pickup 2010; Evans and Anderson 2006), by the voter's party affiliation (Conover et al. 1986 and 1987; Duch et al. 2000; Evans and Andersen 2006; Gerber and Huber 2009 and 2010; Zimmer 2010), and by the demographic context (Hersh and Nall 2016).

The sociotropic theory contrasts with 'egotropic' behavior, where individual circumstances (rather than macro ones) influence voting decisions. The empirical literature shows that individual characteristics matter less, or, at most, in conjunction with broader economic issues (Weatherford 1978; Wolfinger and Rosenstone 1980; Markus 1988; Incantalupo 2011). One of the clearest examples of a determinative individual circumstance is homeownership. Homeowners tend to care more about local issues (like zoning, house prices) and are also less mobile, both of which increase voter participation (Squire et al. 1987; Fischel 1998; Hall and Yoder 2018). Furthermore, homeowners respond when their home is under financial distress; Hall et al. (2021) find that voter turnout is suppressed for individuals whose home is foreclosed (see also Estrada-Correa and Johnson 2012). Homeowners also tend to be older, male, longtime residents and generally more predisposed to political participation (Gibson and Kim 2018; Einstein et al. 2019; Leviten-Reid and Matthew 2017; McCabe 2013; Rossi and Weber 1996).

In between sociotropic and egotropic factors are 'geotropic' ones (Reeves and Gimpel 2012), or the localized economic conditions that affect voting behavior. The literature on these drivers is less expansive and unresolved (Books and Prysby 1999; Johnston et al. 2000; Ragusa and Tarpey 2016). The intuition of geotropic voting relies on the proximity of information. Individuals do not, on a daily basis, necessarily experience national conditions; they are more likely to witness first-hand nearby distress or prosperity. Local conditions may also serve as a shortcut to processing more complex or less easily distilled issues at the national level (Ragusa and Tarpey 2016) Therefore, a more accurate picture of economic threats will come from local contextual environments and how others in close geographic proximity are faring economically (Conover et al. 1986 and 1987).

There are a handful of studies that support this hypothesis. Reeves and Gimpel (2012) use survey data to test the economic perceptions of political independents during the 2008 U.S. presidential election. In their cross-sectional analysis, they find that retrospective national economic assessments are indeed mediated by local economic and social conditions, apart from their

individual circumstances. In another study, Stein and Weisser (2018) find that the proximity of a shock can adversely affect well-being, even without any direct material effects. Holian (2011) finds that dissatisfaction among homeowners in San Jose, CA with local, place-based services induces a higher likelihood of voting, a result that was not as pronounced for renters. Similarly, McCabe (2013) determines that higher voting participation among homeowners is a product of the financial investments they have made in the communities locationally tied to the home (consistent with "interest theory"). In a paper most closely aligned with our analysis, McCartney (2021) tests for the impact of financial distress from the Great Recession on voter turnout. He finds that declines in home values depress voting among homeowners, and especially those with an outstanding mortgage on their property. He finds no effect on renters or those homeowners without any debt on their property.[1] We build on McCartney's work by testing for variations in voting responses across different levels of elections and teasing out the distinct effect of localized (i.e., neighborhood) price changes from broader macroeconomic shocks from the recession. Unlike previous studies, we are able to test for geographic variation with respect to voters' local context and the relevance of the election (i.e., municipal versus state versus national).

Labor markets matter as well. For example, while Charles and Stephens (2013) find that counties with thriving labor markets have higher turnout for elections for governor, senator, US congress and state house representative, Burden and Wichowsky (2014) find that instead counties with *higher* unemployment rates had higher voter turnout in presidential elections. Many of these studies, however, rely on aggregate voting data, which can obscure localized heterogeneity. Using a panel dataset at the voter level and fine-grained controls, we can better home in on the causal relationship between local economic circumstances and voting responses. We also test the robustness of any relationship against various dimensions of heterogeneity at the neighborhood and individual levels.[2]

[1] Cifci et al. (2023) find that housing market performance helps to explain whether or not individuals vote for the incumbent in national elections (they do if market performance is strong). Their geographic scale for prices is the county, whereas we drill down to the ZIP code. Larsen et al. (2019) also find that support for the incumbent government in Denmark is mediated by the performance of the local housing market. Again, this paper estimates the support for the incumbent party, and not the propensity to vote itself.

[2] Furthermore, under circumstances of crisis (such as an economic recession), the salience of the localized economic information can be more pronounced. These high stakes can induce certain political responses. For example, research shows that economic shocks and dissatisfaction are associated with partisan shifts (Funke et al. 2016; Pfeiffer and Wegmann 2018) and even political withdrawal (Tiebout 1956; Hirschman 1970; Levine 2015). Our analysis of voting responses in the face of housing value shocks also contributes to understanding political participation under high-stakes circumstances.

3. Framework

3.1. Voter mobilization vs. withdrawal

Our theoretical framework models the political response to spatially localized economic shocks. While political responses can take many forms, we consider voting participation, and, specifically, whether or not individuals go to the polls. This is a first order concern—for the current analysis we prioritize understanding whether or not individuals go to the polls over subsequent considerations of how they vote (Burden and Wichowsky 2014). We recognize that voting is probably the most intense response—individuals can engage politically in less formal ways, such as local community organizations, donating money or volunteering. However, we are identifying off of dramatic changes in economic circumstances, which could reasonably trigger a similarly intense response.[3]

The direction and nature of such a response are unresolved, as two competing theories suggest different outcomes. The "mobilization" effect (Schlozman and Verba (1979)) suggests that voters in areas undergoing economic distress are more politically active as they seek to make their displeasure known. Thus, a strong negative shock to one's local housing market may spur greater participation at the ballot box.

On the other hand, the "withdrawal" effect (Martins and Veiga (2013)) suggests that voters who are facing hardship see voting as far down on their priority list; it is well documented that lower income and unemployed individuals are less politically engaged (Wolfinger and Rosenstone, 1980; Lewis-Beck and Paldam, 2000; among others). In addition, frameworks that model the tradeoffs between wealth-building and consumption suggest that a depreciation in housing values could discourage consumption due to more severe credit constraints and unabated housing service costs. Constraints on consumption and other utility-maximizing behavior could also translate into voter

[3] We recognize that if we do not pick up a significant response, it does not mean that individuals are not responding politically in other ways. Reeves and Gimpel observe that when economic conditions deteriorate in the short-term, the response is more likely to be political (2012).

demobilization.[4] Therefore, voters impacted negatively by the Great Recession would subsequently vote less. We also recognize that the two effects may both be present, effectively mitigating each other and producing a small or null effect on turnout.

3.2. Why Local Context Matters

We take as given two well-established correlates of voting behavior—macroeconomic conditions and voters' individual characteristics. Here, we introduce the dimension of space, vis-à-vis housing markets, as an additional mediating force in the above tension between voter mobilization and withdrawal.

We exploit two key features of housing and housing markets. First, housing is typically the biggest asset that a household owns, so any shock to the value of this asset should be salient and meaningful to the owners. Second, housing markets are characteristically local and varied. Furthermore, as we describe below, our focus on homeowners ensures that decisions about voting vis-a-vis local housing conditions are especially tied to place. Unlike renters who are more footloose, homeowners cannot move as easily and are therefore more likely to respond to local conditions to which their home asset is tied (McCabe 2013; Dietz and Haurin 2003). Therefore, extreme changes in the value of housing should be specific to the local context and discernible to individual homeowners. This is in contrast to employment markets, which can span neighborhoods and regions. We expect that housing prices will be able to capture more targeted and localized economic shocks than other commonly used employment-based metrics.

These shocks to local housing prices should influence voting behavior through three different channels. First, changes in house values could impact voting through a resource channel. Economic voting theories and wealth-consumption trade-off models predict that a negative shock to housing values should demobilize voters who are now preoccupied with resource management and will substitute away from utility maximizing behavior, such as voting.

[4] Aladangady (2017), for example, finds significant link between house price fluctuations and consumer spending for homeowners, especially those who are credit constrained. There is not a similar relationship for renters. Skinner (1989) is an example of an earlier paper that finds a weaker association between housing wealth and saving/consumption.

Second, the 'homevoter hypothesis" channel (Fischel 1998) predicts that threats to home values mobilize homeowners to engage politically to protect their biggest asset. This second mechanism also suggests that the level of political engagement might matter—homeowners may be more compelled to mobilize in local elections since they most directly affect the officials and institutions making decisions about local housing markets.

Finally, changes in house prices can affect voting behavior through a fiscal and service channel. Economic repercussions from negative housing price shocks can also show up in local government finances (Alm and Leguizamon 2018). Local governments may handle fiscal stress with service reductions and voting households may wither anticipate this outcome or feel it directly. Given the typical "fiscal illusion" (Wagner 1976) among voting individuals, it is more likely that this mechanism would take time to manifest itself after the initial price shock.

We recognize that the voting response may also manifest itself at different scales. For example, individuals may be more inclined to vote in general elections, where information about the candidates and the issues they represent is often more available. On the other hand, individuals may more likely participate in local elections, where the issues are more immediate, and the political remedy seemingly more attainable (Ebeid and Rodden 2006; Martins and Veiga 2014). A threat to a local good, like housing, may especially trigger local redress.

3.3. Focusing on the Great Recession

To operationalize the localized nature of economic shocks and voting responses, we take advantage of the sudden and varied housing price declines after the Great Recession. This scenario is useful for several reasons.

First, the Great Recession was a macroeconomic phenomenon that permeated the national consciousness, regardless of how intense the effects were at a local level. Therefore, the economic precarity at the peak of the recession could reasonably affect anyone's political engagement, even if their local circumstances were less affected.

Second, the severity of the local economic effects from the Recession was varied in terms of magnitude and geography. The variation *across* metropolitan areas is well documented; for example, Garr (2011), in a Brookings brief notes that in cities in the interior West, such as Stockton and Las Vegas, unemployment increased by more than 7 percentage points in the three years after the recession began. On the other hand, Omaha, Madison and Cleveland had unemployment rates that rose by only 1 or 2 percentage points. Housing price responses also varied: cities with smaller increases leading up to the recession, like Boston, saw much smaller drops in values than cities with dramatic price gains during the pre-recession period, like Miami (Ellen and Dastrup 2012). Relatively less is known about variation *within* metropolitan areas. Garr's report notes that the bulk of unemployed population increases were concentrated in suburbs rather than central cities (two-thirds of the net increase in metropolitan unemployed populations). We also know that the economic impacts from the recession were felt differently depending on the pre-existing vulnerabilities of neighborhoods. For example, Williams et al. (2013) find that within Chicago neighborhoods followed independent trajectories, distinct from observed macroeconomic patterns across the city. Most significantly, low-income and predominantly minority neighborhoods experienced more severe economic harms. Variation in the local "reference groups" for a voter (Kinder et al. 1989) could certainly affect their perception of economic conditions and motivation to vote.

Third, housing markets were at the center of the crisis and homes are, after retirement savings, the biggest asset for households (Eggleston et al. 2020).

Finally, we argue that after controlling for a number of context- and individual-level factors (detailed below), the recession-induced neighborhood price changes can be treated as reasonably exogenous.

4. Data

This paper focuses on the Tampa-St. Petersburg Metropolitan Statistical Area (MSA). The Tampa MSA is comprised of four counties: in declining order of 2010 population, Hillsborough (1,229,226), Pinellas (916,542), Pasco (464,697) and Hernando (172,778). We focus on a single MSA for two principal reasons. First, our theoretical framework suggests that even within the same

MSA, economic shocks can be localized on much smaller areas. Exploiting the variation between sub-MSA areas allows us to bypass the well-documented shocks that hit MSAs differently. Furthermore, Tampa includes a reasonable diversity of municipalities, with respect to size and demographics. Second, our data set are constructed from individual parcel and voter registration rolls from the four counties. This amounts to millions of observations. Any broadening of our data set would be computationally taxing. We also manually collected information on the races for each election, a task that was only feasible for the single MSA of Tampa. For the current analysis, the study period spans 2006 to 2015.

4.1. Data set 1: Assessor Rolls

House values and structure characteristics are sourced from the property assessor's offices for the four counties. For each county, we obtain the parcel rolls, along with a geographic information systems (GIS) shapefile of the parcel map. Each parcel is identified with a unique parcel ID. Information relevant to our analysis provided for each parcel from the rolls and map include: parcel coordinates; type of dwelling; exact dates of the last two sales; prices of the last two sales; square footage; number of units; lot size; property age; number of bathrooms; number of stories; number of bedrooms; and whether the property has air conditioning, a pool and garage. We overlay a shapefile with the municipality boundaries onto the parcel map to identify which parcel sits within an incorporated municipality. We also merge 2006-2010 American Community Survey demographic variables at the census tract level to each parcel.

4.2. Data set 2: Voter Registration Rolls

We obtain the most recent set of voter registration rolls from the four counties' Boards of Elections. Because the rolls are updated dynamically, it is not possible to observe or follow voters who fall off the rolls because of a lapsed registration or who move within or out of the county. Specifically, we obtain the registration rolls as of 2016; therefore, while the historical voting record of individuals is included, we can only attach the universe of registrants to the address reported as of 2016 and cannot trace them back to earlier addresses. To overcome this limitation, we develop a strategy for identifying and retaining only the "non-mover" registrants, and discuss it below.

Each voter is represented by a unique Voter ID code, which is attached to the person even if they move.[5] The home address of each voter (which may be long held, but is fixed as of 2016) is matched using GIS to a parcel from the assessors' rolls, allowing us to have a set of dwelling characteristics (including sales transactions) for each voter's residence. The voter ID registration rolls report a standard set of variables for each voter. These include: date of registration; gender; declared party affiliation; race/ethnicity; and, most importantly, participation in each election since their registration date. We cannot observe how the registrant voted; only whether the registrant cast a ballot, and whether it was done in person or absentee.

4.3. Data set 3: Election Information

The Boards of Elections provide detailed data on each election held in the four counties from 2006 to 2015. One novel characteristic of our data is that we augment the administrative voter rolls with manually collected information on the date and content of all elections, including general elections in which federal and statewide offices are decided (i.e. president, U.S. senator or representative, Governor, state congressperson), as well as local (municipal and county) elections. Table 1 shows the distribution of the types of elections over the years in our study.

It is important to distinguish between an *election* and a *race* in our methodology. A race is a competition for a specific office or a specific issue. An election consists of all the races that are held on the same date. For example, a voter who lives in Temple Terrace (Hillsborough County) would see on their November 8, 2012, ballot a federal race (President), a state race (state representative), a county race (county commissioner) and a municipal race (mayor), among others. That voter also faced a statewide referendum (constitutional amendment), a countywide charter amendment and judge retention races. While the general and primary elections tend to have many races, some elections consist of only local races. In the same Hillsborough County, the City of Tampa held a municipal election on 16 March 2007, with the only races being for mayor and for a member of the city council.

[5] Individuals are given a new Voter ID if they leave the state, return sometime later and re-register.

For each election, we systematically classified all the races on the ballot. We count the number of races and candidates for each election in the following categories: president (primary and general races), U.S. senator, U.S. representative, governor, state senator or representative, other state official (e.g., attorney general), mayor, local councilperson, school district, other local official, and local amendment or referendum.

We note, in addition, that the voter participation variable runs with the election, not the race. Therefore, we know if an eligible voter casts a ballot in a specific election in which they are eligible to vote, but not whether they voted in any specific races. This introduces the potential for measurement error, but it is due to the limitation of the voter registration rolls. We rely on the reasonable assumption that most voters will cast a vote for the entire ballot, rather than picking and choosing (Bracco and Revelli 2017). We also measure the likelihood of voting on different races by the intensity of exposure to those races (i.e. the number of local versus national races in the election).

4.4. Identifying "non-movers"

As we mentioned above, while we can observe registrants' voting behavior across elections over time, we cannot follow any changes in their address of residence. The data will report the address at the time of the data pull; therefore, we cannot observe address changes, if they took place, between the date of the voter's registration and the date of the data pull in 2016. We are primarily concerned about address changes *within* the county; if the registrant leaves the county then they would no longer be captured in the county voter file (and we wouldn't see their election participation). Since our housing price shocks (described below) are pegged to the ZIP code, we would be most concerned about registrants moving across ZIP codes over time (even if they are still part of the county-level voter file).

In order to mitigate this threat, we use the property transaction information (from the assessor file) to identify registrants who are *probable* movers, who we then eliminate from the sample. We first assume that the address in the registrant file reflects the reported address at the time of registration; we cannot track systematically if the registrant updates their address over time. We make a second reasonable assumption that if a registrant resides in a property that is flagged as owner-occupied

(using the homestead designation in the assessor files) and then gets sold, the registrant moves from that location. Then, we compare the date of the property sale with the election dates (which exist for a registrant only after their registration date) and drop the registrant from the sample for all of the elections that take place after the date of the property sale. Since we cannot follow the individual to their next location (specifically, the ZIP of their next home), we simply drop them from the sample for the elections for which we do not know that address (we retain them for the elections that precede the sales date, since they would be attached to the recorded address). Given the low rate of mobility observed among Tampa residents (around 15 percent during the study period for all residents, and likely lower for only homeowners), the assumption of a consistent address since the time of registration is a credible one.[6]

Ultimately, we end up with a sample of owner-occupied registrants, who are consistently located in the same address over the course of our study period. We recognize that this precludes generalizability of our analysis to those voters who are renters or more mobile. Therefore, it is likely that our estimates of voting likelihood will be higher for homeowners than the general voting population, given prior research that shows a higher inclination for homeowners (compared to renters) to vote and participate civically (Manturuk et al. 2009; DiPasquale and Glaeser, 1999; Squire, Wolfinger, and Glass, 1987). On the other hand, homeowners should be more in tune with the local economic circumstances that affect home values, therefore establishing a more direct line between the housing price shocks and voting responses. In addition, by eliminating mobile households we can also minimize the threat that voting behavior will be informed by relocation decisions unrelated to recession-induced housing price shocks (McCartney 2021).

The final sample of registrants is large and has a good deal of variation, in terms of individual characteristics and the propensity to vote. Table 2 displays the registrant summary statistics for the pooled sample.[7] We see that the sample used in our analysis looks similar to the universe of registrants (although the sample does shrink by about half). The only exception is that the average

[6] Mobility statistics are pulled from the American Community Survey 1-year (2006 through 2015) and 5-year estimates (2012-2016).

[7] We note that Hillsborough is the largest and most diverse county, where about two-thirds of the registered population is white and most of the remaining population split evenly between black and Hispanic residents. The other counties look very similar in terms of racial/ethnic composition, with the exception of Pinellas, which has a relatively higher share of black registrants. Male and female registrants are about evenly represented in all the counties and the average age consistently hovers around 50. The composition of partisan affiliation is also quite similar across the counties. In terms of turnout, it is highest in Hernando and lowest in Hillsborough--a difference of more than 10 percentage points.

age of the full sample of registrants is slightly higher.[8] We also note that the registrant sample reflects the population composition (as captured in the Neighborhood Characteristics from the ACS), with the exception of Hispanic-identifying registrants who are under-represented.

Twenty-eight percent of registrants voted in elections, of any type, over the course of the study period. Voter turnout is lowest among elections with municipal races (17 percent) and with municipal and county races (22 percent). The highest participation is for elections with general (e.g., federal or statewide) races on the ballot (65 percent). And there is variation over time across elections. For example, Figure 1 shows the distribution of voter turnout over time for the MSA. A few things to note: Municipal elections take place more regularly, but they have the lowest turnout. The highest turnout is usually during on-cycle elections, i.e., those that include a race for a federal office. However, even within election type, there is variation over time.

5. Estimation strategy

We use a two-stage estimation approach in the spirit of Topel (1984) and Murphy and Topel (2002), where housing price shocks for the universe of registrants are unobserved and instead are derived from predicted values in a first-stage regression.[9] We then use these predicted values to construct a measure of negative economic shocks at the localized zip-code level to estimate the likelihood of voting in the second stage regression. We describe these two stages below.

5.1. First stage: Identifying housing price shocks and estimation strategy

Our election data span the years 2006 to 2015, but the sales transaction data captures prices back to 2003. Consistent with NBER's definition, we designate the Great Recession as spanning December 2007 through June 2009. As a point of reference, we use housing price indices generated by the Federal Housing Finance Agency to document price changes over time and by county (displayed in Figure 2).[10] The price trends are similar across the counties, all showing a peak in 2006-2007, before falling around 2008. Prices begin to rise again post-recession around

[8] We do test for different voting outcomes across age cohorts to make sure our findings are not driven by a subset of the age distribution.
[9] It is well established that two-stage procedures yield consistent second-stage estimates (Murphy and Topel 2002).
[10] Data are available at https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx

2013-2014.[11] This definition will be used consistently across the two-stage estimation approach we describe below. To avoid any confounding effects from elections that took place in the midst of the recession, we do not include any voting records from 2007 or 2008 elections in our analysis.[12]

First, we need to identify the magnitude of the localized housing price shock. We want to identify changes in housing prices around the recession at the neighborhood scale. We start with the sample of sales transactions between 2006 and 2012, a window with at least 2 years of sales before and after the peak of the Great Recession.[13] We recognize that the sample of properties that transact is going to be systematically different than the universe of properties in the neighborhood. However, we want to use the information conveyed through sales prices as it can reach the broader set of households through three important channels: (i) their own decisions to sell or refinance, (ii) comparables from actual sales transactions to inform selling, refinancing or other activities that leverage home equity, and (iii) changes in assessment or tax burdens (due to new comparables).

In order to allow neighborhood-specific price changes, we estimate a property-level model separately for each zip code, $z \in [1, j]$, on our sample of sales transactions using the following regression:

$$\ln(Price)_{it} = \beta_0^z + \beta_1^z(Recession\_Post_{it}) + \beta_2^z \boldsymbol{X}_{it} + e_{it} \quad (1)$$

The dummy variable *Recession_Post* takes on the value of 1 for sales after June 2009. The vector $\boldsymbol{X}$ contains a rich set of property-level characteristics from the assessor rolls, which includes characteristics such as lot size, property age, square footage, number of bedrooms and bathrooms, presence of garage and of a pool, and so on.[14] We opt for the 2-stage hedonic approach since the

[11] The analysis that follows is robust to variations in the pre- and post-recession designations. For example, we test model sensitivity to cutoffs at the end of 2006 or later in 2009, and the results are substantively similar.
[12] We do replicate regressions including the 2008 elections, coding them as post-recession, and the findings are materially consistent.
[13] We also replicated the first-stage analysis with a slightly longer panel of sales transactions, but found that this shorter window did a slightly better job of isolating price changes particular to the Great Recession. Extending the panel back earlier than that start of 2006 risked incorporating residual price responses from the 2001 recession. In all instances, we retain only ZIP codes that have at least 100 sales transactions over the interval (this results in dropping 28 out of 162 ZIPs).
[14] We explored different combinations of variables in the X vector, some more parsimonious depending on how populated the variables were in particular counties. Results did not vary much at the margin.

index-based values rely on a selective sample of only repeat-sales. This selection could be particularly distortionary for the time period of the current analysis, when distressed properties, which tend to sell more frequently and at discounted prices, were more prevalent (more justification for the hedonic approach compared to a repeat-sales one is provided in Appendix A).[15] We interpret the parameter β_1^z as the quality-controlled average price change for zip code, z, over the course of the recession.

We bootstrap the standard errors and derive *j* predicted values for *Price*, one for each zip code $z \in [1, j]$, using the zip-specific parameters β_1^z estimated in equation (1). This estimate, $\widehat{Price}^z$, should capture the average housing price shift for zip code *z* over the recession period.

5.2. Second stage: Estimating voter turnout

The second stage estimations are conducted at the registrant level. We use the predicted housing price change values from the first stage ($\widehat{Price}^z$) to instrument for the localized price shock in the second stage regression below. We introduce the price shock in two ways. First, we use a dummy $(Negative\ Shock)^z$ that takes on the value of 1 if the predicted change in price, $\widehat{Price}^z$, is negative, and 0 otherwise. In an alternative measure, we interact $(Negative\ Shock)^z$ with the absolute value of the *size* of the shock, $\widehat{Price}$, to allow the negative price shock to vary by its magnitude.

Central to the identification are the voter-specific fixed effects, which allow us to identify off the zip-level local housing shock for each registrant. Our framework also controls for zip code-year interaction effects to better capture unobserved local heterogeneity over time. Therefore, our

[15] Although repeat sales indices are available at the ZIP code level from FHFA, we opt for the 2-stage hedonic approach since the index-based values rely on a selective sample of only repeat-sales. There is evidence that distressed properties are more likely to sell and at a faster pace, and at discounts (Doerner and Leventis 2015; Lee and Immergluck 2012; Immergluck 2011; Campbell et al. 2011; Coulton et al 2008). This is particularly relevant for our study, since (i) we know distressed property sales were elevated during and after the Recession and (ii) when there could have been large shifts in the quality of properties being sold that the property fixed effects may not fully pick up. Both could systematically push the price changes down compared to those calculated off of the universe of sales. This can be particularly influential for localized indices, like the ZIP-level Federal Housing Finance Agency (FHFA) one (Doerner and Leventis 2015). We do note that when replicating regressions using the FHFA price index instead of our predicted price change the coefficients of interests are insignificant but with the same signs (see Appendix A).

baseline regression estimates the turnout of registrant *i* for election *t* (elections index registrants over time) conditional on the instrumented negative price shock:

$$Turnout_{it} = \gamma_0 + \gamma_1(Recession\_Post_{it}) + \gamma_2(Recession\_Post_{it} \times Negative\ Shock^z) + \gamma_3(Election_{it}) + ZipYear_{it} + d_i + e_{it}. \quad (2)$$

Here, *Recession_Post* is a binary variable that takes on 1 if the date is after December 2009. This dummy operationalizes changes in macroeconomic conditions, so that we can identify off of the negative local price shock, conditional on these broader economic shifts.[16] *Election* is a vector of controls for characteristics of the election, which includes the number and types of races (i.e. local, county or state/federal) on the ballot. These variables are labeled *CityRaces*, *CountyRaces* and *GeneralRaces*. These variables will control for any election-specific features that impact voting apart from the housing price shocks.[17] Finally, there are two sets of fixed effects, one (*ZipYear*) at the zip code-year level and the other (*d*) at the voter level. All standard errors are clustered at the zip code and robust to heteroskedasticity.

γ_2 will serve as the primary parameter of interest—if it is positive this indicates that a negative localized price shock induces a higher probability of voting.

Normally, with a binary dependent variable we would use a conditional logit model with voter-specific fixed effects. However, due to the size of the data set, specifications with zip-year dummy variables failed to converge. Therefore, we revert to OLS as a reasonable approximation, as our turnout variable is generally not near the extremes of 0 and 1 (Hellevik 2009).[18] In addition, the linear probability models will produce more interpretable coefficients, especially in the context of fixed effects (Greene et al. 2002).

[16] We recognize that voters may experience some national economic conditions via the neighborhood-level shock channels (what Ansolabehere et al. refer to as "mecro-economic" voting). However, the *Recession_Post* dummies should absorb most of the systematic variation in national economic conditions and at most we interpret the neighborhood-level impacts as consistently upper bounds. There is no reason to expect that, conditional on the individual-level and other neighborhood-level controls that the bias would vary across ZIP codes.

[17] For example, races may be marketed, and perceived, as more competitive with more candidates on the ballot and could increase voter mobilization (Burden and Wichowsky 2014). Also, previous research out of political science shows that voters participate in elections at different levels of government for different reasons (Atkeson et al. 1995; Carsey and Wright 1998; Burden and Wichowsky 2014).

[18] See a useful post at https://statisticalhorizons.com/linear-vs-logistic.

6. Results

6.1. First stage: House price shocks

We first want to demonstrate that we have a good deal of variation with respect to housing price changes. We turn to our measures of price shocks, $\widehat{Price}^z$, the first stage's predicted value of average price changes between pre-and post-recessions periods for each zip code in our sample. Figure 3 demonstrates the variation in our metric, by county.[19] Each dot (notated with a different shape for each county) represents the predicted price change for the zip code, which are arrayed along the x-axis in decreasing rank of population (so the most populous zip codes for each county are plotted closer to the y-axis and the smallest ones further away).

We confirm that there is a good deal of local variation in the predicted price changes. The median county price change for three of the four counties is between negative 5 percent to negative 7 percent; for Pinellas County, the median price change is slightly positive at 0.5 percent. Interestingly, all four counties have zip codes that experienced meaningful positive price changes over the Recession period, even though price discounts are more typical for most zip codes in the sample. While we have more zip codes for the bigger counties, Hillsborough and Pinellas, the pattern is consistent with the plotted price changes for the full set of counties.

6.2. Baseline regression results

We start with a model that controls only for the timing of the recession (as well as ZIP-year and elections). Results are displayed in Table 3. The first column does not include voter fixed effects. This specification is a useful starting point, as it estimates the likelihood of voting conditional on changes in macroeconomic conditions (i.e., the recession), before controlling for individual-level characteristics (i.e., the registrant fixed effects in the next specification). We find that the propensity to vote after the recession declines on average by 0.04. Given that the mean propensity to vote in our data is 0.28, this is a small but significant shift. We interpret this as a change in

[19] The full set of regression results from the hedonic estimations is available on request.

voting behavior in the context of general economic distress caused by the recession, which could include but does not distinguish from any varied localized conditions.

In the second column of Table 3, we include registrant-level fixed effects. The coefficient on *Recession_Post* is now interpreted as the recession's impact on voting, conditional on individual characteristics; in other words, we have now accounted for the sociotropic and egotropic factors behind voting propensities. The *Recession_Post* variable remains negative but doubles in magnitude. Therefore, the withdrawal from voting hypothesis arising from the recession is even more evident when netting out individual characteristics.

Next, we introduce our measure of localized economic conditions: the housing price shock. This indicator tests directly if the voting response to the broader recession phenomenon is mediated by local conditions, while still controlling for individual voter characteristics. These results are displayed in Table 4. We are interested in the coefficient on *Recession_Post*Negative Shock*, the change in the propensity to vote after the recession conditional on whether or not there was a decline in prices for the local zip code.

We first observe that when controlling for local economic shocks, the coefficient on *Recession* does not change substantively. Second, the coefficient on *Recession_Post*Negative Shock* has the opposite sign (positive), suggesting that zip-code level economic conditions have a countervailing force on voting. The propensity to vote *increases* by 0.13 conditional on receiving a negative shock to housing. This is about one-third of the standard deviation in turnout, so it is a relatively large effect; the magnitude essentially reverses and eclipses the negative association with voting that the *Recession_Post* variable displayed.

Next, we interact *Recession_Post*Negative Shock* with the absolute magnitude of the shock to test if the voting response varies with the size of the price change. This variable, *Recession_Post*Negative Shock*Size*, is included in column 2 of Table 4. When we control for the size of the shock the presence of a negative price change (of any size) is associated with a lower tendency to vote; however, as the size of that shock increases, the likelihood to vote goes up. So, the bigger the price decline, the more likely it is that individuals go to the polls. The

"mobilization" effect seems to dominate the "withdrawal" effect when controlling for local economic conditions.

Going further, we recognize that there may be non-linearities in how the price shock affects voter turnout. We first test for the impact of differently sized negative shocks. We divide the distribution of the size of the negative price changes into terciles and create interactions between *Recession_Post* and these tercile dummies. The results are displayed in Column 3 of Table 4. We do observe some non-linearities such that the propensity to vote decreases over the size of the shock. Therefore, within an initial range of the negative shock, a bigger shock induces more voting; but any changes over 10 percent, or thereabouts, the bigger shock has a declining or negligible effect on the propensity to vote.

We then test for any distinct voting effects from positive price shocks by separating the ZIP codes that experienced negative price changes from those that experienced positive price changes over the course of the recession and then re-estimating the baseline regression (displayed in Appendix B). These regressions confirm that any significant (and positive) localized turnout response is driven by negative price shocks. The coefficient on *Recession_Post* for the positive shock ZIP codes is negative and insignificant (in contrast to the positive and significant coefficient for the sample of ZIP codes with negative price shocks).

To show that our baseline results are robust to variations in how we classify the pre-recession and post-recession period, we present an alternate set of baseline models in Appendix C. The alternate results assume that the pre-recession period is December 2006 and earlier. We find substantively similar results using this alternate definition.

As a final baseline analysis, we test for changes in recession-induced voting responses over time (see Appendix D). Evidence on other economic determinants of voting behaviors suggests that their impact could be short-lived, receding once economic circumstances have improved, for example (Margalit 2013; Incantalupo 2011). In addition, some channels through which the housing price shock influences voting could take time to manifest. Specifically, voters' reaction to changes in their taxes or services could take time to develop and affect elections. We generally find that the increase in voting associated with localized house price shocks does dissipate over

time. While the positive voting change persists, its magnitude goes down five-fold by the 2015-2016 election cycles.[20]

6.2.a. Addressing limitations of homeowner "stayers"

It could be the case that neighborhoods with bigger price shocks also experience higher levels of migration or household transiency (either related or unrelated to the recession). Differential mobility into and out of neighborhoods with higher price shocks could feed into systematic biases in the voting estimates—specifically, it's possible that newly settled or transient households would be less likely to vote, pushing our estimates down. We test for this threat in three ways. First, we divide the sample up into tracts with high and low shares of households who have moved in the past five years (using the median share as the threshold) and run the baseline model for both strata. These results are displayed in Appendix E.1. We find that the positive voting effect observed across the full sample of registrants is driven by tracts with a lower share of newly migrated households.

Second, we repeat the exercise above, but now divide the sample based on the share of renters (under the assumption that renters are typically more transient than homeowners). See Appendix E.2. Registrants in tracts with a higher share of renters withdraw from voting in the face of localized negative price shocks; voting mobilization is concentrated among the tracts with lower concentrations of renters. Altogether, these results suggest that more mobile households (including renters) may exhibit a different response than the more stable homeowners largely represented in our sample. The negative voting response among the more mobile residents also reinforces the turnout decline associated with the broader recession disruption. Therefore, for households less permanently tied to their home location, the neighborhood-level price shocks do not add any new information to counter the voting response to macroeconomic stressors.

Finally, we return to the universe of registrants and calculate voter turnout metrics at the ZIP code level. Therefore, our estimates for voter turnout include both homeowners who stay in place (our current sample) as well as residents who rent or move for other reasons. Using the ZIP code as

[20] We also test for changes in voting response over time by election type and find a similar "recency effect" when separating the elections by off- and on-cycle and when isolating only the municipal elections. These results are available from the authors upon request.

the unit of analysis, we replicate the baseline regression to check if the voting response observed among the stayer sample is different when including a broader set of potential voters. Since we cannot identify the exact address of the registrant over time, we make the reasonable assumption that the ZIP code for the registrant stays constant over the course of the study period. In addition, we cannot identify individual registrants' eligibility for voting in local elections, so we only estimate general elections, or races with high-profile national and state positions. The coefficient on *Recession_Post*Negative Shock* is now negative, although not statistically significant. The attenuation of the positive estimate that we find in the stayer sample is consistent with the stratified results—that renters are more likely to withdraw from voting in the face of localized price shocks. These results are displayed in Appendix F. Altogether, these results suggest that tenure, and stability of residence, mediate the voting response from localized economic shocks. Therefore, we take care in extending our conclusions beyond the stable, owner-occupied class of voters to the more transient and renter populations.

6.3. Exploiting Variation in Local and National Elections

To further disentangle whether the localized housing price shock influences voting differentially at the local or national level, we run regressions that distinguish across the kinds of elections. First, we designate elections as "on-cycle" if they include a presidential race or a midterm race for federal offices. These fall in November on even years and usually garner a much bigger voter turnout. Off-cycle elections tend to be primaries or local races that usually do not receive the same kind of media and public attention; however, off-cycle elections might draw "selective participation" of more informed voters (Berry and Gersen 2011; Oliver and Ha 2007; Oliver et al. 2012).[21]

It is useful to separate these elections for two methodological reasons. First, there could be systematic, unobserved differences across the individuals that tend to vote in on- and off-cycle elections (that could also be correlated with their tendency to respond politically to housing price shocks).[22] Second, we can, albeit indirectly, test whether the voting response itself manifests differently at local or non-local scales (see Hall and Yoder 2020; Jiang 2018).

[21] Hajnal and Lewis (2003), for instance, note the significant gap in turnout between local races that are or are not scheduled at the same time as federal or state elections.
[22] This was posited and tested in papers such as Nownes (1992).

We display the results from the stratified regressions in Columns 1 through 4 of Table 5. We find that the tendency to vote in the face of localized price shocks increases post-Recession for on- and off-cycle elections. Although the increase for on-cycle elections is slightly bigger and more significant, the difference between the *Recession_Post*Negative Shock* coefficients across strata is not statistically significant.[23] Moreover, negative localized price shocks are associated with higher turnout even for the low-turnout off-cycle elections, indicating that "mobilization" is only somewhat sensitive to the "local-ness" of the voting channel.

However, even off-cycle elections can include bundles of municipal, county and state races. For instance, a voter may prioritize voting if an election has an important state house or governor race. So to better capture the impact of local shocks on local voting, we run regressions restricting the sample to elections with *only* local municipal races. In these cases, there would not be a corresponding election at higher levels of government to draw voters to the polls and is our cleanest way to capture local voting. These results are displayed in Columns 5 and 6 of Table 5. Now local elections elicit a different response among voters—in the face of housing price shocks, the tendency to vote *declines*. Further, the decline in voting is most pronounced among registrants who experienced bigger housing price drops. Therefore, for elections that already had lower voter turnout, economic shocks, even those locally pronounced, induce further withdrawal from voting participation. Altogether, the analysis across election types suggests voter mobilization is most pronounced for on-cycle elections with national races that perhaps are more salient (although less directly tied to localized economic circumstances).

6.4. Testing robustness and heterogeneity across the sample

We now exploit variation in our sample to confirm that the voting response we observe is indeed due to the housing price shock and not due to other factors that made individuals more vulnerable to either housing insecurity or to other recession-induced economic shocks. While we cannot observe-individual level economic circumstances (such as income or employment) we proxy for

[23] We implement Wald t-tests for significant differences in the estimated parameters across strata for all of the stratified regressions. We report the cases where those differences are significant, but do not display the results of those tests.

these traits by exploiting information that we can observe at the individual and neighborhood levels (which we assume will be correlated with income and employment attributions at the individual levels).

6.4.1. Demographic, party and income heterogeneity

We know that Black and Hispanic individuals have long faced barriers to homeownership and have been disproportionately exposed to predatory lending practices, making them more housing insecure (the research is extensive, but a few seminal contributions include Galster 1990; Massey and Denton 1993; Yinger 2018). We also know that Black and Hispanic households are often spatially segregated. To test for any individual or neighborhood-based racial disparities in the recession-induced voting response we stratify the sample according the racial identity of the registrants and run the baseline regression for each subsample. Table 6 reports these results. We also stratify the sample by the racial composition of the neighborhood (census tract) and run the baseline regression for each of these subsamples. Table 7 reports these results.

Table 6 shows that the racial identity of the voter does not differentially determine the likelihood of voting in the face of a localized price decline. The coefficients on *Recession_Post*Negative Shock* are relatively similar across the three strata that distinguish voters based on their recorded race. No one group seems to be driving the pooled results. The results for analyses on the sample stratified by predominant racial composition of the voters' neighborhoods (Table 7), however, indicate some heterogeneity in voting responses. In neighborhoods with a higher concentration of Black residents, a localized negative price shock is associated with an increase in voting; the opposite is true for neighborhood with a lower share of Black residents. The importance of the neighborhood features over the voter characteristics suggests that there are either political forces of being in a predominantly Black neighborhood (for example, voter mobilization efforts) or other social or economic features about those neighborhoods that could influence different voting behavior.[24] Although the difference in *Recession_Post*Negative Shock* coefficients is statistically

[24] Indeed, we see moderate correlations between the race of households in a neighborhood and other economic aspects (See Appendix G). For example, neighborhoods with higher shares of Black households also have higher unemployment rates, higher poverty rates and lower educational attainment. In addition, neighborhoods are racially segregated, as indicated by the very high negative correlation between share of Black households and chare of White households in a neighborhood; Hispanic households are relatively less segregated from both White and Black households. In addition, there was a bump up in Black and Hispanic voters for the 2012 presidential election; therefore, some of the neighborhood effect could be driven by voting mobilization specific to that election, when

significant across the sub-samples with the higher/lower neighborhood Hispanic concentrations, the magnitudes are very close. There are no statistically significant discrepancies, however, across neighborhoods with higher/lower concentrations of White residents.

Next, we consider the mediating role of party affiliation, an established factor in explaining voting behavior (Conover et al. 1986, 1987; Duch et al. 2000; Evans and Andersen 2006; Gerber and Huber 2009 and 2010; Burden and Wichowsky 2014). In the current scenario, party affiliation can capture variation in tolerance for economic distress and what responsibility is bestowed on the government in remedying the economic distress. Typically, Democrats support government intervention while Republicans oppose it; Independents, classified as "no party affiliation (NPA)" in Florida, can swing either way and presumably are indifferent, on average. Reeves and Gimpel (2012) also predict that independent voters might be more influenced by local conditions, as their party affiliation won't dominate voting preferences. We stratify our sample by party, and these results are displayed in Table 8. In general, party affiliation also does not appear to mediate the voting response. Those voters without any party affiliation are slightly less inclined to vote in the face of localized negative price shocks, but the difference is not statistically significant. While party affiliation may drive one's expectation of government intervention, perhaps this is less so when local economic conditions are concerned; partisanship can manifest itself differently at the local level, depending on the surrounding economic and demographic characteristics (Trounstine 2009; Gimpel et al. 2004).

It is also the case that shocks to housing prices could influence voting through both housing wealth and income channels. In order to isolate the former, we control for income in two ways. We do not observe the income of the voters, but we can measure the typical income in their neighborhoods. We expect that for lower income households their house will constitute a larger share of their assets and equity and therefore they may respond more intensely than more affluent individuals in their propensity to vote.[25] We stratify the sample by low- and high- income neighborhoods (Columns 1 and 2 of Table 9) and find that while localized negative price shocks are associated with increased voting for all levels of neighborhood income, the magnitude of the

Barack Obama was on the ballot (however, we don't see a similar neighborhood effect among predominantly Hispanic resident who also increased their turnout that year).

[25] Several studies have documented the mediating role of neighborhood and household income in voting and civic engagement (for example Manturuk et al. 2009; McCabe 2013).

association is slightly stronger among the higher income neighborhoods (but the difference across the coefficients for each strata is not statistically significant).[26] To see whether the very rich or the very poor are driving the results, we split the neighborhoods into terciles of income and repeat the analysis in columns 3 through 5. There, negative price shocks are associated with increased voting in the lowest and the highest income terciles (again, these differences are not, however, statistically significant across the strata).[27]

This finding somewhat complicates theories of economic voting, which predict that resources will mediate voting (either through the explicit or implicit endowments of income and other related advantages, like education). The results tenuously support the dual expectations that those with the lowest and highest income endowments will respond vis-à-vis voting. Those living in lower income neighborhoods, where a home may constitute a greater share of household wealth and assets, may respond more strongly to the economic threat of the recession.[28] On the other hand, those with the most resources may have more time and information and higher economic stakes.

6.4.2. Controlling for pre-Recession economic vulnerabilities

As a final set of robustness analyses, we replicate the baseline regressions controlling for localized economic vulnerabilities leading up to the Recession that could mediate the housing price shock and voting response we observe in the results reported thus far. First, we know that the recession introduced economic shocks through job losses. Like income, we cannot observe occupations or wages in our data; therefore, as a proxy we use employment information for the neighborhood where the registrant resides. First, we consider unemployment rates leading up to the peak of the recession, with the expectation that registrants with employment instability leading up to the

[26] We replicate the regressions stratifying instead by neighborhood poverty rates. The results are consistent with those using the income-based strata.

[27] We recognize that rents, rather than home values, may be more determinative in lower-income areas. To tease out any independent influence from rents, we isolate only low-income tracts and then stratify by the median rent in the tract. We find that the positive voting effect among lower-income tracts is largely driven by areas with lower rents; the low-income tracts with relatively higher rents (in the top third of the rent distribution) exhibit a reduced voting response in the face of negative price shocks. Therefore, among lower income households, higher rents may induce voting withdrawal and overcome any mobilizing effect from price shocks (the latter of which may be internalized predominantly by homeowners).

[28] We also run the regressions stratified by the age of the registrant, in case participation in elections varies along this dimension. We find that the overall sign of voting response is the same across age brackets, with the biggest withdrawal in voting post-Recession among the older age cohort. These results are available from the authors upon request.

recession are more likely to fare poorly with respect to employment coming out of the recession. This distress may influence voting behavior apart from any housing-related economic shock. We stratify the sample based on high and low pre-recession unemployment rates (neighborhoods with "high" unemployment have rates in the top third of the distribution across the MSA) and run the baseline regressions (displayed in Table 10). We find that the positive voting response is largely driven by those living in neighborhoods with higher unemployment rates. Those living in areas with lower unemployment tend to vote less in the face of localized housing price shocks. Therefore, there appears be a mediating effect from job (in)security: housing-based economic shocks induce an increased voting response among voters who are likely to have also faced employment instability, making them generally more vulnerable to these kinds of economic shocks.

As another exercise, we identify the sectors that were hit particularly hard during the recession: FIRE (finance, insurance and real estate), construction and certain professional services.[29] We designate neighborhoods as more vulnerable if a high share of residents' jobs (top twenty-five percent of the neighborhood distribution across the MSA) were classified as either FIRE, construction or professional services.[30] We then stratify the sample based on the concentration of vulnerable jobs in the neighborhoods and replicate the baseline regression. These results are displayed in Table 11. The coefficients on *Recession_Post*Negative Shock* are relatively similar across the strata suggesting that sector-specific economic shocks are not confounding the average voting effect we observe for localized housing price shocks. While the coefficient on *Recession_Post*Negative Shock* is bigger for voters more likely to be employed in lower-risk sectors, it is not statistically different from the same coefficient estimated in the higher-risk strata.

Finally, we expect that price shocks will resonate differently in housing markets that were more or less robust leading up to the recession. We want to be sure that we are capturing the change in voting behavior due to the recession-induced housing price shock and not housing market precarity and softness that was evident even before the recession. We proxy for the robustness of the local housing market in three ways: the share of vacant housing stock, the share of foreclosed loans and

[29]See report from the Federal Reserve Bank of Cleveland at https://www.clevelandfed.org/newsroom-and-events/publications/economic-trends/economic-trends-archives/2010-economic-trends/et-20100910-the-great-recession-and-its-impact-on-different-industries

[30] We test several definitions of job vulnerability and all of the results are consistent with those presented.

the degree of ZIP code price appreciation leading up to the recession period.[31] We then run stratified regressions using these variables to split up the sample (see Table 12). We find that in neighborhoods with higher foreclosure rates, the likelihood of voter turnout is somewhat higher in areas with negative price shocks. Thus, the political response was at least somewhat driven by those already living in tenuous housing conditions (made worse by the recession-induced price drops). Results for the analyses on samples stratified by vacancy rates show that the localized negative housing price shocks in markets with lower vacancy rates were positively associated with increased voter turnout. The differences between the *Recession_Post*Negative Shock* coefficients across the high/low foreclosure and vacancy strata, however, are not statistically significant. Finally, results from regressions stratified by housing price changes leading up to the recession indicate that voting responses do not vary with respect to localized price shocks across high- and low-price-appreciation ZIP codes (the coefficients across the strata are not statistically different). Therefore, the voting response from a localized negative housing price shock was not systematically dependent the strength of local markets before the recession.

7. Conclusion

The importance of economic factors in driving voting behavior is well-established. However, does their impact change when the economic shocks are very localized? Are individuals more or less likely to respond to proximate economic threats by going to the polls? And if so, do they seek redress in local or national elections? We use a rich, longitudinal dataset on the universe of registrants and elections in the Tampa, Florida metro area to shed light on these questions.

Our findings show that localized shocks to the housing market do matter in explaining changes in voter turnout. While the recession, as a macro-event, is associated with a reduction in voting, the localized economic repercussions have the opposite effect. We find residents in neighborhoods with negative price shocks were more likely to vote after the recession. In addition, the propensity to vote increases with the size of the negative price shock. This pattern was persistent regardless of the voter's identity, such as party affiliation or race. However, analyses that control for the prevalence of renters or more transient households suggest that the countervailing and mobilizing

[31] We obtain information on loans in foreclosure from Zillow. We capture price appreciation between 2000 and 2006 using FHFA price indices at the ZIP code level. We divide the sample into strata with ZIP code price appreciations in the top (bottom) 40 (60) percent of price changes in the sample.

turnout effect from localized shocks is most pronounced among stable and homeowner households—in other words, households more permanently tied to their place of residence. We recognize that localized drivers of voting behavior may look different for a subset of households that are more mobile or renters—namely those who cannot stay in place during such an economic shock. Nevertheless, we can conclude that relying on only macroeconomic trends to predict voter turnout will obscure the effects from localized, and heterogeneous, economic circumstances.

While the localized economic effects from the recession induce distinct voting tendencies from macro conditions, we find participation is still targeted at national elections. That is, redress at the polls is not channeled towards local institutions or races, but rather towards federal, and possibly state, elected officials. This could be due to the baseline low participation in local elections that characterizes these places (and most U.S. municipalities)—*any* political response would more likely be directed towards general elections. Alternatively, this could be due to the nature of the problem we focused on; the Great Recession was a global economic phenomenon and voters may simply see the responsibility for remedy at the national level as well.

We consider dimensions of heterogeneity that could obscure important variation or confound the average voting effects discussed above. There is some evidence that variation at the neighborhood level matters more than voter-level heterogeneity. The positive voting response is most profound in predominantly Black neighborhoods, and, to a lesser extent, in predominantly Hispanic neighborhoods and the lowest income neighborhoods. When we stratify the sample by levels of neighborhood unemployment we find that voting increases largest among neighborhoods with higher unemployment rates. However, the persistence of the locally induced voting increase suggests that localized housing price shocks induce a voting response above-and-beyond employment related distress from the recession and other pre-existing vulnerabilities related to race and income.

We also conduct analyses to mitigate concerns that the pooled results may be driven by sector-specific economic shocks (to those employed in harder-hit sectors during the Recession) and local housing market conditions leading up to the Recession. The direction of the voting response is not systematically confounded by employment-related shocks or housing conditions leading up to the recession.

The results indicate that dramatic and sudden changes in localized economic conditions can drive voting behavior, and in ways that are distinct from macroeconomic drivers. Even when controlling for individual variation, the neighborhood-level factors, including housing price shocks, continue to explain changes in voting behavior. In addition, the housing asset channel appears to be a powerful one that can induce significant voting responses apart from other localized economic drivers. Considering that around 65 percent of households are homeowners in the U.S., the locally-driven voting response could have meaningful national political implications.

Neighborhood conditions have always been important drivers of local politics; indeed, much of the NIMBY and YIMBY movements are very much about localized housing markets. However, our findings show that national and state politics are also influenced by how individuals experience economic circumstances in their local community. The variation in localized economic impacts seems to change voting the most for elections least tied to those specific communities. And we find this in the context of housing, one of the most locally determined and controlled commodities.

8. References

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Table 1: Distribution of Elections

	# Elections	# Elections w/ Municipal Races	# Elections w/ County Races	# Elections w/ State/Fed. Races
Before Recession (< Dec. 2007)	10	10	4	2
After Recession (> June 2009)	38	33	6	21

**Note*: elections can contain local, county and general races on the same date.

Table 2: Sample Summary Statistics

	Sample for Analysis		*Full Voter Roll*	
	Mean	***Std. Dev.***	***Mean***	***Std. Dev.***
Registrant characteristics				
% White NH	0.793		0.776	
% Black NH	0.087		0.08	
% Hispanic/Latino	0.068		0.09	
% Other	0.053		0.054	
% Female	0.535		0.535	
% Male	0.453		0.451	
% Unidentified	0.012		0.013	
Avg. Age	50.07	17.33	54.02	18.4
% Democrat	0.373		0.368	
% Republican	0.38		0.362	
% No Party	0.208		0.229	
% Other	0.039		0.041	
Avg. # years since registration	13.873	11.029	16.76	10.89
Neighborhood characteristics (as of 2006)				
Avg. HH Income ($)	66,272	24,028		
% BA +	0.271	0.135		
Unemployment Rate	0.05	0.025		
% White NH	0.836	0.182		
% Black NH	0.098	0.175		
% Hispanic/Latino	0.112	0.115		
% Other	0.032	0.034		
Housing Vacancy Rate	0.145	0.088		
% Homeowners	0.744	0.159		
Election characteristics				
% Voted	26.97%	44.38%		
# Elections Total	48			
# Elections w/ Municipal Races	43			
# Elections w/ County Races	10			
# Elections w/ State/Fed. Races	23			
N	1,292,604		2,602,281	

Table 3: Base (No Housing Shock) Regressions

VARIABLES	[1]		[2]	
Recession_Post	-0.0427	***	-0.0977	***
	(0.007)		(0.003)	
CityRaces	0.0003	***	0.0003	***
	(0.000002)		(0.000002)	
CountyRaces	-0.0074	***	-0.0075	***
	(0.00004)		(0.00003)	
GeneralRaces	0.0223	***	0.0224	***
	(0.00002)		(0.00002)	
Constant	0.1083		0.1550	***
	(0.093)		(0.003)	
Voter F.E.?	No		Yes	
Observations	12,365,172		12,365,172	
Adj. R-squared	0.193		0.427	
Number of voterid			1,053,795	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *I* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *CityRaces, CountyRaces* and *General Races* count the number of races in City, County and State/Federal elections, respectively. Controlling for election-level variation in races, voter turnout declines after the recession.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Housing Shocks Regressions

VARIABLES	[1]		[2]		[3]	
Recession_Post	-0.0977	***	-0.0977	***	-0.0977	***
	(0.003)		(0.003)		(0.003)	
Recession_Post*Negative Shock	0.1266	***	-0.1163	**	0.4031	***
	(0.009)		(0.069)		(0.072)	
Recession_Post*Negative Shock*Size			1.3793	***		
			(0.390)			
Recession_Post*Negative Shock*Tercile2					-0.2765	***
					(0.073)	
Recession_Post*Negative Shock*Tercile3					-0.0723	
					(0.072)	
Constant	0.0796	***	0.0776	***	-0.0193	
	(0.006)		(0.006)		(0.015)	
Observations	12,365,172		12,357,371		12,365,172	
Adj. R-squared	0.427		0.427		0.427	
Number of voterid	1,053,795		1,053,302		1,053,795	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; **Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z; Recession_Post*Negative Shock*Size* allows the change in voter turnout to vary with the absolute magnitude of the predicted price shock for ZIP code *z; Tercile2* and *Tercile3* capture the size of the price shock in discrete tercile categories (*Tercile1 is omitted)*. The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. Controlling for election-level variation in races and macro-level recession-induced price changes, voter turnout increases among registrants in ZIP codes with negative price shocks after the recession. This increase in turnout intensifies over the absolute size of the price shock, but at a declining rate.

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Stratified by Election Type

	On Cycle		Off Cycle		On Cycle		Off Cycle		Municipal		Municipal	
	[1]		[2]		[3]		[4]		[5]		[6]	
VARIABLES												
Recession_Post	0.0340		-0.0838	***	0.0330		-0.0838	***	0.2680	***	0.2681	***
	(0.029)		(0.003)		(0.029)		(0.003)		(0.007)		(0.007)	
Recession_Post*Negative Shock					0.0480	***	0.0215	*	-0.4368	***	0.2498	***
					(0.015)		(0.011)		(0.021)		(0.051)	
Recession_Post*Negative Shock*Size											-1.882	***
											(0.190)	
Constant	0.5513	***	0.1270	***	0.5187	***	0.1142	***	0.1392	***	0.0650	***
	(0.036)		(0.003)		(0.038)		(0.007)		(0.014)		(0.010)	
Observations	3,565,420		8,799,752		3,565,420		8,799,752		1,533,652		1,531,464	
Adj. R-squared	0.514		0.344		0.514		0.344		0.450		0.450	
Number of voterid	1,040,003		1,053,196		1,040,003		1,053,196		426,469		425,833	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z; Recession_Post*Negative Shock*Size* allows the change in voter turnout to vary with the absolute magnitude of the predicted price shock for ZIP code *z*. The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep the table simple. *On-Cycle* elections include a presidential or midterm race for federal offices; *Off-Cycle* include primaries or local elections; *Municipal* include only municipal elections. Controlling for macro-level recession-induced price changes, voter turnout in municipal elections decreases among registrants in ZIP codes with negative price shocks after the recession. This is in contrast to increases in voter turnout in general elections among registrants in ZIP codes with negative price shocks.

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Stratified by Voter Race

	Black Voters		White Voters		Hispanic Voters	
	[1]		[2]		[3]	
VARIABLES						
Recession_Post	-0.0045		-0.1059	***	-0.0405	***
	(0.023)		(0.003)		(0.016)	
Recession_Post*Negative Shock	0.1547	***	0.1182	***	0.1421	***
	(0.044)		(0.010)		(0.030)	
Constant	-0.1031	***	0.1057	***	-0.0282	***
	(0.042)		(0.007)		(0.026)	
Observations	1,196,959		9,619,227		890,272	
Adj. R-squared	0.434		0.428		0.371	
Number of voterid	92,820		818,827		83,191	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the reported race of the registrants. Controlling for macro-level recession-induced price changes, voter turnout increases among registrants in ZIP codes with negative price shocks after the recession, regardless of racial identity.

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Stratified by Predominant Neighborhood Race

	Black Nbd=High		Black Nbd=Low		White Nbd=High		White Nbd=Low		Hispanic Nbd=High		Hispanic Nbd=Low+	
VARIABLES	[1]		[2]		[3]		[4]		[5]		[6]	
Recession_Post	-0.1074	***	-0.0914	***	-0.1139	***	-0.0972	***	0.0362	***	-0.0889	***
	(0.007)		(0.003)		(0.004)		(0.007)		(0.007)		(0.003)	
Recession_Post*Negative Shock	0.1467	***	-0.5530	***	0.1480	***	0.2090	***	0.1701	***	0.057	
	(0.011)		(0.167)		(0.012)		(0.069)		(0.010)		(638.84)	
Constant	0.0658	***	0.420	***	0.1212	***	-0.0325		-0.0708	***	0.098	
	(0.010)		(0.083)		(0.008)		(0.048)		(0.010)		(338.09)	
Observations	6,988,836		5,376,336		5,165,480		5,002,688		5,825,609		6,539.563	
Adj. R-squared	0.435		0.420		0.431		0.428		0.440		0.422	
Number of voterid	599,562		454,233		463,263		403,745		522,930		530,865	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z*. The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the predominant race of the neighborhood (census tract). A neighborhood is designated "high" if the given race percentage is in the top 25% of tracts in the sample; "low" if the percentage is in the bottom 25%. Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession in predominantly Black neighborhoods and decreases among registrants in neighborhoods with low shares of Black residents. There are no differences in turnout among neighborhoods of different Hispanic and White shares.

+ Due to the inflated standard error for the *Recession_Post*Negative Shock* coefficient, we run identical regressions without voter-ID fixed effects and find substantively similar estimates with reasonable standard errors (the magnitudes of the coefficients are about double in size, but the sign is the same and the difference in coefficients across the strata remains significant). There are two elections in September and November 2009 where voters are disproportionately clustered in certain low-Hispanic neighborhoods, pushing the standard error up (note that when we omit those elections the standard error also returns to a reasonable level). We do not present the alternative results here, but they are available upon request from the authors.

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Stratified by Voter Party Affiliation

	DEM Voters		REP Voters		NPA Voters	
	[1]		[2]		[3]	
VARIABLES						
Recession_Post	-0.1054	***	-0.1236	***	-0.0663	***
	(0.005)		(0.005)		(0.005)	
Recession_Post*Negative Shock	0.1364	***	0.1294	***	0.0994	***
	(0.016)		(0.014)		(0.019)	
Constant	0.0642	***	0.1341	***	0.0350	***
	(0.012)		(0.009)		(0.012)	
Observations	4,704,897		4,592,370		2,591,426	
Adj. R-squared	0.428		0.445		0.349	
Number of voterid	386,720		384,899		240,599	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the registrants' recorded party affiliation. Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession, regardless of party affiliation.
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Stratified by Neighborhood Income

	High Income		Low Income		Tercile 1 Income		Tercile 2 Income		Tercile 3 Income	
	[1]		[2]		[3]		[4]		[5]	
VARIABLES										
Recession_Post	-0.1061	***	-0.0684	***	-0.0862	***	-0.0629	***	-0.1063	***
	(0.003)		(0.007)		(0.013)		(0.008)		(0.003)	
Recession_Post*Negative Shock	0.1342	***	0.1067		0.2364	***	0.0961		0.1354	***
	(0.009)		(0.082)		(0.091)		(0.091)		(0.009)	
Constant	0.0974	***	0.0323		-0.0677		0.0424		0.0970	***
	(0.006)		(0.065)		(0.076)		(0.061)		(0.006)	
Observations	8,846,605		3,518,567		2,252,827		1,413,858		8,698,487	
Adj. R-squared	0.432		0.416		0.417		0.415		0.433	
Number of voterid	752,712		301,083		190,868		123,408		739,519	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. For columns 1 and 2, the sample is stratified based on the median neighborhood (census tract) household income; a "high income" tract has median household income above the median income across the sample. For columns 3 to 5, we stratify our tracts again by terciles of median household income). Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks in regardless of typical neighborhood incomes.

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Stratified by Neighborhood Unemployment

	High Unemp		Low Unemp	
	[1]		[2]	
VARIABLES				
Recession_Post	-0.1102	***	-0.0919	***
	(0.009)		(0.003)	
Recession_Post*Negative Shock	0.1738	***	-0.5506	***
	(0.010)		(0.166)	
Constant	0.0760	***	0.4276	***
	(0.012)		(0.089)	
Observations	4,717,249		7,647,923	
Adj. R-squared	0.435		0.426	
Number of voterid	425,684		628,111	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the neighborhood (census tract) unemployment rate ("high" unemployment rates are in the top third of the distribution of neighborhoods across the MSA, "low" otherwise). Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession in neighborhoods with high unemployment rates and decreases among registrants in neighborhoods with low unemployment rates.

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Stratified by Vulnerable Sectors

	High At Risk Ind		Low At Risk Ind	
	[1]		[2]	
VARIABLES				
Recession_Post	-0.0994	***	-0.0988	***
	(0.003)		(0.009)	
Recession_Post*Negative Shock	0.1330	***	0.2603	***
	(0.009)		(0.092)	
Constant	0.0840	***	-0.0466	
	(0.006)		(0.068)	
Observations	9,900,176		2,464,996	
Adj. R-squared	0.431		0.418	
Number of voterid	837,307		216,488	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the prevalence of at-risk industries (i.e., FIRE, profession services or construction) in the neighborhood (census tract). A tract is designated "high at-risk" if its at-risk industry rate is among the top 25% of tracts in the sample, otherwise, it is "low at-risk." Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession, regardless of the prevalence of at-risk industries. *** p<0.01, ** p<0.05, * p<0.1

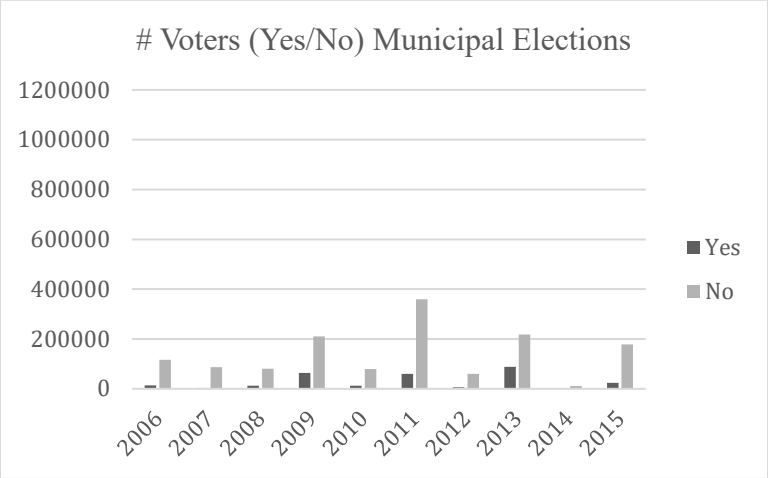
Table 12: Stratified by Housing Market Indicators

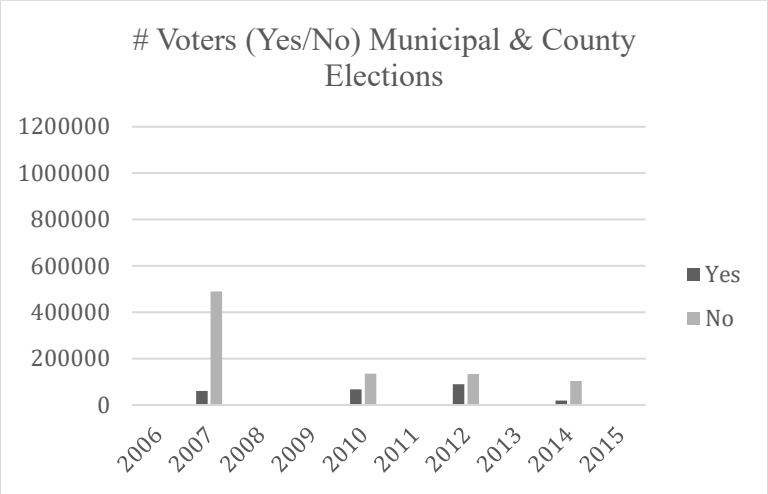
	High Vacant		Low Vacant		High Foreclosure		Low Foreclosure	High Appreciation		Low Appreciation	
VARIABLES	[1]		[2]		[3]		[4]	[5]		[6]	
Recession_Post	-0.1177	***	-0.0913	***	-0.0737	***	0.1103	-0.0915	***	0.0697	***
	(0.007)		(0.003)		(0.009)		(0.156)	(0.003)		(0.005)	
Recession_Post*Negative Shock	0.0279		0.1558	***	0.1516	***	0.0674	0.3109	***	0.1378	***
	(0.069)		(0.078)		(0.010)		(0.223)	(0.005)		(0.009)	
Constant	0.1877	***	0.0369		0.0297	***	-0.0656	-0.1130	***	-0.0638	***
	(0.043)		(0.043)		(0.004)		(0.111)	(0.004)		(0.006)	
Observations	4,758,722		7,606,450		7,874,024		4,491,148	5,508,080		6,857,092	
Adj. R-squared	0.431		0.428		0.420		0.444	0.420		0.434	
Number of voterid	424,118		629,677		964,556		518,569	448,911		604,804	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the share of vacant units, the share of foreclosed loans in the neighborhood (census tract), and the rate of price appreciation in the ZIP code between 2000 and 2006 (based on FHFA HPIs). A tract is designated "high vacancy" if its vacancy rate is among the top 20% of tracts in the sample; otherwise, it is "low vacancy." A tract is designated "high foreclosure" if its foreclosure rate is among the top 33% of tracts in the sample, otherwise, it is "low foreclosure." A ZIP is designated as "high appreciation" if the change in the HPI between 2000 and 2006 is in the top 40 percent of the sample; otherwise it is classified as low (including zero) appreciation. Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession. The magnitude of the turnout increase is larger in neighborhoods with fewer vacancies, more foreclosures and higher appreciation; however, none of these differences is statistically significant.

*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Turnout, by Election Type





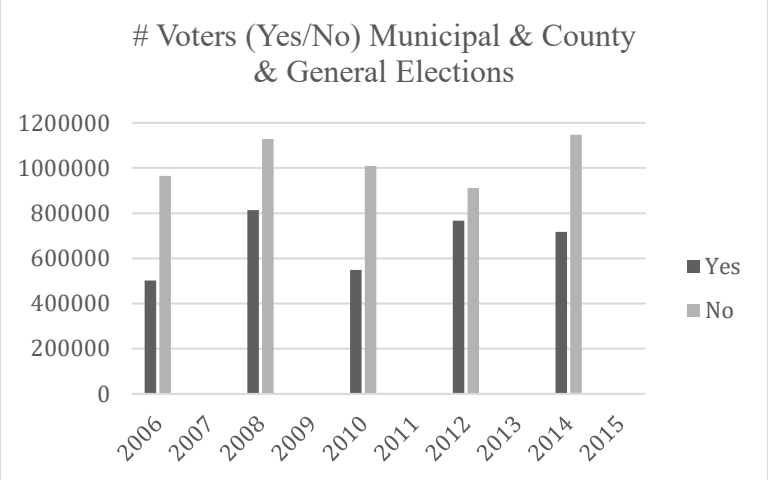
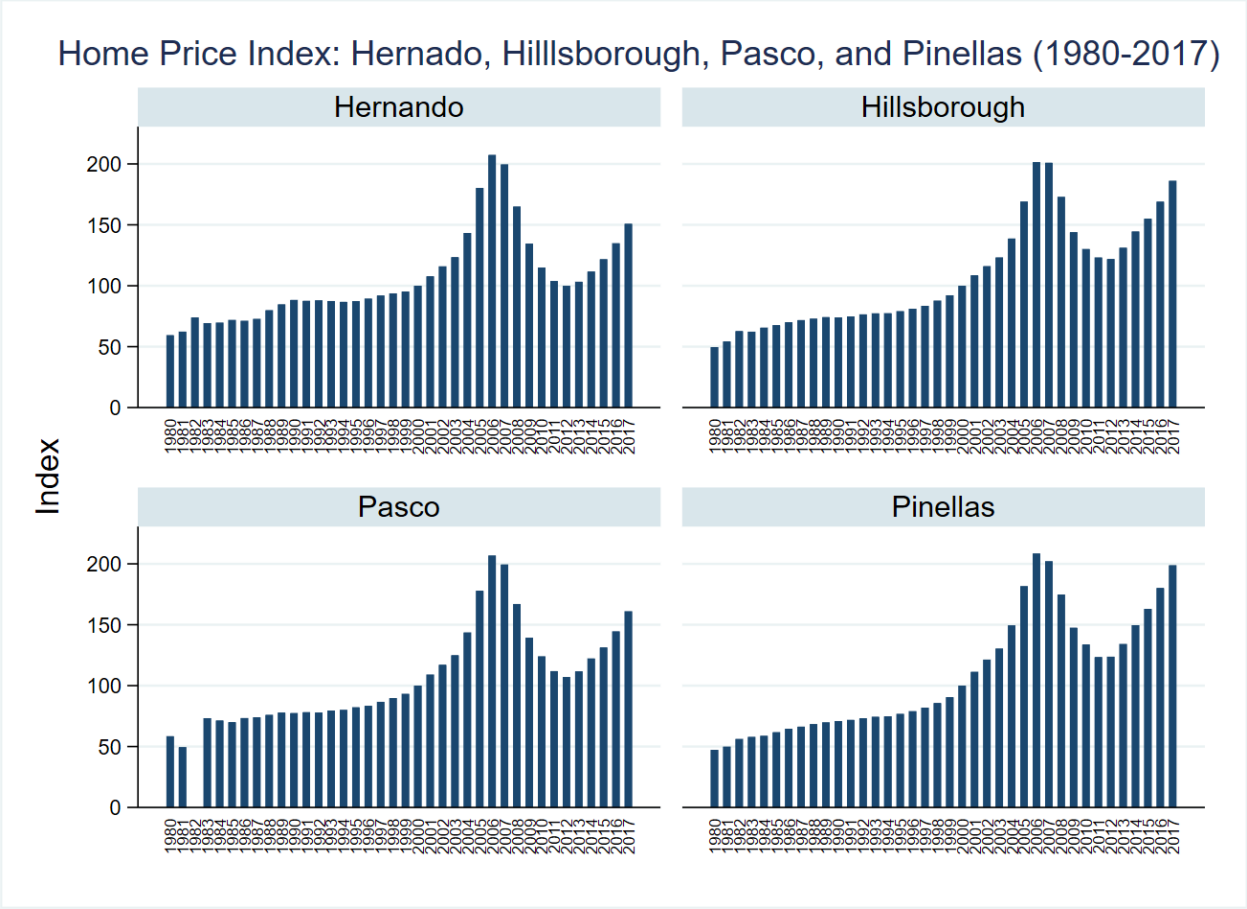
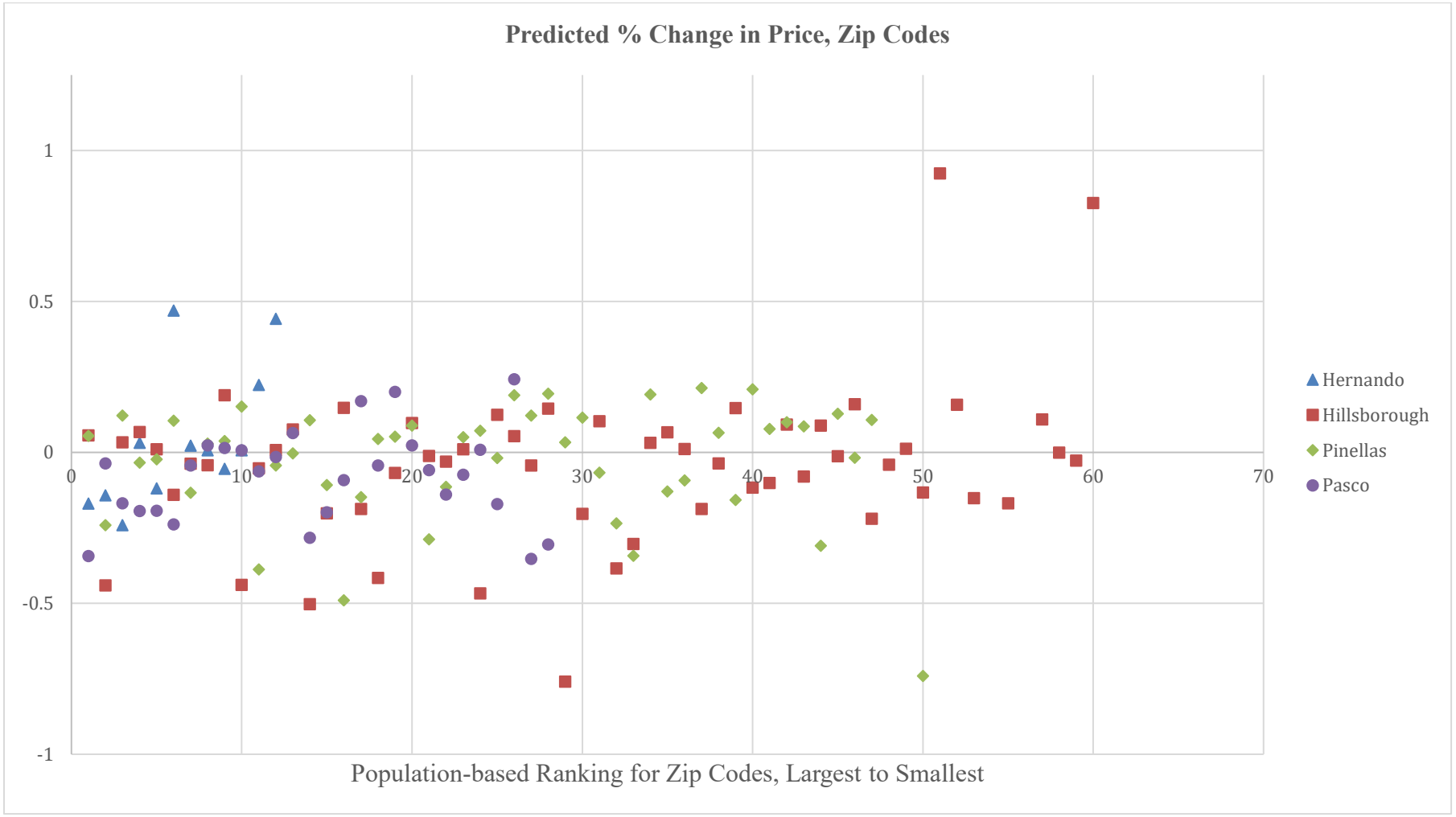


Figure 2: House Price Indexes by County



Source: FHFA and Authors' calculations.

Figure 3: Housing Shock Variable (Predicted Price Change) Variation



Notes: The predicted values are generated while controlling for property characteristics. Summary statistics for ZIP-level predicted price change:

Mean	Std. Dev.	Percentile								
		1	5	10	25	50	75	90	95	99
-0.055	0.156	-0.447	-0.410	-0.283	-0.128	-0.027	0.064	0.064	0.148	0.190

Appendix A: Comparing First-stage Hedonic Analysis with Repeat-sales Estimation

In order to capture localized price shocks, we want to observe price changes at the ZIP level. This was initially why we first derived a ZIP-level change in price and then instrumented with that predicted value for the shock variable in our second stage–in other words, the transaction-level nature of our sales data alone was not useful for what we were aiming to capture. We rely on property-level hedonic controls in the first stage to control for heterogeneity across the properties and net out average ZIP-level price changes that control for different property characteristics (and quality variation, assuming the observable features proxy at least partially for these differences).

The most meaningful difference between our method (hedonic-based) and the FHFA index (repeat-sales-based) is the samples on which they rely. Namely, we use the universe of sales in our sample (those that take place between 2006 and 2012) and control for their property characteristics. The HPI uses a sample of sales that have transacted at least twice over the period for which the index is constructed (FHFA has produced the index since 1996), and includes property fixed effects to control for differences in characteristics or quality across properties. In addition to the fact that the repeat-sales sample reduces the volume of sales used to estimate the price changes, it does so selectively. Namely, the properties that sell more often are likely systematically different than those that don't. For example, there is evidence that distressed properties are more likely to sell, at a faster pace, and at discounts (Doerner and Leventis 2015; Lee and Immergluck 2012; Immergluck 2011; Campbell et al. 2011; Coulton et al 2008). This is particularly relevant for our study, since (i) we know distressed property sales were elevated during and after the Recession and (ii) it was a time when there could have been large shifts in the quality of properties being sold, which the property fixed effects may not fully pick up. Both factors could systematically push the prices down compared to those calculated off of the universe of sales. This can be particularly influential for localized HPIs, like the ZIP-level FHFA one (Doerner and Leventis 2015).

We see these potential biases in the data. First, we first confirm that the FHFA HPI and our analysis cover the same ZIP codes for our study area. We also confirm that when we rank the ZIP codes based on the price change over the Recession period, using both the FHFA index and our estimated values, and then correlate those rankings, the coefficient is around .5. This indicates that, at a minimum, the two methods reasonably identify the same ZIP codes with the highest/lowest price changes.

However, the variation in price changes is different: our data reveals both negative and positive price changes, whereas the FHFA index only produces negative price changes over the study period (see the summary statistics below). As described above, this is likely a product of the selection of sales underlying the HPI index, especially during this time period. While neither approach is objectively superior, we opt for the hedonic-approach to preserve the less selective sample of sales (and the wider range of price change outcomes).

Table A.1: Comparison of Price Change Instruments

Predicted Price Change (Hedonic method)		***Price Change (FHFA HPI)***	
Percentiles		Percentiles	
1%	-0.4469	1%	-0.2317
5%	-0.4096	5%	-0.2131
10%	-0.2834	10%	-0.1924
25%	-0.1281	25%	-0.1597
50%	-0.0269	50%	-0.1337
75%	0.0643	75%	-0.1153
90%	0.1098	90%	-0.1057
95%	0.148	95%	-0.088
99%	0.1903	99%	-0.0681
Mean	-0.0555	Mean	-0.1399
Std. Dev.	0.1562	Std. Dev.	0.036
Variance	0.0244	Variance	0.0013
Skewness	-0.9556	Skewness	-0.411
Kurtosis	4.33	Kurtosis	3.838
# Obs	12,146,544	# Obs	12,088,432

Table A.2: Comparison of 2-stage Estimates

We also run the second stage regressions only, using the change in ZIP-level FHFA HPI to create our binary shock variable and the coefficients are slightly changed, but overall not materially different (see the results below). While the magnitudes of the coefficients on the localized housing price shock are smaller (and insignificant) when using the FHFA data, the signs are consistent with what we obtain when using the two-stage approach. It is likely that the lack of significance is tied to the reduced variation in the underlying HPI values, and in turn the binary price "shock" variable.

	Original 2-stage				**1-stage using FHFA HPI**			
VARIABLES	[1]		[2]		[2]		[3]	
Recession	-0.097725	***	-0.097737	***	-0.10084	***	0.0828193	***
	(0.00300)		(0.00300)		(0.01131)		(0.01526)	
Recession*Negative Shock	0.126574	***	-0.116313	***	0.0031197	***	-0.2912279	
	(0.00905)		(0.00905)		(0.01170)		(41.34197)	
Recession*Negative Shock*Size			1.379058	***			0.9600003	
			(0.00000)				(358.48100)	
CityRaces	0.0002847	***	0.0002841	***	0.0002845	***	0.000283	***
	(0.00000)		(0.00000)		(0.00000)		(0.00000)	
CountyRaces	-0.007472	***	-0.007459	***	-0.007464	***	-0.0074269	***
	(0.00003)		(0.00003)		(0.00003)		(0.00003)	
GeneralRaces	0.0224385	***	0.0224385	***	0.0224353	***	0.0224122	***
	(0.00002)		(0.00002)		(0.00002)		(0.00002)	
Constant	0.0809902	***	0.0783909	***	0.1559418	***	0.1303824	
	(0.00622)		(0.00622)		(0.00314)		(9.22743)	
Observations	12,154,693		12,146,544		12,154,693		12,088,432	
Adj. R-squared	0.4268		0.4268		0.4268		0.4268	
Number of voterid	1,053,377		1,052,710		1,053,377		1,047,172	

Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects
*** p<0.01, ** p<0.05,
* p<0.1

Appendix B: Stratified by ZIPs with Negative and Positive Price Shocks

	ZIPs with Neg Price Shocks		ZIPs with Pos Price Shocks	
VARIABLES	[1]		[2]	
Recession_Post	0.236	***	-0.0978	***
	(0.004)		(0.003)	
CityRaces	0.0003	***	0.0003	***
	(0.000003)		(0.000003)	
CountyRaces	-0.008	***	-0.0069	***
	(0.00004)		(0.00004)	
GeneralRaces	0.023	***	0.022	***
	(0.00003)		(0.00003)	
Constant	-0.172	***	0.136	***
	(0.004)		(0.003)	
Observations	7,001,479		5,363,693	
Adj. R-squared	0.427		0.427	
Number of voterid	600,758		453,037	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for December 2006 and earlier. The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively. Controlling for election-level variation in races and macro-level recession-induced price changes, voter turnout increases among registrants in ZIP codes with negative price shocks after the recession; the change in turnout after the recession in ZIP codes with positive price shocks is not statistically different from zero.
*** p<0.01, ** p<0.05, * p<0.1

Appendix C: Alternate Definition of Recession

	[1]		[2]		[3]		[4]		[5]	
Recession_Post	-0.0450	***	-0.0494	***	-0.0494	***	-0.0494	***	-0.0494	***
	(0.007)		(0.003)		(0.003)		(0.003)		(0.003)	
Recession_Post*Negative Shock					0.1262	***	-0.5028	***	0.3478	***
					(0.009)		(0.083)		(0.008)	
Recession_Post*Negative Shock*Size							2.6648	***		
							(0.348)			
Recession_Post*Negative Shock*Tercile2									-0.1499	**
									(0.073)	
Recession_Post*Negative Shock*Tercile3									-0.2216	***
									(0.012)	
Constant	0.1068		0.1087	***	0.0290	***	0.0980	***	-0.0324	***
	(0.094)		(0.003)		(0.007)		(0.011)		(0.016)	
Voter F.E.?	No		Yes		Yes		Yes		Yes	
Observations	11,511,970		11,511,970		11,511,970		11,503,821		11,511,970	
Adj. R-squared	0.193		0.433		0.433		0.433		0.433	
Number of voterid			1,051,926		1,051,926		1,051,259		1,051,926	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after December 2009 and 0 for December 2006 and earlier; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z; Recession_Post*Negative Shock*Size* allows the change in voter turnout to vary with the absolute magnitude of the predicted price shock for ZIP code *z; Tercile2* and *Tercile3* capture the size of the price shock in discrete tercile categories (*Tercile1 is omitted).* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. Controlling for election-level variation in races and macro-level recession-induced price changes, voter turnout increases among registrants in ZIP codes with negative price shocks after the recession. This increase in turnout intensifies over the absolute size of the price shock, but at a declining rate.
*** p<0.01, ** p<0.05, * p<0.1

Appendix D: Housing Shocks Regressions Over Time

VARIABLES	[1]	
Recession_Post*Negative Shock*2010	0.193	***
	(0.010)	
Recession_Post*Negative Shock*2011	0.225	***
	(0.022)	
Recession_Post*Negative Shock*2012	0.107	***
	(0.010)	
Recession_Post*Negative Shock*2013	-0.065	***
	(0.012)	
Recession_Post*Negative Shock*2014	0.079	***
	(0.011)	
Recession_Post*Negative Shock*2015	0.039	***
	(0.017)	
Constant	0.023	***
	(0.009)	
Observations	12,365,172	
Adj. R-squared	0.427	
Number of voterid	1,053,795	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post*Negative Shock*Year* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z* and each year post-Recession. The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. Controlling for election-level variation in races and macro-level recession-induced price changes, voter turnout increases among registrants in ZIP codes with negative price shocks after the recession. This increase is most pronounced is years immediately following the recession and dissipates over time.
*** p<0.01, ** p<0.05, * p<0.1

Appendix E.1: Stratified by Share of Recent Household Mobility

	High Mobility		Low Mobility	
	[1]		[2]	
VARIABLES				
Recession_Post	-0.104	***	-0.091	***
	(0.004)		(0.004)	
Recession_Post*Negative Shock	-0.524	***	0.124	***
	(0.165)		(0.009)	
Constant	0.521	***	0.064	***
	(0.109)		(0.006)	
Observations	7,254,205		5,110,967	
Adj. R-squared	0.423		0.433	
Number of voterid	636,951		416,844	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the share of households in the neighborhood (census tract) who have moved in the past five years. A tract is designated "high mobility" if its share of moving households is above the median share in the sample; otherwise, it is "low mobility." Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession are driven by tracts with a lower share of newly migrated households.

*** p<0.01, ** p<0.05, * p<0.1

Appendix E.2: Stratified by Share of Renters

	High Renters		Low Renters	
	[1]		[2]	
VARIABLES				
Recession_Post	-0.092	***	-0.110	***
	(0.004)		(0.006)	
Recession_Post*Negative Shock	-0.533	***	0.136	***
	(0.164)		(0.009)	
Constant	0.489	***	0.106	***
	(0.107)		(0.007)	
Observations	7,396,375		4,968,797	
Adj. R-squared	0.424		0.434	
Number of voterid	619,838		433,957	

Notes: Robust standard errors in parentheses; models include zip-year dummies and voter-ID fixed effects. The dependent variable is *Turnout*, which takes on the value of 1 if the registrant *i* votes in election *t* and 0 otherwise. *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively; coefficients are not reported to keep table simple. The sample is stratified based on the share of households in the neighborhood (census tract) who are renters. A tract is designated "high renters" if its share of renters is in the top third in the sample; a tract is "low renters" if its share of renters is in the bottom third. Controlling for macro-level recession-induced price changes, voter turnout increases among registrants with negative price shocks after the recession are driven by tracts with low numbers of renters.

*** p<0.01, ** p<0.05, * p<0.1

Appendix F: ZIP Code Level Regressions

VARIABLES	[1]	
Recession_Post	-0.023	***
	(0.008)	
Recession_Post*Negative Shock	-0.009	
	(0.012)	
Constant	0.199	***
	(0.005)	
Observations	700	
Adj. R-squared	0.174	
Number of zip codes	141	

Notes: Robust standard errors in parentheses; models include year fixed effects. The dependent variable is *Turnout*, which is the *share of voters in the zip code* that voted in election *t (t* are the general elections between 2006 and 2014.). *Recession_Post* takes on the value of 1 after June 2009 and 0 for elections prior to December 2007; *Recession_Post*Negative Shock* allows the change in voter turnout to vary with the presence of a negative price shock for ZIP code *z.* The regression also controls for *CityRaces, CountyRaces* and *GeneralRaces*, the number of races in City, County and State/Federal elections, respectively, in election *t*; coefficients are not reported to keep table simple. Controlling for election-level variation in races and macro-level recession-induced price changes, voter turnout decreases among registrants in ZIP codes with negative price shocks after the recession, but this is not statistically significant.
*** p<0.01, ** p<0.05, * p<0.1

Appendix G: Correlation Matrix of Selected Covariates

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) High income	1.000									
(2) High unemployment	-0.264	1.000								
(3) High at-risk industries	0.274	-0.166	1.000							
(4) High vacancy	-0.133	0.0291	-0.049	1.000						
(5) High foreclosure	-0.108	0.097	-0.140	-0.046	1.000					
(6) High % below poverty line	-0.440	0.276	-0.186	0.078	0.094	1.000				
(7) High college-educated	0.565	-0.283	0.244	-0.022	-0.167	-0.377	1.000			
(8) Share black	-0.306	0.283	-0.279	0.043	0.231	0.411	-0.250	1.000		
(9) Share white	0.309	-0.308	0.278	0.008	-0.268	-0.417	0.282	-0.967	1.000	
(10) Share Hispanic	-0.199	0.181	0.024	-0.169	0.162	0.236	-0.237	0.067	-0.169	1.000