Batten Down the Hatches: Hedonic Valuation of Private Hurricane Protection

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Introduction

Climate change is expected to exacerbate the impacts of hurricanes and typhoons by increasing the intensity and decreasing the speed at which they travel. Many coastal communities have responded to this risk by investing in collective flood protection, restricting development in high-risk zones, and by adopting managed retreat strategies (Gopalakrishnan et al., 2011; Wolf and Takeuchi, 2022). However, certain communities may face economic or political limitations that render these public responses unfeasible. In such cases, private households bear the majority of responsibility in determining how to manage risk.

Households have adapted to this heightened risk by purchasing more flood insurance (Gallagher, 2014), refraining from moving to or building in flood-prone areas (Georgic and Klaiber, 2022), and making personal investments to safeguard their property. Our study focuses on the latter aspect, particularly the construction of personal seawalls and storm shutters, by examining how these investments effect property values and the likelihood of a household needing to make a major repair following a hurricane.

Data and Empirical Model

We collect data on over 50,000 housing transactions and 75,000 building permits (2009 – 2019) from the Property Appraiser's Office in Lee County, Florida. Lee County is situated along Florida's southwest coastline and is home to the city of Cape Coral, which is built on top of a 600-kilometer-long canal system. This canal system provides thousands of households private access to the ocean but also subjects them to greater risk during a storm or hurricane. City officials have explicitly stated that homeowners bear the responsibility of repairing or replacing the seawalls that safeguard their property due to the city's inability to manage such a substantial liability. This circumstance makes it an ideal study area for our research question.

We investigate the benefit storm shutters and private seawalls confer on property values using a hedonic pricing model. The dependent variable is the natural log of sale price for property i sold during time t:

$$[1]\ \text{Ln Sale Price}_{it} = \beta + \gamma \text{Shutters}_{it} + \pi \text{Seawall}_{it} + \delta X_{it} + \zeta + \eta + \varepsilon_{it}$$

On the righthand side, we include our two variables of interest: an indicator for whether the property has storm shutters (Shutters_{it}) and/or a private seawall (Seawall_{it}). A vector of structural characteristics, and year by month and neighborhood by year fixed effects are included as well, identified respectively by X_{it}, ζ, and η. The inclusion of neighborhood by year fixed effects is an important component of our identification strategy as it controls for unobservable factors that may be correlated with the decision to build a seawall or install storm shutters. This includes factors like localized damage or flooding from a recent storm and local housing market conditions.

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In a second regression, we examine whether the decision to install storm shutters prior to Hurricane Irma – a Category 5 hurricane that struck southwestern Florida in early September of 2017 – had an impact on the probability of a household needing to repair their home after the storm.

$$[2]\ \text{RepairPermit}_i = \beta + \gamma\text{PriorInstallation}_i + \delta X_i + \psi + \varepsilon_{it}$$

Where RepairPermit_i is a dummy variable equal to one if property i applied for a repair permit within a year after September 2017 and 0 otherwise, while $\text{PriorInstallation}_i$ is an indicator for whether the property installed storm shutters before September of 2017. We also include a vector of structural characteristics, X_i, and fixed effects defined at the neighborhood level, ψ. Unlike equation [1], equation [2] relies on a cross-sectional dataset.

Results and Discussion

In our baseline specification of equation [1], we find that storm shutters and private seawalls increased the value of a property by 5.7% and 17.6%, respectively. For the average household in our dataset, this would correspond to a price premium of $12,242 and $37,800. As a point of comparison, the average seawall in Cape Coral costs around $30,000 to $50,000 to repair or replace, while storm shutters cost between $12 and $50 per square foot (Gillis, 2017).

As a robustness check, we also allow the price premium of private seawalls to vary based on its relative age at the time of sale, while still controlling for the overall age of the property. We adjust equation [1] to allow for this extra dimension of heterogeneity by interacting Seawall_{it} with a series of dummies indicating the relative age of the seawall and present these coefficients in Figure 1. We see that prior to the construction of a seawall (e.g., Age of Seawall ≤ 0) there is no price premium between properties that don't have a seawall and properties that will have a seawall built in the future. As soon as a seawall is built, however, the value of a home increases between 10% and 20%. This capitalized effect diminishes as the seawall gets older and eventually becomes zero after the seawall becomes 15 years old.

From equation [2], we also find that installation of storm shutters prior to Hurricane Irma did affect the probability of a home needing repairs. Specifically, properties with storm shutters were 9.9% less likely to apply for a repair relative to homes without storm shutters. We note that a similar analysis could not be conducted with seawalls as there were very few seawall repairs requested following Hurricane Irma. Overall, our results suggest homeowners value both forms of private hurricane protection and that storm shutters are an effective method to prevent damage that would require a house repair.

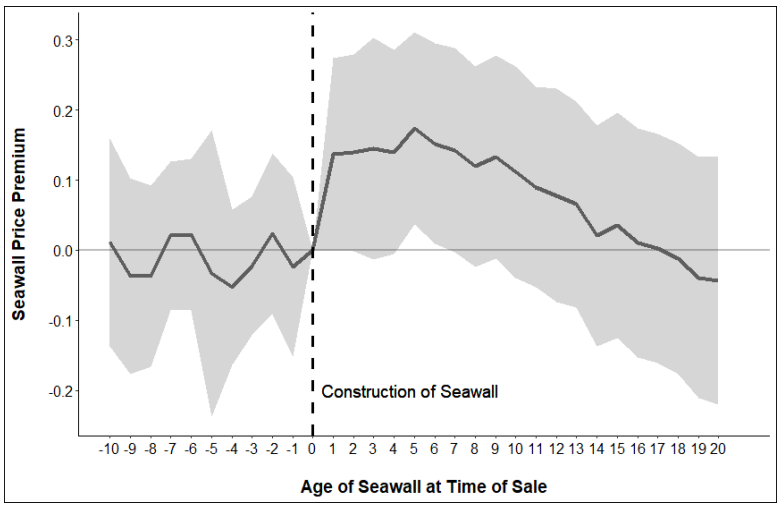

Figure 1 – Seawall Price Premium versus Relative Age at Time of Sale