**4. Main Results:**

Carbon pledges, which are company promises to change current or future operations, offer new ground for investors and journalists to make decisions on their involvement and engagement with the company. Through staggered difference in difference analysis, I find that stock prices of companies lose $X or X percent in the first year after making a carbon neutral pledge, which they steadily gain back over the following years. Additionally, using the same model, companies that make carbon pledges receive an increase in total news articles each preceding year, slight increases to percent of negative business articles, and decreases to percent of negative personal articles. I expand on each of these analysisusing heterogenous comparisons that measure the effects of carbon credits, accountability deliverables, interim pledge targets, and differentcomplete-by dates. As stock information is only publicly available for public companies, I only consider public companies for stock price analysis.

**4.1 Impacts to Average Stock Prices**

I find that companies that make net zero or carbon neutral pledges experience (not sure how to interpret the magnitude of the estimate, -28.1) a substantial drop in their stock prices the year and the year after they make a carbon neutral pledge in comparison to companies that have not made that pledge. As can be seen in Table 1 and Figure 1, these rates slowly recover after the pledges have been made. It’s important to recognize that these results are in comparison to “Year – 1,” the year before companies make a carbon pledge. While these results are not statistically significant, they encourage the notion that investors are frightened by the announcement of changes that don’t directly maximize output and efficiency. However, as years continue after the pledge, the stock recovers as investors settle into the change and regain faith in the company’s path to success.

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**4.2 Heterogenous Carbon Pledge Variation on Average Stock Price**

I delve deeper into 4 important elements of carbon pledges: the use of carbon credits, interim pledge targets, complete-by dates, and accountability deliverables. For each of these experiments, I analyze the impact that these variables have on my staggered DiD result.

**4.2.1 Carbon Credit Impact**

The first variation that I test is the expressed use of carbon credits within the carbon neutral pledge. Because the Carbon Pledge Tracking dataset has 3 categories for this variable, “Yes,” “No,” and “Not Specified,” I compare each category with the same control group from the original staggered difference in difference. Figure 2 shows these three plots.

**Figure 2: Carbon Credit Heterogeneity**A graph with lines and dots

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These results showcase a couple of interesting observations. First, it appears that for the initial shock of making a carbon pledge on stock price, providing carbon credit information is important for investors. When information on carbon credits is not available (“Not Specified”), companies experience the year of pledge negative shock drastically more than companies that disclose whether they are using carbon credits or not. In fact, these results allude that companies that reveal their carbon credit plans don’t experience a negative year of pledge shock. After a year, all three groups experience a negative shock, however, again, companies that don’t specify carbon credit use have notably lower stocks in comparison to the year before pledge. The preceding years show that companies that disclose their carbon credit plans experience positive effects of stock performance compared to the control groups, while the unspecified group consistently preforms lower than the control group. By 2 years, companies that do not use carbon credits experience higher stock success than those that are using carbon credits with differences further widening in year 3. ­­­­­ It’s important to understand that these results cannot be deemed causal, as parallel trends do not hold for the “Not Specified” category and results are not significant for “Yes” and “No.”

**4.2.2 Interim Pledge Targets**

This section looks at the effect of companies making an interim pledge within their carbon neutral pledge. These two groups of companies that have made carbon neutral pledges, “has an interim pledge” and “no interim pledge” are each compared to the control group that have not made a carbon neutral pledge.

**Figure 3: Interim Targets**

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When analyzing Figure 3 and Table 3, we again see that the year of pledge shock to stock price is minimized by more information. When companies reveal an interim plan, they adramatically reduced negative shock. Similarly, to the effect of companies using carbon credits, stock prices dip the year after pledge for both groups of companies, however, the preceding trends differ. Companies without an interim target make a quick recovery as stock prices return to their pre-pledge rates over time, however companies with interim targets experience a slower and steadier to recovery. This leads to the story that investors may be more immediately scared when companies have no midpoint plan, but over time, they realize that companies with interim plans may be more dedicated to reducing current efficiency to achieve their sustainability goals than those without a plan.

**4.2.3 Complete-by Dates**

The third experiment that I test for is complete-by dates. When companies make a net zero pledge, they assign a year to complete it by. I test for variation within two groups, those with a complete-by date earlier or equal to than 2035 and those that plan to complete the pledge later than 2035.

**Figure 4: Net Zero Target Year Heterogeneity (Staggered DiD Estimates)**

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These results show that pledging companies with complete-by dates before 2035 experience the dramatic negative shock in the year of pledge and the year after. This trend, while the magnitudes are larger, follows similarly to the original trend where rates slowly and steadily recover. Tis left hand graph is the closest we have yet to significant causal results, as parallel trends hold with no statically significant trends pre-pledge, but post-pledge, there are significant differences between treatment and control.

Companies that make a pledge to complete later than 2035, have the opposite trends, gaining stock price in the years after the pledge, but slowly descend back towards pre-pledge rates in the third year after pledge. Unfortunately for this plot, parallel trends do not hold.

This variation shows that investors are alarmed when companies make pledges that come with haste to update their methods, but as time goes on, they slowly accept the changes. However, if the pledge date is considerably in the future, investors face less uncertainty in the near future can only benefit from the immediate increased attention and boost. But, as that buzz dies down and the pledge years get a bit closer, the stock prices of carbon neural pledgers with distant complete by dates slowly trend towards pre-pledge rates.

**4.2.4 Accountability Deliverables**

The last measure of heterogeneity that I test for on the effect of average stock prices is whether companies hold themselves accountable. While there is no description for the meaning of this variable in the Carbon Pledge Tracker dataset, based on the variable categories, I make the assumption that this variable accounts for promises of accountability deliverables in their original plan.

**Figure 5: Stock Price Impact by Accountability Delivery (Staggered DiD Estimates)**

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First, those that do not specify if they are planning to produce accountability deliverables, are congruent to the control group. Second, companies that aim to produce accountability deliveries are more negatively affected on the year of their pledges. However, paying attention to the differing y axis of plot 2 and 3, companies that say they do not have plans to hold themselves accountable begin to be dramatically worse off than those that do have accountability deliverables. This suggests that while investors may be immediately worried about companies planning to document themselves following through with their sustainability plans, the effect of explicitly not planning to deliver accountability measures is much worse for companies’ stock prices.

**4.3 Media Attention**

A second impact that making a carbon pledge has on companies is their media attention. This can impact many forms of valuation and relevancy. I look at the effect of companies making a carbon pledge on their total media, percent of negative business articles, and percent of negative personal articles. I then analyze each of these outcome variables across the same heterogeneous variation as stock prices.

**4.3 Effect**

This analysis begins by delving into how total media, percent of negative business articles, and percent of negative personal articles are impacted by carbon pledges.

**Figure 6: Media Coverage**

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The results on total media is a bit concerning, as there seem to be a clear trend where before companies before pledging had less total media than the control group and the point where this changes is at the year before pledging. Surprisingly, negative business articles increase after companies make carbon pledges. More congruently with my hypothesis, negative personal articles drop after making a carbon pledge. This could suggest that companies that were gaining momentum with total media attention are more likely to make a carbon pledge than those that previously had more attention. For negative business articles, this increase could reflect a combination of worries about reducing efficiency and carbon pledging skeptisism. For negative personal articles, the drop off could reflect more positive reviews of the CEO’s commiting to public welfare.

**4.4 Heterogenous Carbon Pledge Variation on Media Attention**

Like I did with average stock price, I delve deeper into 4 important elements of carbon pledges: the use of carbon credits, interim pledge targets, complete-by dates, and accountability deliverables. For each of these experiments, I analyze the impact that these variables have on my staggered DiD results.

**4.4.1 Use of Carbon Credits**

First, I explore how the disclosure of the use of carbon credits effects the outcome variables.

**Figure 7: Carbon Credit Heterogeneity**

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A couple of key results can be found from figure 7 and table 7. First, when looking at total media, not specifying carbon credit use seems to have varying results, however companies that do not use carbon credits have dramatically less news articles written about them than those that will use carbon credits (comparing the first row). When comparing negative articles of those that will explicitely not use carbon credits to those that will, the most pronounced result is that companies that pledge to not use carbon credits have consistently less negative personal articles than those that pledge to use credits.

**4.2.2 Interim Target Heterogeneity**

I continue to analyze carbon pledge variation by testing the effect of interim targets on media attention.

**Figure 8: Interim Target Heterogeneity**

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**4.4.3 Complete-by Date Heterogeneity**

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These plots show interesting results. First, companies that make carbon pledges with complete by dates before 2035 receive more total news articles after making a pledge than those that have further distances. This makes sense theoretically, as those that have nearby deadlines have to change faster, resulting in more headlines on their plans.

Secondly, those that pledge for earlier deadlines have negative trends of negative business articles after pledging, while the later deadlines have positve trends. This could be because later deadlines are under more scrutiny for the reliability of their pledges.

Lastly, personal articles have the opposite effect where later complete by date pledging companies experience fewer negative personal articles than earlier pledgers. This could match the reason for the total articles, where these companies are getting less attention so there are less articles critizing their CEOs.

**4.4.4 Accountabiltiy effect on Media**

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