Hidden in the Woodshed:
Big Bath Herding

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Abstract

This paper investigates both theoretically and empirically, how firms' reporting is affected by their peers in a situation of a systematic economic shock. We show that the optimal reporting strategy is consistent with bad news herding – after the firms most affected by the shock (Leaders) disclose bad news, it is optimal for their peers (Followers) to also report bad news, even when such disclosure can be further postponed. Importantly, Followers not only strategically time the release of bad news, but also undertake a "big bath" by reporting excessive amount of bad news. We empirically test our model and find evidence of big bath herding. We demonstrate that Leaders' write-offs are more strongly associated with economic indicators than those of Followers, while Follower's write-offs have a greater association with big bath and smoothing reporting incentives. Further, consistent with the over-reporting strategy, we find that Followers demonstrate superior future operating performance in terms of accrual accounting earnings but not in terms of cash flows.

Keywords: big bath, herding, write-offs.

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1. Introduction

"*If you are a smart CEO, you're going to write off everything and then some, maybe even to below-market prices, because you're going to be hidden in the woodshed with everybody else*" (*Wall Street Journal*, October 4, 2007 "Are Banks' Charges Result of Honest Tack, Or "Big Bath" Strategy?").

The majority of existing accounting studies (Moore, 1973; Healy, 1985; Strong and Meyer, 1987; Francis et al., 1996; Kirschenheiter and Melumad, 2002) examine "big bath" behavior of individual firms without considering how this behavior can be affected and even induced by their peer firms' actions.[1] However, as we demonstrate theoretically and empirically the big bath strategy can also arise as an optimal response to other firms' reporting choices, i.e., it has a "collective" or "coordinative" nature. We show that when a negative shock affects a group of firms in the economy, firms herd to disclose bad news after observing their peers' write-offs and report write-offs even when such disclosure could be further postponed. More interestingly, as an optimal equilibrium strategy, herding firms over-report bad news.

We offer a parsimonious model that reflects conservatism of Generally Accepted Accounting Principles (GAAP) and the discretion in its implementation, adding to the extant literature on the interaction between mandatory and voluntary disclosure (Dye, 1990; Einhorn, 2005; Bagnoli and Watts, 2007; Einhorn and Ziv, 2008).[2] Conservatism of GAAP requires firms

[1] "Big Bath" has become the general term that describes a large asset write-down, or other non-recurring charge strategically taken by a management team, that makes the current period's poor results look even worse, but helps report better future earnings.

[2] For example, ASC 350, Intangibles: Goodwill and Other (Financial Accounting Standard Board (FASB) [2009a]) requires at least an annual impairment test for goodwill and indefinite-lived intangibles when it is more likely than not that their fair values are materially less than their carrying amounts. ASC 360, Property, Plant, and Equipment (PP&E) (Financial Accounting Standard Board (FASB) [2009b]) requires that PP&E and finite-lived intangible assets be tested for impairment when circumstances warrant. These assets are impaired if they are evaluated and found not to be fully recoverable (i.e., their carrying amount exceeds the estimated gross undiscounted cash flows from their use and disposition). The amount of impairment is measured as the excess of the asset's carrying value over its fair value. For more information about the impairment of PP&E and finite-

to write-down most non-financial assets when their fair values drop sufficiently below their carrying values, but generally does not allow firms to write-up assets when the fair values rise above their carrying values. We model a situation when a negative systematic shock affects a group of firms leading to the reduction in their assets' fair value. While write-off disclosure reduces a firm's stock price (Francis et al., 1996) and the manager is often interested in keeping the stock price high by postponing a write-off, he must disclose bad news at some point to comply with GAAP due to potential litigation concerns or a lack of resources to further postpone a write-off (Kothari et al., 2009).[3] In our model, after the firms with materially large bad news (Leaders) disclose their write-offs, market updates other firms' (Followers') market value conditioning on this information. We demonstrate that Followers' equilibrium strategy is to voluntarily accelerate bad news disclosure and write-off devaluated assets even when a write-off can be further postponed because the market would interpret non-disclosure as pessimistically as possible. Moreover, Followers' equilibrium strategy is to undertake a big bath and write-down assets below their fair value if such excessive write-offs can be used to gain future benefits,[4] because their stock prices are less sensitive to write-offs after Leaders' disclosure that effectively separates the worst firms.

We use data from the National Bureau of Economic Research (NBER) on two major recessions – the 2001 recession induced by the dot-com crash and the 2008 recession induced by

lived assets, see ASC 360-10-35. The subjectivity of fair value determination and auditors' and regulators' difficulty in verifying fair value estimates give rise to considerable discretion in the application of impairment rules. In addition, the recoverability test, which is less stringent than a strict fair value test, gives managers justification for additional discretional choices when reporting impairments.

[3] For example, in the second-quarter of 2007, managers of Merrill Lynch & Co Inc. tried to hide the company's problems and had asked hedge funds to take its troubled assets for a year in an off-balance sheet credit facility. The effect of such a deal would reduce Merrill exposure to collateralized debt obligations However, in the next quarter, Merrill Lynch & Co Inc. still had to undertake an 8.4 billion write-down, the largest quarterly loss in its history (*Reuters*, November 2, 2007, "*Merrill Shares Fall as Credibility Questioned*").

[4] For example, big bath can allow a firm to smooth earnings in later periods (Kirschenheiter and Melumad, 2002), or to meet analysts' forecasts (Moehrle, 2002).

the financial markets meltdown – as a natural experiment to test our empirical predictions. For each recession, we classify firms into Leaders and Followers based on the timing of their large write-offs. We define a "Leader" as a firm that had a write-off around the beginning of the recession, and a "Follower" as a firm that had a write-off in the subsequent periods.

Supporting the predictions of our theoretical model, we start by demonstrating that the financial market reacts less negatively to Followers' write-offs than to Leaders'. We also confirm our theoretical prediction that Followers time their write-offs to occur soon after their peers' write-offs by showing that the probability of a Follower's disclosure at a specific time is positively associated with the number of peers' write-offs in the preceding three months.

Both these effects, i.e., a reduced market reaction to Followers' write-offs and herding among firms, can also be attributed to a common economic shock itself and its spillover effect on market prices of affected firms.[5] However, if herding is non-strategic and solely driven by a shock, Leaders' and Followers' write-offs should not be different in that they should be unbiased representation of the underlying firms' economic conditions. Therefore, to further demonstrate the strategic nature of the herding, we need to show that Followers and only Followers do a big bath when they write-off their assets. To do that, we perform two sets of tests. First, we link Leaders' and Followers' ex-ante characteristics and managerial incentives with their write-offs. If Followers strategically time their write-offs to herd after Leaders and over-report write-off amounts, then we expect that Followers' write-offs are less reflective of their economic performance and are more strongly associated with managerial reporting incentives than the write-offs of Leaders. Consistent with this, we find that Followers' write-offs are less strongly associated with the decline in

[5] In our empirical analysis, to separate the common shock effect from the strategic herding, we control for synchronicity between a firm's earnings and stock returns and its industry peers' earnings and returns.

profitability over the five years preceding the event and more strongly associated with proxies for big bath and smoothing incentives than Leaders' write-offs.

In the second set of tests, we consider Leaders' and Followers' post-disclosure performance. If Followers indeed excessively write-off assets by shifting their future accrued expenses into the current reporting period, then we expect Followers to report higher future bottom line income, which includes all accrual accounting items such as depreciation and amortization, as well as other non-operating expenses, than Leaders. In contrast, Followers' future performance measured by operating cash flows and operating income should be indistinguishable from that of Leaders, because cash flows are accrual free and operating income does not contain depreciation and other irregular accounting items that are most susceptible to future reversals. Consistent with the excessiveness of Followers' write-offs, we find that Followers report a greater increase in future ROA than Leaders, but no difference in future operating cash flows and operating income. Overall, our empirical results support the model's prediction that big bath herding can arise as an optimal response to peer firms' reporting.

Our paper is most closely related to Tse and Tucker (2010), who examine earnings warnings using duration analysis and find evidence of warnings clustering, suggesting that managers herd and time their warnings to occur soon after their peers' warnings. The similarity between our papers is in the finding that managers herd to report unfavorable information: earnings warnings in Tse and Tucker (2010) and write-offs in our paper. However, there are two fundamental differences between the two papers. First, we not only demonstrate that firms herd in reporting bad news, but also show that they strategically overstate bad news, i.e., they do a big bath. Second, we study reasons behind herding and link herding to future benefits such as reporting higher operating performance.

Our study makes several contributions to the literature. First, we show theoretically and empirically that in the event of a negative economic shock firms strategically time the release of bad news by herding with their peers; furthermore, the herding firms undertake a big bath, i.e., over-report the amount of bad news. While Acharya et al. (2011) show that the release of negative information tends to be clustered and not necessarily postponed as was suggested by prior research (Dye, 1990; Dye and Sridhar, 1995; Genotte and Trueman, 1996; Shin, 2003), we document the *excessive* bad news reporting arising as an equilibrium strategy during the herding - a new result not presented in prior theoretical or empirical literature. Our finding of strategic over-reporting of unfavorable information can be applied to a variety of events such as accounting restatements, earnings warnings, and changes in accounting standards.

Second, we contribute to the big bath literature by extending prior research that considers big bath behavior as a firm-specific event (Moore, 1973; Healy, 1985; Francis et al., 1996; Riedl, 2004). We are the first to model and provide empirical evidence of a big bath herding – a big bath that arises not only as a response to firm-level events such as managerial turnover or bad performance, but also as a response to other firms' reporting choices. Additionally, we differentiate between non-discretionary and discretionary large write-offs. While Lawrence et al. (2013) underscore the impact of non-discretionary conservatism, which results from the unbiased application of GAAP, the literature often designates *all* large non-recurring charges as "big bath" (Haggard et al., 2015; Cready et al., 2012; Atiase et al., 2004). We refer to "big bath" as a reporting behavior arising from a purposeful intervention in the financial reporting in order to adjust the amount and possibly the timing of large asset write-downs, and we provide a theoretical prediction of when we expect to observe an un-biased or a discretionary application of conservatism. Further,

we show that firms' future reporting is different following non-discretionary and discretionary write-offs.

Third, we contribute to the growing managerial herding literature (Tse and Tucker, 2010; Myers et al., 2013; Bratten et al., 2016), which presents empirical evidence of bad news herding in cases of earnings warnings, restatements, and missing analyst forecasts. In this paper, we present evidence that managerial herding behavior also appears in relation to accounting write-offs, and further demonstrate that by herding firms gain future benefits. While prior studies only assume that managers herd to reduce personal responsibility or to gain future benefits, we are the first study that provides evidence that managers indeed succeed in their actions.

The rest of the paper is organized as follows. Section 2 reviews prior research. Section 3 presents a theoretical model of big bath herding, and Section 4 discusses our model's empirical predictions and research methodology. Section 5 describes the data, and Section 6 presents the results. We conclude the paper with Section 7.

2. Prior research

Our research focuses on firms' behavior at times when negative economic shocks affect the economy. Specifically, we address three research questions: 1) whether firms herd and time their write-offs to occur soon after their peer firms' write-offs; 2) whether herding firms undertake a big bath by over-reporting the write-offs; and 3) whether firms gain future benefits from big bath herding. Therefore, we integrate two streams of research: literature on herding and the literature on big bath.

2.1 Bad news herding: theories

Most of prior the literature on disclosure document that firms appear to delay the release of bad news (Dye, 1990; Dye and Sridhar, 1995; Genotte and Trueman, 1996). Dye and Sridhar (1995) study herding behavior in disclosures and model the sequence of managers' actions leading to strategic clustering even in the absence of information cascades (Avery and Zemsky, 1998; Arya and Mittendorf, 2005) and reputation herding (Trueman, 1994; Graham, 1999). They assume that the information arrival is correlated across firms, and find clustering of good and bad news.

Most related to our paper is Acharya et al. (2011). They assume that the information arrival is independent across firms, but that the information itself is positively correlated. Consistent with prior research (Dye, 1990; Rajan, 1994; Dye and Sridhar, 1995; Genotte and Trueman, 1996; Miller, 2002), they find that in absence of the external public signal about the state of the economy, release of bad news will be delayed. However, when there is an external public signal about market conditions, under certain parameters (i.e., only when firms can receive and release their information before the arrival of external public information about the state of the economy), bad news will be promptly released by firms while good news will be released later. As a result of this pattern of disclosure, bad news and only bad news announcements will be clustered.

In our model, we incorporate both mandatory and voluntarily disclosures: if a piece of bad news is material enough, "bad" firms have to make a mandatory write-off, while "good" firms with less material bad news have an option to voluntarily report or withhold a write-off. We also extend the prior models by allowing for three types of disclosure: firms can 1) refrain from disclosure, 2) truthfully disclose a write-off by unbiased application of GAAP, or 3) conservatively over-report a write-off by adjusting the amount and timing of conservative accounting. We believe that a model of non-discretionary and discretionary applications of accounting rules more realistically reflects the current reporting environment. The opportunity to exercise discretion

arises from the subjectivity of GAAP. For example, most of non-financial assets must be written down when their fair values drop sufficiently below their carrying values, but the determination of fair value estimates involves considerable subjectivity. As a result, auditors and regulators also have difficulty with verification of such estimates. Finally, we model disclosures in discrete times (e.g., Acharya et al., 2011 model disclosures in continuous time), to better incorporate a nature of accounting write-offs that are reported in quarterly financial statements.

2.2. Bad news herding: empirical findings

The majority of empirical papers on herding focus on herding among financial intermediaries such as financial analysts (Welch, 2000; Clement and Tse, 2005), mutual and hedge fund managers (Grinblatt et al., 1995; Werners, 1999), and financial media (Graham, 1999). Studies on strategic herding in accounting reporting are very limited.

Tse and Tucker (2010) is one of the first empirical papers dealing with managerial strategic reporting choices that lead to bad news clustering. They employ a duration model to study whether managers "herd" in disclosing earnings warnings. Tse and Tucker (2010) find evidence of clustering in earnings warnings, and argue that bad news herding is driven by managerial incentives to shift blame for poor performance to external factors and minimize personal responsibility for earnings shortfalls. However, they neither link firms' ex-ante incentives to firms' herding decisions nor provide evidence that firms actually benefit from herding. Such causes and consequences analysis would provide additional insight on reasons behind firms' decisions strategically time bad news disclosure. In our paper, we fill this gap and link firms' ex-ante incentives to their herding behavior and present evidence that firms indeed gain benefits from herding.

Myers et al. (2013) extends the bad news clustering literature by showing that firms' restatement disclosure choices are influenced by the disclosures of their industry peers. Bratten et al. (2016) examine how the reported performance of a leader affects discretionary reporting of the followers (all firms in the same industry that announce earnings after the leader). They find evidence that if the leader (defined as a larger firm within an industry that is the first to announce earnings) misses the financial analysts' earnings forecast, the followers report lower discretionary accruals and are more likely to miss analysts' expectations as well. Such reporting behavior is consistent with bad news herding, where followers strategically use discretion to flock with the leader when the leader reports bad news. Evidence on good news herding, i.e., that followers are more likely to use discretion and meet analysts' expectations when the leader reports good news, are more limited, consistent with Acharya et al. (2011), who predict bad news, but not good news herding.

While the above papers present evidence of bad news herding in different settings, e.g., earnings warnings, meeting analysts' expectations, and restatements, they only assume that managers herd to reduce personal responsibility or to gain future benefits, but do not provide evidence that managers indeed succeed in their actions. We complement extant empirical studies by presenting new evidence that managers obtain future benefits, i.e., managers are able to report higher future net income by timing their write-offs to occur soon after their peers' write-offs and doing a big bath.

2.3. Big bath: theories

While modeling of earnings management and earnings smoothing is quite prolific (Dye, 1988; Trueman and Titman, 1988; Fudenberg and Tirole, 1995), big bath modeling is rather

limited. One notable exception is Kirschenheiter and Melumad (2002), who present a model in which both earnings smoothing and the big bath reporting strategies can arise in equilibrium. As investors do not know a firm's real long-term earnings and the precision of announced earnings, they try to infer this information from managers' reports. On the one hand, when a firm experiences a large positive earnings surprise, to maximize the firm's value, the manager would underreport current earnings and create reserves to report positive earnings surprises in the future. On the other hand, when a firm faces a large negative earnings surprise, the manager has an incentive to over-report current losses to induce extra noise that reduces inferred earnings precision; additionally, over-reported losses can be reversed in future periods to report smoother earnings.

Our big bath model complements findings presented in Kirschenheiter and Melumad (2002), who model optimal reporting for a single firm, as we consider reporting interactions among multiple firms. While Kirschenheiter and Melumad (2002) demonstrate that a big bath reporting strategy can arise in equilibrium for a single firm, we show that the firm's big bath can be triggered by the bad news reporting of its peers.

2.4. Big bath: empirical findings

Broadly speaking, the big bath empirical literature investigates 1) determinants and incentives of big bath reporting, and 2) the informational environment of large non-recurring charges. Exploring the determinants and incentives of big bath behavior, an extant literature considers firm-specific factors such as managerial turnover and the effect of extreme earnings surprises on managers' compensation and the firm's market value. For example, managerial turnover is regarded as one of the important factors influencing large write-offs due to either greater scrutiny of new top management over the value of existing assets or to new management's incentives to take all potential charges and attribute them to the preceding management team

(Moore, 1973; Strong and Meyer, 1987; Francis et al., 1996; Riedl, 2004). Extreme earnings surprises might induce bath accounting from the managerial compensation perspective if earnings in the current period are too low to reach a pre-specified bonus benchmark (Healy, 1985), and from the capital market perspective if large surprises reduce the inferred precision of the reported earnings and lessen their effect on firm value (Kirschenheiter and Melumad, 2002; Riedl, 2004).

Regarding the informativeness of large non-recurring charges, the literature develops transparency and opacity hypotheses. If a write-off realigns reporting values with economic values, then it enhances the informativeness of a firm's financial reporting (Haggard et al., 2015; Elliott and Shaw, 1988; Francis et al., 1996). Alternatively, large non-recurring charges can hide ongoing poor operating performance as they can be reversed at a later period to artificially inflate future earnings (Moehrle, 2002; Atiase et al., 2004; Bens and Johnston, 2009; Riedl and Srinivasan, 2010).

Our paper adds to the extant literature by showing that the big bath is not only driven by firm-specific events like managerial turnover or bad performance, but also arises as a strategic response to other firms' reports. Additionally, we distinguish between non-discretionary and discretionary large write-offs. Lawrence et al. (2013) underscore the impact of extant accounting rules on conservative accounting and the importance of taking them into account when explaining cross-sectional variation in conservatism. However, the accounting literature often designates *all* large non-recurring charges as "big bath" (Haggard et al., 2015; Cready et al, 2012; Atiase et al., 2004). In our paper, we denote by "big bath" the reporting behavior arising from purposeful intervention in the financial reporting in order to adjust the amount and timing of conservative accounting. Our model provides a theoretical prediction of when we expect to see unbiased and

discretionary application of conservatism and helps us document big bath herding – a cluster of excessive write-offs.

3. Model

Graham (1999) points out that most of the existing empirical herding studies examine empirical clustering without directly testing the implications of herding models. In this paper, we first develop a model of bad news herding, and then empirically test the model's implications. By doing so, we are able to 1) link firms' ex-ante characteristics to their reporting choices; 2) present evidence of big bath herding; and 3) examine how firms benefit from the herding strategy.

There are *N* identical firms with initial value *V*, normalized to 1. The market price of firm *i* is given by $P_{i,t} = E[V_i \mid I_t]$, where V_i is the value of firm *i* (where $i \in [1, N]$), and I_t denotes the information set available to the market at period *t*.

In *Period 0*, a systematic economic shock $\delta \in U[0,1]$ affects each firm simultaneously, though to a different extent, so that value V_i of firm *i* becomes: $V_i = 1 - \delta_i$, where $i \in [1, N]$ and δ_i is a realization of δ, i.e., $\delta_i \in [0,1]$.[6,7]

In *Period 1*, firms with the most material losses (the *Leaders*), i.e., firms with $\delta_i \geq \delta^*$, are forced to follow accounting rules and write-off devaluated assets.[8] For simplicity, we assume that $\delta^* = 1/2$ (the equilibrium presented below will exist for any value of $\delta^* \in (0, 1/2]$). Parameter δ^* represents a materiality threshold, so that any loss greater than δ^* (recall that δ is expressed

[6] While we assume a uniform distribution for δ, δ can be given by any continuous strictly positive density function.

[7] Alternatively, δ_i can be interpreted as a percentage of firm's *i* value, and assuming that initial value of a firm is 100%.

[8] The assumption of forced disclosure for firms with most significant losses can be relaxed by introducing cost (even marginal) for delaying a write-off. In this case, the main result of herding behavior with a big bath will stay the same as in presented parsimonious model with a forced disclosure.

as a percentage of the firm's value) is considered to be material and is required to be disclosed immediately. When disclosing losses, Leaders can choose to disclose them truthfully, or to overstate losses and to take a big bath. The rest of the firms, the *Followers* (i.e., firms with $\delta_i < \delta^*$), can voluntarily disclose write-offs in Period 1. If a Follower decides to do a write-off in Period 1, it can do so truthfully, or with a big bath. The market prices the firms disclosing write-offs, and updates values for non-disclosing firms.

In *Period 2*, the Followers that did not disclose write-offs in Period 1 decide whether to disclose write-offs in Period 2. If a Follower decides to do a write-off in Period 2, it can do so truthfully, or with a big bath. The market prices firms disclosing write-offs, and updates values for non-disclosing firms.

In *Period 3*, the firms' terminal values are determined.

We denote firm's *i* disclosure as: $d_i = \delta_i + b_i$, where δ_i denotes the write-off due to a real loss, and b_i denotes the excessive write-off, or a big bath. We model the big bath as a fraction of the real loss, so that $0 \le b_i \le k\delta_i$, where $0 \le k \le 1$. Coefficient k determines the highest possible big bath as a fraction of the real loss δ. Say, if $k = 30\%$ then the big bath could not exceed 30% of the real loss. Coefficient k can also be interpreted to represent the "leniency" of accounting rules: the higher is k the higher are possibilities for a big bath.

The firm's objective function is to maximize the Period 3 share price. We also assume that a firm is gaining potential future benefits from a big bath as a big bath allows the firm to create a "cookie jar" to be utilized later (for example, to smooth earnings in later periods, as in Kirschenheiter and Melumad, 2002; or to meet analysts' earnings forecasts as in Moehrle, 2002). Therefore, the firm's objective function is given by:

$$U_i(P_{i,3}, b_i) = P_{i,3} + \beta \cdot b_i, \quad \text{where } 0 \le \beta \le 1 \qquad \text{(M1)}$$

First, let us make the following observation. If a Follower does not disclose a write-off in Period 1, then, in equilibrium, it necessarily discloses a write-off in Period 2. This follows from the observation that after the Leaders' write-offs in Period 1, the market updates other firms' values based on conditional expectations. Thus, if a firm does not make a disclosure in Period 2, the market assumes this is the firm with a maximum loss among all firms that did not make a disclosure in Period 1 (i.e., that $\delta = \delta^*$ for this firm), since otherwise the firm would have incentives to deviate and disclose a smaller loss (Dye and Sridhar, 1995).

Next, we will demonstrate that (M2) is an equilibrium reporting strategy profile:

$$\begin{cases} d_i = \delta_i \quad in\ Period 1\ for\ any\ \delta_i \ge 1/2 \\ d_i = \delta_i + b_i = \delta_i + k\delta_i \quad in\ Period 2\ for\ any\ \delta_i < 1/2 \end{cases} \qquad \text{(M2)}$$

(M2) reporting strategy assumes that any firm with $\delta_i \ge 1/2$ will truthfully report the real loss in Period 1; and any firm with $\delta_i < 1/2$ will wait for Period 2 to disclose losses and to make a big bath. In response to the strategy profile (M2), the market rationally prices firms so that upon the disclosure by the Revelation Principle the pricing must satisfy:

$$P_{i,t} = E[V_{i,t} \mid I_t] = E[V_{i,t} \mid d_{i,t}] = 1 - \delta_i \qquad \text{(M3)}$$

As follows from (M2) and (M3), in terms of the reported write-off amount d_i, an equilibrium pricing rule can be written as:

$$\begin{cases} P_{1,i} = 1 - d_i \quad in\ Period 1 \\ P_{2,i} = 1 - \dfrac{1}{1+k} d_i \quad in\ Period 2 \end{cases} \qquad \text{(M4)}$$

Next, we will demonstrate that (M2) and (M4) are indeed an equilibrium, i.e., we will show that no firm will deviate from the reporting strategy (M2) given the pricing rule (M4).

Let's start with Period 2 (backward induction). As was shown above, all firms with $\delta_i < 1/2$ will make disclosures in Period 2. The reporting profile (M2) suggests that all firms making a disclosure in Period 2 will undertake a bid bath $b_i = k\delta_i$, i.e. taking the maximum possible big bath. Below we demonstrate that deviating from this strategy, i.e., reporting less than a maximum possible big bath is suboptimal. Let's consider utility from the reporting strategy (M2) – denoted by $U^*(P_{i,2}, b_i)$, and the utility from a deviated reporting $\widetilde{d}_i$ - denoted by $\widetilde{U}(\widetilde{P}_{i,2}, \widetilde{b}_i)$, where $\widetilde{b}_i = b_i - \Delta b_i$, and Δb_i is an extent of deviation from the maximum big bath.

$$
\begin{aligned}
&U^*(P_{i,2}, b_i) = 1 - \frac{1}{1+k} d_i + \beta b_i = 1 - \frac{1}{1+k}(\delta_i + k\delta_i) + \beta k\delta_i = 1 - \delta_i + \beta k\delta_i \\
&\widetilde{U}(\widetilde{P}_{i,2}, \widetilde{b}_i) = 1 - \frac{1}{1+k}\widetilde{d}_i + \beta \widetilde{b}_i = 1 - \frac{1}{1+k}(\delta_i + \widetilde{b}_i) + \beta \widetilde{b}_i = \\
&1 - \frac{1}{1+k}(\delta_i + k\delta_i - \Delta b_i) + \beta(k\delta_i - \Delta b_i) = 1 - \delta_i + \beta k\delta_i - \Delta b_i(\beta - \frac{1}{1+k})
\end{aligned}
\qquad \text{(M5)}
$$

As can be seen from (M5), $U^*(P_{i,2}, b_i) > \widetilde{U}(\widetilde{P}_{i,2}, \widetilde{b}_i)$ for any $\beta \geq 1/(1+k)$. Therefore, for this range of parameter β, it is never optimal to deviated from the reporting strategy (M2) and report any but the maximum big bath in Period 2.

As given by (M2) and (M4), in Period 1, $d_i = \delta_i$, and the pricing rule is $P_{i,1} = E[V_{i,1} \mid d_i] = 1 - d_i$. However, if a firm decides to deviate from truthful reporting, and reports a big bath $\widetilde{d}_i = \delta_i + \widetilde{b}_i$, then the market would price such deviated reporting as $\widetilde{P}_{i,1} = 1 - \widetilde{d}_i = 1 - \delta_i - \widetilde{b}_i$. Let's consider the firm's utility from the reporting strategy (M2), denoted by $U^*(P_{i,1}, b_i)$, and utility from a deviated reporting $\widetilde{d}_i$, denoted by $\widetilde{U}(\widetilde{P}_{i,1}, \widetilde{b}_i)$.

$$
\begin{aligned}
&U^*(P_{i,1}, b_i) = 1 - d_i + \beta b_i = 1 - \delta_i + \beta b_i = 1 - \delta_i + \beta \cdot 0 = 1 - \delta_i \\
&\widetilde{U}(\widetilde{P}_{i,1}, \widetilde{b}_i) = 1 - \widetilde{d}_i + \beta \widetilde{b}_i = 1 - \delta_i - \widetilde{b}_i + \beta \widetilde{b}_i = 1 - \delta_i - \widetilde{b}_i (1 - \beta)
\end{aligned}
\qquad \text{(M6)}
$$

As can be seen from (M6), $U^*(P_{i,1}, b_i)$ is always greater than $\widetilde{U}(\widetilde{P}_{i,1}, b_i)$, and, therefore, deviating from the truthful reporting strategy is not optimal for any firm reporting in Period 1.

The intuition for this equilibrium strategy is quite straightforward. Since the pricing rule (M4) is very "sensitive" to write-offs in Period 1 (i.e., a slope of a price-response coefficient is 1 for reported losses), it is never optimal to undertake a big bath for firms reporting in Period 1 (Leaders). Therefore, Leaders will report their losses truthfully. As for firms reporting losses after the Leaders (Followers), the result is opposite. Since the pricing rule is less "sensitive" to write-offs that are reported in Period 2 (i.e., a slope of a price-response coefficient is $1/(1+k) \leq 1$ for reported losses), it is optimal for firms with smaller losses wait until the Leaders are revealed to the market, and then report excessive losses, i.e., undertake big bath. This is what we call a "strategic big bath herding".

4. Empirical predictions and methodology

4.1 Empirical predictions

The above theoretical analysis generates several empirical implications. Our first empirical prediction follows from the equilibrium strategy that if in the presence of a negative economic shock a firm that did not disclose a write-off in the first period, it will make such disclosure in the second period. This implies that Followers, firms that could otherwise postpone write-off disclosure, will accelerate the timing of their disclosure after observing peers' write-offs. This equilibrium strategy leads to our first empirical hypothesis:

H1: *A firm's likelihood of reporting write-offs increases with the number of peer firms that reported write-offs in the prior periods.*

Further, the model predicts that it is optimal for Followers to over-report the write-off amounts. Ideally, to test the excessiveness of Followers' write-offs, we would measure the "normal" and "excessive" portions of write-offs and compare them across Leaders and Followers. However, the precise amount of the fundamental decrease in asset value due to a negative economic shock is difficult to measure because of the unusual nature of the event. Concerned that any proposed expectation model will yield highly noisy results, we instead use series of indirect tests and one direct test of write-offs reversals to access the excessiveness of Followers' write-offs. Thus our second set of empirical hypotheses follows from the differential association between unbiased and excessive write-offs with their ex-ante economic determinants and managerial incentives. If Leaders truthfully report a decrease in asset value, their write-offs should be stronger associated with ex-ante economic performance than the write-offs of Followers who exacerbate the decrease in assets value. Similarly, if Followers exercise a greater discretion over the amount of write-offs and strategically time the write-offs, we expect that their write-offs are greater associated with the managerial reporting incentives than those of Leaders. This leads to the second set of our empirical hypotheses:

H2a: *The association between write-offs and ex-ante economic performance differs for Leaders and Followers.*

H2b: *The association between write-offs and reporting incentives differs for Leaders and Followers.*

The third set of our empirical hypotheses follows from the differential impact of excessive and truthful write-offs on firms' future accounting reporting. By reporting an excessive write-off a firm efficiently shifts its future expenses into a current period (Elliott and Hanna, 1996; Burgstahler et al., 2002). Confirming this notion, literature finds a positive association between

negative special items and future performance attributing it, at least partially, to the accelerated and excessive expense recognition (Moehrle 2002; Atiase et al., 2004; Cready et al., 2012). On the other hand, literature debate whether improved performance can be also attributed to real improvements to efficiency and/or strategic refocusing after the write-offs, and propose alternative accounting measures with various degrees of reliance on accruals to differentiate between expense shifting and real improvement (Atiase et al., 2004; Cready et al., 2012). On the one hand, if a firm creates a reserve by transferring future expenses into write-downs or restructuring charges, the release of this reserve would be reflected in the bottom line GAAP income as it includes all accrual accounting items. On the other hand, a transfer of future expenses into current period will not improve operating cash flows, which are accrual free, or operating income, which excludes depreciation and other irregular accounting items that are most susceptive to management discretion and possible future reversals. Therefore, *ceteris paribus*, if Followers shift future expenses by overstating their write-offs, their future operating performance measured by bottom line accounting earnings would be higher than that of Leaders, while their future cash flows and operating income would not be different from those of Leaders. The above discussion leads us to our third set of empirical hypotheses:

H3a: *Followers experience better future performance measured by bottom line GAAP accounting earnings than Leaders.*

H3b: *Followers' future performance measured by operating cash flows and operating income is indistinguishably different from that of Leaders.*

4.2 Empirical research design

4.2.1 Herding

We use duration analysis to test our empirical hypothesis H1 that Followers time their write-offs to occur soon after industry peers' write-off vbs. In particular, we estimate whether the probability of reporting a write-off by firm *i* is affected by the incidences of its industry peers' write-offs, given that firm *i* has not reported write-offs since the beginning of the sample period. Because the timing of write-offs reporting is discrete, i.e., firms provide financial reporting on a quarterly basis, we use a general piecewise log-logistic model for our analysis. This general non-parametric model does not make an assumption about a particular hazard function specification within each reporting interval, but allows for time-varying covariates. [9] We do so by estimating the following logistic regression:

$$\begin{aligned} Pr(WO_i) = a_0 + \ & b_0 Peerwriteoff(t)_i + b_1 UE_i + b_2 \Delta Sale_i + b_3 RET_i \\ & + b_4 Size_i + b_5 MKTshare_i + b_6 WRITEOFF_i + b_7 SynEarn_i \\ & + b_8 SynRet_i + \sum_{j=n}^{N} d_j DTIME_j + e_i \end{aligned} \tag{1}$$

where the dependent variable WO_i is equal to one if firm *i* experiences a large write-off (the sum of COMPUSTAT items WDP and RCP exceeds one percent of lagged total assets) in the reporting quarter and zero otherwise. Our primary variable of interest is $Peerwriteoff(t)_i$, measured as the number of large write-offs reported by industry peers in the three month period preceding firm *i*'s write-off. [10] If, as predicted by our theoretical model, a manager's decision to write-off the assets is accelerated by the peers' write-offs, the coefficient on $Peerwriteoff(t)_i$ should be positive.

[9] We also followed Tse and Tucker (2010) and used Cox proportional hazard model for the duration analysis. Proportional hazard models specify a common baseline hazard function for all firms and allow individual firms' hazard functions to differ proportionally with observed covariates. In that specification, the time of the write-off is assumed to be continuous and is measured as the number of days from the beginning of the recession. The results of this alternative specification are similar to those reported in the paper.

[10] We also used an alternative specification, which measures the number of large write-offs by industry peers during six month preceding firm *i*'s write-off, and obtained similar results.

Alternatively, if manager's decision is not influenced by peers' write-offs, the coefficient estimate is expected to be insignificantly different from zero. . $DTIME_j$ are duration-interval dummy variables representing either calendar reporting quarters or months after negative economic shock.

We include three sets of control variables in this regression that are identified in the prior literature as being associated with firms' decisions to write-off assets (Francis et al. 1996; Reidl 2004). The first set captures economic conditions that affect a firm's decision. In particular, we use a magnitude of pre-write-off unexpected earnings (UE_i), sales growth ($\Delta Sale_i$), and cumulative abnormal stock return (RET_i) in the year prior to the event. We define, UE_i as the difference between operating earnings (COMPUSTAT item OIADP) in the event quarter and operating earnings from the same quarter last year, deflated by a firm's total assets at the end of the last fiscal year prior to the event. $\Delta Sale_i$ is a firm's sales growth during the calendar year preceding the event quarter. RET_i is a firm's cumulative abnormal return computed over the year preceding the event.

The next set of control variables reflects a firm's disclosure environment, litigation concerns, and investors' scrutiny. In particular, we include a firm's market capitalization ($Size_i$), measured as a natural logarithm of firm *i*'s market capitalization at the end of the last fiscal year preceding the event, and a market share of a firm's product in the industry ($MKTshare_i$), measured as the ratio of a firm's total sales in the most recent fiscal year before the event over the industry's total sales in that year. In addition, to control for litigation concerns, we include the amount of write-offs ($WRITEOFF_i$), which is the sum of the write-downs and restructuring charges (COMPUSTAT items WDP and RCP), converted to positive values, deflated by the total assets at the end of the last fiscal year prior to the event.

Our final set of control variables accounts for synchronicity of a firm's earnings and stock returns with the industry peers, $SynEarn_i$ and $SynRetFirm_i$. Firms with fundamentals that are highly synchronous with their industry peers are more likely to be affected by common shocks and thus have a propensity to write-off assets faster. Following Tse and Tucker (2010) and Morck et al. (2000), we measure earnings synchronicity ($SynEarn_i$) by the R^2 of the regression of a firm's return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry assets) in the 20 quarters before the event quarter. Similarly, we calculate stock returns synchronicity ($SynRetFirm_i$) as the R^2 of the regression of a firm's weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter (Tse and Tucker, 2010; Piotroski and Roulstone, 2004). We convert all continuous control variables into within-industry-quarter ranking because we are interested in examining a firm's disclosure behavior relative to the industry peers. While we rank $WRITEOFF_i$ only among the firms included in our write-off sample, all other control variables ($UE_i, \Delta Sale_i, RET_i$, $Size_i, MKTshare_i, SynEarn_i, SynRet_i$) are ranked among *all* firms in the industry quarter that are covered by COMPUSTAT and CRSP.

4.2.2 Write-offs determinants of Leaders and Followers

Our empirical hypotheses H2a and H2b predict that the associations between write-offs and economic factors and reporting incentives differ for Leaders and Follower. Following Riedl (2004) and Francis et al. (1996), we test these hypotheses by running the following Tobit regression:

$$
\begin{aligned}
WRITEOFF_i = \; & a_0 + Leader[a_{0t}\sum_{t=1}^{2} Shock_t + \; a_1 RET_i + \; a_2 BM_i + \; a_3 \Delta BM_i \\
& + a_4 \Delta ROA_i + a_5 \Delta MGMT_i + a_6 BATH_i + a_7 SMOOTH_i \\
& + a_8 HIST_i + a_9 Size_i + a_{10} MKTShare_i + a_{11} SynEarn_i \\
& + a_{12} SynRet_i \;] \\
& + Follower\left[b_{0t}\sum_{t=1}^{N} Shock_t + \; b_1 RET_i + \; b_2 BM_i + \; b_3 \Delta BM_i \right. \\
& + b_4 \Delta ROA_i + b_5 \Delta MGMT_i + b_6 BATH_i + b_7 SMOOTH_i \\
& + b_8 HIST_i + b_9 Size_i + b_{10} MKTShare_i + b_{11} SynEarn_i \\
& \left. + b_{12} SynRet_i\right] + \; e_i
\end{aligned}
\tag{2}
$$

where the dependent variable ($WRITEOFF_i$) is the sum of firm *i*'s write-down and restructuring charges (COMPUSTAT items WDP and RCP) deflated by the total assets at the end of the last fiscal year prior to the event quarter (converted to positive amount), and zero if firm *i* is a non-write-off firm.

This regression represents the stacking of two regressions: the first where the observations are from the "Leaders' period", and the second where the observations are from the "Followers' period". The stacking of the equations enables statistical tests of the difference in coefficient estimates across the two periods. This regression requires identification of benchmark non-write-off firms in the Leaders' and Followers' periods. We use as a benchmark group all firms with necessary financial data from the matched industries, which report earnings in the same period but do not record large write-offs. $Leader$ is an indicator variable, which equals one for Leaders observations occurring in the "Leaders' period", and zero otherwise. The ***a*** coefficients of the first regression measure association between write-off amounts and the economic factors and

managerial reporting incentives of Leaders. Similarly, $Follower$ is an indicator variable, which equals one for the Followers observations in the "Followers' period"; and the $\boldsymbol{b}$ coefficients measure the same association for Followers. We include dummy variables, $Shock_t$, for each economic shock to control for the variation in write-offs that might be caused by any macro-economic shifts and interact these intercepts with variables $Leader$ and $Follower$.

To test whether the association between write-offs and ex-ante economic performance differs for Leaders and Followers, we include the following proxies for economic firm-specific factors that capture the underlying performance of a firm's assets: abnormal stock return (RET_i), book-to-market ratio (BM_i), mean change in book-to-market ratio (ΔBM_i), and mean change in return on assets (ΔROA_i) over years -5 to -1 prior to the event year (Francis et al., 1996; Riedl, 2004). Abnormal stock returns RET_i of firm i is cumulated over the year preceding the event and adjusted by market-wide returns.[11,12] We expect the likelihood and amount of write-offs to be negatively associated with past stock performance. BM_i is the ratio of firm i's book value of equity (COMPUSTAT item CEQ) and market capitalization computed as number of shares outstanding (COMPUSTAT item CSHO) multiplied by the stock price (COMPUSTAT item PRCC_F) at the end of the last fiscal year preceding the event year. High book-to-market ratio might indicate a decline in a firm's performance or lack of growth opportunities and thus be positively related to the likelihood and the amount of write-off. Alternatively, firms with low book-to-market ratio, which tend to be young and growth, might be more severally impacted by economic shock and thus be more likely to write-off assets. Therefore, we do not make a prediction about the sign of the coefficient on BM_i. Mean change in book-to-market ratio (ΔBM_i) and return on assets (ΔROA_i)

[11] For non-write-off firms, *RET* is the computed over the year preceding the earnings announcement date.
[12] We also use size and book-to-market adjusted returns and obtain qualitatively similar results.

over the five years preceding the event year capture a more general and systematic decline in a firm's performance. We expect that firms with increased ΔBM_i are more likely to write-off assets. Similarly, we expect that ΔROA_i is negatively related to write-offs.

To test whether the association between write-offs and reporting incentives differs for Leaders and Followers we include the next set of variables: $\Delta MGMT_i$, $BATH_i$, $SMOOTH_i$. Our first variable is the change in management ($\Delta MGMT_i$), which is defined as an indicator variable that equals one if a firm experiences the change in top three executives either in the event year or in the prior year. Literature shows that the change in top management is associated with write-offs (Francis et al., 1996; Riedl, 2004) due to either greater scrutiny of new top management over the value of existing assets, or to new management's incentives to take all potential charges and attribute them to the preceding management team. Accordingly, we expect that the change in management is positively associated with the extent of the write-offs. However, we do not anticipate that this association is different for Leaders and Followers because the change in top management is usually not at management discretion. Next, following Bartov (1993), Francis et al. (1996) and Reidl (2004), we include separate proxies for "big bath" ($BATH_i$) and "smoothing" ($SMOOTH_i$) incentives that are caused by large unexpected earnings. Kirschenheiter and Melumad (2002) present a model showing that a larger earnings surprise reduces the inferred precision of the reported earnings and thus lessens its effect on firm value. While unexpectedly low earnings create the incentives for managers to take "big bath", unexpectedly high earnings create the incentives to "smooth" earnings.[13] Accordingly, $BATH_i$ equals the change in pre-write-off operating earnings from quarter t-4 to t, divided by the total assets at the end of the last fiscal year

[13] Additionally, managers with earnings-based bonus plans might have incentives to report write-offs if the pre-write-off earnings are already below or much higher the target (Healy, 1985).

before the event, when this change is negative, and zero otherwise, while $SMOOTH_i$ equals the change in pre-write-off operating earnings when this change is positive, and zero otherwise. We expect that Leaders' and Followers' write-offs are negatively associated with $BATH_i$ and positively associated with $SMOOTH_i$. However, if Followers exercise greater discretion over the amount and timing of write-offs, as predicted by our model, we expect these associations to be stronger for Followers than for Leaders.

We include additional variables to control for a firm's disclosure environment, litigation concerns and investors scrutiny. Similarly to regression (1) we include $Size_i$, $MKTShare_i$, $SynEarn_i$, and $SynRet_i$, which are defined the same way as in regression (1). In addition, we control for the history of write-offs ($HIST_i$) because, as evidenced by Elliot and Hanna (1996) and Francis et al. (1996), the likelihood of a write-off increases with the number of write-offs a firm had in the past. $HIST_i$ is equal to the number of large negative write-off reported by firm *i* in the previous five years. Similarly to regression (1) we convert RET_i, BM_i, ΔBM_i, ΔROA_i, $BATH_i$, $SMOOTH_i$, $HIST_i$, $Size_i$, $MKTShare_i$, $SynEarnFirm_i$, and $SynRetFirm_i$ into ranked within industry-quarter variables, because we are interested in examining a firm's disclosure behavior relative to the industry peers.[14]

4.2.3 Future performance of Leaders and Followers

We test our empirical hypotheses H3a and H3b by running the following OLS regression:

[14] These variables are ranked among all firms in the industry quarter that are covered by COMPUSTAT and CRSP.

$$\begin{aligned}\Delta PERF_{i,t,t+2} = {} & \gamma_0 + \gamma_1 Follower_i + \gamma_2 PERF_{i,t} + \gamma_3 \Delta PERF_{i,t-1,t} \\ & + \gamma_4 \Delta ROE_{i,t-5,t} + \gamma_5 \Delta BM_{i,t-5,t} + \gamma_6 \Delta SALE_{i,t-1,t} \\ & + \gamma_7 WRITEOFF_i + \gamma_8 INDGROWTH_i + \gamma_9 FINLEV_i \\ & + \gamma_{10} SIZE_i + \gamma_{11} BM_i + \gamma_{12} MKTShare_i + \gamma_{13} \Delta MGMT_i \\ & + \gamma_{14} SynEarn_i + \gamma_{15} SynRet_i + \mu_i\end{aligned} \quad (3)$$

where dependent variables ($\Delta PERF_{i,t,t+2}$) measure the change in future performance of firm *i* from the event year *t* to two years after the event. We use three performance measures: change in industry adjusted return on equity ($\Delta ROE_{i,t,t+2}$), change in operating cash flows ($\Delta CFO_{i,t,t+2}$), and change in operating income ($\Delta OPINC_{i,t,t+2}$). Return on equity (*ROE*) is calculated as the ratio of income before extraordinary items (COMPUSTAT item IB) to the total shareholders' equity (COMPUSTAT item CEQ). Operating cash flows (CFO) are computed as the ratio of cash from operations (COMPUSTAT item OANCF) to the total shareholders' equity. Finally, operating income (OPINC) is the ratio of operating income before depreciation and amortization (COMPUSTAT item OIBDP) to the total shareholders' equity. All performance measures are adjusted by the industry performance by subtracting industry median ROE, CFO or OPINC.[15]

Our main variable of interest is $Follower_i$, which is an indicator variable that is equal to one if firm *i* is a Follower and zero otherwise. If Followers make excessive write-offs by shifting future period expenses into the current period, we expect that their future ROE, which encompasses all accrual components, is higher than that of Leaders, who report write-offs truthfully and thus do not have accrual reserves that help achieve better future accounting performance. Therefore, we expect a positive coefficient on $Follower_i$ when $\Delta ROE_{i,t,t+2}$ is a dependent variable. However, we expect that coefficient on $Follower_i$ is insignificantly different

[15] We determine industry based on the two-digit SIC code.

from zero when $\Delta CFO_{i,t,t+2}$ and $\Delta OPINC_{i,t,t+2}$ are dependent variables because these accounting measures do not contain highly discretionary accrual components that can be used by managers to release reserves created by excessive write-offs.

We control for firm characteristics that were shown in the prior literature to be correlated with the change in future performance. In particular, we include the level and change in the past performance measures ($PERF_{i,t}$ and $\Delta PERF_{i,t-1,t}$), where $PERF_{i,t}$ is either industry adjusted ROE, CFO or OPINC at the event year and $\Delta PERF_{i,t-1,t}$ is the change in these measures from one year before the event year to the event year. A systematic decline in a firm's performance before the write-off, measured as the mean change in book-to-market ratio (ΔBM_i) and return on equity ($\Delta ROE_{i,t-5,t}$) over five years preceding the event year, might affect the speed of a firm's recovery from a negative economic shock and thus are included as control variables. We include a firm's sales growth ($\Delta SALE_{i,t-1,t}$) in the year prior to the event year because a trend in sales growth affects future performance. The write-off amount ($WRITEOFF_i$) is also included in our control variables. We include industry growth ($INDGROWTH_i$), which is computed as mean change in aggregated industry sales over the five years prior to the event year, to control for the effect of overall industry trend on individual firm. We also include financial leverage ($FINLEV_i$), defined as the ratio of total assets (COMPUSTAT item TA) to the book value (COMPUSTAT item CEQ) at the end of the last fiscal year prior to the event. Finally, we control for size ($SIZE_i$), book-to-market ratio (BM_i), market share ($MKTShare_i$), change in top management ($\Delta MGMT_i$), and synchronicity of a firm's earnings and stock returns with the industry peers ($SynEarn_i$ and $SynRet_i$), which are defined the same way as in regressions (1) and (2).

5. Data and Sample selection

We use two major negative economic shocks that affect a wide-range of industries - 2001 recession of dot-com crush and 2008 recession associated with financial crisis - to test our theoretical model. NBER defines recession as a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. A recession begins when the economy reaches a peak of activity and ends when the economy reaches its trough. NBER's Business Cycle Dating Committee maintains a chronology of the U.S. business cycle.[16] The recession of 2001 lasted from March 2001 to November 2001, while recession of 2008 – from December 2007 to June 2009. These recessions provide a natural experiment to test our hypothesis because (i) they affected almost all industries in the economy and (ii) were strong enough to trigger write-offs.

We take advantage of the expanded COMPUSTAT reporting on categories of special items and define the write-off event as any quarter observation for which the sum of pre-tax "write-downs" (COMPUSTAT item WDP) and "restructuring costs" (COMPUSTAT item RCP) exceeds one percent of lagged firm's total assets.[17] Starting from 2000, Compustat provides a breakdown of largely ambiguous category "Special Items" on items related to (i) Acquisition/Merger, (ii) Gain/Loss on Sale of Assets, (iii) Impairment of Goodwill, (iv) Settlement (Litigation/Insurance), (v) Restructuring Costs, (vi) Writedowns, (vii) Extinguishment of Debt, (viii) In-Process Research & Development, and (ix) other Special Items. Managers have differential discretion over the

[16] See announcements from the NBER's Business Cycle Dating Committee, http://www.nber.org/cycles.html.

[17] Prior literature takes two approaches for identification of large and unusual income decreasing items – (i) identification of announced asset write-downs (Strong and Meyer, 1987; Zucca and Campbell, 1992; Francis et al., 1996) and (ii) classifying as an event any fiscal year-end observation in Compustat for which Special Items (SPI) is negative and exceeds one percent of lagged firm total assets (Elliot and Shaw, 1988; Riedl, 2004; and Haggard et al., 2015). Our methodology is based on the latter approach while taking advantage of the expanded classification of Special Items.

timing and amount of different types of special items. For example, managers have little discretion over reporting losses from legal/insurance settlements, extinguishment of debt, or in process R&D because the timing of events that trigger these items is often controlled by the outside party. We believe that writedowns and restructuring charges are best suited for testing our model of managerial discretion over the reporting strategies. We chose not to consider goodwill impairments for two reasons. First, the recession of 2001 falls to the transition period from the long-accepted practice of amortization of goodwill acquired in business combinations under SFAS 121 "Accounting for impairment of long-lived assets" to SFAS 142 "Goodwill and other intangible assets", which instead requires companies to review goodwill for impairment periodically and to recognize a loss if goodwill is impaired. SFAS 142 became effective for fiscal years beginning after December 15, 2001, with early adoption permitted for fiscal years beginning after March 31, 2001. During the transition period from December 15, 2001 to December 31, 2003, which includes the first fiscal year of application of the standard for all the companies, firms were permitted to report a loss under "cumulative effect of accounting changes" as a below the line item in income statement (Beatty and Weber, 2006; Li et al., 2011). Thus, during the transition period firms' reporting incentives related to impairment of goodwill might differ from those, which we consider in our model. Second, after the adoption of SFAS 142, goodwill impairment becomes more of a common event, as evidenced by higher frequency of reporting goodwill impairment losses and lesser market response to such losses (Li et al., 2011), than a reaction to unusual negative economic shocks.

The first step of our sample selection is to identify large write-off firm-quarter observations that have earnings announcements during period starting from 3 months before and ending 18 months after the beginning of the recession and have non-missing financial data necessary to our

analysis.[18] We chose to start 3 months before the beginning of the recession, determined by NBER, to capture reporting of the bellwether industries or firms. Prior literature shows that certain industries or firms, which are characterized by high interconnectedness with their direct suppliers/customers and/or indirect chains of downstream sectors, may originate aggregate fluctuations from microeconomic shocks (Acemoglu et al., 2012; Aobdia et al., 2014; Ahern and Harford, 2014; Bonsall et al., 2013) and thus these industries/firms may write-off assets even before the beginning of the recession. We identified 840 firm-quarter observations with large write-offs at the first step.

Second, following prior literature we eliminate financial firms and firms in gas, oil and utilities industries as these firms have different regulatory environment (Francis, 1996; Riedl, 2004; Haggard et al., 2015). In particular, we exclude observations in industries with codes 30 (Petroleum and Natural Gas), 31 (Utilities), 45 (Banking), 46 (Insurance), 47 (Real Estate), 48 (Trading) and 49 (Almost Nothing) of Fama and French (1993) 49-industry classification and retain 788 firm-quarter observations.

Third, because our goal is to study how the timing and magnitude of a firm's write-off is affected by its peers, we retain only the first firm-quarter write-off reported during the sample period. Any write-offs that are subsequent to a firm's first write-off might be influenced by its own financial situation and market reaction to its previously announced write-off and we don't have model predictions for such scenarios. After this step we retain 542 firm-quarter observations.

Fourth, we require that each industry has at least three qualifying events per recession, and delete 29 events that fail to satisfy this requirement. Fifth, we define "Leader" as any firm that has

[18] We require the presence of the following variables: total assets, shareholders' equity, market value of equity, sales, net income, operating cash flows, operating earnings, and CEO's name in the year preceding the write-off year and write-off year; monthly stock returns during the year preceding the write-off; and daily stock returns over (0;+3) days relative earnings announcement.

a write-off during the period starting 3 months before and ending 3 months after the beginning of the recession, and "Follower" as any firm that has a large write-off during our sample period starting 3 months after the beginning of recession. We exclude industries for which we did not observe large write-offs during Leader's period ([-3;+3] months relative to the beginning of recession).[19] This brings us to our final "write-off" sample of 459 firms. Table 1 summarizes our sample selection process. In addition, we construct a matching benchmark sample of firms with non-missing required financial data that did not have large write-offs during the recession period and belong to the same industry as firms in our "write-off" sample. This benchmark "non-write-off" sample is comprised of 6,800 firm-quarter observations.

Our stock return data comes from the Center for Research in Security Prices (CRSP) monthly returns database, while financial statement data and other company information are extracted from Merged CRSP-COMPUSTAT database. We obtain analyst coverage from the I/B/E/S database, both its detail and summary history files, for each stock in our sample using historical CUSIP codes to link these two databases. The number of analysts covering a stock is defined as the number of unique analysts issuing EPS forecast during a calendar year.

Table 2 Panel A displays the frequency and amount of write-offs by industry and recession. Computers, Business Services, Computer Software, and Electronic equipment industries have the largest number of write-offs in 2001 recession (18, 19, 30, and 46, respectively). Similarly, Computer Software, Business Services, and Electronic Equipment have the most write-offs in 2008 recession (16, 22, and 28, respectively). The higher frequency of write-offs in these industries

[19] We did not observe significant write-offs during (-3;+3) months relative to the beginning of the recession for following industries: Food Products (recession 2001 and 2008); Printing and Publications in recession 2008 – 7 observations; Pharmaceutical in recession 2008 – 9 observations; Machinery in recession 2008 – 9 observations; Telecommunication in recession 2001 – 4 observations; Measuring and Controlling Equipment in recession 2008 – 11 observations and Shipping in recession 2008 – 4 observations.

might be explained by the greater number of firms operating in them. For the majority of industries, the Leader group consists of 1-3 firms.

Table 2 Panel B summaries the frequency of write-offs relatively to the recession peak for all firms in our sample. First two months after the beginning of the recession have the highest frequency of reporting write-offs among Leaders (40 and 30 observations, respectively). Firms most frequently report write-offs in the months 4, 7 and 10 in the Follower's period. Figure 1 graphically summarizes the frequency of Leaders' and Followers' write-offs relative to the beginning of recession. Around 73% of all write-offs are done in one year period from the beginning of the recession.

Table 2 Panel C reports the frequency of write-offs by fiscal quarters. Consistent with the prior research, we observe that firms are more likely to report write-offs in the fourth fiscal quarter than in any other quarter: 188 out of 459 large write-offs (or 41% of all write-offs) are taken in the fourth quarter. Importantly, the percentage of write-offs in the fourth quarter is the same for Leaders and Followers, suggesting that our choice of Leader and Follower periods does not bias us towards finding of accelerated write-offs for Followers.

We summarize the characteristics of Leaders and Followers in Table 3. Leaders and Followers are similar in size and market share of their products in the industry. The median of the mean change of return on assets (ΔROA) over years -5 to -1 prior to the event for the Leaders (-0.005) is more negative than for the Followers (-0.001), indicating that Leaders might have lesser ability to postpone the write-off than Followers because their performance declined substantially more. Similarly, the mean and median cumulative abnormal return computed over the year preceding the write-off is more negative for the Leaders than for Followers. The rest of the firm characteristics of Leaders and Followers are statistically similar with the exception of book-to-

market ratio and return synchronicity. The mean book-to-market ratio is lower for the Leaders than for Followers indicating that growing firms tend to lead the write-offs triggered by the recession. The return synchronicity, measured as the R^2 of a firm's weekly stock returns on the value weighted market returns and industry returns in the calendar year before the event quarter, is higher for Followers than for Leaders, suggesting that stock prices but not earnings of Followers are more sensitive to the price movement of the peer firms than that of Leaders.

6 Empirical Results

6.1 Price response to write-offs of Leaders and Followers

We start our empirical analysis by confirming the conjecture of our theoretical model that market reacts less negatively to Followers' write-offs than to Leaders'. Because information about large write-downs and restructuring charges is most often disclosed at the earnings announcements (Francis et al., 1996), we regress stock returns at the time of earnings announcement on the amount of write-offs, controlling for earnings surprise and other factors that might influence price elasticity. We do so by running OLS regression in the following form:

$$\begin{aligned} ANNRET_i = {} & \gamma_0 + \gamma_1 WRITEOFF_i + \gamma_2 Follower_i \\ & + \gamma_3 WRITEOFF_i * Follower_i + \gamma_4 UE_i + \gamma_5 Size_i + \gamma_5 BM_i \\ & + \gamma_5 SynRet_i + \gamma_5 SynEarn_i + \tau_i \end{aligned} \qquad (4)$$

where $ANNRET_i$ is firm *i's* compounded excess return over days 0 and +3 relative to earnings announcement day. Excess return is measured as the difference between the realized return and the corresponding size and book-to-market portfolio of firms on CRSP-COMPUSTAT universe.[20] $WRITEOFF_i$ is the sum of the write-down and restructuring charges (COMPUSTAT items WDP

[20] We obtain daily size and book-to-market benchmark portfolio returns from professor's French website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

and RCP), converted to positive values, deflated by the total assets at the end of the last fiscal year prior to the event quarter; and $Follower_i$, is an indicator variable, which equals one if firm i is a Follower and zero otherwise. A negative coefficient on $WRITEOFF_i$ would indicate that stock returns at the time of announcement react negatively to a firm's write-offs. To capture the differential price sensitively to write-offs of Followers and Leaders, we interact the size of write-off, $WRITEOFF_i$, with a $Follower_i$ dummy. A positive coefficient on this interaction term would indicate that stock returns react less negatively per dollar of write-off amount for Follower than for Leaders.

To control for other information that was contemporaneously announced, we include adjusted for the write-offs earnings surprise (UE_i), which is calculated as the difference between operating earnings (COMPUSTAT item OIADP) in the event quarter and operating earnings from the same quarter of the last year, deflated by a firm's total assets at the end of the last fiscal year prior to the event. Other control variables include $Size_i$, BM_i, $SynRet_i$ and $SynEarn_i$, which are described in section 4.

Table 4 reports coefficient estimates of regression (5). The coefficient estimates on $WRITEOFF_i$, $Follower_i$, and UE_i are insignificantly different from zero. The coefficient estimate on the interaction of $WRITEOFF_i$ with $Follower_i$ is significantly positive (0.486), indicating that Followers' price-response for the write-off amount is lower than that of Leaders'. Among other control variables, only coefficient estimate on book-to-market ratio is positive and significant (0.011). Overall, Table 4 results support our theoretical conjecture that market reacts less negatively to Followers' write-off than to Leaders'.

6.2 Herding

Panel A of Table 5 provides intuitive description of write-offs clustering by reporting how soon Followers disclose a write-off after the most recent peer's write-off. We group Follower's by the interval in month (30 days) between a firm's write-off and the most recent peers' write-off (either Leader of Follower). We observe that in the majority of cases (316 write-offs or 89.77%) a firm announces a write-off within four months after the most recent write-off announcement of its peer firms. For example, the number of firms announcing write-offs in the same month as peers is 27 (7.67%); the number of write-offs announced in the next month is 179 (50.85%). The number of firms reporting write-offs after 4 month from the most recent peer's write-off decreases substantially. For example, only 8 firms report write-offs in the month five. This pattern of reporting is consistent with herding behavior.

Panel B presents the duration analysis of regression (1) that tests our empirical hypothesis H1. The estimation uses 887 quarterly observations from 353 Followers. Positive and statistically significant coefficient on $PEERWRITEOFF(t)_i$ (z-statistics=29.92) indicates that the probability of reporting a write-off by a Follower, which has not been reporting write-offs previously, in a particular month is positively associated with the number of peers' write-offs in the preceding three month. The effect of $PEERWRITEOFF(t)_i$ is also economically significant as evidenced by the odds ratio of 1.306, which indicates that the odds that a Follower will report a write-off is 30.6 % higher if the number of write-offs recently reported by peers' increases by 1. Supporting our empirical hypothesis H1, this result suggests that Followers accelerate the reporting of write-offs after observing peers' recent write-offs.

The estimation results of the control variables are as follows. The coefficient estimates on $WRITEOFF_i$ is negative and significant (-0.186), consistent with model prediction that firms with smaller write-offs will be the first to herd. The probability of write-offs increases with unexpected

earnings, cumulative abnormal return in the year prior to the event, size, and synchronicity of earnings, as evidences by positive and significant coefficient on UE_i (1.520), RET_i (0.176), $SIZE_i$ (0.274), and $SynEarn_i$ (0.200). The coefficients on change in sales, market share and synchronicity of returns are all insignificant.

6.3 Write-offs determinants of Leaders and Followers

Table 6 presents the Tobit analysis examining our empirical hypothesis H2a and H2b regarding the differential association between Leaders' and Followers' write-offs and their ex-ante economic performance and managerial incentives. For the economic indicators, for Leaders, coefficient estimates on cumulative abnormal return (RET_i) and mean change in return on assets (ΔROA_i) are as predicted significant and negative, -0.004 and -0.004, respectively, while the coefficient estimate on ΔBM_i is statistically insignificant. For Followers, the coefficient estimate on RET_i is also negative and significant (-0.005), while coefficient estimates on ΔBM_i, ΔROA_i are statically insignificant.

For the reporting incentives, for Leaders, coefficient estimates on change in management ($\Delta MGMT_i$) and proxy of "big bath" ($BATH_i$) are insignificant, while coefficient on proxy for smoothing incentives ($SMOOTH_i$) is significant at 10% significance level but negative. For Followers, coefficient estimate on ($\Delta MGMT_i$) is also insignificant, suggesting that during big economic shocks change in management does not play essential role in reporting write-offs. For Leaders, coefficient estimate on $BATH_i$ is negative and significant (-.009) as predicted; and coefficient estimate on $SMOOTH_i$ is positive and significant (0.006) also as predicted.

Among the control variables for a firm's disclosure environment, litigation concerns and investors scrutiny, coefficient estimates on $Size_i$ are significant and negative for both Leaders and Followers (-0.007 and -0.008, respectively), while coefficient estimates on $MKTShare_i$ are positive

and significant for both groups (0.008 and 0.009, respectively). The coefficient estimate on book-to-market (BM_i) is negative -0.003 for Leaders, and insignificantly different from zero for Followers. All other variables are statistically insignificant.

As we discussed in sections 4.1 and 4.2.2, the empirical hypotheses are stated in terms of the relative associations between write-offs and economic indicators and reporting incentives across Leaders and Followers. Thus, relating to empirical hypothesis H2a, a comparison of coefficients across Leaders and Followers reveals significantly negative difference of the coefficient estimate on ΔROA_i (difference is -0.004; z-statistics is 10.86) and BM_i (difference is -0.004; z-statistics is 2.05). A negative difference between coefficient estimates on ΔROA_i indicates that Leaders' write-offs are more strongly associated with such important economic indicator as the decline in profitability over the five years preceding the event than Followers' write-offs. Significant negative difference between coefficient estimate on BM_i suggests that Leaders' have lower book-to-market ratios, which are often used as proxies for growth, than Followers.

Examining empirical hypothesis H2b, we observe that coefficient estimates on $BATH_i$ is more negative for Followers than for Leaders (difference is 0.007; z-statistics is 3.99) and coefficient estimate on $SMOOTH_i$ is more positive for Followers than for Leaders (difference is -0.011; z-statistics is 11.22). These findings suggest that Followers' write-offs have a greater association with "big bath" and "smoothing" reporting behavior than those of Leaders. Overall, Table 6 results provide support to our empirical hypotheses H2a and H2b, which follow from the Followers' optimal strategy of taking excessive write-offs predicted by our theoretical model.

6.4 Future performance of Leaders and Followers after write-offs

Table 7 reports the results of regression (3) that tests empirical hypotheses H3a and H3b regarding Leaders' and Follower's future operating performance after the write-off. In Model 1, dependent

variable is the change in a firm's industry adjusted ROE over the two years following the write-off event ($\Delta ROE_{i,t,t+2}$). We find that after controlling for other factors associated with the future performance, Followers exhibit a greater increase in return on equity than Leaders as evidenced by positive and significant coefficient estimate on $Follower_i$ (0.126). The greater increase in ROE of Follower relative to Leaders confirms our empirical hypothesis H3a.

In Models 2 and 3, we use the change in a firm's industry adjusted cash flows from operating activities ($\Delta CFO_{i,t,t+2}$) and operating income before depreciation ($\Delta OPINC_{i,t,t+2}$) over the two years following the write-off event scaled by a firm's equity at the last fiscal year preceding the event as dependent variables. In these specifications, the coefficient estimates on $Follower_i$ are insignificantly different from zero, confirming our hypothesis H3b and suggesting the Followers and Leaders have the same performance with respect to cash flows and core operating income.

Regarding the control variables, significant negative coefficients on performance level at the year of write-off, pre-write-off changes in the corresponding performance measures and sales, suggest that a firm's post-event performance is partially explained by their pre-event performance.

In summary, results reported in Table 7 confirm our empirical hypotheses H3a and H3b. Faster improvements of future performance measured by GAAP bottom line earnings of Followers, together with marginally similar performance measured by operating cash flows and operating earnings, provides support that Follower's follow optimal strategy of reporting excessive write-offs predicted by our theoretical model. Indeed, if a firm creates a reserve by transferring future expenses into write-downs or restructuring charges, the release of this reserve would be reflected in ROE as it includes all accrual accounting items, such as depreciation and amortization

and other non-operating expenses, while leaving future cash flows and core operating earnings unaffected.

7 Summary and conclusion

This paper first presents a model of big bath herding of firms affected by a common economic shock, and then empirically tests model's predictions. The model describes a situation when firms in the economy are affected by bad news, and have to write-off devaluated assets. After firms with the most material write-offs (the Leaders) make their disclosure, it becomes optimal for other firms (the Followers) to herd with the Leaders and also report write-offs. Furthermore, because the market reacts less negatively to the Followers' write-offs after Leaders already revealed themselves to the market, Followers' optimal strategy is to make excessive write-offs, i.e., to do a big bath.

To empirically test our model, we study two major recessions (as defined by NBER): 2001 and 2008 recessions. During these two recessions, we separate firms with large write-offs into Leaders (firms that first report large write-offs) and Followers (remaining firms following the Leaders). We find that: 1) market reacts less negatively to the write-offs done by Followers than to the write-offs done by Leaders; 2) using duration analysis, we show that Followers cluster and report their write-offs soon after their peers; 3) Leaders write-offs are associated with poor operating performance preceding the write-off, while Followers write-offs are not associated with operating performance, but are elated to the reporting incentives like smoothing and big bath; 4) Followers experience better future performance measured by bottom line GAAP accounting earnings (but not to future cash flows or operating earnings).

In this paper we consider strategic interaction among reporting firms, and present evidence of big bath herding. Our findings of bad news over-reporting can also be tested in multiple settings where firms can strategically time their disclosures to herd with other firms: restatements, earnings warnings, meeting accounting and non-accounting benchmarks.

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FIGURE 1

Frequency of big write-offs relative to the beginning of recession

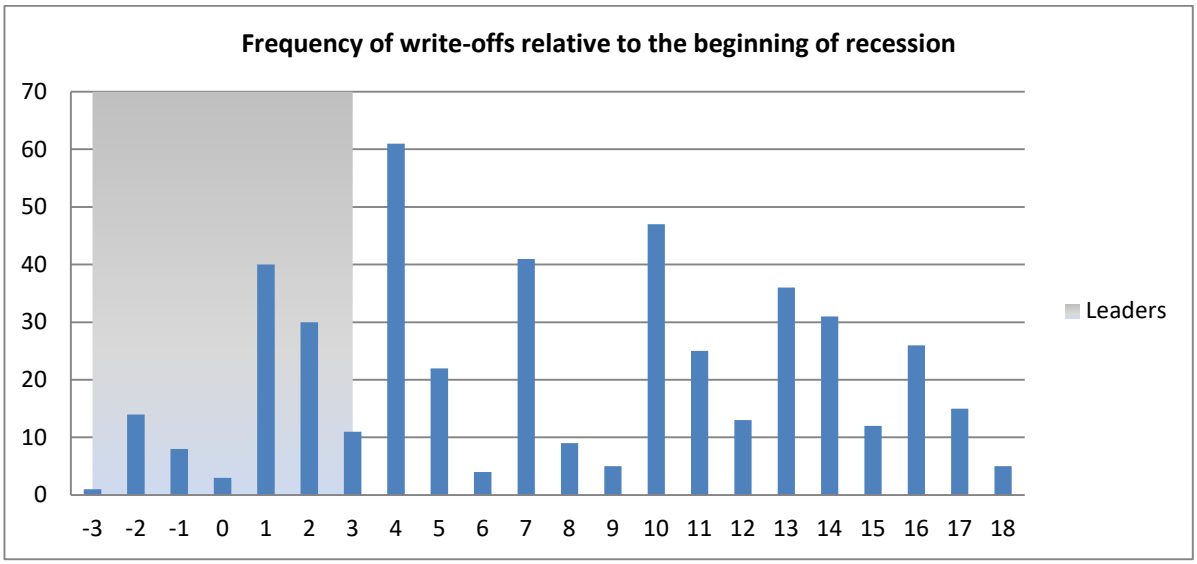

TABLE 1

Sample Selection

Data selection procedure	Excluded events	Remaining events
Select firm-quarter observations with (i) earnings announcements announced 3 month before and 18 month after the beginning of the recessions of 2001 and 2008 (January 2001- September 2002 and September 2007 – May 2009), (ii) negative pre-tax writedowns and restructuring charges (sum of Compustat items WDP and RCP) greater than 1% of lagged total assets, and (iii) non-missing financial data required for analysis		840
Exclude oil and gas, utilities, and financial and banking industries (codes 30, 31, 45,46,47,48, and 49) of Fama-French industry classification	52	788
Retain only first firm-quarter event per recession	246	542
Exclude industry-quarters that have fewer than three events per recession	29	513
Exclude industry-quarters with no events announced between 3 months before and 3 month after the beginning of the recession	54	459
Final write-off sample		**459**

TABLE 2
Descriptive Statistics of Sample Firms' Write-offs

Panel A: Write-offs by industry and recession

		All				Leaders				Followers		
Industry Name	N	Mean	Median	Std dev	N	Mean	Median	Std dev	N	Mean	Median	Std dev
Recession 2001												
Recreation	3	0.020	0.019	0.009	2	0.024	0.024	0.008	1	0.012	0.012	.
Printing and Publishing	7	0.018	0.017	0.007	3	0.012	0.011	0.002	4	0.023	0.023	0.005
Consumer Goods	15	0.023	0.022	0.011	2	0.024	0.024	0.020	13	0.023	0.022	0.011
Apparel	9	0.029	0.016	0.030	1	0.012	0.012	.	8	0.031	0.020	0.031
Healthcare	4	0.023	0.022	0.015	1	0.037	0.037	.	3	0.018	0.010	0.014
Medical Equipment	5	0.042	0.033	0.037	1	0.036	0.036	.	4	0.044	0.026	0.042
Chemicals	10	0.026	0.024	0.015	2	0.020	0.020	0.004	8	0.028	0.026	0.017
Construction Materials	10	0.027	0.013	0.034	4	0.013	0.012	0.002	6	0.036	0.015	0.043
Steel Works	11	0.042	0.018	0.073	1	0.024	0.024	.	10	0.044	0.017	0.076
Machinery	11	0.017	0.014	0.006	1	0.016	0.016	.	10	0.017	0.013	0.007
Electrical Equip	15	0.040	0.024	0.032	4	0.051	0.048	0.036	11	0.036	0.023	0.031
Automobiles and	6	0.031	0.036	0.016	1	0.011	0.011	.	5	0.036	0.039	0.014
Business Service	19	0.044	0.025	0.047	3	0.017	0.013	0.007	16	0.049	0.031	0.049
Computers	18	0.039	0.036	0.021	5	0.049	0.041	0.030	13	0.034	0.035	0.015
Computer Software	30	0.040	0.024	0.043	6	0.032	0.018	0.028	24	0.042	0.028	0.046
Electronic Equipment	46	0.041	0.027	0.033	4	0.067	0.053	0.054	42	0.039	0.027	0.031
Measuring and Co	7	0.024	0.019	0.014	2	0.027	0.027	0.019	5	0.023	0.019	0.014
Business Supplies	4	0.050	0.033	0.051	1	0.125	0.125	.	3	0.026	0.024	0.015
Transportation	5	0.045	0.021	0.044	1	0.060	0.060	.	4	0.041	0.019	0.050
Wholesale	19	0.041	0.027	0.041	4	0.037	0.029	0.030	15	0.042	0.027	0.044
Retail	16	0.034	0.024	0.028	6	0.023	0.014	0.025	10	0.040	0.032	0.029
Total recession 2001	259				55				215			
Recession 2008												
Recreation	4	0.017	0.017	0.003	2	0.018	0.018	0.003	2	0.016	0.016	0.004
Consumer Goods	8	0.034	0.016	0.049	3	0.015	0.016	0.004	5	0.046	0.016	0.061
Apparel	4	0.015	0.015	0.005	1	0.011	0.011	.	3	0.017	0.016	0.004
Medical Equipment	5	0.014	0.014	0.004	2	0.015	0.015	0.007	3	0.013	0.014	0.003

Pharmaceutical P	7	0.029	0.020	0.015	2	0.042	0.042	0.012	5	0.024	0.019	0.014
Chemicals	8	0.015	0.014	0.003	1	0.012	0.012	.	7	0.015	0.014	0.003
Construction Mat	7	0.045	0.014	0.052	1	0.087	0.087	.	6	0.038	0.014	0.054
Steel Works	6	0.020	0.012	0.016	1	0.011	0.011	.	5	0.022	0.013	0.017
Electrical Equip	8	0.022	0.013	0.015	1	0.012	0.012	.	7	0.023	0.013	0.015
Automobiles and	7	0.019	0.012	0.012	3	0.011	0.011	0.001	4	0.025	0.024	0.013
Communication	6	0.030	0.019	0.025	2	0.029	0.029	0.015	4	0.031	0.017	0.031
Business Service	22	0.026	0.021	0.020	5	0.027	0.031	0.014	17	0.026	0.019	0.022
Computers	9	0.027	0.013	0.023	3	0.017	0.013	0.009	6	0.032	0.022	0.026
Computer Software	16	0.030	0.019	0.026	4	0.027	0.020	0.017	12	0.032	0.018	0.029
Electronic Equipment	28	0.020	0.014	0.017	7	0.014	0.013	0.005	21	0.022	0.016	0.020
Business Supplies	5	0.030	0.030	0.019	3	0.034	0.031	0.024	2	0.023	0.023	0.010
Transportation	6	0.029	0.029	0.009	1	0.020	0.020	.	5	0.031	0.030	0.009
Wholesale	13	0.026	0.021	0.015	3	0.022	0.021	0.012	10	0.027	0.021	0.017
Retail	14	0.019	0.017	0.008	5	0.018	0.015	0.006	9	0.020	0.018	0.010
Restaurants	6	0.024	0.021	0.012	2	0.030	0.030	0.011	4	0.021	0.016	0.013
Total recession 2008	189				52				137			
Total	459				107				352			

Panel B: Frequency of write-offs relative to the recession peak

Month relative to recession peak	Frequency	Percent	Cumulative frequency	Cumulative percent
-3	1	0.22	1	0.22
-2	14	3.05	15	3.27
-1	8	1.74	23	5.01
0	3	0.65	26	5.66
1	40	8.71	66	14.38
2	30	6.54	96	20.92
3	11	2.4	107	23.31
4	61	13.29	168	36.6
5	22	4.79	190	41.39
6	4	0.87	194	42.27
7	41	8.93	235	51.2
8	9	1.96	244	53.16
9	5	1.09	249	54.25
10	47	10.24	296	64.49
11	25	5.45	321	69.93
12	13	2.83	334	72.77
13	36	7.84	370	80.61
14	31	6.75	401	87.36
15	12	2.61	413	89.98
16	26	5.66	439	95.64
17	15	3.27	454	98.91
18	5	1.09	459	100

Panel C: Frequency of write-off by fiscal quarters

	Total		Leaders		Followers		Difference between frequency of write-offs of Leaders and Followers	
	N	%	N	%	N	%	Chi-square	p-value
1st quarter	68	14.81	30	28.04	38	10.8	19.33	<.0001
2nd quarter	105	22.88	12	11.21	93	26.42	10.75	0.00
3rd quarter	98	21.35	22	20.56	76	21.59	0.05	0.82
4th quarter	188	40.96	43	40.19	145	41.19	0.03	0.85
Total	459	100.00 %	107	100%	352	100		

TABLE 3
Descriptive Statistics of Write-offs Sample

	Leader				Follower				Difference between Leaders and Followers			
Variable	N	Mean	Med	Std	N	Mean	Med	Std	Mean		Med	
WRITEOFF	107	0.028	0.019	0.025	352	0.032	0.021	0.032	-0.004		0.002	
Size	107	7.439	7.122	1.857	352	7.146	6.995	1.687	0.294		0.126	
BM	107	0.378	0.310	0.481	352	0.506	0.375	0.909	-0.128	*	-0.065	
ΔBM	107	-0.010	-0.004	0.111	352	-0.001	-0.007	0.173	-0.009		0.003	
ROA	107	0.054	0.057	0.131	352	0.045	0.053	0.161	0.009		0.003	
ΔROA	107	-0.009	-0.005	0.061	352	-0.001	-0.001	0.058	-0.008		-0.004	**
RET	107	-0.112	-0.107	0.458	352	0.021	0.084	0.532	-0.133	**	-0.191	***
MKTShare	107	0.006	0.002	0.012	352	0.005	0.001	0.013	0.001		0.000	
SynEarn	107	0.173	0.087	0.203	352	0.167	0.099	0.196	0.007		-0.012	
SynRet	107	0.238	0.227	0.156	352	0.377	0.370	0.212	-0.139	***	-0.142	***
ΔMGMT	107	0.187	0.000	0.392	352	0.145	0.000	0.352	0.042		0.000	
HIST	107	4.794	5.000	0.595	352	4.759	5.000	0.571	0.036		0.000	
BATH	107	-0.015	-0.006	0.023	352	-0.020	-0.010	0.027	0.004	*	0.004	
SMOOTH	107	0.003	0.000	0.008	352	0.007	0.000	0.033	-0.004	*	0.000	

This Table presents the descriptive statistics of the write-off sample with 459 observations. Variable definitions: *WRITEOFF* is the sum of the write-off and restructuring charges (COMPUSTAT items WDP and RCP) deflated by the total assets at the end of the last fiscal year prior to the event quarter, reflected as a positive amount; *Size* is the natural logarithm of a firm's average market value of equity in the four fiscal quarters before the write-off; *BM* is book to market ratio measured at the end of fiscal year prior to write-off; ΔBM is the mean change in firm *i*'s book-to-market ratio over years -5 to -1; *ROA* is return on assets of firm *i* at fiscal year before the event calculated as income before extraordinary items divided by lagged total assets (COMPUSTAT mnemonic: IB/(lag AT)); ΔROA is mean change in firm *i*'s return on assets ratio over years -5 to -1; *RET* is cumulative abnormal return of firm *i* computed over the year preceding the write-off; *MKTShare* is the ratio of a firm's total sales in the most recent fiscal year before the event quarter over the industry's total sales in that year; *SynEarn* is R^2 of the regression of the firms' return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry sales) in the 20 quarters before the event quarter; *SynRet* is R^2 of the regression of the firms' weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter; *ΔMGMT* is an indicator variable equal to 1 if the firm experiences the change in top three executives in the fiscal year before or fiscal year of the write-off; *HIST* is equal to the number of significant negative write-off and restructuring charges and exceed one percent of lagged firm total assets reported by firm *i* in the previous five years; *BATH* equals the change in pre-write off operating earnings from quarter t-4 to t, divided by total assets at the end of the last fiscal year before the event, when this change is negative, and zero otherwise; *SMOOTH* is equals the change in pre-write off operating earnings from quarter t-4 to t, divided by total assets at the end of the last fiscal year before the event, when this change is positive, and zero otherwise.

TABLE 4
Stock Price Sensitivity to Write-offs

Variable	Coefficient		p-value
Intercept	-0.026	**	0.011
WRITEOFF	-0.084		0.501
Follower	-0.008		0.676
*WRITEOFF *Follower*	0.493	***	<0.0001
UE	0.259		0.266
Size	0.003		0.185
BM	0.011	***	<0.0001
SynRet	0.007		0.657
SynEarn	0.005		0.949
Nobs	459		
Adj R^2	0.0038		

This table presents the coefficient estimates of the OLS regression in the following form:

$$ANNRET_i = \gamma_0 + \gamma_1 WRITEOFF_i + \gamma_2 Follower_i + \gamma_3 WRITEOFF_i * Follower_i + \gamma_4 UE_i + \gamma_5 Size_i + \gamma_5 BM_i + \gamma_5 SynRet_i + \gamma_5 SynEarn_i + \tau_i$$

where $ANNRET_i$ is firm *i's* compound excess return over days 0 and +3 relative to earnings announcement day, which is measured as the difference between the realized return and the corresponding size and book-to-market portfolio of firms on CRSP-COMPUSTAT universe obtained from professor French website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html; $WRITEOFF_i$ is the sum of the write-down and restructuring charges (COMPUSTAT items WDP and RCP), converted to positive values, deflated by the total assets at the end of the last fiscal year prior to the event quarter; and $Follower_i$, is an indicator variable, which equals one if firm *i* is a Follower and zero otherwise; UE_i is the difference between operating earnings (COMPUSTAT item OIADP) in the event quarter and operating earnings from the same quarter last year, deflated by a firm's total assets at the end of the last fiscal year prior to the event; $Size_i$ is the natural logarithm of a firm's average market value of equity in the four fiscal quarters before the write-off; BM_i is book to market ratio measured at the end of fiscal year prior to write-off; $SynEarn_i$ is the R^2 of the regression of the firms' return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry sales) in the 20 quarters before the event quarter; $SynRet_i$ is the R^2 of the regression of the firms' weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter. Reported p-values are based on bootstrapped standard errors clustered by recession. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively, in a two-tailed test.

TABLE 5
Write-off Clustering of Followers

Panel A: How soon Followers issue write-off after the most recent peers' write-off

Month	Frequency	Percent	Cumulative frequency	Cumulative percent
The same month	27	7.67	27	7.67
1	179	50.85	206	58.52
2	32	9.09	238	67.61
3	56	15.91	294	83.52
4	22	6.25	316	89.77
5	8	2.27	324	92.05
6	10	2.84	334	94.89
7	6	1.7	340	96.59
8	2	0.57	342	97.16
9	2	0.57	344	97.73
10	2	0.57	346	98.3
11	1	0.28	347	98.58
12	1	0.28	348	98.86
13	4	1.14	352	100

Panel B: Logit model

	Coefficient		z-stat	p-value	Odds ratio
Intercept	-0.222		00.00	1.00	1.306
Peerwriteoff	0.267	***	29.92	<.0001	1.306
UE	1.520	***	103.29	<.0001	4.574
ΔSale	-0.099		1.89	0.17	0.906
RET	0.176	***	5.54	0.02	1.193
Size	0.274	**	4.26	0.04	1.316
MKTShare	-0.052		0.81	0.37	0.949
WRITEOFF	-0.186	**	4.72	0.03	0.830
SynEarn	0.200	***	6.86	0.01	1.222
SynRet	0.064		0.21	0.65	1.066
DTIME	Yes				
Wald-test	111.50				
Number of Followers	352				

Panel A describes how soon Followers issue write-off after the most recent peers' write-off.

Panel B presents regression coefficients of the Logit model in the following form:

$$Pr(WO_i) = a_0 + b_0 Peerwriteoff(t)_i + b_1 UE_i + b_2 \Delta Sale_i + b_3 RET_i + b_4 Size_i + b_5 MKTshare_i + b_6 WRITEOFF_i + b_7 SynEarn_i + b_8 SynRet_i + \sum_{j=4}^{N} d_j DTIME_j + e_i$$

where $Pr(WO_i)$ is the probability of firm *i* reporting a large write-off given that it has not previously reported a write-off; $Peerwriteoff(t)_i$ is the number of write-offs issued by industry peers in the three

month preceding the earnings announcement of firm i; UE_i is the difference between operating earnings (COMPUSTAT item OIADP) in the event quarter and operating earnings from the same quarter last year, deflated by a firm's total assets at the end of the last fiscal year prior to the event; $\Delta Sale_i$ is firm i's sales growth during the calendar year preceding the event quarter; $Size_i$is the natural logarithm of a firm's average market value of equity in the four fiscal quarters before the write-off; RET_i is cumulative abnormal return of firm i computed over the year preceding the write-off; $MKTshare_i$ is the ratio of a firm's total sales in the most recent fiscal year before the event quarter over the industry's total sales in that year; $WRITEOFF_i$ is the sum of the write-off and restructuring charges (COMPUSTAT items WDP and RCP) deflated by the total assets at the end of the last fiscal year prior to the event quarter, reflected as a positive amount; $SynEarnFirm_i$ is the R^2 of the regression of the firms' return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry sales) in the 20 quarters before the event quarter; $SynRetFirm_i$is the R^2 of the regression of the firms' weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter; $DTIME_j$ are duration-interval dummy variables representing calendar reporting months after the beginning of recession. For the model estimation we rank UE_i, $\Delta Sale_i$, CAR_i, $Size_i$, $MKTshare_i$, $SynEarnFirm_i$, and $SynRetFirm_i$ into deciles among all firms in the industry quarter that are covered by COMPUSTAT and CRSP; we rank variable $WRITEOFF_i$ among the firms reported big write-offs. Industry classification is based in the 49 Fama and French (1997) grouping. The regression is estimated on 887 quarterly observations from 352 Followers. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively, in a two-tailed test.

TABLE 6
Tobit Regression of the Determinants of Write-offs

	Leader			Follower					Test of Hypothesis across regimes	
	Coefficient		z-stat	Coefficient		z-stat	Difference		z-stat	p-value
recession2001	-0.035		-1.38	-0.062	***	-4.19				
recession2008	-0.048	*	-1.93	-0.092	***	-6.16				
RET	-0.004	**	-2.51	-0.005	***	-6.11	0.001		0.03	0.001
BM	-0.003	*	-1.93	0.001		1.13	-0.004	**	2.05	-0.004
ΔBM	0.001		0.88	0.001		0.68	0.001		0.00	0.001
ΔROA	-0.004	***	-3.16	0.000		-0.49	-0.004	***	10.86	-0.004
ΔMGMT	0.000		-0.07	-0.001		-1.33	0.001		0.00	0.001
BATH	-0.003		-1.18	-0.009	***	-7.15	0.007	**	3.99	0.007
SMOOTH	-0.005	*	-1.81	0.006	***	4.51	-0.011	***	11.22	-0.011
HIST	-0.002		-0.82	0.000		-0.14	-0.002		0.52	-0.002
SIZE	-0.007	**	-2.29	-0.008	***	-4.90	0.002		0.02	0.002
MKT Share	0.008	***	2.77	0.009	***	5.97	-0.001		0.00	-0.001
SynEarn	-0.001		-0.48	0.001		1.07	-0.002		0.40	-0.002
SynRet	0.003		1.42	0.000		-0.10	0.003		1.35	0.003

This table displays coefficient estimates of the following Tobit regression:

$$WRITEOFF_i = a_0 + Leader[a_0 Recession2001 + a_0 Recession2008 + a_1 RET_i + a_2 BM_i + a_3 \Delta BM_i + a_4 \Delta ROA_i + a_5 \Delta MGMT_i + a_6 BATH_i + a_7 SMOOTH_i + a_8 HIST_i + a_9 Size_i + a_{10} MKTShare_i + a_{11} SynEarn_i + a_{12} SynRet_i] + Follower[b_0 Recession2001 + b_0 Recession2008 + b_1 RET_i + b_2 BM_i + b_3 \Delta BM_i + b_4 \Delta ROA_i + b_5 \Delta MGMT_i + b_6 BATH_i + b_7 SMOOTH_i + b_8 HIST_i + b_9 Size_i + b_{10} MKTShare_i + b_{11} SynEarn_i + b_{12} SynRet_i] + e_i$$

This regression represents the stacking of two regressions: first where observations at the "Leaders period" (from -3 to + 3 month relative to the recession peak), and the second where the observations are from the "Followers' period" (from 3 month to 18 month relative to the recession peak). Variable definitions: $Leader$ is an indicator variable equal to 1 for observations occurring in the "Leaders period", and zero otherwise; $Follower$ is an indicator variable equal to 1 for the observations in the "Followers period"; $WRITEOFF_i$ is the sum of the write-off and restructuring charges (COMPUSTAT items WDP and RCP) deflated by the total assets at the end of the last fiscal year prior to the event quarter, reflected as a

positive amount; $Recession2001$ is an indicator variable that is equal 1 if write-off was performed during recession of 2001, and 0 otherwise; $Recession2008$ is an indicator variable that is equal 1 if write-off was performed during recession of 2008, and 0 otherwise; RET_i is cumulative abnormal return of firm i computed over the year preceding the write-off; BM_i is book to market ratio measured at the end of fiscal year prior to write-off; ΔBM_i is mean change in book-to-market ratio over years -5 to -1 prior to the event year; ΔROA_i is mean change in firm i's return on assets ratio over years -5 to -1; $\Delta MGMT_i$ is an indicator variable equal to 1 if the firm experiences the change in top three executives in the fiscal year before or fiscal year of the write-off; $BATH_i$ equals the change in pre-write off operating earnings from quarter t-4 to t, divided by total assets at the end of the last fiscal year before the event, when this change is negative, and zero otherwise; $SMOOTH_i$ equals the change in pre-write off operating earnings from quarter t-4 to t, divided by total assets at the end of the last fiscal year before the event, when this change is positive, and zero otherwise; $HIST_i$ is equal to the number of significant negative write-off and restructuring charges and exceed one percent of lagged firm total assets reported by firm i in the previous five years; $Size_i$ is the natural logarithm of a firm's average market value of equity in the four fiscal quarters before the write-off; $MKTshare_i$ is the ratio of a firm's total sales in the most recent fiscal year before the event quarter over the industry's total sales in that year; $SynEarn_i$ is the R^2 of the regression of the firms' return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry sales) in the 20 quarters before the event quarter; $SynRet_i$ is the R^2 of the regression of the firms' weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter. For the model estimation we rank UE_i, $\Delta Sale_i$, CAR_i, $Size_i$, $MKTshare_i$, $SynEarn_i$, and $SynRet_i$ among all firms in the industry quarter that are covered by COMPUSTAT and CRSP. Industry classification is based in the 49 Fama and French (1997) grouping. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively, in a two-tailed test.

TABLE 7
Future Performance of Leaders and Followers

	Model 1 - Dependent Variable industry adjusted $\Delta ROE_{t,t+2}$				**Model 2 – Dependent Variable industry adjusted $\Delta CFO_{t,t+2}$**				**Model 3 – Dependent Variable industry adjusted $\Delta OP\_INC_{t,t+2}$**			
Variable	Coefficient		t-stat	p-value	Coefficient		t-stat	p-value	Coefficient		t-stat	p-value
Intercept	-0.492	***	-3.78	0.000	-0.008		-0.05	0.963	-0.140	***	-0.77	0.439
Follower	0.126	***	2.62	0.009	0.011		0.17	0.867	0.024		0.36	0.718
$PERF_t$	-0.967	***	-11.76	<.0001	-0.475	***	-4.26	<.0001	-0.570	***	-5.50	<.0001
$\Delta PERF_{t-1,t}$	-0.384	***	-4.83	<.0001	-0.248	***	-2.61	0.009	-0.125		-1.35	0.178
ΔROE	-0.682		-2.07	0.039	-1.236	***	-2.72	0.007	-1.047	**	-2.31	0.022
ΔBM	-0.199		-0.89	0.373	-0.196		-0.65	0.517	-0.134		-0.44	0.657
$\Delta SALE_{t-1,t}$	-0.216	***	-4.41	<.0001	-0.240	***	-3.61	0.000	-0.249	***	-3.74	0.000
WRITEOFF	-0.185		-0.28	0.776	0.295		0.33	0.739	0.488		0.55	0.582
INDGRWOTH	0.030		0.51	0.610	0.079		0.98	0.328	0.094		1.17	0.242
FIN_LEV	-0.017	*	-1.74	0.082	-0.013		-0.95	0.342	-0.010		-0.70	0.485
SIZE	0.154	***	3.48	0.001	-0.060		-0.99	0.322	-0.066		-1.09	0.276
BM	0.062	***	3.83	0.000	0.013		0.59	0.558	0.030	***	1.34	0.183
MKTShare	0.258		0.15	0.882	0.041		0.02	0.986	-0.248		-0.10	0.917
$\Delta MGMT$	-0.077		-1.44	0.150	-0.009		-0.13	0.899	-0.011		-0.16	0.875
SynEarnFirm	-0.373	***	-3.71	0.000	0.098		0.71	0.476	0.085	**	0.62	0.533
SynRetFirm	-0.067		-0.59	0.557	-0.048		-0.31	0.755	-0.081		-0.52	0.601
Nobs	433				433				433			
Adj R^2	48.26%				14.44%				13.56%			

This table presents regression coefficient of the following OLS regression:

$$\Delta PERF_{i,t,t+2} = \gamma_0 + \gamma_1 Follower_i + \gamma_2 PERF_{i,t} + \gamma_3 \Delta PERF_{i,t-1,t} + \gamma_4 \Delta ROE_{i,t-5,t} + \gamma_5 \Delta BM_{i,t-5,t} + \gamma_6 \Delta SALE_{i,t-1,t} + \gamma_7 WRITEOFF_i + \gamma_8 INDGROWTH_i + \gamma_9 FINLEV_i + \gamma_{10} SIZE_i + \gamma_{11} BM_i + \gamma_{12} MKTShare_i + \gamma_{13} \Delta MGMT_i + \gamma_{14} SynEarn_i + \gamma_{15} SynRet_i + \mu_i$$

Where dependent variables, $\Delta PERF_{i,t,t+2}$, measure the change in future performance of firm *i* from the event year *t* to two years after event. Models 1, 2, and 3 use $\Delta ROE_{i,t,t+2}$, $\Delta CFO_{i,t,t+2}$, and $\Delta OPINC_{i,t,t+2}$, respectively. *ROE* is calculated as the ratio of income before extraordinary items (COMPUSTAT item IB) to the total shareholders' equity (COMPUSTAT item CEQ); *CFO* is computed as the ratio of cash from operations (COMPUSTAT item OANCF) and the total shareholders' equity; *OPINC* is the ratio of operating income before depreciation and amortization

(COMPUSTAT item OIBDP) and the total shareholders' equity. All performance variables are adjusted by the industry performance by subtracting industry median ROE, CFO or OPINC. $Follower_i$ is an indicator variable that equals 1 if firm i had write-downs or restructuring charges that exceeds 1% of total assets during the period starting 3 month before and ending 3 month after the beginning of the recession, and 0 otherwise. $PERF_{i,t}$ takes values of industry adjusted ROE, CFO or OPINC at the event year in Models 1, 2, and 3, respectively, while $\Delta PERF_{i,t-1,t}$ is the change in those measures from one year before the event year to the event year. ΔBM_i is mean change in book-to-market ratio over years -5 to -1 prior to the event year; ΔROE_i is mean change in firm i's return on assets ratio over years -5 to -1. $\Delta SALE_{t-1,t}$ is the sales growth in the year prior to the event year. $WRITEOFF_i$ is the sum of the write-off and restructuring charges (COMPUSTAT items WDP and RCP) deflated by the total assets at the end of the last fiscal year prior to the event quarter, reflected as a positive amount; $INDGROWTH_i$ is computed as mean change in aggregated industry sales over the five years prior to the event year; $FINLEV_i$ is the ratio of total assets (COMPUSTAT item TA) to the book value (COMPUSTAT item CEQ) at the end of the last fiscal year prior to the event; $Size_i$ is the natural logarithm of a firm's average market value of equity in the four fiscal quarters before the write-off; $MKTshare_i$ is the ratio of a firm's total sales in the most recent fiscal year before the event quarter over the industry's total sales in that year; $SynEarn_i$ is the R^2 of the regression of the firms' return on assets (ROA) on the industry ROA (calculated as the total industry earnings divided by the total industry sales) in the 20 quarters before the event quarter; $SynRet_i$ is the R^2 of the regression of the firms' weekly stock returns on the value-weighted market returns and industry returns in the calendar year before the event quarter. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels, respectively, in a two-tailed test.