Investments under Risk: Evidence from Hurricane Strikes

Rajesh Aggarwal
D'Amore-McKim School of Business
Northeastern University
Dodge Hall 450D
360 Huntington Avenue
Boston, MA 02115
617-373-8333
r.aggarwal@northeastern.edu

Mufaddal Baxamusa
Opus College of Business
University of St. Thomas
MCH 356, 2115 Summit Avenue
St Paul, MN 55105
651-962-5845
mufaddalb@stthomas.edu

June 2025

We thank Max Maksimovic for helpful comments. We thank participants in the 2023 FSRDC Annual Research Conference and the seminar audience at Northeastern University and University of St Thomas for their feedback and comments on earlier drafts. All remaining errors are ours alone.

Investments under Risk: Evidence from Hurricane Strikes

Abstract: We demonstrate that firms with plants in areas subject to a significant hurricane strike reduce their capital expenditures at the hurricane-affected plants and shift capital expenditures to plants in non-hurricane-affected areas. This effect is not present prior to 1997 and only appears from 1997 on. Our evidence is consistent with a significant climate event such as the signing of the Kyoto Protocol increasing perceived future hurricane risk from actual hurricane strikes and shifting firm behavior.

1. Introduction

Hurricane strikes can lead to significant damage. For instance, Hurricane Katrina in 2005, one of the most catastrophic hurricanes in U.S. history, caused an estimated $182.5 billion in damages (adjusted to 2021 dollars). While the immediate impacts of such events are severe, their long-term effects on the economy are unclear. Following a hurricane, affected areas may experience a period of rebuilding, which could spur economic recovery. Conversely, the heightened awareness of future risks and the influence of climate change may also prompt individuals and companies to relocate, possibly leading to sustained economic losses. For example, New Orleans only regained its pre-Katrina population by 2023.

This paper examines the responses of companies' capital investment decisions to hurricane strikes. Companies may increase capital investment in the aftermath of a hurricane to rebuild or repair damage (Pelli et al., 2023, Olshansky, 2018) or capitalize on government incentives (see Fu and Gregory, 2019) and tax relief (Stead, 2006).

Alternatively, the perceived increase in hurricane risks and climate change concerns may encourage companies to shift their operations to less hurricane-prone regions, resulting in a reduction of capital expenditures in affected areas. We hypothesize that hurricane strikes are not independent and identically distributed events as climate change suggests that the hurricane-hit areas have an increased probability of being hit by another hurricane. We propose that the increased frequency of hurricanes—potentially exacerbated by climate change—raises the perceived long-term risk of being located in hurricane-prone areas. As a result, companies may respond by reducing investments in the regions impacted by hurricanes.

Similar to Dessaint and Matray (2017), we use a natural experiment, examining hurricanes from 1989 to 2017 that caused economic losses exceeding $5 billion, adjusting for inflation. By analyzing establishment-level data from the Census Bureau, we investigate how capital expenditures vary before and after the hurricane strike across plants located in affected versus unaffected regions.

Our findings suggest that companies in hurricane-impacted areas tend to decrease their capital expenditures post-strike, reflecting a shift in investment away from these higher-risk locations. In contrast, plants in non-hurricane-impacted regions, particularly those owned by firms with plants in affected areas, tend to increase their capital investments.

Capital expenditure can be broadly categorized into two types: building capital expenditure and machinery capital expenditure. Both building capital expenditures and machinery capital expenditures show a clear decline in investments in regions impacted by hurricanes. In contrast, plants of the same firms in regions unaffected by hurricanes show an increase in building capital expenditures and machinery capital expenditures, suggesting a redirection of investments from hurricane-impacted areas to safer regions. This shift in capital investment behavior may reflect the growing perceived risk associated (see Engle et al, 2020; Braun et al., 2021; Huang et al., 2021) with operating in areas prone to recurrent hurricane strikes, prompting firms to allocate resources away from vulnerable locations.

The impact of hurricanes on business activity extends beyond capital expenditure decisions, influencing the survival and formation of new plants. The results show an increased probability of plant exits in hurricane-impacted areas, indicating that hurricanes may prompt businesses to close or relocate plants. In contrast, firms with plants in both hurricane and non-hurricane-affected areas are less likely to exit in non-hurricane-affected areas, suggesting a shift of economic activity from disaster-prone zones to more stable locations. Similarly, the likelihood of new plant formation in non-hurricane areas increases, especially for firms with plants in affected regions, further supporting the notion of investment redirection in response to heightened risk.

Next, we examine the effect of hurricanes on real output across different metropolitan statistical areas (MSAs). Prior research has shown that natural disasters can cause substantial economic damage, leading to significant reductions in output due to physical destruction and disrupted supply chains (e.g., Rose, 2004; Hallegatte & Przyluski, 2010). Our analysis reveals a significant decrease in real output in plants located in hurricane-impacted regions, as expected. However, we also observe a notable increase in real output in non-hurricane-impacted areas, particularly for firms that operate plants in both affected and unaffected regions. This suggests that some firms may shift production to non-impacted areas.

Further investigation into the pre- and post-1997 periods suggests that the observed patterns are more pronounced in the post-1997 period, with hurricanes after 1997 having a more significant impact on real output. Prior to 1997, there is no significant impact of hurricanes on real output from prior to after the hurricane. This suggests that prior to 1997, hurricane-affected areas quickly reverted to their pre-hurricane level of economic activity. After 1997, the level of economic activity declines significantly post-hurricane. This shift in the magnitude of the effect could be attributed to increased awareness of climate risks in the wake of major global climate agreements, such as the Kyoto Protocol (MacCracken et al., 1999), which may have influenced businesses' risk perceptions.

One possible explanation for our results is that the reduction in capital expenditures and real output is due to labor relocating away from hurricane-impacted areas. We examine labor's share of output and find that from 1997 on, labor's share of output increases after a hurricane strike in hurricane-affected areas. At least in the short-run, firms do not seem to be responding to changes in their workforce. Instead, firms seem to be choosing to relocate their economic activity.

Overall, our findings demonstrate that hurricanes lead to significant shifts in economic activity, with firms adjusting their output and capital expenditures in response to the disruptions caused by hurricane events. This paper contributes to the understanding of how climate change influences business decision-making and the reallocation of resources.

Section 2 describes our data. Section 3 describes our identification strategy. Section 4 presents our results. Section 5 concludes.

2. Data

We use the list of the costliest hurricanes and tropical storms from the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information.[1] The estimates of the losses from the hurricane include those from the payouts by the federal and state governments and insurance companies. We use hurricanes and tropical storms with an estimated loss of more than $5 billion in 2021 dollars that struck between the years 1989 and 2017 for which we have establishment level data. The $5 billion threshold was chosen as the economic damages are sufficiently significant that they are likely to be visible to managers and firms. The threshold results in 23 hurricanes and one tropical storm as reported in Table 1.

We use the Spatial Hazard and Loss Data of the United States (Sheldus) to find counties impacted by these hurricanes (see Dessaint, and Matray, 2017). The Sheldus database lists all the counties and the estimated dollar amount of losses for all natural disasters. We include all the

[1] https://www.ncdc.noaa.gov/billions/dcmi.pdf. The data were previously reported in the NOAA memorandum on the "Deadliest, Costliest and Most Intense U.S. Tropical Cyclones."

hurricane-affected metropolitan statistical areas with more than $5 million CPI adjusted dollar damage from a given hurricane event. Note that a given hurricane event can affect multiple metropolitan statistical areas.

For establishment level data, we use the Annual Survey of Manufacturing (ASM), Census of Manufacturers (CMF) and the Longitudinal Business Database (LBD). These three databases are restricted files available from the Census Bureau. The ASM provides information about the capital expenditures and other variables for every year; except for years ending in 2 and 7. The ASM is a survey of about 40,000 plants covering all plants with the NAICS codes 31-33 and more than 250 employees. It also randomly includes smaller plants. For the years not covered by ASM, CMF reports data from a census of all manufacturing plants. For the years not covered by ASM, a census of all manufacturing plants is performed and the data is reported in CMF. Using both ASM and CMF allows us to construct a panel.

The panel's limitation is that ASM may randomly drop smaller plants from the survey. To overcome this limitation, we use LBD to find plant opening and closing years. LBD has information about the annual population of all business establishments with at least one paid employee. ASM/CMF share an establishment identifier with LBD, allowing us to merge both datasets. One of the benefits of using LBD is that it has information about the plant's parent firm. Table 2 presents summary statistics for the variables used in this study.

3. Identification Strategy

A. Specifications

We use major hurricane strikes as a natural experiment (see Dessaint and Matray 2017).

In this setting, major hurricane strikes are an ex ante random exogenous shock, as the timing, intensity, and path of a major hurricane are uncertain. Ex post, a realized hurricane strike may increase the perceived probability of its recurrence.

The hurricanes in our sample inflict major economic damage. Insurance and the government pay for a large portion of the loss. However, the uncompensated direct and indirect costs of the damage are still large. Firms with establishments in or near the damaged area may then give more weight to the possibility that there could be future hurricane strikes in that area. Firms with establishments far from the affected areas may not change any decisions.

Hurricane strikes lead to two distinct time periods – before the hurricane strike and after the hurricane strike. In addition, it creates two distinct groups of plants – plants in locations impacted by the hurricanes and plants in locations that were not impacted by the hurricane. Thus, the shock from the hurricane strikes leads to a difference-in-difference regression specification:

$$Rate\ of\ Capital\ Expenditure_{i.y} = \alpha + \beta_1 Post_y * Treated_i + \beta_2 Post_y + \beta_3 Treated_i + \beta_4 Controls_{i,y-1} + Fixed\ Effects + \varepsilon \quad (1)$$

In the above equation *i* indicates the plant and *y* the year. *Post* is a dummy variable that takes the value of one for three years after the hurricane strike, and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one if the plant is impacted by the hurricane as defined in the next subsection and zero otherwise. The estimate of interest is β_1 which is the interaction term of both these dummy variables. *Controls* include the age and the size of the plants. *Fixed Effects* include dummy variables for state, MSA, industry*year, and plant. These fixed effects mitigate concerns about industry dynamism and location effects. Importantly, including plant fixed effects removes concerns about plant heterogeneity. The standard errors are clustered by MSA and year.

We will also estimate the following regression:

$$Rate\ of\ Capital\ Expenditure_{i,y} = \alpha + \sum_{t=1990}^{2020} \beta_t Post_y * Treated_i * Year_t + \beta_2 Post_y + \beta_3 Treated_i + \beta_4 Controls_{i,y-1} + Fixed\ Effects + \varepsilon \quad (2)$$

This regression is an augmented version of our first regression. Here we interact *Post*Treated* with calendar years *t* to trace out whether the effect of hurricanes on plant investment changes over time. An event such as signing the Kyoto Protocol in 1997 could change perceived future hurricane risk after an actual hurricane strike.

B. Treatment and Control Plants

We will present four specifications. In the first specification, treated plants are the plants in MSAs with more than $5 million in damage from hurricanes listed in Table 1. For parent firms of treated plants, the hurricane event is likely to be visible and we should be able to observe the changes in their decisions because of the hurricane strike. Firms with plants in the treated group could also have other plants in MSAs that were not struck by the hurricane. This group of plants is the control group. For example, a hurricane may strike Houston, and Firm A has plants in Houston and Dallas. Dallas is not affected by the hurricane. The plant in Houston is treated, and the plant in Dallas is the control. This specification shows whether firms change the location of investment within the firm. The hypothesis is that firms change investment in the treatment group, but changes could happen either at the treatment or at the control group.

The second specification uses the same treated group as the first specification, but a different control group. Here we compare treated plants to other firms' plants. Treated plants belong to a firm which was directly exposed to the hurricane. The directly exposed firm has plants that operate in multiple MSAs. The control group for the second specification is plants of firms that are not directly exposed but operate in a MSA in which a directly exposed firm also operates a plant. For example, a hurricane may strike Houston, and Firm A has plants in Houston and Dallas, while Firm B just has a plant in Dallas. Firm A's plant in Houston is treated and Firm B's plant in Dallas is a control. This specification isolates the change in investment at the treated plant in Houston.

The third specification recognizes that there could be competitive interactions between plants operating in the same MSA. To mitigate this possibility, the treated for this specification are plants directly exposed to hurricanes (same as in specifications 1 and 2), and the controls are plants that are not in any of the MSAs that a directly exposed firm operates in. In this example, Firm C has a plant in San Antonio (also not hurricane-affected), while Firm A does not. In this case, Firm A's plant in Houston would be treated, and Firm C's plant in San Antonio would be the control.[2]

The fourth specification is designed to isolate the change in the directly exposed firm's plant outside of the MSA that was struck by the hurricane (treated). The control for this specification is the plant of the firm that was not directly exposed but is in the same MSA that is outside of the hurricane-struck MSA. In this example, Firm A's plant in Dallas is treated, and Firm B's plant in Dallas is the control, and the direct impact is the hurricane in Houston. This

[2] Note that Firm B might also have a plant in San Antonio. Firm B's plant in San Antonio would also be a control in the third specification. Competitive interactions occurring between the plants of Firm A and Firm B in the Dallas MSA are mitigated in this specification.

specification isolates the change in investment at the treated plant in Dallas after the hurricane in Houston, and so mitigates any heterogeneity at the MSA level. Unlike the third specification, this fourth specification explicitly considers the effects of the competitive interaction between plants in the same MSA.

4. Results

A. Capital Expenditures

We hypothesize that capital expenditures will decline following a hurricane. Firms may view the affected area as more vulnerable to future hurricane events, thus increasing the perceived risk to their plants. In this section, we explore this relation by employing a regression framework with different control samples.

Table 3, Panel A examines the impact of hurricanes on the rate of capital expenditure relative to total capital. The interaction term (Post * Treated) captures the effect of the hurricane event on each of the four treated groups relative to their respective control groups from before to after the hurricane. Column (1) shows that plants in hurricane-affected areas reduce their investments compared to other plants of the same firm located in non-hurricane-impacted areas. This is consistent with the idea that within a firm, capital expenditures shift from plants in MSAs struck by a hurricane to plants in MSAs that are not struck by a hurricane from before to after the hurricane. Relative to the mean rate of capital expenditures in sample plants of 0.083 from Table 2, the statistically significant coefficient of -0.0100 implies a shift of capital expenditures of 12.0% from before to after the hurricane. This relative decline may result from either a decrease in capital expenditures at the hurricane-impacted plants or an increase in the capital expenditures of plants in non-hurricane-impacted areas or both.

Column (2) indicates that capital expenditures at the hurricane-impacted plants have declined relative to plants of competitor firms located in non-hurricane-affected MSAs where the hurricane-impacted firm also operates. Relative to the mean rate of capital expenditures in sample plants of 0.083, the statistically significant coefficient of -0.0070 implies a decline in capital expenditures of 8.4% from before to after the hurricane relative to competitor firms' plants.

Column (3) further shows that capital expenditures at hurricane-impacted plants decrease in comparison to competitor plants where the competitor is non-hurricane-affected and the competitor plant is in an MSA where the hurricane-impacted firm does not operate. Relative to the mean rate of capital expenditures in sample plants of 0.083, the statistically significant coefficient of -0.0060 implies a decline in capital expenditures of 7.2% from before to after the hurricane relative to competitor firms' plants. All three columns suggest a decline in capital expenditures for plants located in hurricane-impacted areas.

In Column (4), the treated group consists of plants located in non-hurricane-affected MSAs that are owned by a hurricane-affected firms, while the control group consists of non-hurricane-affected competitors' plants in the same non-hurricane-affected MSAs. In contrast to Columns (1), (2), and (3), Column (4) shows that capital expenditures increase for a plant located in a non-hurricane-affected MSA that is owned by a hurricane-affected firm relative to a non-hurricane-affected competitor's plant in the same non-hurricane-affected MSA. Relative to the mean rate of capital expenditures in sample plants of 0.083, the statistically significant coefficient of 0.0037 implies an increase in capital expenditures of 4.5% from before to after the hurricane relative to competitor firms. This result is consistent with hurricane-impacted firms shifting capital expenditures from plants in hurricane-impacted MSAs to plants located in non-hurricane-impacted MSAs.

For robustness, we consider an alternative definition of our dependent variable. Panel B contains the results of a similar analysis to that in Panel A using log-transformed capital expenditures as the dependent variable instead of the rate of capital expenditures. Consistent with the findings in Panel A, the results show a statistically significant decrease in capital expenditures for plants located in hurricane-impacted areas following a hurricane, as shown in Columns (1) through (3). In contrast, Column (4) reports that in non-hurricane-affected MSAs, capital expenditures increase at plants for hurricane-affected firms relative to plants for non-hurricane-affected firms after a hurricane strikes.[3]

The analysis shows that hurricanes lead to a decrease in capital expenditure in the areas directly affected by the hurricane. In contrast, these same firms with plants located in regions not impacted by hurricanes tend to increase their capital spending consistent with capital investment shifting from the hurricane-impacted areas to those that are unaffected.

B. Time-trend around 1997

We next examine the dynamics of the change in capital expenditures at hurricane-affected firms over time. Firms could either increase capital expenditures in a hurricane-affected area in reaction to the destruction of a hurricane, or shift capital expenditures to other areas as the perceived risk of hurricane strikes increases. Our previous results suggest the latter effect dominates over our entire sample period. However, it is possible that firms could change their response to hurricane events as their perceived risk from hurricane events changes.

[3] As the results are robust to using the log-transformed version of our dependent variable, we only report results for the rest of our specifications using the rate version of the dependent variable.

We conjecture that early in our sample period, managers may have paid less attention to hurricane risk (Li, et al., 2024), and so firms may not have shifted investment in response to hurricane strikes. Later, as information about climate change becomes more prevalent managers pay more attention to hurricane risk , and so firm responses at the plant level may have changed. In particular, a significant climate change treaty such as the Kyoto Protocols of 1997 may have raised awareness of climate events (see Brechin 2003) including hurricanes. For instance, Engle, et al. (2020) report a distinct spike in climate change news reported in the Wall Street Journal during 1997. We validate this in Figures 1A and 1B. Figure 1A shows the rate at which "climate risk" is prevalent in media over the period 1985 to 2005 using Google Ngram. Figure 1B shows the count of the use of "climate change" in leading printed media from Factiva. Both show that the prevalence of climate risk and change news increases post 1997.

To further examine the possibility that there are distinct time periods in firm responses to climate events, we estimate the dynamic difference-in-difference regression Equation (2) using the rate of capital expenditures as our dependent variable. Rather than tabulate the results, we present dynamic difference-in-difference graphs for each of our four definitions of treated and control samples.[4] Figure 2A shows that from 1990 to 1996, when a hurricane struck, firms with plants in hurricane-affected MSAs statistically significantly increased capital expenditures at plants in the hurricane-affected MSAs relative to plants in non-hurricane-affected MSAs.[5] This is consistent with rebuilding after a hurricane strike. From 1997 to 2020,[6] however, these firms reversed their behavior, and statistically significantly decreased capital expenditures at plants in the hurricane-

[4] This choice is driven by Census disclosure restrictions.
[5] 1989 is the omitted year.
[6] While we use hurricanes from 1989 to 2017, our plant level data extend through 2020, allowing us to examine up to three years after a hurricane strike.

affected MSAs relative to plants in non-hurricane-affected MSAs. This is consistent with perceived hurricane risk increasing substantially such that firms substitute away from risky areas.

Figure 2B shows a similar pattern. From 1990 to 1996, when a hurricane struck, firms with plants in hurricane-affected MSAs statistically significantly increased capital expenditures at plants in the hurricane-affected MSAs relative to competitor firms' plants in non-hurricane-affected MSAs. In 1997, there was no significant difference between the treated and control groups. From 1998 to 2020, firms with plants in hurricane-affected MSAs statistically significantly decreased capital expenditures at plants in the hurricane-affected MSAs relative to competitor firms' plants in non-hurricane-affected MSAs.

Figure 2C shows a very similar pattern to Figure 2B for firms with plants in hurricane-affected MSAs statistically significantly increased capital expenditures at plants in the hurricane-affected MSAs relative to firms with plants in non-hurricane-affected MSAs that do not compete with any hurricane-affected firm plants.

Figure 2D graphs results where the treated group consists of plants located in non-hurricane-affected MSAs that are owned by a hurricane-affected firms, while the control group consists of non-hurricane-affected competitors' plants in the same non-hurricane-affected MSAs. From 1990 to 1996, there is no significant difference between the treated and the control groups. From 1997 to 2020, plants in non-hurricane affected MSAs owned by hurricane-affected firms statistically significantly increase their rate of capital expenditures relative to plants in non-hurricane affected MSAs owned by non-hurricane-affected firms.

All these dynamic results suggest that firm behavior changed significantly in 1997 to 1998. The Kyoto Protocol, a significant international climate change treaty aimed at reducing the emission of greenhouse gases, was adopted on December 11, 1997. We conjecture that the Kyoto Protocol raised the perceived risk of autocorrelated hurricane events after actual hurricane strikes.

C. Capital Expenditures on Buildings

We categorize capital expenditures into two types: capital expenditures on buildings and capital expenditures for machinery. In Table 4, Panel A, we examine how hurricanes influence the rate of capital expenditures on buildings in relation to total capital expenditures. The results indicate that plants in areas affected by a hurricane experience a statistically significant decrease in building capital expenditures relative to plants in areas not affected by the hurricane. Columns (1) through (3) demonstrates a significant reduction in building capital spending post-hurricane. Conversely, for plants owned by hurricane-affected firms but not in the area affected by the hurricane, capital expenditures on building increase relative to plants owned by non-hurricane affected firms, as shown in Column (4). These results are consistent with the general decrease in capital expenditures in hurricane-affected areas and a redirection of investment from hurricane-impacted areas to areas that are non-hurricane-affected.

We examine whether the response in the rate of capital expenditures changes over time. We separate our sample into two time periods: 1989 through 1996, and 1997 through 2020. This choice is motivated by our findings in Figures 2A through 2D showing a reversal in the capital expenditure pattern in 1997. This choice is necessitated by Census disclosure requirements limiting the number of coefficients we can report, thus rendering the dynamic difference-in-difference approach infeasible.

Panel B presents the effects of hurricanes on capital expenditures for buildings before 1997. During the pre-1997 period, there was a slight increase in capital expenditures on buildings following hurricanes, likely due to rebuilding efforts. This trend is consistent across Columns (1) to (3). These findings are consistent with the literature on economic resilience and recovery, which suggests that post-disaster periods often result in increased investments driven by rebuilding efforts (Kates et al, 2006; Basker and Miranda, 2018). In contrast, non-hurricane-affected areas, as reported in Column (4), show no significant change in capital expenditures on buildings. This suggests that these areas do not experience the same increases in investment as those impacted by hurricanes.

In the post-1997 period, the results reported in Panel C show a significant decrease in capital expenditure on buildings in areas affected by hurricanes. The decline in building capital expenditure in hurricane-affected areas supports our hypothesis that firms reduced investments in hurricane hit areas after 1997. Additionally, for plants owned by hurricane-affected firms but not in the area affected by the hurricane, capital expenditures on building increase relative to plants owned by non-hurricane affected firms. Panels B and C are consistent with the idea that after the Kyoto accord in 1997, firms perceived an increase in systemic risk in investing in hurricane affected areas and so shifted investments to non-hurricane impacted areas.

D. Capital Expenditures on Machinery

Table 5, Panel A, examines the impact of hurricanes on the rate of capital expenditures for machinery. The results again indicate that plants in areas affected by a hurricane experience a statistically significant decrease in capital expenditures for machinery relative to plants in areas not affected by the hurricane. Columns (1) through (3) demonstrates a significant reduction in building capital spending post-hurricane. Conversely, for plants owned by hurricane-affected firms but not in the area affected by the hurricane, capital expenditures on machinery increase relative to plants owned by non-hurricane affected firms, as shown in Column (4). These results are consistent with the general decrease in capital expenditures in hurricane-affected areas and a redirection of investment from hurricane-impacted areas to areas that are non-hurricane-affected.

Panel B reports the impact of hurricanes on the rate of machinery capital expenditure before 1997. In Columns (1), (2), and (3), the coefficient for the post-treatment interaction term is positive and significant. There is a significant increase in the rate of capital expenditure on machinery post-hurricane for hurricane-affected plants relative to non-hurricane-affected plants. This increase is consistent with a regional economic boost in capital investment post-hurricane, possibly due to insurance payouts, government aid, or a general drive to rebuild. In the fourth column, the coefficient is statistically insignificant. This suggests that there is no significant change in the rate of machinery capital expenditure for plants in non-hurricane-affected areas.

Panel C examines the impact of hurricanes on the rate of machinery capital expenditure after 1997. In the first three columns, the coefficient for the interaction term is negative and significant, indicating a decrease in the rate of capital expenditure on machinery post-hurricane for plants in hurricane-affected areas relative to plants in non-hurricane-affected areas. In the fourth column, the coefficient is positive and significant. Plants owned by hurricane-affected firms but not in the area affected by the hurricane increase capital expenditures on machinery relative to plants owned by non-hurricane affected firms, consistent with the redirection of capital spending to non-hurricane-affected areas.

E. Plant Deaths and Births

We next examine plant deaths (plant closures) and births (new plants). In Table 6, Panel A examines the effect of hurricanes on plant closures in metropolitan statistical areas impacted by hurricanes. The dependent variable is a binary indicator, with one indicating a plant exit and zero otherwise. In Columns (1), (2), and (3), the coefficients are positive and significant. These findings indicate an increased probability of plant exits in hurricane-impacted areas relative to non-hurricane-affected areas. In Column (4), the coefficient is negative and significant indicating a significant decrease in plant exits post-hurricane in non-hurricane-affected areas for firms that are hurricane-impacted relative to firms that are not hurricane-impacted. This result is consistent with the migration of capital investment from hurricane-impacted areas to non-hurricane-impacted areas.

Panel B investigates the impact of hurricanes on plant closures before 1997. In Columns (1), (2), and (3), the coefficients for the post-treatment interaction term are not statistically significant, suggesting that hurricane events have no significant impact on plant closures in hurricane-affected areas pre-1997. The coefficient is also statistically insignificant in Column (4), suggesting that hurricane events have no significant impact on plant closures in non-hurricane-affected areas pre-1997 as well.

Panel C examines the impact of hurricanes on plant closures after 1997. In Columns (1), (2), and (3), the coefficients are positive and significant, again indicating an increased probability of plant exits in hurricane-impacted areas relative to non-hurricane-affected areas. In Column (4), the coefficient is negative and significant indicating a significant decrease in plant exits post-hurricane in non-hurricane-affected areas for firms that are hurricane-impacted relative to firms that are not hurricane-impacted. This result is again consistent with the migration of capital investment from hurricane-impacted areas to non-hurricane-impacted areas.

Table 7 studies the impact of hurricanes on the establishment of new plants. The dependent variable is a binary indicator where 1 indicates the presence of a new plant and 0 otherwise. In

Panel A, Columns (1), (2), and (3), the coefficients are negative and significant (marginally so in Columns (2) and (3)), indicating a decreased likelihood of new plant formation in hurricane-impacted areas relative to non-hurricane-affected areas after a hurricane strike. In Column (4), the coefficient is positive and significant suggesting an increase in the likelihood of new plant formation in non-hurricane-affected areas post-hurricane for the firms that have been hurricane-impacted. This result implies that non-hurricane-impacted MSAs may benefit, as capital investments shift from hurricane-impacted areas to those at less risk of hurricane strikes.

Panel B examines the impact of hurricanes on the establishment of new plants before 1997. In Columns (1) and (3), the coefficients for the post-treatment interaction term are not statistically significant, indicating no significant change in the likelihood of new plant formation post-hurricane in hurricane-affected areas. In Column (2), there is a marginally significant increase in new plant formation for hurricane-affected areas. In Column (4), there is a marginally significant decrease in new plant formation for hurricane-affected firms operating in non-hurricane-affected areas relative to non-hurricane-affected firms.

Panel C reports the results of the impact of hurricanes on new plant formation after 1997. In Columns (1) through (4) the results are consistent with and more statistically significant than those reported in Panel A. Firms decrease new plant formation in hurricane-affected areas and increase new plant formation in non-hurricane-affected areas after a hurricane strike. The results in Panel A are driven by the post-1997 sample.

F. Real Output and the Labor Share

Table 8 Panel A investigates the impact of hurricanes on real output. Real establishment-level total output is calculated by the Census as:

> Real Output Q = (total value shipped + change in finished goods inventory + Change in work-in-progress inventory)/Deflator for shipments.

In Columns (1), (2), and (3), the coefficient for the post-treatment interaction term is negative and statistically significant, indicating a significant decrease in real output after the hurricane for plants in the hurricane-impacted MSAs. In Column (4), there is a statistically significant increase in real output after the hurricane in plants located in non-hurricane-affected areas of hurricane-affected firms relative to plants of non-hurricane-impacted firms.

Panel B examines the impact of hurricanes on real output before 1997. In Columns (1) through (4), the coefficients for the post-treatment interaction term are not statistically significant, indicating no significant impact of hurricane strikes on plant-level output for plants located in either hurricane- or non-hurricane-affected areas. This suggests that prior to 1997, hurricane-affected areas quickly reverted to their pre-hurricane level of economic activity. Panel C studies the effect of hurricanes on real output after 1997. The results for this subsample mirror those for the entire sample in Panel A. After 1997, the level of economic activity declines significantly post-hurricane in hurricane-affected areas.

We next examine labor's share of output (Barkai (2020)). Table 9, Panel A, Columns (1), (2), and (3) shows that labor's share of output increases after a hurricane strike in hurricane-impacted areas, while labor's share decreases in non-hurricane-impacted areas over the full sample (Column

(4)). However, Panel B shows the opposite effects prior to 1997, consistent with firms rebuilding capital in the pre-1997 part of the sample in hurricane-impacted areas. From 1997 on, as firms shift away from rebuilding capital in hurricane-impacted areas, Panel C shows that labor's share of the reduced output increases after a hurricane strike in hurricane-impacted areas. The increase in the labor share after a hurricane strike suggests that in the short-run, labor is not relocating away from the hurricane-impacted area, although capital is.

5. Conclusion

We explore how companies adjust their capital investment in response to hurricane strikes. Firms may either invest more in disaster-hit areas due to rebuilding efforts and government incentives or relocate and reduce investments due to heightened risk awareness and the increasing frequency of hurricanes linked to climate change. Intriguingly, we find evidence for the first hypothesis, rebuilding, during the early part of our sample up to 1997. From 1997 on, we find evidence for the second hypothesis, relocation. We conjecture that the Kyoto Protocol signed in December 1997 may have increased the perceived risk of future hurricanes after actual hurricane strikes for hurricane-affected firms.

For the sample as a whole, as well as the post-1997 sub-sample, we find that hurricanes generally lead to a decrease in capital expenditures in plants in affected areas, with a significant reduction in both building and machinery investments. By contrast, the same firms with other plants in non-hurricane hit areas experience increased investment, likely due to a shift in capital away from risk-prone areas. The likelihood of plant closures increases significantly in hurricane-affected areas, while new plant formation declines. Conversely, non-hurricane areas see an increase in new plant formation, suggesting a shift of economic activity to safer regions. Also, real output decreases significantly in hurricane-affected areas, while non-hurricane areas experience growth, indicating a redistribution of economic activity away from disaster-prone regions.

Our results have implications for the geography of firm production in response to increased climate risk. Perhaps not surprisingly, firms relocate from areas that are perceived to be riskier. In the short run, this does not appear to be a response to labor relocation. The precise mechanisms for this relocation—is it due to expected long-run labor relocation, greater insurance costs, or more general costly production—we leave to future research.

References:

Barkai, S., 2020. Declining Labor and Capital Shares**.** *Journal of Finance* 75(5): 2421-2463.

Basker, E. and Miranda, J., 2018. Taken by storm: business financing and survival in the aftermath of Hurricane Katrina. *Journal of Economic Geography*, *18*(6), pp.1285-1313.

Braun, A., Braun, J. and Weigert, F., 2021. Hurricane risk and asset prices. *Available at SSRN*, *3952620*.

Brechin, S.R., 2003. Comparative public opinion and knowledge on global climatic change and the Kyoto Protocol: the US versus the world?. *International journal of sociology and social policy*, *23*(10), pp.106-134.

Dessaint, O. and Matray, A., 2017. Do managers overreact to salient risks? Evidence from hurricane strikes. *Journal of Financial Economics*, *126*(1), pp.97-121.

Engle, R.F., Giglio, S., Kelly, B., Lee, H. and Stroebel, J., 2020. Hedging climate change news. *The Review of Financial Studies*, *33*(3), pp.1184-1216.

Fu, C. and Gregory, J., 2019. Estimation of an equilibrium model with externalities: Post-disaster neighborhood rebuilding. *Econometrica*, *87*(2), pp.387-421.

Hallegatte, S. and Przyluski, V., 2010. The economics of natural disasters: concepts and methods. *World Bank policy research working paper*, (5507).

Huang, H.H., Kerstein, J., Wang, C. and Wu, F., 2022. Firm climate risk, risk management, and bank loan financing. *Strategic Management Journal*, *43*(13), pp.2849-2880.

Kates, R.W., Colten, C.E., Laska, S. and Leatherman, S.P., 2006. Reconstruction of New Orleans after Hurricane Katrina: a research perspective. *Proceedings of the national Academy of Sciences*, *103*(40), pp.14653-14660.

Li, Q., Shan, H., Tang, Y. and Yao, V., 2024. Corporate climate risk: Measurements and responses. *The Review of Financial Studies*, *37*(6), pp.1778-1830.

MacCracken, C.N., Edmonds, J.A., Kim, S.H. and Sands, R.D., 1999. The economics of the Kyoto Protocol. *The Energy Journal*, *20*(1_suppl), pp.25-71.

Olshansky, R.B., 2018. Recovery after disasters: How adaptation to climate change will occur. *Climate change and its impacts: Risks and inequalities*, pp.195-207.

Pelli, M., Tschopp, J., Bezmaternykh, N. and Eklou, K.M., 2023. In the eye of the storm: Firms and capital destruction in India. *Journal of Urban Economics*, *134*, p.103529.

Rose, A., 2004. Defining and measuring economic resilience to disasters. *Disaster Prevention and Management: An International Journal*, *13*(4), pp.307-314.

Stead, M.M., 2006. Implementing disaster relief through tax expenditures: An assessment of the Katrina emergency tax relief measures. *NYU Law Review.*, *81*, pp.2158-2191.

Table 1: List of hurricanes used in the analysis

	Hurricane (1)	Year (2)	Category (3)	Adjusted Damage $B (4)
1	Katrina	2005	3	182.5
2	Harvey	2017	4	141.3
3	Maria	2017	4	101.7
4	Sandy	2012	1	80
5	Irma	2017	4	56.5
6	Andrew	1992	5	54.3
7	Ike	2008	2	39.6
8	Ivan	2004	3	30.8
9	Wilma	2005	3	27.7
10	Rita	2005	3	17
11	Charley	2004	4	24
12	Hugo	1989	4	20.7
13	Irene	2011	1	17
14	Frances	2004	2	14.7
15	Allison	2001	TS	13.5
16	Matthew	2016	1	11.7
17	Jeanne	2004	3	11.2
18	Floyd	1999	2	11
19	Georges	1998	2	10.3
20	Fran	1996	3	9
21	Opal	1995	3	8.7
22	Isabel	2003	2	8.4
23	Gustav	2008	2	8.4
24	Iniki	1992	4	6.2

Column (1) reports the name of the hurricane. Column (2) reports the year of the hurricane. Column (3) the category of the hurricane or tropical storm represented with TS. The inflation adjusted damage from the hurricane is reported in Column (4) in billions of 2021 dollars using the Consumer Price Index.

Table 2: Summary Statistics

Name	Mean (1)	Std.Dev (2)
log(Capital Expenditure)	5.041	2.637
Rate of Capital Expenditure	0.083	0.104
log(Capital Expenditure—Building)	2.141	2.519
Capital Expenditure—Build Rate	0.011	0.029
log(Capital Expenditure—Machinery)	4.854	2.642
Capital Expenditure—Machinery Rate	0.072	0.104
log(Real Capital Stock Structure)	7.390	1.942
log(Real Capital Stock Equipment)	7.916	1.886
Labor's Cost Share	0.249	0.105
Real Output	9.503	1.715
Plant Exit	0.116	0.321
Plant Birth	0.108	0.311
Log(Age)	2.673	0.82
Log(Employees)	5.292	1.416

This table presents summary statistics at the plant level for all treated and control plants in the sample. Data are from the Annual Survey of Manufacturing (ASM), Census of Manufacturers (CMF), and the Longitudinal Business Database (LBD) from the Census Bureau.

Table 3: Shift in Capital Expenditures After Hurricane Hit

Panel A) Rate of Capital Expenditure

Dep. Variable	**Capital Expenditure/Capital**			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0100***	-0.0070**	-0.0060**	0.0037***
	(0.001)	(0.003)	(0.002)	(0.001)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.587	0.574	0.591	0.580

Panel B) Level of Capital Expenditure

Dep. Variable	**log(Capital Expenditure)**			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.1798***	-0.0843***	-0.0939***	0.0566***
	(0.035)	(0.024)	(0.032)	(0.020)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.771	0.735	0.730	0.732

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 4: Shift in Building Capital Expenditures After Hurricane Hit

Panel A) Rate of Building Capital Expenditure

Dep. Variable	Capital Expenditure Building/Capital			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0015***	-0.0008**	-0.0006**	0.0015**
	(0.000)	(0.000)	(0.000)	(0.001)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.438	0.457	0.469	0.413

Panel B) Building Capital Expenditures Prior to 1997

Dep. Variable	Capital Expenditure Building/Capital			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0005***	0.0009**	0.0004**	-0.0001
	(0.000)	(0.000)	(0.000)	(0.002)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.528	0.590	0.555	0.561

Panel C) Building Capital Expenditures Post 1997

Dep. Variable	Capital Expenditure Building/Capital			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0018***	-0.0018**	-0.0011***	0.0020**
	(0.000)	(0.000)	(0.000)	(0.001)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.465	0.482	0.541	0.544

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value

of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 5: Shift in Machinery Capital Expenditures After Hurricane Hit

Panel A) Rate of Machinery Capital Expenditure

Dep. Variable	**Capital Expenditure Machinery/Capital**			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0100***	-0.0050***	-0.0058***	0.0041***
	(0.001)	(0.001)	(0.002)	(0.001)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.522	0.548	0.532	0.563

Panel B) Machinery Capital Expenditures Prior to 1997

Dep. Variable	**Capital Expenditure Machinery/Capital**			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0030***	0.0061***	0.0015***	-0.0044
	(0.001)	(0.002)	(0.004)	(0.000)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.652	0.676	0.639	0.648

Panel C) Machinery Capital Expenditures After 1997

Dep. Variable	**Capital Expenditure Machinery/Capital**			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0148***	-0.0013***	-0.0083***	0.0031**
	(0.002)	(0.003)	(0.002)	(0.000)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.574	0.579	0.562	0.578

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated

plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 6: Plant Exits After Hurricane Hit

Panel A) Plant Exits—Full Sample

Dep. Variable	Plant Exit = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0398***	0.0292***	0.0386**	-0.0472***
	(0.010)	(0.009)	(0.015)	(0.004)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.739	0.755	0.701	0.632

Panel B) Plant Exits Prior to 1997

Dep. Variable	Plant Exit = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0688	0.0101	0.0154	-0.0029
	(0.054)	(0.062)	(0.014)	(0.066)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.766	0.734	0.713	0.760

Panel C) Plant Exits After 1997

Dep. Variable	Plant Exit = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0274***	0.0222**	0.0260**	-0.0409***
	(0.001)	(0.009)	(0.009)	(0.005)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.777	0.785	0.780	0.802

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value

of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 7: Plant Births After Hurricane Hit

Panel A) Plant Births—Full Sample

Dep. Variable	New Plant = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0024**	-0.0110*	-0.0019*	0.0107***
	(0.001)	(0.006)	(0.001)	(0.002)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.654	0.659	0.665	0.642

Panel B) Plant Births Prior to 1997

Dep. Variable	New Plant = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0008	0.0031*	-0.0006	-0.0052*
	(0.005)	(0.001)	(0.005)	(0.003)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.661	0.685	0.664	0.668

Panel C) Plant Births After 1997

Dep. Variable	New Plant = 1; 0 otherwise			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0024**	-0.0108***	-0.0107**	0.0230***
	(0.001)	(0.003)	(0.004)	(0.007)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.671	0.675	0.618	0.650

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated

plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 8: Real Output After Hurricane Hit

Panel A) Real Output—Full Sample

Dep. Variable	Real Output			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.2024***	-0.0337***	-0.0381***	0.0770***
	(0.029)	(0.006)	(0.009)	(0.007)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.791	0.776	0.775	0.792

Panel B) Real Output Prior to 1997

Dep. Variable	Real Output			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0088	0.0074	-0.0069	-0.0099
	(0.023)	(0.031)	(0.012)	(0.010)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.790	0.786	0.784	0.771

Panel C) Real Output After 1997

Dep. Variable	Real Output			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.1596***	-0.0515**	-0.0369***	0.0638***
	(0.037)	(0.025)	(0.012)	(0.011)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.845	0.877	0.877	0.865

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value

of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Table 9: Labor Share After Hurricane Hit

Panel A) Labor Share—Full Sample

Dep. Variable	Labor Share			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0101***	0.0011**	0.0013*	-0.0030***
	(0.002)	(0.000)	(0.001)	(0.001)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	293,000	275,000	269,000	196,000
Adj R^2	0.623	0.670	0.668	0.623

Panel B) Labor Share Prior to 1997

Dep. Variable	Labor Share			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	-0.0084***	-0.0071**	-0.0083***	0.0031**
	(0.002)	(0.003)	(0.002)	(0.000)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	81,000	65,000	69,000	80,000
Adj R^2	0.652	0.676	0.639	0.648

Panel C) Labor Share After 1997

Dep. Variable	Labor Share			
	Hurricane impacted			Non-hurricane
	(1)	(2)	(3)	(4)
Post * Treated	0.0130***	0.0094***	0.0115***	-0.0044
	(0.002)	(0.003)	(0.004)	(0.000)
Estab Controls	Yes	Yes	Yes	Yes
Estab FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	212,000	210,000	200,000	116,000
Adj R^2	0.574	0.579	0.562	0.578

Post is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one for the treated plants and zero for the control plants. In Columns (1), (2), and (3), treated

plants are in hurricane-struck MSAs. In Column (1), the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Column (2), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Column (3), the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Column (4), the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. We report robust standard errors clustered by year and MSA in parentheses below the estimates. Observations have been rounded to the nearest 1000. *, **, and *** represent statistical significance at the ten, five, and one percent levels, respectively.

Figure 1A: Climate Risk

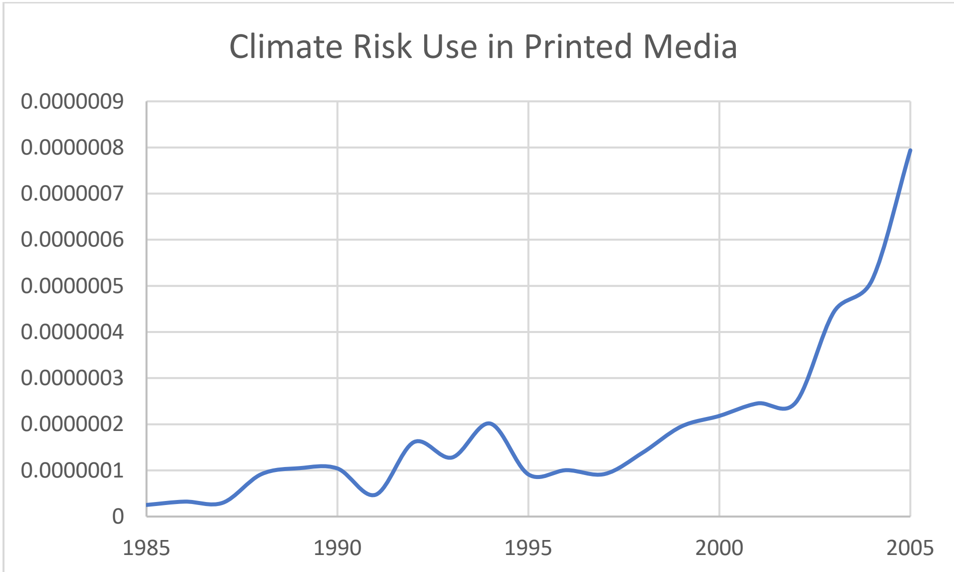
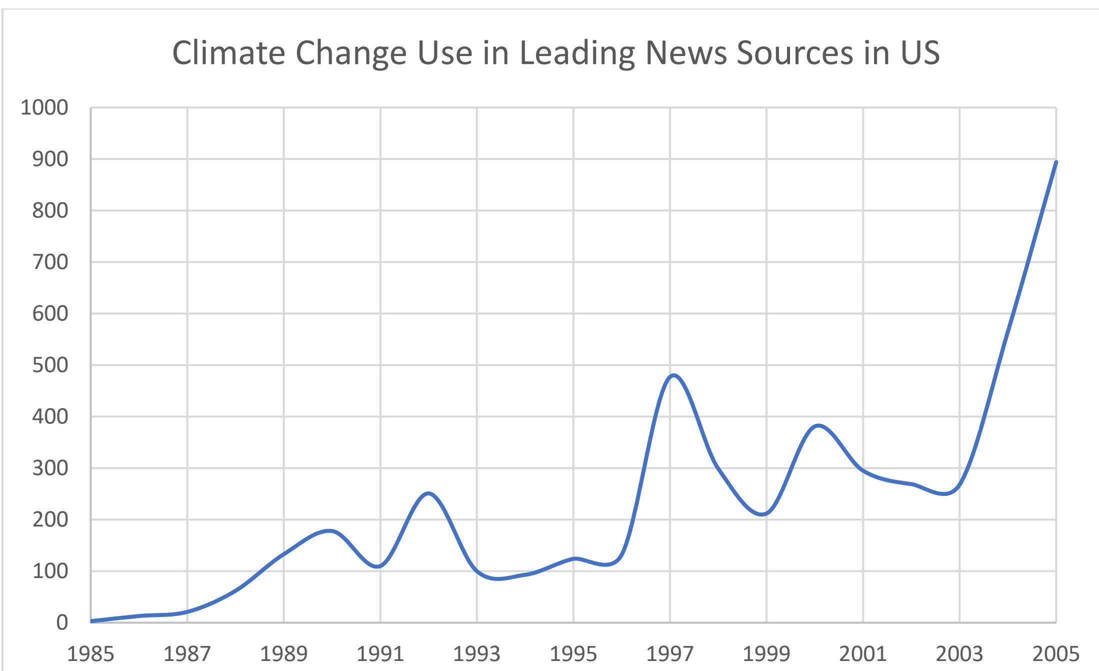


Figure 1B: Climate Change



In Figure 1A, the y – axis is the percentage of times "climate risk" has been used in the printed media in that year. The graph was generated by https://books.google.com/ngrams/. In Figure 1B, the y-axis is the count of the times "climate change" was used in leading printed media. The data are from Factiva. Usage of the phrases "climate risk" or "climate change" in the printed media increases after 1997.

Figure 2A

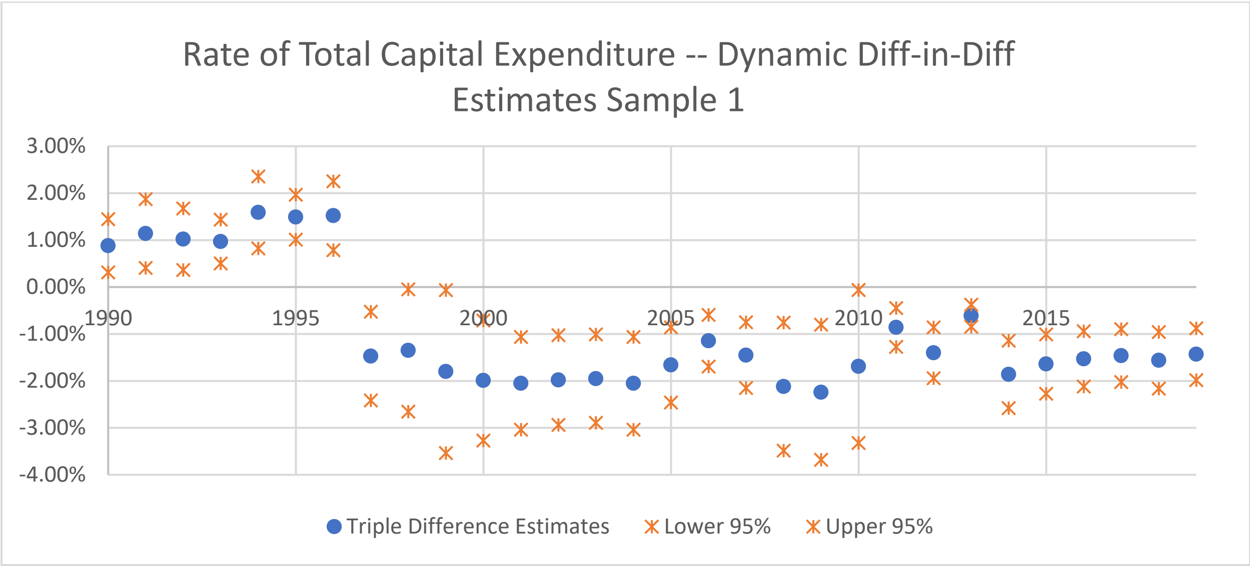


Figure 2B

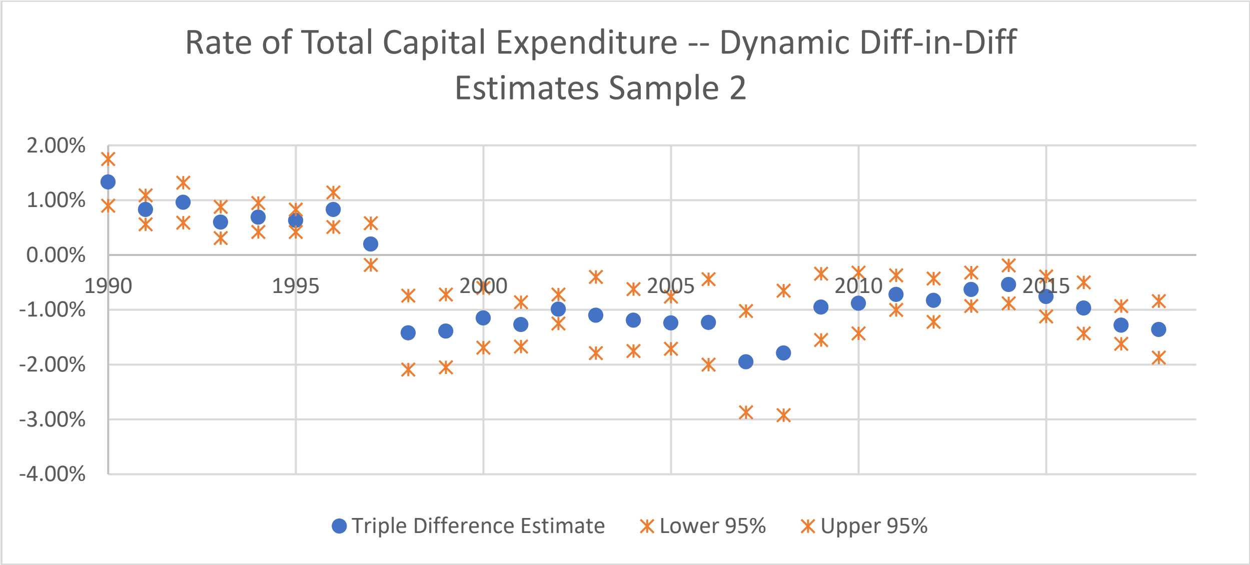


Figure 2C

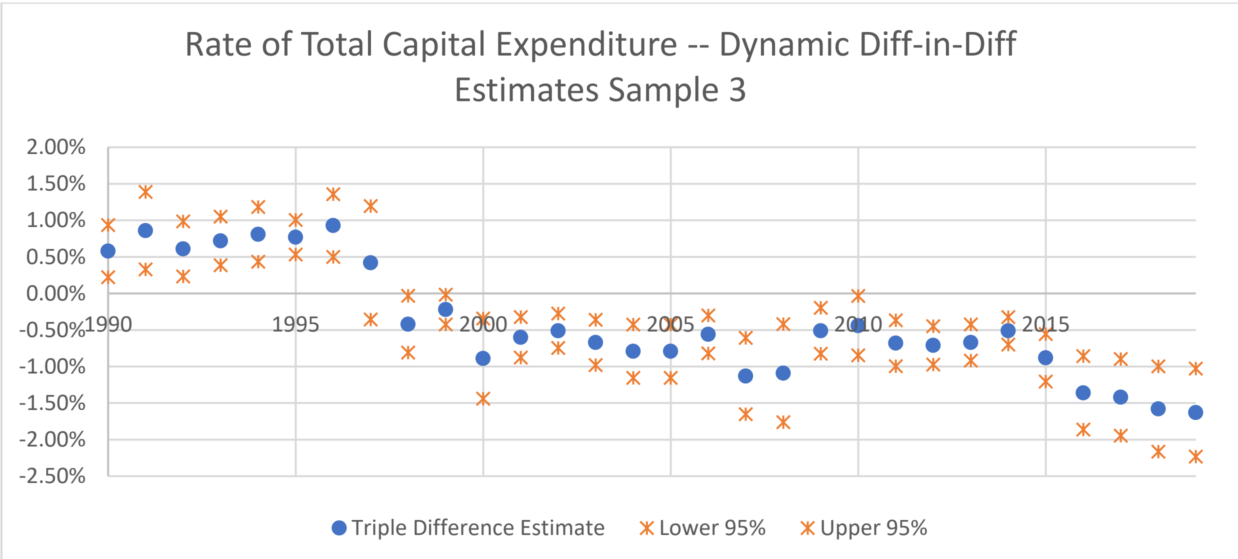
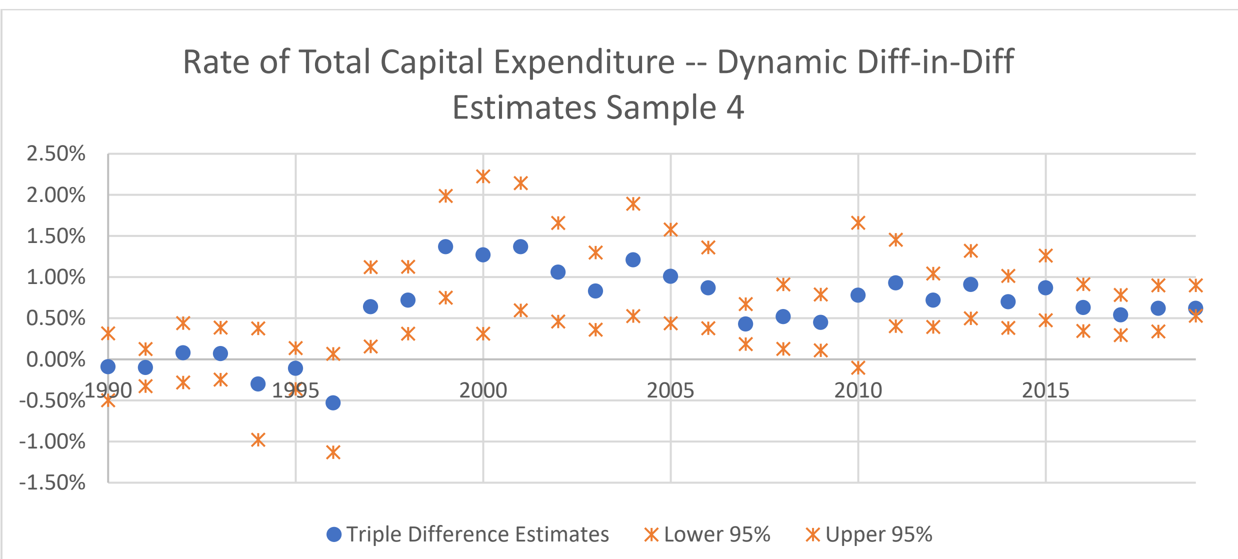


Figure 2D



These figures plot the dynamic difference-in-difference coefficients in blue for the rate of total capital expenditures regressed on the interaction of *Year*Post*Treated*. *Year* is plotted on the x-axis. *Post* is a dummy variable that takes the value of one for three years after the hurricane strike and zero for three years before the hurricane strike. *Treated* is a dummy variable that takes the value of one for the treated plants and zero for the control plants. In Figures 2A, 2B, and 2C, treated plants are in hurricane-struck MSAs. In Figure 2A, the control plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane. In Figure 2B, the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane but compete in MSAs with firms struck by the hurricane. In Figure 2C, the control plants are in MSAs not struck by the hurricane and belong to parent firms not struck by the hurricane and do not compete in the control plant's MSA with a firm struck by the hurricane. In Figure 2D, the treated plants are in MSAs not struck by the hurricane but belong to parent firms with plants struck by the hurricane and the control plants are in the same MSAs but belong to parent firms not struck by the hurricane. We include fixed effects for state, MSA, industry*year, and plants. Confidence bands in orange are based on robust standard errors clustered by year and MSA.