Doing Good When Doing Well: Evidence on Real Earnings Management*

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ABSTRACT

We provide evidence on earnings management by exploiting temporary exogenous shocks to utility firms' sales in the form of annual weather variation. We find that sample firms' sales are highly sensitive to annual changes in average temperatures in the region where the firm operates, but this sensitivity disappears quickly moving down the income statement. We interpret this as indirect evidence of earnings management. In search of direct evidence, we study charitable giving decisions by sample firms and uncover a significant positive sensitivity of charitable spending to weather-driven demand shocks. Given the magnitude of this detected relation and the economic returns from charitable giving, this behavior appears to be driven by a desire to smooth earnings.

Keywords: real earnings management; charitable giving; weather shocks
JEL Codes: M41; G31; G32; L21

1. Introduction

Understanding the quality of a firm's reported earnings is a central issue in financial accounting and of much interest to investors. Reported earnings are a function of the true economic performance of a firm, but they are also influenced by many reporting and operating choices (see Dechow, Ge, and Schrand (2010)). If these choices are managed strategically, reported income figures will lose some of their information content, possibly impacting real decisions made by outsiders (e.g., transaction prices in security sales or acquisitions). Moreover, changes in real operating decisions by firms in response to concerns about reported earnings may be deleterious to firm value if they lead firms to deviate from first-best operating policies. Not surprisingly, these concerns have generated a large research literature (see Roychowdhury, Shroff, and Verdi (2019)).

While the existing literature on earnings management has generated a host of interesting findings, much of the evidence is indirect. In particular, researchers often identify firms that they suspect managed earnings, for example, by just meeting a certain earnings threshold, and then work backward to identify the accounting or operating choices that appear to have allowed the firm to meet a certain target or expectation. While evidence of this type is informative, the ex-post nature of these investigations often does not allow one to gauge the importance/magnitude of earnings management activities for an unselected firm population. Moreover, it remains possible that the earnings characteristic that qualifies an observation for investigation, and the firm choice(s) studied, are jointly determined by external circumstances unrelated to any earnings management motivations (Cohen, Pandit, Wasley, and Zach (2020)).

In this paper, we study earnings management by working forward from exogenous shocks that should affect unmanaged earnings. After identifying these shocks, we examine the impact on reported earnings and on operating choices that may be influenced by earnings management efforts. We conduct this investigation in the context of the electric and gas utility industry, as the main driver of demand at utilities is ambient air temperature, with cold (warm) weather driving heating (cooling) demand in the winter (summer). Variations in weather conditions that deviate from long-term trends are essentially exogenous and unpredictable at an annual frequency. Thus, annual weather shocks are ideal episodes to study, as they have no information content regarding the future economic environment of the firm, even though they have a sharp impact on current sales.

In a sample of 51 utilities from 2000-2016, we detect evidence of a strong sensitivity of annual revenues to annual weather variation, helping to confirm our use of weather shocks as an exogenous demand shifter. However, when we look down the income statement, the estimated sensitivity of both EBITDA and net income (and items in between) to weather is small in magnitude and statistically insignificant. Since the utility business is capital intensive, we would expect (unmanaged) costs to vary less than proportionally with revenues. Thus, this evidence on EBITDA and net income is puzzling and highly suggestive of earnings management behavior. While a minority of studies in the related prior literature exclude utilities on the grounds that regulation may impact earnings management incentives, our evidence is consistent with a handful of prior authors who explicitly mention that their findings extend to regulated firms (e.g., Burgstahler and Dichev (1997), Cheong and Thomas (2011)).[1]

Several authors discuss how modifying real decisions may be a particularly effective method of managing earnings in a relatively opaque way that can help avoid outside scrutiny and

[1] Since utilities are required to maintain separate regulatory accounting books, their financial reporting incentives likely share many similarities with unregulated firms. Anecdotally, in their investor communication materials, many utilities appear quite concerned with reporting smooth and growing earnings to investors, even in the presence of large weather shocks. For example, CMS Energy, a Michigan utility in the S&P 500, typically reports in its earnings call slide decks a graph of adjustments made to achieve smooth earnings growth in the face of weather variation.

detection (e.g., Roychowdhury (2006)). However, the ability to undertake these modifications will depend on the ease and speed with which real decisions can be altered. In the face of weather shocks experienced by the firms we study, particularly those occurring near the end of the fiscal year, there may be few real activities that can be modified to smooth earnings. Ideal candidates would include any expensed discretionary items with low explicit modification costs, for example, spending on executive education classes and employee training. Importantly, the optimal level of spending on these types of investments will typically be independent of current idiosyncratic weather shocks, absent concerns about reported earnings.

One particularly important spending decision of this type in the electric and gas utility industry is charitable giving. Since utilities are highly regulated, they often invest heavily in public relations activities in order to best position themselves during the highly regulated and politicized rate-setting process (Masulis and Reza (2015)). Thus, not surprisingly, utilities routinely land on lists of the largest corporate givers. Many large utilities sponsor a charitable foundation to coordinate their giving efforts, with final decisions on the level of giving frequently deferred until the end of the year. However, as we describe below, the actual level of firm giving is somewhat opaque, as it is not a standardized item in financial reports. Given these features, we examine variation in sample firms' charitable giving choices as a lens into understanding more generally how firms modify opaque real decisions to accomplish earnings management goals.

To conduct this investigation, we hand-collect data on charitable giving and proceed to estimate models relating giving levels to weather shocks in our sample. Our analysis reveals a strong and significant relation between giving and weather, with increased (decreased) giving in response to demand increasing (decreasing) weather shocks. This is precisely what we would expect if charitable giving is being altered from planned/optimal levels in order to manage earnings in the face of unexpected temporary demand variation. Since we expect that many other unobservable decisions with comparable salient features are likely to display similar behavior, our evidence appears highly consistent with the hypothesis that real earnings management activities are a significant component to the surprisingly smooth earnings we observe at sample firms, even in the face of large demand shocks. We also present some evidence on the cross-sectional variation in earnings management behavior, with some limited support for heightened behavior of this type when earnings management incentives are relatively large.

The rest of the paper is organized as follows. In section 2, we review the related literature and outline our empirical strategy. In section 3, we describe the data, sample, and variable constructions. Our main findings on the sensitivity of sales, income, and charitable giving to weather is reported in section 4. Section 5 concludes.

2. Background, motivation, and empirical strategy

2.1 Earnings management in its many forms

A large literature attempts to identify whether firms deliberately make choices to manage their earnings to certain levels.[2] Substantial evidence suggests that earnings often cluster around focal thresholds to an abnormally high degree, indicating the presence of earnings management (Burgstahler and Dichev (1997), Degeorge, Patel, and Zeckhauser (1999)). Many subsequent studies investigate the statistical properties of earnings, both cross-sectionally and over time, and report patterns consistent with active efforts by managers to make choices that smooth earnings

[2] The incentive to manage earnings is often associated with market rewards for beating analyst expectations (e.g., Bartov, Givoly, and Hayn (2002)). Since managers can also manage expectations, we would expect the equilibrium level of earnings and expectations management to be jointly determined (e.g., Das, Kim, and Patro (2012)).

(e.g., Cheong and Thomas (2011, 2018)). Doyle, Jennings, and Soloman (2013) present evidence that motivations to strategically manage GAAP earnings also extend to efforts to define non-GAAP "street" earnings to maximize certain managerial objectives. Perhaps most convincingly, survey evidence indicates that managers believe earnings management is quite common (Graham, Harvey, and Rajgopal (2005), Dichev, Graham, Harvey, and Rajgopal (2013)).

Not only is there ample general evidence that firms often make choices to manage earnings to specific levels, but there is also specific evidence that the tendency to undertake this behavior is greatest in circumstances when incentives to do so are large. In particular, earnings management appears to increase around control contests (Erickson and Wang (1999), Louis (2004)), security sales (Kothari, Mizik, and Roychowdhury (2016)), or in response to incentives induced by particular market or governance features (Matsumoto (2002), McInnes and Collins (2011), Irani and Oesch (2016)), and Chu, Dechow, Hui, and Wang (2019)). This evidence helps to clarify some of the reasons that managers are sometimes particularly intent on managing earnings.

There are many tools at the disposal of managers who desire to smooth earnings, and some of these are pure accounting devices to move income across periods. However, it is also possible that managers alter their real operating decisions in anticipation of the effect of those decisions on earnings, rather than purely for value maximization. Roychowdhury (2006) presents evidence of this type of behavior across a variety of operating decisions. This real earnings management activity is particularly concerning, as it suggests an inefficiency in resource allocation decisions and possibly negative welfare consequences.[3] Researchers have

[3] Welfare effects will be negative if, absent earnings management concerns, firms follow a value-maximizing strategy. Evidence in Vorst (2016), Kothari, Mizik, and Roychowdhury (2016)), and Greiner (2017) supports the presence of these negative welfare effects. If firms have a propensity to under or overspend on certain items, it is

identified evidence consistent with this behavior for many different types of spending decisions including R&D choices (Bushee (1998)), advertising spending (Cohen, Mashruwala, and Zach (2010), spending on labor (Dierynck, Lansman, and Renders (2012), pension funding choices (Bergstresser, Desai, and Rauh (2006), Naughton (2019)), securitization decisions (Dechow, Myers, and Shakespeare (2010), and capital spending (Bens, Nagar, and Wong (2002)).

While this existing evidence is both interesting and compelling, most of these studies rely on endogenous variations in firms' economic environments as a starting point for examining either general or real earnings management. This is problematic, since the omitted factor that drives the firm's underlying economic environment may be correlated in a complicated and unknown way with the decisions that are being used to identify earnings management. Dechow, Hutton, Kim, and Sloan (2012) and Cohen, Pandit, Wasley, and Zach (2020) discuss econometric modeling approaches to ameliorate this problem. Our complementary approach, sharing some features with an instrumental variable strategy, is to exploit an exogenous shock that should shift earnings and to follow this shock through both the income statement and some identifiable real decisions.[4]

2.2 Charitable giving

A small but growing literature considers the causes and consequences of charitable giving. Researchers have hypothesized several benefits to firms from charitable giving,

theoretically possible that the real earnings management could improve efficiency, with some indirect supportive evidence reported by Guo, Perez-Castrillo, and Todra-Simats (2019).

[4] Our approach is reminiscent of the strategy exploited by Lamont (1997) in which he identifies exogenous variation that should not matter for firm decisions under the null hypothesis of interest. An alternative approach that exploits exogenous variation in the earnings management environment is exploited by Huang, Roychowdhury, and Sletten (2020).

including enhanced firm reputation and political influence (Bertrand, Bombardini, Fisman, and Trebbi (2018)). Consistent with the hypothesis that these types of benefits are particularly important to regulated firms, Masulis and Reza (2015) report a large and positive statistically significant relation between regulated status and corporate giving.

There is an active debate as to whether firms optimally invest in charitable giving from a shareholder value perspective. Some researchers report evidence suggesting that charitable giving is a symptom of managerial agency problems (Masulis and Reza (2015)), while others report that charitable giving in particular, and corporate social responsibility (CSR) activities more generally, are causally associated with enhanced shareholder value (Ferrell, Liang, and Renneboog (2016) and Liang and Renneboog (2017)). Earlier evidence by Brown, Helland, and Smith (2006) supports both possibilities for different subsets of firms.

This prior literature establishes that charitable spending can be viewed as a type of intangible investment that is important for the types of firms we study. The returns from this investment are difficult to measure/quantify, potentially leading to the mixed evidence on whether firms are optimizing on this dimension. Whatever the verdict on this issue, firms must have some decision rules in place regarding the desired level of charitable spending arising from the maximization of an objective function. Absent concerns about earnings, we would not expect this optimal path to depend on temporary variations in weather. At the same time, since charitable giving is expensed, discretionary, and often deferred until the end of the year, it seems like an ideal item to alter to smooth reported income in response to exogenous economic shocks. Petrovits (2006) provides supportive evidence by showing that firms that she identifies as potential earnings managers often display abnormal giving patterns. Our study complements hers, but with a very different approach for identifying earnings management behavior.

2.3 Weather

Several recent papers have explored the role of weather in the economic environment of firms. In an influential study, Perez-Gonzalez and Yun (2013) report that utility firm cash flows are sensitive to weather variation and that the introduction of weather derivatives allowed these firms to partially hedge this risk.[5] Along related lines, Brown, Gustafson, and Ivanov (2017) show that many private firms have demand that is sensitive to weather conditions and that banks play a critical role in buffering these firms financially from these shocks. Dessaint and Matray (2017) demonstrate that some firms may even overreact in their financial response to extreme weather events (hurricanes) because of a managerial bias to overweight recent experiences.

These prior studies provide evidence that weather shocks are important and substantive demand shifters for many firms, with the potential in many cases to have a large impact on a firm's financial performance and policy choices. Utilities figure prominently in this literature, given the naturally weather-sensitive nature of their revenues. Many of these utilities are large, publicly-traded, included in major indexes, and widely followed by analysts. This raises the possibility that these firms' desire to meet certain earnings expectations will clash with uncooperative (or overly cooperative) weather shocks, providing an interesting natural experiment laboratory to examine earnings management questions.[6]

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[5] Interestingly, Purnanandam and Weagley (2016) show that government weather measurements become more accurate after the establishment of an active weather derivatives market. The entire sample period we consider lies in this post-derivatives introduction era. The formation and growth in the market can be viewed as a market response to provide utilities with a device to help achieve earnings management (or other) goals.

[6] If firms can completely hedge weather risk at low cost using derivatives, we might observe no sensitivity of both income *and* spending to weather variation. Practically speaking, weather derivatives have a substantial level of basis risk, and the costs from using these tools are likely substantial. Perez-Gonzalez and Yun (2013) report that only 25% of their sample uses weather derivatives, casting down on the possibility that income risk is widely eliminated at low cost using these vehicles.

2.4 Empirical strategy

The survey and discussion above provide the motivation for our empirical strategy. Given the prior literature on weather shocks, we select a set of large utilities and match these utilities with government-derived weather data. We then consider whether the sales of these utilities are sensitive to weather, as they should be if the prior literature correctly characterizes this industry. After establishing this baseline finding, the natural question raised by the earnings management literature is whether these exogenous demand shocks are transmitted all the way down the income statement to a firm's net income. If the transmission is small or non-existent, this would suggest firms take actions to mitigate the effect of sales shocks on the bottom line, providing general, but indirect, evidence of general earnings smoothing behavior.[7]

To provide more direct evidence on the type of real activities management that can lead to this smoothing, we examine whether firms change their charitable giving in response to weather shocks. Viewing this giving as a real (intangible) investment activity with an optimal level that should be insensitive to a transitory weather shock, any significant sensitivity of giving to weather can be viewed as direct evidence of firms actively modifying real decisions to manage earnings. If other types of intangible investment scale proportionally with charitable giving (e.g., public relations or lobbying investments, executive education spending, training, etc.), the magnitude of overall real earnings management could be quite large, perhaps explaining all or most of the observed income smoothing in this industry.[8]

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[7] Instead of an earnings smoothing motivation, managers may alter real decisions because of financial constraints (see Stein (2003)). However, this would appear unlikely for our sample firms as they tend to be financially strong firms with high bond ratings and low measures of financial constraints.

[8] Cohen, Dey, and Lys (2008) and Zang (2012) present evidence on the magnitude of real earnings management activities compared to accrual-based alternatives.

Many papers in the prior literature undertake empirical comparative statics exercises to investigate whether earnings management activities are heightened in situations where incentives to do so are magnified. Thus, after establishing our main findings, we also consider extensions along these lines. There are some challenges in doing so, as the predicted signs are, in some cases, theoretically unclear, and prior empirical evidence is often mixed. In addition, our sample is small, thus potentially leading to power issues. Nevertheless, extensions along these lines have the potential to be informative and to more richly illustrate sample firm behavior, as long as these limitations are recognized. While we motivate specific tests as they are introduced, based on prior work, our general strategy considers variation by (a) timing of weather shocks during the fiscal year, (b) past evidence of earnings management behavior at a firm, and (c) firm ownership/incentive structure.

3. Sample Selection and Description

3.1 Initial sample selection

We begin with all Compustat firms with SIC codes of 4911, 4922, 4931, and 4932. Our charitable contribution data commences in 2000, and thus we study the period 2000 to 2016. Since there was some substantive consolidation in electric and gas utilities during this period, we account for large mergers or divestitures that would result in non-comparable spending numbers for a given firm over time. In particular, in all cases in which a firm's annual gross ppe expenditure differs by more than ±10% from the prior year's number incremented by its capital expenditures, we treat the firm from that point on as a new (or reincarnated) firm for the purposes of differencing or including firm fixed effects. Our selection criteria plus this treatment yields a sample of 276 firms with 1,261 firm-year observations. We successfully obtain weather data for this entire sample, so requiring weather information does not result in any dropped observations.

3.2 Charitable giving information

Firms do not report charitable giving as a separate accounting item, but many firms routinely report this information separately from their formal financial statements and/or sponsor a non-profit foundation that is required to submit an IRS 990-PF filing.[9] For each sample firm, we collect annual information on the firm's direct charitable giving and its donation to charitable foundations by aggregating all figures reported in available IRS 990 filings, firm foundation websites, available issues of the National Directory of Corporate Giving, and 10K filings. As in much prior research, we find that the most consistently reported and comprehensive sources of disclosed charitable spending levels are the 990 filings.

Since our analysis exploits changes in spending in order to remove firm-level unobserved heterogeneity, it is important that a given time series of charitable spending figures for a firm represents a consistently reported set of expenditure items that can reasonably be expected to be proportional to total charitable spending. Thus, we are careful in using the same set of data sources and aggregating items in a consistent way for each individual firm that we follow over time. In addition, to avoid using differences of more than a single year, we only include a firm-year in the charitable giving sample if we observe charitable spending for, at a minimum, the prior or subsequent firm-year.

[9] A useful description of the legal and accounting rules regarding charitable contributions by corporations is reported by Kahn (1997). Charitable contributions are often embedded in a miscellaneous account that is folded into a firm's SG&A line item (Wilkinson (2013)).

Many firms either do not appear in these data sources or do not specifically discuss/disclose charitable giving. Thus, the charitable giving data requirement results in a substantially smaller sample of 51 firms and 340 firm-year observations. We refer to this as the charity sample. Note that we do not drop an observation if our data sources report a charitable spending level of zero, as happens in a fair number of cases (i.e., we record a spending level of zero if reported as such by our data sources). Thus, missing data is truly missing and often arises because a firm does not have an associated foundation and does not routinely report charitable giving in its filings, press releases, or other sources tracked by directories. As we discuss below, utilities that tend to disclose charitable giving in our data sources tend to be larger-than-average utilities, so inferences from the charity sample are more likely to be representative of the behavior of relatively larger firms.

3.3 Weather information

We obtain weather data at the zip code level from the data vendor *Frontier Weather*. The data includes a monthly report on cooling (heating) degree days at the zip code level defined to scale linearly with the amount of time during the month that the temperature was above (below) 65 degrees Fahrenheit. Most of the underlying data is derived from official government sources (i.e., the National Oceanic and Atmospheric Administration's National Weather Service). These cooling and heating measures, abbreviated as CDD and HDD respectively, are common proxies in the industry for the level of demand for energy-related to cooling and heating. They are frequently summed into a total degree day (TDD) figure that serves as a simple aggregate indicator of total energy demand.

For each firm, we identify its headquarters location zip code in the first year it appears in the sample from historical annual Compustat header files. Since most utilities are geographically concentrated, the weather for this zip code should be closely related to the overall demand for the firm's output. We use weather, as measured by TDD at the zip code level, aggregated over all 12 months of the year, as our basic annual weather measure (calendar and fiscal years are concurrent for all sample observations).

3.4 Sample description

We report basic summary statistics for the final charitable giving sample in Table 1. All figures are inflation-adjusted to 2016 dollars and are winsorized at the 1% tails. The ratio statistics reported in the table are comparable to figures others have reported for utilities, but the firms in the final sample are larger than the typical utility. For example, the sample median assets (sales) figure reported in the table is 1.38 (1.18) times as large as the corresponding figure for the sample before imposing the requirement of having available charitable giving data.

The weather data indicates that the typical utility has a much higher level of heating degree days compared to cooling degree days, so we would expect weather variation in the peak winter months to be particularly important for sample firms. The reported mean TDD for the charitable giving sample of 5,933.46 can be divided by 365 to reveal that, on an average day, the weather in the headquarters' location zip code of a sample utility is ±16.27 degrees away from the 65 degrees Fahrenheit point. There is reasonable variation in the TDD variable, with an interquartile range of approximately one-third of the mean and median values.

Turning to charitable spending, the mean sample firm spends $5.58 million, and the mean ratio of charitable spending to net income is 1.00%. As is typical of skewed distributions related to spending, medians are substantially smaller. Certainly, it appears that charitable giving is a nontrivial spending item for many utilities. Moreover, under the reasonable assumption that tracked charitable spending is closely related to both untracked spending and expenditures with similar characteristics to the hypothesis of interest (i.e., discretionary soft expenditures that can be quickly adjusted and expensed from an accounting perspective, for example, executive education classes), our inferences will understate the overall magnitude of any economic effects. The interquartile range in spending and the average magnitude of annual changes in spending suggest substantial cross-firm and within-firm variation in charitable giving.

4. Weather Shocks, Income Items, and Charitable Giving

4.1 Weather shocks and reported income items

We now examine the role of weather shocks on various components of sample utility firms' income statements. Given the high degree of serial correlation in the data coupled with Wooldridge's (2010) discussion that first difference estimates are likely more efficient in such a setting, our default choice is to use first differences. We first estimate models that predict sales as a function of weather to confirm that weather is a key exogenous driver of demand for utilities. These models also allow us to gauge the magnitude of the underlying demand relation. We then turn to components further down the income statement to investigate whether firms appear to buffer these sales shocks, possibly through real earnings manipulation, in a way that minimizes the impact on the bottom line.

There are a variety of reasonable specification choices to model the role of weather on income statement items. To span a wide set of these choices, we focus on three distinct specifications. In what we refer to as specification 1, we model the dependent variable (i.e., sales, EBITDA, net income) normalized by the start of period book assets as a function of changes in zip-code level weather (i.e., change in total degree days in units of 1,000). To minimize the role of extremely large changes and to estimate a coefficient with an elasticity interpretation, in specification 2 ,we take natural logarithms and predict changes in the log of the dependent variable values as a function of changes in the log of weather values.[10] Finally, in specification 3, we create an alternative elasticity type model by dividing the change in the dependent variable by the firm's average value in the five years preceding the first year the firm enters the sample, while simultaneously dividing the change in weather variable by the headquarters zip code level average over this same pre-sample period.

Coefficient estimates for models predicting income statement items as a function of weather for these three alternative specifications are reported in Table 2. All models include year dummy variables. Reported standard errors, listed in parentheses under each coefficient estimate, are clustered at the firm level.

In the first three columns of Panel A of the table, we consider models predicting sales. The positive and highly significant coefficient of .020 on the weather variable in the first column of this panel indicates a strong role for the weather as a determinant of a utility firm's revenues. This estimate implies that a change in temperature of 1,000-degree days, which roughly corresponds to a one quartile change, is associated with a 2.0% increase in sales measured relative to assets. Since the sample-wide mean and median sales to assets ratios are approximately one third (see Table 1), this implies a roughly 6% increase in sales. The corresponding coefficient for the logarithmic specification in Column 2 of .238 is highly significant and implies an effect of similar magnitude, with a 2.38% increase in the sales to assets ratio for each 10% increase in weather degree days. Similarly, the highly significant coefficient of .262 in the normalized change specification in Column 3 implies that when degree days increase by 10% measured relative to the estimated normal degree-day level for the zip

[10] In all logged variables in the paper, before taking logs, we add one plus the absolute value of the minimum sample value if there are any negative values, and we simply add one before logging if the smallest value is zero. If the smallest value is positive, we do not make any adjustments before taking logs.

code, the sales to asset ratio will increase by 2.62%, measured relative to the firm's estimated normal level. Again, dividing these figures by a typical sales-to-assets ratio of one-third implies reasonably large sales-weather elasticities.

These initial estimates in Table 2 provide strong evidence that utility sales are, as expected, quite sensitive to exogenous weather variation in the geographic region where a utility operates. If a firm's profit margins are relatively fixed, or perhaps even elevated (depressed) in times of high (low) demand because of the capital-intensive nature of the business, we would expect to observe similar positive and significant sensitivities of overall profit measures to weather. However, if firms smooth earnings via accounting choices and/or real earnings devices, the impact of weather variation on profits may be muted, particularly for line items lower in the income statement where there is more scope for strategically managing cost items.

To investigate, in the first three columns of Panel B of Table 2, we present an analogous set of regressions but with EBITDA used in place of a firm's sales in constructing the dependent variables. Interestingly, in all three specifications, the weather coefficient is small in magnitude and statistically insignificant. If EBITDA/Sales ratios were fixed, we would expect these coefficients to be of similar statistical significance and roughly ¼ of the magnitude of the corresponding coefficients in the sales models, as the typical EBITDA/Sales ratios hover around .25 (see Table 1). The estimated magnitudes of the coefficients reported in the table are an order of magnitude smaller than these predicted values, and from an economic magnitude perspective, they are effectively 0.

It appears from Panel B that while sales shift up and down sharply with the weather, firms report offsetting cost adjustments that limit the impact on EBITDA. While surely many costs scale proportionally with sales, for example, raw fuel costs and some labor costs, it is difficult to envision a scenario in which these costs scale more than proportionally with sales, particularly given the capital-intensive nature of the business. Thus, the fact that EBITDA is not highly sensitive to weather is strongly suggestive of some type of earnings management (real or non-real), although, of course, the evidence is indirect.

Our initial suspicion was that EBITDA might show some sensitivity to weather shocks, even if those effects disappear by the time net income is calculated. Given that weather sensitivity already largely disappears in moving from sales to EBITDA, we expect to find a similar lack of sensitivity for all subsequent income items (EBIT, income before extraordinary items, net income, etc.). We have confirmed that this is, in fact, the case, and we report the actual estimates for corresponding net income models in the first three models of Panel C of Table 2. As the figures reveal, the estimated coefficients on the weather variable are statistically insignificant, with economic magnitudes close to zero and coefficients in some cases of the wrong sign (i.e., negative).

We have experimented with a wide variety of robustness checks and extensions to the models in columns 1-3 of Table 2, but these offer little additional insight into the behavior of firms. Fixed-effects models generally have coefficient magnitudes that are comparable to the reported first-difference coefficients in the table, but often with larger standard errors and thus lower levels of significance. If we consider larger sets of firms, for example, by not requiring membership in the charity sample, the coefficients generally tell the same story. In particular, changes in sales are always clearly dependent on the weather variable. In a few limited cases, the positive coefficient on EBITDA becomes marginally significant, but this significance always disappears by the time we consider net income. Thus, the general picture that sales are tightly linked to weather and that this sensitivity to weather demand shocks disappears as one moves down the income statement appears quite robust.

We have also explored whether this evidence related to apparent earnings management varies by the direction of the weather shock, as the scope for strategically managing costs or recording revenues may differ across economic environments. When we allow the weather slope coefficient to vary by the sign of the shock in the Table 2 models, in all cases the difference in coefficients between positive and negative shocks is insignificant. Thus, our data do not reveal any strong differences, although our detection power may be limited.

4.2 Income item variation across regulatory regimes

Since the utility rates are fixed by regulation, demand shocks should translate into sales changes as long as the regulatory process does not immediately adjust rates to neutralize the impact of any change in demand. This seems like a reasonable assumption, given the slow regulatory rate-setting process that typically spans several years (Bonbright, Danielson, and Kamerschen (1988)). Moreover, the regressions discussed above with sales as the dependent variable are measured net of any rate changes, so it must be that, in an average sense, weather demand shocks are an important driver of utility revenues. Notwithstanding this observation, there has been a trend to adjust regulated utility rates to somewhat neutralize the impact of demand variation, primarily to incentivize utilities to encourage more efficient uses of energy. States that adopt some form of this adjustable rate structure are known as "decouplers" (i.e., rates are automatically partially adjusted in an attempt to at least somewhat decouple revenues from demand changes).

To investigate how this industry feature may affect our inferences, we set a decouple dummy variable equal to 1 for all years in which the state of a utility's headquarters had adopted some decoupling in the rate structure as reported in the state-by-state list compiled by Cleveland, Dunning, and Heibel (2019). Approximately 42% of sample observations are considered decoupled using this assignment procedure. We then estimate models in which we allow weather sensitivities to vary by decoupler status in the final column of Table 2.

Consistent with the notion that decoupling weakens the sales-weather link, we detect in model 4 of Panel A of Table 2 a negative and marginally significant (t=1.73) weakening of the relationship between sales and weather for decoupled observations compared to others. This suggests that any effort to smooth earnings will be more (less) challenging for firms without (with) a decoupled regulatory structure. When we turn to the corresponding EBITDA model in Panel B, the point estimates on weather and weather interacted with the decouple variable have signs suggestive of a small positive (negative) relation between EBITDA and weather for these two sets of firms, but both are insignificant. Thus, while the point estimates are suggestive of a more challenging route to smoothing earnings for the non-decoupled observations, even these firms appear to achieve smooth enough EBITDA that a statistically significant relation with weather cannot be detected.

Once we move to net income (Panel C), the picture looks complete. Point estimates here suggest a negative and insignificant relation between net income and weather for observations in either regulatory regime. While all column 4 estimates are derived using the percent specification (i.e., specification 3), the character of these findings is unaltered if we estimate parallel models using the other two specifications (raw changes, log changes). Based on this evidence, it appears that all utilities are able to report earnings that are immune from weather shocks, even when the regulatory structure would appear to make this a more challenging task.

4.3 Charitable giving and weather shocks

The preceding evidence is certainly strongly suggestive of earnings management behavior at utilities in which managers take deliberate actions to smooth out the impact of exogenous demand shocks. However, the evidence is indirect. Thus, we next turn our attention to more directly detecting the types of firm actions/decisions that might allow apparent earnings smoothing to take place. As we discuss earlier, charitable giving is an ideal firm decision to investigate, as this investment spending is (a) expensed, (b) often deferred until near the end of the year, and (c) unlikely to have an optimal level that is related to idiosyncratic weather shocks absent earnings management concerns.

Since detected charitable spending does not scale linearly with firm size, we estimate models that exactly parallel our earlier models for sales and income, but with raw (i.e., non-normalized) charitable spending (in millions of $) used in the construction of the dependent variable.[11] Models predicting changes in this spending as a function of weather for the three types of specifications are reported in the first three columns of Panel A of Table 3.

As the table illustrates, all three models in Panel A indicate a significant positive relation between charitable giving and weather demand shocks. The 5.686 coefficient in column 1 implies that a 1,000-degree day change (approximately a one quartile move) is associated with a $5.686 million increase in charitable spending, a figure that is slightly larger than the interquartile range for this item. This suggests a relatively large sensitivity of charity to weather, consistent with a real earnings management scenario.

The elasticity-type models in Columns 2 and 3 of the same panel tell a similar story, with large positive and statistically significant coefficients on the weather explanatory variables. The Column 2 estimate of 13.903 using a log model indicates a change in charitable spending of almost 14% for each 1% change in weather, while the Column 3 estimate implies an estimated

[11] The issue of whether to normalize by size is largely unimportant in specifications 2 and 3 since these elasticity models effectively adjust for size. The findings in Table 2 (Table 3) are substantively unchanged if we drop (add) the normalization of the dependent variables by start-of-period firm assets.

4.475% change in charitable spending measured relative to an imputed normal level when weather deviates 1% from a baseline level.[12] While these varying specifications all weigh the data variation differently, the fact that they all indicate an economically large and statistically significant relation between charitable spending and weather shocks provides compelling evidence of an underlying relation, while allowing us to be agnostic on the preferred specification.

To check that this evidence is robust to even very conservative weightings of large data variations, we consider a coarse model that uses only discrete variables. Specifically, we create a dependent variable that assumes a value of +1 for charitable spending changes in the top sample quartile, 0 for changes in the middle two quartiles, and -1 for changes in the bottom quartile. Similarly, we create a discrete weather change variable that assumes a value of +1 for TDD changes in in the top quartile, -1 for the bottom quartile, and 0 otherwise. In calculating these two variables, we normalize both charitable giving changes and weather changes by the estimated normal levels for each firm, so these variables flag large changes in a relative sense. As we report in the final column of Table 3, when we regress this discrete giving change variable against the discrete weather shock variable, we again detect a significant positive relation. The estimated coefficient of .161 (p-value = 0.041) can be approximately interpreted as indicating that a top quartile weather shock raises the probability of a top quartile charitable spending increase by 16.1%.

As an additional robustness check, we estimate fixed effects (FE) models that correspond to the three first difference (FD) models discussed above. Grieser and Hadlock (2019)

[12] We do not have charitable spending data for the pre-sample period, and thus we impute a "normal" level of charitable giving by running a regression of spending against firm size in the first sample year and use the predicted value from the regression coefficients as a measure of a typical spending level for the normalization in specifications 3 and 4.

recommend comparing these two sets of estimates, even when efficiency concerns related to high levels of serial correlation dictate a preference for relying more on the first difference estimates. As we report in panel B of Table 3, the resulting fixed effects coefficients are fairly close in magnitude to the first difference estimates, particularly for the elasticity models (columns 2 and 3). Nevertheless, in all cases, the estimated coefficients on the weather variable are significant at the 10% level or better.

4.4 Additional evidence on variations in charitable giving behavior

The preceding evidence on the sensitivity of charitable giving to weather shocks is highly consistent with behavior in which firms actively manipulate spending on expensed discretionary items to deliberately smooth earnings. If the resulting path of spending decisions for these types of items deviates sharply from the first-best path, the welfare consequences of this behavior could be substantial. To add context to this evidence, we consider variation in charitable giving-weather sensitivities both across time and across firms. If firms use charitable giving to assist in their real earnings management activities, it is possible that weather shocks that appear late in the year are particularly likely to impact charitable giving, as the firm may have few alternative levers of the real activity flavor to manage annual earnings as the year-end approaches.[13] To consider this possibility, we augment the models in Panel A of Table 3 by adding a variable that represents the yearly weather change in only quarters 1 to 3. Thus, the weather coefficient will represent the implied effect of fourth-quarter weather variation, and the coefficient on change in weather over quarters 1 to 3 will indicate whether this effect is lessened in the earlier quarters of the year.

[13] A similar argument based on fiscal year timing issues with regard to advertising spending is made by Cohen, Mashruwala, and Zach (2010).

As we report in Panel A of Table 4, the evidence of a weaker weather effect earlier in the year is limited. As expected, in all cases, the coefficient on the weather variable remains positive and highly significant. However, while the coefficient on the Q1-Q3 weather variable is in all cases negative, it is significant in only two of the four specifications. In untabulated results, we have also experimented with using a Q1-Q2 dummy, but the evidence with this alteration is similarly cloudy. Thus, while the evidence here is suggestive, it is certainly not conclusive, perhaps because of limited power to detect such variation in our small sample.

A second possibility we consider is that some firms may be more aggressive earnings managers than others, in which case these firms may exhibit a greater sensitivity of charitable spending decisions to weather shocks.[14] To investigate, we attempt to identify firms that aggressively manage earnings by considering how closely they have recently met analyst expectations. Specifically, we create an aggressive earnings manager dummy variable that assumes a value of 1 for firms in which the difference between reported prior year's earnings and the mean of all IBES analyst estimates eight months prior to the fiscal year-end, all scaled by actual earnings, falls in the bottom sample quartile relative to the industry-year cohort. The idea here is that these firms managed to land very close to earnings expectations, even when those expectations were formed early in the year. The aggressive earnings manager dummy is assigned a value of 0 for all other observations.

We present models of charitable spending that add an interaction of this aggressive manager dummy variable with the weather variable in Panel B of Table 4. The resulting evidence is quite weak, with none of the estimated coefficients on the interaction terms being significant, and with one having the wrong sign (negative). We have experimented with using

[14] The suspicion that some firms have an innately higher propensity to manage earnings is implicit in many prior studies. See, for example, Chu, Dechow, Hui, and Wang (2019).

terciles to define aggressive earnings managers and/or basing this variable on analyst expectations 20 months prior to the fiscal year ending, but the findings with these alterations are substantively similar to what we report in Table 4. Given our small sample and the possibility of a high degree of noise in our aggressive earnings manager proxy, the power of these tests may be weak.

4.5 Firm ownership structure and evidence for earnings management

Given the possibility of extreme noise in categorizing firms by past earnings behavior, we next follow a more traditional approach and consider differences across firms in earnings management behavior using firm ownership characteristics to sort firms. First, we consider levels of institutional ownership, as Bushee (1998) and others present evidence that higher levels of institutional ownership may curb incentives to manage earnings owing to a more patient investor base. Second, we sort firms by levels of managerial ownership, as some prior research suggests that lower inside ownership firms may manage earnings more aggressively given their weaker incentives to manage for long-run value maximization.[15]

In columns 1-3 of Table 5, we consider the earlier baseline models of income items and charitable giving as functions of weather, but where we allow the weather coefficient to vary by whether the level institutional ownership from 13F filings was above the sample annual cohort median at the start of the observation year. If higher institutional ownership firms are less prone to managing earnings, we would expect a positive coefficient on the interaction of weather with a

[15] Prior research on this issue is mixed. Some argue that higher managerial ownership will increase incentives to manage earnings to maximize the value of any impending personal equity sales (Cheng and Warfield (2005)). However, others assert that managers who are less secure in their positions, which tend to be managers with lower ownership, will tend to have greater incentives to manage earnings (Ali and Zhang (2015), Cheng, Lee, and Shevlin (2016)). Given the convexity of option-induced incentives, we exclude options in all ownership calculations.

high institutional ownership dummy in the EBITDA and net income models (indicating a greater willingness to allow weather shocks to be transmitted to income), and perhaps a negative coefficient in the charitable giving models (indicating a greater reluctance to alter charitable giving in response to weather shocks to manage earnings).

As we report in these first three columns of Table 5, none of these predictions is borne out in the data. The coefficients in Panel A indicate that the sales sensitivity to weather is similar for both types of firms, but the signs on the EBITDA/income models in Panel B and C are all of the wrong sign, and in 2 of the 6 cases, significantly so. The response of charitable giving to weather appears quite similar across the two groups. We conclude that there is no evidence of more limited earnings management by the higher institutional ownership firms in the sample.

Th evidence from the managerial ownership models in columns 4-6 of Table 5 is more illuminating. We categorize low managerial ownership firms using a dummy variable indicating whether direct holdings by top five officers were below the sample annual cohort median as of the start of the observation year. The point estimates on sales-weather sensitivities in Panel A indicate a slightly lower sensitivity for the low managerial ownership firms, but none of the three interaction term estimates are statistically significant. However, turning to the EBITDA and net income models, all six coefficients on the ownership interaction terms are significant, suggesting that the lower ownership firms are more aggressive in mitigating the impact of weather shocks on a firm's reported EBITDA and net income. The point estimates on charitable giving in Panel D are positive in sign, which is consistent with more earnings management using for the lower ownership firms, but all are statistically insignificant at conventional levels. We interpret this evidence on managerial ownership, taken as a whole, as moderately supportive of the hypothesis that earnings management activities are somewhat more aggressive in lower managerial ownership sample firms.

5. Conclusion

In this study, we investigate earnings management activity in response to exogenous weather shocks in a sample of 51 utilities from 2000-2016. We find that weather conditions have a substantial and significant impact on sample firms' annual revenues. However, these same shocks have a negligible effect on firms' reported incomes. Since it is hard to envision a scenario in which (unmanaged) average costs for sample firms would change sharply with weather-induced demand shocks, we argue that these findings provide compelling indirect evidence for the presence of earnings management activities undertaken by managers to smooth earnings.

Motivated by this initial evidence suggesting the presence of earnings management, we search for direct evidence of real earnings management activities by studying the charitable giving behavior of sample firms. These are important expenditures for many utilities given their regulated structure and consequent public relations concerns. Moreover, they are expensed items that are somewhat opaque to outsiders and are frequently finalized near the end of the fiscal year.

We detect strong evidence that charitable spending is sensitive to weather shocks with more (less) spending when weather-induced demand shocks are positive (negative). The estimated magnitudes of these effects, measured in elasticity form, are quite large. Since the optimal level of charitable giving is unlikely to be sensitive to idiosyncratic weather shocks, these findings provide direct evidence indicating that firms are engaging in a form of real earnings management. If other types of spending with similar features behave similarly, the aggregate effect of real earnings management activities could explain the surprisingly smooth earnings behavior of the firms we study, despite the naturally high sensitivities of their fundamental economic performance to weather-induced demand shocks. We also present some admittedly limited evidence that earnings management is more acute when unanticipated weather shocks occur late in the year, and also for firms with weak managerial ownership incentives.

Our evidence indicating active earnings management efforts at utilities is interesting, particularly when juxtaposed with the findings of Perez-Gonzalez and Yun (2013). Those authors find that utilities are active users of weather derivatives, contracts that may assist in managing earnings and/or alleviating financial constraints. However, most large utilities are financially-strong firms with excellent debt market access and high bond ratings, presumably leading to few concerns about financial constraints.[16] Thus, their evidence and our findings suggest a strong desire to manage earnings amongst regulated utilities. Perez-Gonzalez and Yun (2013) present some evidence that firm value is actually enhanced by access to hedging risk management tools, perhaps because derivative usage is a relatively harmless way of smoothing earnings compared to, for example, altering investment spending on intangibles such as the charitable contributions we study. Certainly, this is an interesting issue for future research.

[16] The mean level of the Hadlock and Pierce (2010) index of financial constraints for our sample falls in the 15th percentile when measured relative to the Compustat universe.

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Table 1 - Summary Statistics

	# Obs.	Mean	Median	25^{th} Percentile	75th Percentile	Standard Deviation
Firm-years	340					
Firms	51					
Book assets ($ millions)	340	24,737.24	14,203.69	6,234.38	41,788.22	22,171.43
Sales	340	7,755.48	4,871.33	1,947.95	12,792.42	6,474.69
EBITDA	340	2,202.98	1,217.51	568.40	3,587.55	2,018.73
Net income	340	693.13	393.70	146.40	1,119.48	715.16
Book debt	340	8,337.17	5,581.98	2,025.74	13,011.37	7,374.10
Book equity	340	6,649.75	3,724.11	1,688.45	10,733.86	6,043.27
Market equity	340	11,121.72	6,021.42	2,523.70	17,489.68	11,353.21
EBITDA/sales	340	0.273	0.280	0.231	0.325	0.070
Sales/book assets	340	0.352	0.318	0.269	0.379	0.152
EBITDA/book assets	340	0.089	0.087	0.078	0.096	0.019
Net income/book assets	340	0.027	0.027	0.022	0.034	0.014
Charitable spending	340	5.58	0.79	0	4.84	10.90
Charitable spend/net income, in %	340	1.00%	0.23%	0.00%	1.35%	1.60%
Annual change in charitable spend/ sample mean spend, in %	274	3.70%	0.00%	-10.97%	18.85%	194.23%
Cooling degree days: CDD	340	1,279.67	1,033.79	670.26	1,614.55	858.38
Heating degree days: HDD	340	4,650.87	5,134.99	3,193.71	6,232.29	2,037.97
Total degree days: TDD	340	5,933.46	6,135.23	4,945.18	6,955.95	1,418.98

Note. – The sample is composed of Compustat listed utilities from 2000-2016 with charitable giving data available for at least two consecutive years from the sources described in the text. If a firm experiences a major merger/divestiture, it is treated as a new firm. All non-normalized spending figures are in millions of dollars (inflation adjusted to 2016). EBITDA is set equal to the Compustat OIBDP variable. All ratios that are normalized by book assets are divided by start of year asset values. The degree day figures are calculated by selecting a standardized reading of temperature in a firm's headquarter zip code measured in Fahrenheit each day and then calculating the absolute value of the difference between this figure and 65 degrees. Points above (below) 65 are the cooling (heating) degree day measure for the day. The sum of these figures for the year are the reported CDD and HDD. Total degree days (TDD) is the sum of CDD and HDD. All variables are winsorized at the sample 1% tails.

Table 2 – Reported Income Items and Weather Shocks

Panel A: First difference models of Sales	(1)	(2)	(3)	(4)
Weather	0.020*** (0.007)	0.238*** (0.089)	0.262*** (0.089)	0.389*** (0.112)
Weather x Decouple				-0.236* (0.137)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	3: Percent
Panel B: First difference models of EBITDA	(1)	(2)	(3)	(4)
Weather	0.000 (0.002)	0.002 (0.007)	0.015 (0.096)	0.115 (0.119)
Weather x Decouple				-0.188 (0.169)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	3: Percent
Panel C: First difference models of Net income	(1)	(2)	(3)	(4)
Weather	0.000 (0.002)	-0.000 (0.008)	-0.542 (0.414)	-0.328 (0.675)
Weather x Decouple				-0.398 (0.686)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	3: Percent

Note.- The sample includes observations for which we have annual change in charitable contribution data. Models in Panel A (Panel B, Panel C) are based on the ratio of a firm's inflation-adjusted annual sales (EBITDA, Net income) to the start of period book assets. The dependent variable in column 1 models is the simple change in this variable. The dependent variable in column 2 is the change in the natural logarithm of these values, where we add 1 plus the absolute value of the sample minimum value before taking logs whenever the minimum is 0 or negative. The dependent variable in columns 3 and 4 uses the column 1 variable and normalizes by dividing by the average value of the variable for the firm over all available years in the five-year period before the first sample observation for the firm. The weather variable in column 1 (column 2) is the contemporaneous annual change in TDD (the natural log of TDD) measured in thousands of days. The weather variable in columns 3 and 4 is the column 1 change divided by the average TDD in the firm's headquarter zip code in the five-year period preceding the sample period. The decouple variable in the column 4 models is a dummy variable that assumes a value of 1 if the observation is for a utility headquarter in a state with a decoupled regulatory structure as reported by Cleveland, Dunning, and Heibel (2019). All models are estimated via OLS and standard errors are reported in parentheses under the coefficient estimates. Standard errors are clustered by firm and all estimated models include individual year dummies. All other data treatment and variable definitions are reported in the text and preceding table. */**/*** Denotes significance at the 10%/5%/1% levels.

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Table 3 - Charitable Giving and Weather Shocks

Panel A: First difference models	(1)	(2)	(3)	(4)
Weather	5.686**	13.903**	4.475***	0.161**
	(2.535)	(6.118)	(1.679)	(0.077)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	4: Discrete
Panel B: Fixed effects models	(1)	(2)	(3)	
Weather	3.150*	11.630*	2.919**	
	(1.846)	(6.510)	(1.315)	
Number of Obs.	340	340	340	
Specification	1: Changes	2: Logs	3: Percent	

Note.- For Panel A, the sample includes all observations for which we have the firm's annual change in charitable contributions measured in millions of inflation adjusted dollars. The dependent variable in column 1 (column 2) of Panel A is this annual change (the annual change in the natural log of 1 plus the annual level of charitable giving). The dependent variable in column 3 of Panel A is the same as in column 1 but where the dependent variable is normalized by the predicted baseline charitable giving level for the firm from the first year they entered the sample using a regression model with size (assets) as an explanatory variable. The dependent variable in column 4 is a discrete variable assuming a value of +1 (-1) if the change in charitable contributions normalized by the imputed baseline level for the firm places the observation in the top (bottom) quartile, with all other observations receiving a dependent variable value of 0. The weather explanatory variable in the first three columns of Panel A is defined as in Table 2. The weather explanatory variable in column 4 is a discrete variable assigned a value of +1 (-1) if the change in TDD for the firm's zip code normalized by predicted baseline level at the start of the sample period falls in the top (bottom) quartile, and 0 otherwise. The Panel B models are firm fixed effects models that exactly parallel the corresponding Panel A first difference models. Observations are only included in Panel B if they compose one of the two endpoints in a differencing calculation used for a Panel A observation. All models are estimated via OLS (with firm fixed effects included in Panel B and eliminated by differencing in Panel A). Standard errors are clustered by firm and all estimated models include individual year dummies. All other data treatment and variable definitions are reported in the text and earlier tables. */**/*** denotes significance at the 10%/5%/1% levels.

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Table 4 – Variations in the Charitable Giving-Weather Sensitivities

Panel A: First difference models, quarterly variation	(1)	(2)	(3)	(4)
Weather	11.115*** (4.122)	27.963** (12.433)	8.464*** (2.603)	0.229** (0.088)
Q1 to Q3 Weather	-7.584** (3.598)	-14.423 (11.060)	-5.719** (2.434)	-0.101 (0.084)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	4: Discrete
Panel B: First difference models, variation by proxy for past earnings management aggressiveness	(1)	(2)	(3)	(4)
Weather	5.466** (2.205)	11.678* (6.711)	4.555*** (1.634)	0.170** (0.084)
Weather * Aggressive manager dummy	0.884 (3.295)	8.656 (15.671)	-0.302 (2.372)	-0.038 (0.162)
Number of Obs.	274	274	274	274
Specification	1: Changes	2: Logs	3: Percent	4: Discrete

Note.- All models exactly parallel the corresponding Panel A models of Table 3 in terms of sampling, variable construction, and estimation/specification details. The only modification is that each model in this table adds an additional variable. In Panel A, the added variable is constructed using the quarter 1 through 3 total degree day change in the firm's zip code compared to the same period a year earlier. The raw (logged/normalized/discretized) value of this variable is used in columns 1 (2/3/4) using the same exact treatment as in the earlier tables applied to the quarter 1 through 3 weather figures. In normalizing this variable for models 3 and 4 of Panel A, we divide by the estimated normal annual weather (TDD) in the zip code rather than a specific Q1-Q3 estimate. In Panel B, we sort observations into annual-4 digit sic code quartiles based on the absolute value of the distance between prior year's earnings and analyst predictions of those earnings eight months before the fiscal year end, scaled by the actual earnings number. The aggressive earnings manager dummy is assigned a value of 1 for observations in the bottom quartile and 0 otherwise. This dummy is then interacted with the annual weather variable in each model. */**/*** denotes significance at the 10%/5%/1% levels.

Table 5 – Ownership Measures and Sensitivity to Weather

	Institutional Ownership			Managerial Ownership		
Panel A: Models of Sales	(1)	(2)	(3)	(4)	(5)	(6)
Weather	0.022*** (0.008)	0.252** (0.122)	0.303*** (0.102)	0.027*** (0.008)	0.352*** (0.112)	0.374*** (0.110)
Weather x High Institutional Own	-0.004 (0.010)	-0.034 (0.147)	-0.081 (0.1110)			
Weather x Low Managerial Own				-0.013 (0.012)	-0.182 (0.137)	-0.202 (0.133)
Number of Obs.	274	274	274	274	274	274
Specification	1:Changes	2:Logs	3:Percent	1:Changes	2:Logs	3:Percent
Panel B: Models of EBITDA	(1)	(2)	(3)	(4)	(5)	(6)
Weather	0.002 (0.002)	0.011 (0.009)	0.160 (0.128)	0.003* (0.002)	0.015 (0.010)	0.226 (0.142)
Weather x High Institutional Own	-0.004 (0.002)	-0.018 (0.012)	-0.287 (0.197)			
Weather x Low Managerial Own				-0.005*** (0.002)	-0.024** (0.010)	-0.382*** (0.142)
Number of Obs.	274	274	274	274	274	274
Specification	1:Changes	2:Logs	3:Percent	1:Changes	2:Logs	3:Percent
Panel C: Models of NI	(1)	(2)	(3)	(4)	(5)	(6)
Weather	0.002 (0.002)	0.010 (0.010)	-0.207 (0.421)	0.002* (0.001)	0.011* (0.007)	0.247 (0.365)
Weather x High Institutional Own	-0.003** (0.002)	-0.027*** (0.010)	-0.670 (0.474)			
Weather x Low Managerial Own				-0.003* (0.002)	-0.020** (0.009)	-1.429*** (0.462)
Number of Obs.	274	274	274	274	274	274
Specification	1:Changes	2:Logs	3:Percent	1:Changes	2:Logs	3:Percent
Panel D: Models of charitable giving	(1)	(2)	(3)	(4)	(5)	(6)
Weather	5.908* (2.937)	13.701* (7.555)	5.479** (2.058)	4.055** (1.752)	9.807 (8.055)	4.226** (1.621)
Weather x High Institutional Own	-0.479 (3.337)	0.397 (10.552)	-1.982 (2.462)			
Weather x Low Managerial Own				3.253 (2.765)	7.103 (11.746)	0.451 (2.119)
Number of Obs.	274	274	274	274	274	274
Specification	1:Changes	2:Logs	3:Percent	1:Changes	2:Logs	3:Percent

Note.- The sample is the same as in the prior tables, and all models are augmented versions of the first difference models in the earlier tables (Table 2 for the Panel A/ B/C models and Table 3 for the Panel D models), with the same dependent variables, weather variables, and specification labeling as in those earlier tables. The high institutional ownership dummy assumes a value of 1 for firms with institutional ownership above the sample median using sample annual cohorts and Thomson-Reuters 13F institutional ownership data (supplemented with hand collected data as needed) as of the start of the fiscal year that the dependent variable change is measured. The high managerial ownership dummy assumes a value of 1 for firms with the percentage of managerial ownership at the start of the observation year above the sample median using sample annual cohorts and summing Execucomp data (supplemented with hand collected dated as needed) on the percentage of total shares (excluding options) held by all executives of the firm. All models are estimated via OLS and standard errors are reported in parentheses under the coefficient estimates. Standard errors are clustered by firm and all estimated models include individual year dummies. All other data treatment and variable definitions are reported in the text and preceding table. */**/*** Denotes significance at the 10%/5%/1% levels.