Building back better? The effect of post disaster assistance on housing development

Yunan Zhu, The Ohio State University, and zhu.2904@osu.edu

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On average, three hurricanes annually make landfall in the United States, accounting for more than half of the damage from high impacts natural hazards (Smith, 2020). As climate change intensifies, the intensity of hurricane events is projected to increase (Oppenheimer et al., 2014). Despite these alarming trends, the population and economics activities in hazard prone area continue to grow (Allison & Bassett, 2015; Neumann et al., 2015). Remarkably, in some regions, natural hazards even trigger residential renovation, drawing more affluent households to natural hazard prone areas (Graff Zivin et al., 2023; Lazarus et al., 2018).

Several factors influence costal development from the demand side. First, coastal areas provide natural amenities such as beaches and ocean views (Bin et al., 2008). Second, natural hazard risks are often underpriced in property value because of misinformed property buyers (Bin & Landry, 2013), low flood risk belief (Bakkensen & Barrage, 2021), and subsidization in National Flood Insurance Program (NFIP) (de Ruig et al., 2022). From the supply side, investments in protective infrastructure help maintain high property values and can increase housing supply (Li et al. 2023). While these factors can explain long term population and property increases in coastal areas, these fall short in explaining increase in housing supply and housing quality immediately after realization of natural hazards (Lazarus et al., 2018).

In this study, we explore the role of post-hazard Federal Emergency Management Agency (FEMA) assistance in coastal development, which becomes increasingly important due to increasing natural hazards and escalating assistance levels. Similar to the subsidized NFIP, post-disaster FEMA assistance provide incentives for coastal development since part of the cost are covered by taxpayers (Kousky et al., 2018). Between 2000 and 2020, FEMA distributed around $90 billion to local governments and households after hurricane events, which is around 25% of all flood insurance payouts in the coastal areas. Since 40%-45% of the NFIP payoff are subsidized (GAO, 2011) and NFIP covers a wider range of hazard events, we anticipate FEMA post hurricane assistance to have similar amounts of distortion in housing market.

We construct a monthly panel dataset with all coastal villages in the US east coast from 2000 to 2020[1]. To estimate housing development patterns, we collects counts and construction cost of new housing permits for single-family house based on data from Housing and Urban Development. This dataset incorporates information on both new constructions and renovations. To capture hurricane damage, which is both closely related to post-disaster development need and FEMA assistance, we develop a county level hurricane damage index from interpolated local wind speed using the International Best Track Archive for Climate Stewardship dataset (Knapp et al., 2018). The objective measures of hurricane damage are thus fully exogenous, relying solely on exogeneous physical characteristics of hurricane paths (Hsiang & Jina, 2014; Noy & Strobl, 2023).

We obtain FEMA assistance levels based on the budget of implemented projects following hurricane events under the FEMA public assistance program. The primary objective of this program is to offer support to local governments and specific types of non-profit organizations in the aftermath of disasters, facilitating post-disaster recovery. Given that the federal share of this assistance is a minimum

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[1] We adopt definition of coastal counties based on NOAA document.

of 75% of the total cost, the receipt of such aid holds significant importance for budget-constrained local governments. It enables them to swiftly recover after natural hazards and can influence the evaluation of incumbent governors (Dodlova & Zudenkova, 2021).

In this paper, we empirically quantify the effect of post-hurricanes FEMA assistance on number of housing permit applications using two complementary empirical methods. First, we adopt a panel fixed effect model which exploits the timing of hurricane as an exogenous variation relative to election cycles. Both congress election and presidential election are held on the first Tuesday of November in even year, which are directly after the hurricane season. As a result, natural hazards and associated recovery process is a salient electoral matter during election and higher disaster relief funds can represent better performance for incumbents (Dodlova & Zudenkova, 2021). As more than half of all disaster relief is motivated by political reasons (Garrett & Sobel, 2003), the exogeneous timing of hurricane events can lead to substantial differences in assistance levels (Henkel et al., 2022). The panel fixed effect model captures such difference in assistance levels through interaction term between exogeneous hurricane damage and whether the event happened before the congress election. Conditional on hurricane damage, the interaction term captures difference in assistance levels that are driven by timing of the hurricane events.

Then, to quantify the effect of post-hurricanes FEMA assistance, we use an instrumental variable (IV) approach following Kousky et al. (2018) and Davlasheridze et al. (2017). Specifically, we use the interaction term between presidential election year and politically important states as our IV since FEMA assistance tend to be distributed to states that are important to presidents in election year[2].

For both models, we use village fixed effects to control for time invariant county-level characteristics. We also include other social economic indicators to capture time varying factors that can explain change in housing development. I cluster the standard error at county level since the frequencies of hurricanes are different across counties in the US east coast (Abadie et al., 2022). To test the robustness of results, we vary the critical coefficient in wind field models and the span of election related periods. Our results are qualitatively similar across a battery of robustness tests.

The panel model results show that counties experience same levels of hurricane are likely to receive 5 times as much disaster relief funding in election year (even year) compared to odd year, which leads to higher post-disaster housing development in election year. Based on the preliminary IV model, we find that 1% increase in FEMA assistance can lead to 1.6 housing permits increase for recipient counties, which sums up to 700,000 more housing permits in hurricane affected area from 2000 to 2020. While not all housing permits lead to actual construction, our results provide evidence that FEMA assistance can stimulate both rebuilding and new construction in natural hazard-prone areas, thereby increasing the value at risk and exposure to future hazards. As most post-disaster assistance programs create incentives for excessive development in natural hazard prone regions, governments should consider bundling assistance with regulations, such as retreat or 'buyouts and rentbacks', to mitigate the increasing trend of economic activities in coastal floodplains (Keeler et al., 2022).

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[2] We find that FEMA assistance is 50% higher in politically important area in presidential election year conditional on exogeneous hurricane damage index calculated by wind field.

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