ANALYZING THE IMPACT OF DIRECTOR BLOCKHOLDERS USING BENFORD'S LAW

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ABSTRACT

This study investigates Blockholders' impact on a firm's financial reporting through corporate governance. We specifically focus on the effects of Blockholders serving on the board of directors. Using a sample of 7,454 firm-years from 1996 to 2001, we utilize Benford's Law to determine how director Blockholders impact earnings management associated with rounding reported earnings. We find evidence that director Blockholders lessen this type of earnings management, a trait not shared by other Blockholders. Further evidence suggests that busy boards increase this type of earnings management, implying that our findings may be driven by a lack of monitoring by non-director Blockholders. We also show that director Blockholders may be able to prevent firms from misrepresenting the value of their inventory. Our paper demonstrates the value of having Blockholders on the board of directors because they can avoid financial misreporting through more robust corporate governance.

1-INTRODUCTION

"Managers that always promise to 'make the numbers' will at some point be tempted to 'make up' the numbers." – Warren Buffett

Having a system in place to ensure strong corporate governance in a firm is essential to ensure managers act in the shareholders' best interest. An important issue in the corporate governance literature is the prevention of earnings management, ensuring that shareholders are not being deceived by overly optimistic earnings numbers. An example of why managers may choose to manipulate earnings numbers is to ensure they hit specific incentive targets. While the board of directors is expected to identify and prevent improper reporting of earnings, it may be unable to catch all instances of earnings management. Researchers must examine alternative corporate governance mechanisms to assess managers' ability to prevent wrongdoing. Research has shown that shareholders cannot recognize and prevent earnings management, which involves the manipulation of cash flows (Sloan 1996). Shareholders who own a significant amount of stock in a company may be more invested in preventing earnings management to protect their wealth. Thus, we look at Blockholders, defined as shareholders who own at least 5% of a firm's stock, to see if they can limit earnings management in a firm.

In this paper, we use Benford's Law to examine the impact Blockholders sitting on the board of directors have on earnings management. Benford's Law is a mathematical law that distributes leading digits in a set of naturally generated numbers. The manipulation of numbers would potentially cause any statistically significant deviation from the provided distributions. The number manipulation can be used for accounting purposes to detect instances of earnings

management or outright fraud. Thus, Benford's Law is a valuable tool in determining the effectiveness of corporate governance measures in preventing real earnings management.

Following the methodology developed by Carslaw (1988) and Thomas (1989), we examine the leading two digits of 7,454 firm years from 1996 to 2001 using Benford's Law to detect the management of reported earnings. We provide evidence that director Blockholders, which are Blockholders that serve on the board of directors and are not officers of a firm, can limit earnings management in firms. Other types of Blockholders do not have this ability, and this may exacerbate this problem. Using busy boards, we further show that this may be a function of having attentive directors, suggesting that director Blockholders are effective because of their willingness to monitor the firm. Finally, we find that director Blockholders can prevent inventory manipulation, a tool managers can use to manage real earnings (Roychowdhury 2006). This ability is likely because directors know more about a firm's day-to-day operations than outside investors. Overall, director Blockholders can prevent earnings management due to a unique combination of specialized knowledge and a willingness to act to protect their wealth.

Our paper contributes to the corporate governance literature by highlighting the ability of director Blockholders to prevent earnings management. Previous research has shown that Blockholders not affiliated with a firm cannot prevent earnings management (Zhong *et al*. 2007; Guthrie and Sokolowsky 2010). Our study provides evidence that director Blockholders are successful monitors, likely due to working in the firm and having more knowledge of the firm's activities than outside Blockholders. We also show that director Blockholders can prevent managers from making suboptimal decisions with inventory, which is one example of real earnings management. One limitation of our study is that our sample period only lasted six years, from 1996 to 2001, and does not cover the post-Sarbanes Oxley period. Cohen *et al*. (2008) note that accrual-based earnings management declined after the passing of Sarbanes-Oxley, and real earnings management became more rampant, suggesting that our results may become stronger in a more recent sample period. Still, this may need to be confirmed in future research.

Section 2 reviews previous literature and develops our primary hypotheses for this paper. Section 3 explains the dataset and methodology used in this paper, and Section 4 reports empirical results. Section 5 concludes.

2-LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Types of Earnings Management

The accounting literature discusses two types of earnings management: real earnings management and accrual-based earnings management. Real earnings management involves the manipulation of earnings through altering cash flows, while accrual-based earnings management utilizes accounting methods to adjust earnings (Badertscher 2011; Kothari et al. 2016). Managers often exhaust the flexibility in accruals management before implementing costlier real earnings management activities to mislead investors into overvaluing their firm (Badertscher 2011; Kothari et al. 2016).

In evaluating accrual-based models, Dechow, Sloan, and Sweeney (1995) compared five alternative approaches for detecting earnings management. They analyzed the specification and power of commonly used test statistics across measures of discretionary accruals generated by these models. Their findings suggest that while all the models appear to produce reasonably well-specified tests for random samples, the power of the tests is relatively low for detecting

economically plausible earnings management magnitudes. Importantly, they underscore the importance of controlling for firm performance, as all models rejected no earnings management more frequently when applied to firms with extreme financial performance.

Extending this line of research, Cohen, Zarowin, and Dey (2008) analyzed both accrual-based and real activities manipulation around seasoned equity offerings (SEOs). To capture accrual-based earnings management, they employed the cross-sectional Jones model. For real earnings management, they followed Roychowdhury's (2006) approach of estimating abnormal levels of cash flows, discretionary expenses, and production costs as proxies. Their evidence indicates that firms engage in both earnings management types around SEOs. Notably, they document a more severe decline in post-SEO operating performance attributable to real activities management compared to accruals management, suggesting real consequences of operational decisions made to manage earnings.

On another aspect of earnings management, Hu, Hwang, and Jiang (2020) studied how the cessation of quarterly earnings guidance impacts information asymmetry using a 2002-2011 sample. Their results demonstrate that stopping earnings guidance significantly reduces information asymmetry versus matched non-guiders and guidance maintainers. Interestingly, they find less accrual-based earnings management after guidance cessation, especially for firms persistently providing guidance previously. This finding implies that issuing earnings guidance contributes to myopic firm behavior and earnings management, while stopping guidance can improve the information environment.

Further examining real earnings management consequences, Gunny (2005) notes that this practice refers to deviating from optimal operations, investing, and financing to mislead stakeholders on economic performance. One common technique is decreasing discretionary expenses like R&D, advertising, and maintenance to boost earnings despite potential long-term value destruction temporarily. Other examples include offering discounts/lenient credit terms to increase revenues, overproducing inventory to reduce the cost of goods sold, and pulling forward future sales into the current period through incentives to inflate revenues.

Building on these findings, Kothari et al. (2016) conclude that compared to accruals manipulation, real earnings management has a significantly larger negative impact on impairing future operating performance and cash flows. It is also more challenging to detect since it distorts real business activities and transactions.

For our study, we focus on Blockholders' impact on earnings management. Shareholders tend to be unable to recognize earnings management by firms, leading to poor future stock performance (Sloan 1996). Blockholders who own at least 5% of a firm's stock will likely have greater financial incentive to prevent earnings management due to their massive investment in the firm and wish to protect their wealth. After the passing of Sarbanes-Oxley in 2002, the use of accruals management declined (Cohen *et al*. 2008). Since our sample lasts until 2001, we look at real earnings management. Real earnings management avoids the potential limitations of using accruals-based earnings management, which may yield results that would not extend after the passing of Sarbanes-Oxley. We utilize Benford's Law to analyze the direct impact of outside director Blockholders on reported earnings.

Benford's Law and Earnings Management

Benford's Law is a mathematical law that examines the leading digits of numbers in naturally occurring tables. The probability of the first digit equaling some number *d* is roughly equal to

$$P(d)=\log_{10}\left(1+\frac{1}{d}\right) \quad (1)$$

where *d* is some number between 1 and 9. The probability of the second digit equaling some number *d* is roughly equal to

$$P(d)=\sum_{x=1}^{9}\log_{10}\left(1+\frac{1}{10x+d}\right) \quad (2)$$

where *d* is some number between 0 and 9. Table 1 shows the expected distributions of the first and second digits given by Benford's Law. A statistical derivation of the Law is given by Hill (1995), which justifies the use of Benford's Law in the analysis of accounting data as an empirically observable phenomenon.

Table 1
DISTRIBUTION OF DIGITS ACCORDING TO BENFORD'S LAW
This table shows the expected distribution of digits in a set given by Benford's Law. P (1st digit) shows the expected percentage of observations, which should have a given number as the first digit of the observation's value. P (2nd digit) shows the expected percentage of observations with a given number as the second digit in the observation's value.

DIGIT	P (1st Digit)	P (2nd Digit)
0		12.0%
1	30.1%	11.4%
2	17.6%	10.9%
3	12.5%	10.4%
4	9.7%	10.0%
5	7.9%	9.7%
6	6.7%	9.3%
7	5.8%	9.0%
8	5.1%	8.8%
9	4.6%	8.5%

Durtschi *et al*. (2004) guide the proper use of Benford's Law in accounting. Analysis using Benford's Law is helpful for sets of numbers that are mathematical combinations of other numbers. It is also useful when the mean of a set of numbers is greater than the median, and the skewness is positive. Benford's Law is applicable for finding irregularities in most accounting

data sets, including earnings, inventory, accounts receivable, and accounts payable, making it useful for studies of potential earnings management.

Carslaw (1988) and Thomas (1989) systematically document firms' earnings management. These papers show that a sample of firms in New Zealand and the United States had more zeroes and fewer nines among the second digits of reported earnings than should be reported according to Benford's Law. This phenomenon is explained through earnings management, as firms potentially rounded up earnings to a reference point with a higher leading digit. In other words, a firm with earnings of $1,953,000 may have rounded its earnings up to $2,050,000, or a firm with earnings of $58 million may have rounded its earnings above $60 million. Firms may do this because of the "$1.99 phenomenon," where earnings of $200,000 are perceived as significantly higher than $190,000, or to reach key contractual numbers, which would likely be set at a rounded number with a second digit of a zero.

Other papers have confirmed the findings of Benford's Law using different samples. Many of these papers look at the distribution of second digits in a sample of firms, looking at certain digits like zeroes and nines, which can indicate rounding behavior. Van Caneghem (2002) confirms that the number of zeroes and nines in a distribution of UK firms' second digits does not conform to Benford's Law. Further evidence suggests that accrual manipulation is the cause of earnings management. Skousen *et al.* (2004) looked at Japanese firms and showed that the incidence of rounding decreased the further earnings from the reference point to which they were being rounded. Key reference points were found to extend to even the fourth digit. Guan *et al.* (2006) show that firms tend to engage in rounding each quarter, with decreased rounding in the fourth quarter. They argue that this is because of the greater scrutiny from auditors during the fourth quarter, suggesting that monitoring can prevent earnings management associated with rounding. Recently, Lebert *et al.* (2021) found substantial earnings management in German firms through rounding. Rounding linked to zeroes and nines in the second digit was found to be limited to net income and EPS, while other variables, such as operating income and revenue, conformed to Benford's Law. Tran *et al.* (2023) use zeroes, fives, and nines in the distributions of second digits of loan loss allowances to check for rounding. They find evidence of rounding behavior during good times, suggesting banks manage loan loss accounts to signal information and pursue efficiency.

Benford's Law has allowed researchers to look at the historical impact of regulation on earnings management. Archambault and Archambault (2011) looked at regulation in a pre-SEC environment and found more earnings manipulation among less-regulated companies. Alali and Romero (2013) show that the passage of the Sarbanes-Oxley Act of 2002 lowered the likelihood of earnings management. However, the chance of earnings management increased again during the financial crisis. They also show that firms that hired one of the Big 4 auditors had less earnings management than other firms. Finally, Lin *et al.* (2018) use Benford's Law to show that firms with board members who can increase their pay tend to have higher earnings management than other firms, based on a sample of Taiwanese firms.

Director Blockholders and Earnings Management

Xie *et al.* (2001) examine the impact of the board of directors on earnings management. Using current discretionary accruals as their proxy for earnings management, they find that specific characteristics of the board of directors lead to lessened earnings management. Specifically, having board members with corporate or financial backgrounds and more frequent

meetings leads to lower discretionary accruals. The findings suggest that having board members with more knowledge of how the firm operates and who spend more time monitoring the firm leads to lower earnings management.

Blockholders are seen in the finance literature as capable corporate governance mechanisms, mainly when not affiliated with the firm. Zhong *et al.* (2007) and Guthrie and Sokolowsky (2010) examine outside Blockholders' impact on firm earnings management. Both papers report that outside Blockholders fail to prevent earnings management and may exacerbate a firm's earnings management. The failure may be because outside Blockholders aren't involved in the firm's day-to-day operations and are, therefore, unable to recognize some types of earnings management.

Since director blockholders have significant equity stakes, they are naturally incentivized to oversee and monitor management to protect the firm's value and wealth tied to its stock performance. Therefore, firms with director Blockholders may be less prone to using accrual manipulations like rounding in addition to the real earnings management activities examined around SEOs (Cohen and Zarowin, 2010). Their monitoring role and alignment with shareholders could make director blockholders less tolerant of even accrual gimmicks that distort reporting integrity and scrutinize suboptimal real operating decisions made solely to inflate earnings. Director blockholders may discourage firms from using an accrual earnings management technique of rounding reported dollar amounts up or down to achieve desired earnings figures.

Jensen (1993) suggests that having board members hold sizable amounts of equity in the firm might lead to better corporate governance due to higher incentives to monitor the firm. Since Blockholders on the board of directors have a tremendous financial stake in the firm, they should be more incentivized to prevent earnings management than other board members. They should also have greater insight into how the firm operates than other Blockholders due to their position on the board of directors. Overall, director Blockholders who do not serve as officers of the firm may be able to positively impact a firm due to their willingness and ability to prevent managers from engaging in actions detrimental to the firm, which leads to this paper's first hypothesis.

> ***Hypothesis 1:*** *Firms with director Blockholders are less likely to engage in earnings management through rounding behavior with reported dollar amounts up.*

Earnings Management and Working Capital

Roychowdhury (2006) highlights many real activities firms utilize to increase reported earnings. These activities include overproduction to report lower costs of goods sold and manipulation of working capital. Further accounting studies have supported that inventory overproduction can artificially inflate earnings to meet incentive targets (Cohen and Zarowin 2010; Gunny 2010). This manipulation may be complex for most monitors because they may not know the optimal inventory policies necessary to recognize when managers deviate from best inventory practices to artificially inflate the firm's value.

Inventory is part of a company's working capital and relates to accrual-based earnings management. Papers such as Teoh *et al.* (1998) use working capital measures such as accounts receivable, accounts payable, and inventory to construct discretionary accruals. These accruals are then used to determine whether firms are involved in accrual-based earnings management.

While the paper focuses on real activities and reported earnings, working capital management is also related to accrual-based earnings management.

Benford's Law has been adopted to detect inventory manipulation in different contexts. Chandra Das, Chandra Sekhar, and Rajib (2017) use the financial accounting data from a large sample of publicly listed Indian companies to examine if they depart from Benford's Law. Their result indicates that inventory significantly differs from Benford's Law distribution, and small firms have more data anomalies than large firms in the Indian context. Luty and Costa (2022)'s analysis of almost 9,000 Portuguese companies for 2020-2016 confirms that Benford's Law can be used to analyze the quality of financial information regarding inventory disclosure in the balance sheet. Alali and Romero (2013) find different indicators of inventory manipulation during different periods and differences between small and big companies and companies audited by Big 4 and non-Big 4 firms.

Director Blockholders may have specialized knowledge concerning how a firm should be run, which would include optimal inventory practices for their firm. These Blockholders are incentivized to drive their firm towards keeping optimal inventory levels, as using inventory to inflate firm values artificially may harm the firm in the long run, which leads to our second hypothesis.

> ***Hypothesis 2:*** *Director Blockholders can restrict earnings management by controlling inventory manipulation.*

3-DATA

This paper primarily utilizes data on Blockholders and earnings. Data on Blockholders comes from Andrew Metrick's website, as described in Dlugosz *et al.* (2006). This data set corrects problems in other Blockholder data available to researchers, consisting of 7,649 firm-years and 1,913 unique firms. Information on each Blockholder for each firm-year is listed, with each Blockholder listed as either an officer Blockholder, director Blockholder, outside Blockholder, or an Employee Stock Ownership Plan (ESOP). The dataset also provides the percentage of the firm owned by each Blockholder. However, we focus on the aggregate level dataset provided on the website, which compiles all blockholder data into a single pooled time-series and cross-section dataset. Data on earnings, accounts receivable, accounts payable, and inventory are taken from Compustat. The primary dataset for this paper consists of all Blockholder data with earnings data on Compustat, yielding a sample of 7,454 firm-years from 1996 to 2001.

For this study, Blockholders are defined as any shareholder who owns at least 5% of a firm's shares. Blockholders are divided into categories based on their role in the firm. Officer Blockholders are categorized as any Blockholders who work as firm officers. Director Blockholders are Blockholders who serve on a firm's board but are not officers of the firm they serve on. Outside Blockholders are Blockholders who are not employed by a firm in any capacity or are directly affiliated with officers and directors.

Statistically significant deviations from the distributions given by Benford's Law in the first and second digits of earnings may represent earnings management caused by manipulation of earnings. This paper focuses on managing the second digit of earnings, which may provide evidence of firm rounding earnings in reports due to either the "$1.99 phenomenon" or wanting earnings to reach key contractual numbers, as mentioned in Thomas (1989).

Tests in this paper are primarily done by analyzing each firm's second digits of variables. We determine how much the distribution of the second digits deviates from what would be expected based on the distribution given in Benford's Law. We use a normally distributed Z-statistic, as Thomas (1989) described, to calculate the significance of deviations from the expectations for Benford's Law. The Z-statistic is:

$$Z = \frac{|p - p_0| - \frac{1}{2n}}{\sqrt{\frac{p_0(1-p_0)}{n}}} \tag{3}$$

where p is the observed proportion, p_0 is the expected proportion, and n is the sample size. The second term in the numerator is applied only when it is less than the first term, as it is used to bring normal and binomial curves into an agreement.

Following Amiram e*t al.* (2015), we use Kolmogorov-Smirnov (KS) statistics to determine if firms conform to Benford's Law. We choose this method over the Mean Absolute Deviation statistics used by this paper, as the KS statistic provides critical values for comparisons between samples with different sample sizes. The KS statistic is:

$$\begin{aligned} KS = Max(&|AD_1 - ED_1|, |(AD_1 + AD_2) - ((ED_1 + ED_2)|, \ldots, \\ &|(AD_1 + AD_2 + \ldots + AD_n) - ((ED_1 \\ &+ ED_2 + \ldots + ED_n)|) \end{aligned} \tag{4}$$

where *AD* is the actual distribution of a number, and *ED* is the expected distribution of a number. Critical values to test the conformity of the distribution to Benford's Law at the 10% level are calculated using 1.63 divided by the square root of the sample size. To test conformity at the 5% level, we use 1.36 divided by the square root of the sample size. If the KS value exceeds the critical value, we can reject the null hypothesis that the distribution conforms to Benford's Law.

Following both Jiang *et al.* (2024) and Lebert *et al.* (2021), we use chi-squared statistics to determine if firms in our sample conform to Benford's Law. The chi-squared statistic is:

$$\chi^2 = \sum_{i=a}^{9} \frac{(o_i - b_i)^2}{b_i} \tag{5}$$

where o_i is the observed number of observations with the given leading digit and b_i is the expected number of observations with the given leading digit. The variable a equals one during tests of the first digits in a sample and zero during tests of the second digits in a sample.

4-EMPIRICAL RESULTS

Blockholders and Earnings Management

We begin by analyzing how the distribution of the second digits of earnings for firms in our primary sample differs from the distribution given in Benford's Law. Table 2 reports the deviations of each number from zero to nine when compared to the expected proportion of each number. As expected from previous research, there is a significantly greater number of zeroes in the sample than expected based on Benford's Law for firms with positive earnings. 12.94% of firms with positive reported earnings in our sample report earnings with a zero as the second digit, which is 0.97% higher than the expected amount of 11.97%. The finding suggests that firms manage earnings by rounding them up to a reference point. For firms with negative reported earnings, there is a significantly greater number of nines than would typically be expected from Benford's Law. 10.22% of these firms report earnings with a nine as the second digit, 1.72% greater than the 8.50% expected by Benford's Law. The finding further suggests earnings management, as firms with negative earnings seem to be rounding their negative earnings down below a reference point. These reported deviations are also statistically significant, as shown by the 2.36 and 2.08 Z-statistics.

Table 2
Deviations of Earnings for Director Blockholder Firms

This table reports deviations from the expected proportions of the second digit of a firm's earnings. Firms are separated into two samples based on whether they reported positive or negative earnings. Director Blockholder firms refer to firms with at least one director Blockholder, while non-director Blockholder firms are those without director Blockholders. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Positive Earnings										
Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion (Percent of Sample)	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
Total Sample	0.98**	-0.33	-0.35	0.02	0.10	-0.40	0.28	-0.40	-0.04	0.14
(n = 6250)	(2.36)	(0.81)	(0.88)	(0.03)	(0.23)	(1.06)	(0.74)	(1.07)	(0.08)	(0.37)
Director Firms	0.85	-0.79	-1.48	0.33	-0.97	-0.10	2.97**	1.39	-1.75	-0.47
(n = 585)	(0.57)	(0.54)	(1.08)	(0.19)	(0.71)	(0.01)	(2.40)	(1.10)	(1.42)	(0.33)
Non-Director Firms	0.99**	-0.29	-0.24	-0.01	0.21	-0.44	0.01	-0.58	0.14	0.20
(n = 5665)	(2.27)	(0.66)	(0.55)	(0.00)	(0.49)	(1.09)	(0.02)	(1.50)	(0.35)	(0.52)
Negative Earnings										
Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion (Percent of Sample)	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
Total Sample	0.08	-1.67**	0.41	1.02	-0.73	-1.94**	-0.28	-0.23	1.63**	1.72**
(n = 1204)	(0.04)	(1.78)	(0.41)	(1.11)	(0.79)	(2.23)	(0.29)	(0.23)	(1.94)	(2.08)
Director Firms	-0.75	-3.91	-3.41	3.58	4.92	-2.19	2.81	0.31	-0.35	-1.02
(n = 107)	(0.09)	(1.12)	(0.98)	(1.05)	(1.53)	(0.60)	(0.83)	(0.05)	(0.04)	(0.21)
Non-Director Firms	0.16	-1.45	0.79	0.77	-1.28	-1.92**	-0.59	-0.28	1.82**	1.98**
(n = 1097)	(0.11)	(1.47)	(0.79)	(0.78)	(1.36)	(2.10)	(0.62)	(0.28)	(2.08)	(2.30)

To Test Hypothesis 1, we divide the sample into firms with director Blockholders and firms without director Blockholders. Firms without director Blockholders have a statistically higher number of zeroes than expected when earnings are positive (0.98% higher) and a higher number of nines than expected when earnings are negative (1.98% higher). These deviations are also statistically significant at the 5% level, with 2.27 and 2.30 Z-statistics, respectively. The finding suggests that these firms manage earnings by rounding earnings. On the other hand, firms with director Blockholders do not have significant deviations for either the zero or nine digits. These results suggest that firms with director Blockholders are less likely to engage in earnings management related to rounding than firms without director Blockholders.

It should be noted that Durtschi *et al.* (2016) point out the pitfall of using Benford's Law with large samples, explaining how larger samples require only a small number of deviant

transactions to reject the null hypothesis that a distribution conforms to Benford's Law. However, by focusing only on a single second digit for our study, we largely avoid this problem. For our positive earnings sample of 6,250 firm-year observations, there would be an expected 748 observations (11.97% * 6,250) with a zero in the second digit. The number of zeroes required to reach a Z-score of 1.96 is 799. This result suggests that there must be at least 51 extra zeroes to achieve the significant 5% level or an additional 6.8% (51/748) number of zeroes. We would argue that this is not an insignificant number of deviant observations. All other sub-samples have fewer observations, requiring an even larger proportion of deviant observations to reject the null hypothesis at the 5% level. Also, our sample size is comparable to similar papers that look at the second digit for evidence of rounding behavior, such as Thomas (1989) and Lebert *et al.* (2021).

Table 3
Goodness of Fit Tests

This table reports goodness-of-fit tests for our indicated subsamples. Both Kolmogorov-Smirnov and chi-squared statistics are reported. Firms are separated into two samples based on whether they reported positive or negative earnings. Director Blockholder firms refer to firms with at least one director Blockholder, while non-director Blockholder firms are those without director Blockholders. The sample size was used to calculate critical values for the KS statistics, with the 5% critical values for each subsample reported in the table. A KS statistic greater than the critical value signifies that we can reject the null hypothesis that the sample conforms to Benford's Law. P-values from the chi-squared tests are also reported. Statistics were found for both the first and second digits in the subsample. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Positive Earnings

Subsample and Digits Used	Sample Size	KS Statistic	KS 5% CV	Chi^2	*p*-value
First Digits of all Firms	6250	0.0125	0.0172	10.08	0.259
Second Digits of all Firms	6250	0.0098	0.0172	9.162	0.423
First Digits of all Director Blockholder Firms	585	0.0149	0.0562	4.532	0.806
Second Digits of all Director Blockholder Firms	585	0.0220	0.0562	11.32	0.254
First Digits of all Non-Director Blockholder Firms	5665	0.0145	0.0181	11.02	0.201
Second Digits of all Non-Director Blockholder Firms	5665	0.0099	0.0181	9.201	0.419
First Digits of DB Firms with 0's or 1's in Second Digit	137	0.0484	0.1162	6.266	0.618
First Digits of Non-DB Firms with 0's or 1's in Second Digit	1363	0.0372**	0.0368	13.202	0.105

Negative Earnings

Subsample and Digits Used	Sample Size	KS Statistic	KS 5% CV	Chi^2	*p*-value
First Digits of all Firms	1204	0.0369*	0.0392	14.803*	0.063
Second Digits of all Firms	1204	0.0335	0.0392	17.770**	0.038
First Digits of all Director Blockholder Firms	107	0.0880	0.1315	11.453	0.177
Second Digits of all Director Blockholder Firms	107	0.0807	0.1315	7.882	0.546
First Digits of all Non-Director Blockholder Firms	1097	0.0340	0.0411	12.747	0.121
Second Digits of all Non-Director Blockholder Firms	1097	0.0381*	0.0411	19.054**	0.025
First Digits of DB Firms with 8's or 9's in Second Digit	17	0.2491	0.3299	9.761	0.283
First Digits of Non-DB Firms with 8's or 9's in Second Digit	231	0.1019**	0.0895	17.522**	0.025

To further test the impact of director Blockholders, we utilize goodness-of-fit tests to determine if our data fits the distribution suggested by Benford's Law. Both KS and chi-squared tests are reported in Table 3 for various subsamples of our data. For KS statistics, if the statistic is greater than a critical value, we can reject the null hypothesis that the sample conforms to Benford's Law. As an example, Amiram e*t al.* (2015) find that 85.63% of firm financial statements in their sample conform to Benford's Law when their KS statistics are compared to 5% critical values. Our findings support this, as our results for the first and second digits of firms with positive earnings suggest that they follow Benford's Law. (Reported deviations for the first digits can be found in the appendix.) However, the first digit of all firms with negative earnings does not conform to Benford's Law, based on the 10% critical value. Results for the first and second digits of director Blockholder and non-director Blockholder firms also follow Benford's Law, except for the second digits of non-director Blockholder firms with negative earnings.

For firms with positive earnings, chi-squared statistics seem to be insignificant when looking at the first and second digits for both director Blockholder and non-director Blockholder firms. However, both the first and second digits for firms with negative earnings significantly deviate from Benford's Law. The first and second digits for Director Blockholder firms report insignificant chi-squared values, while non-director Blockholder firms' second digits are significant at the 5% level. Overall, these results suggest that firms with negative earnings are more likely to manage earnings, likely due to greater desperation to avoid looking worse to investors.

To test the impact of rounding behavior, we look at firms with positive earnings and either 0's or 1's in the second digit. We also look at firms with negative earnings and either 8's or 9's in the second digit. As these firms are more likely to have managed earnings, particular focus is placed on these firms. This is similar to the process used by Lebert *et al.* (2021), which does additional Benford's Law testing on firms considered more likely to engage in rounding earnings management based on previous Benford's Law analysis. Two digits are used rather than one to ensure that the director Blockholder firms with negative earnings have a large enough sample size to be analyzed. The KS statistics are not significant for director Blockholder firms but are significant at the 5% level for non-director Blockholder firms. The chi-squared statistics are significant at the 5% level for non-director Blockholder firms with negative earnings while remaining insignificant for firms with director Blockholders. This provides greater support for Hypothesis 1 while showing that director Blockholders have an even greater impact on firms reporting negative earnings.

Table 4
Deviations of Earnings for Officer and Outside Blockholder Firms

This table reports deviations from the expected proportions of the second digit of a firm's earnings. Only firms with positive earnings are reported. Officer Blockholder firms refer to firms with at least one officer director Blockholder, while outside Blockholder firms refer to firms with at least one outside director Blockholder. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Officer and Non-Officer Blockholder Firms with Positive Earnings

Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
(Percent of Sample)										
Total Sample	0.98**	-0.33	-0.35	0.02	0.10	-0.40	0.28	-0.40	-0.04	0.14
(n = 6250)	(2.36)	(0.81)	(0.88)	(0.03)	(0.23)	(1.06)	(0.74)	(1.07)	(0.08)	(0.37)
Officer Firms	2.58**	-1.76	-0.53	-1.63	0.32	0.68	1.22	-1.04	0.77	-0.61
(n = 976)	(2.44)	(1.68)	(0.48)	(1.61)	(0.28)	(0.67)	(1.25)	(1.08)	(0.80)	(0.63)
Non-Officer Firms	0.68	-0.07	-0.32	0.33	0.06	-0.60	0.11	-0.28	-0.19	0.28
(n = 5274)	(1.50)	(0.14)	(0.73)	(0.75)	(0.11)	(1.46)	(0.24)	(0.67)	(0.46)	(0.70)

Outside and Non-Outside Blockholder Firms with Positive Earnings

Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
(Percent of Sample)										
Total Sample	0.98**	-0.33	-0.35	0.02	0.10	-0.40	0.28	-0.40	-0.04	0.14
(n = 6250)	(2.36)	(0.81)	(0.88)	(0.03)	(0.23)	(1.06)	(0.74)	(1.07)	(0.08)	(0.37)
Outside Firms	1.02**	-0.26	-0.69	-0.06	0.12	0.10	0.11	-0.77	-0.05	0.46
(n = 4719)	(2.14)	(0.55)	(1.50)	(0.11)	(0.25)	(0.21)	(0.24)	(1.82)	(0.09)	(1.12)
Non-Outside Firms	0.83	-0.55	0.68	0.27	0.03	-1.96**	0.79	0.76	0.00	-0.86
(n = 1531)	(0.97)	(0.63)	(0.81)	(0.30)	(0.00)	(2.55)	(1.01)	(1.00)	(0.03)	(1.16)

To see if this finding applies to all Blockholders, we repeat the tests using both officer and outside Blockholders. Table 4 shows that firms with officer Blockholders that report positive earnings have significantly more zeros in the distribution of second digits than would usually be expected by Benford's Law. The same is true for firms with outside Blockholders. However, firms without these Blockholders do not have significant deviations in the number of zeroes reported. The finding suggests that Blockholders who do not sit on the board of directors increase earnings management, which is associated with rounding to a reference point. Officer Blockholders may allow this earnings management to happen for their benefit. For outside Blockholders, this is consistent with the findings of Zhong e*t al.* (2007) and Guthrie and Sokolowsky (2010), who report that outside Blockholders may increase the amount of earnings management in a firm.

Busy Boards and Earnings Management

To further test the impact of directors on earnings management, we apply Benford's Law to firms with busy boards and firms without busy boards. Using BoardEx data, we classify

directors on at least three boards as busy directors. Any boards where at least 50% of directors are busy directors as busy boards. We then followed the same matching method used for the list of the firms in our Blockholder data. All BoardEx firms from 1996 to 2001 were matched with their net income reported in Compustat where available, leading to a sample of 13,329 firm-year observations. Both samples operate under the same pre-SOX sample and have similar regulations. One issue is that this leads to a sample almost twice that of our sample testing for Blockholder firms. However, we are not directly comparing the relative strength between director Blockholders and busy directors. We are merely providing supporting evidence that directors can impact reported earnings by analyzing the impact of inattentive directors. This may give an explanation for our previous findings, as director Blockholders can be expected to be more attentive to the firm due to financial incentives to protect their investments.

Table 5
Deviations of Earnings for Firms with Busy Boards

This table reports deviations from the expected proportions of the second digit of a firm's earnings. Only firms with positive earnings are reported. Busy board firms refer to firms with a busy board, while non-busy board firms are firms without a busy board. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
(Percent of Sample)										
Total Sample	0.97***	-0.24	-0.41	0.21	-0.32	0.28	0.12	-0.24	0.34	-0.73***
(n = 13329)	(3.45)	(0.86)	(1.50)	(0.78)	(1.20)	(1.08)	(0.48)	(0.96)	(1.36)	(3.00)
Busy Board Firms	1.20***	-0.09	-0.30	0.33	-0.22	0.11	-0.09	-0.53	0.34	-0.75**
(n = 8301)	(3.35)	(0.24)	(0.87)	(0.96)	(0.66)	(0.33)	(0.25)	(1.67)	(1.07)	(2.44)
Non-Busy Board Firms	0.60	-0.49	-0.58	0.02	-0.46	0.55	0.47	0.23	0.33	-0.68
(n = 5028)	(1.29)	(1.07)	(1.30)	(0.02)	(1.07)	(1.31)	(1.12)	(0.55)	(0.81)	(1.71)

Table 5 compares the deviations between the actual distributions of second digits and the distribution expected from Benford's Law. Firms with busy boards have significantly more zeroes in their distributions than expected, while firms with non-busy boards do not report any significant deviations. The finding suggests that having attentive directors sitting on a firm's board lowers the amount of earnings management one might expect. This helps to provide theoretical justification for our findings, as greater attention paid to a firm may be what drives director Blockholders to limit earnings management.

Management of Working Capital

Firms manipulating earnings numbers will also likely need to adjust other financial numbers. Amiram *et al.* (2015) specifically mention three journal entries that simulations showed had a significant impact on other financial items and are directly related to masking poor performance. Two of these involve accounts receivable and inventory. We, therefore, look at working capital variables to see if they conform to Benford's Law. It should also be noted that working capital variables are related to accrual-based earnings management, as they are used in

calculating discretionary accruals in papers such as Teoh *et al.* (1998). Thus, our results here should have some correlation with accrual-based earnings management.

Non-officer director Blockholders should be willing to ensure that managers follow optimal working capital practices. This action should prevent real earnings management from firms using inflated working capital reporting to increase the firm's value artificially. We analyze if firms improperly manage accounts receivable, accounts payable, and inventory through rounding. To test this, we used all observations in our Blockholder sample, which reported all three variables in Compustat and had positive earnings, dropping the sample to 4,262 firm years.

Table 6 shows the deviations from the expected distribution of the second digit of working capital components for firms in our Blockholder sample with positive earnings. The number of zeros in the accounts receivable and accounts payable distributions are insignificant, implying they are not being significantly managed. However, the deviation from the expected number of zeros for inventory is significant, as 13.57% of firms in this sample report earnings with a zero as the second digit. This is higher than the 11.97% of firms that would be expected to report earnings with a zero as the second digit, with a 3.20 Z-statistic, suggesting that firms may be manipulating their inventory reporting through rounding.

Table 6
Deviations of Working Capital Variables for Director Blockholder Firms
This table reports deviations from the expected proportions of the second digit of a firm's accounts receivable, accounts payable, and inventory. Only firms with positive earnings are reported. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
(Percent of Sample)										
Accounts Receivable	0.57	-0.30	-0.41	-0.38	-0.61	-0.05	0.08	0.04	0.32	0.73*
(n = 4262)	(1.18)	(0.63)	(0.89)	(0.83)	(1.36)	(0.10)	(0.17)	(0.08)	(0.75)	(1.76)
Accounts Payable	0.71	0.55	-1.08**	0.46	-0.31	-0.05	0.15	0.47	-0.47	-0.45
(n = 4262)	(1.49)	(1.17)	(2.35)	(1.01)	(0.69)	(0.10)	(0.33)	(1.11)	(1.13)	(1.08)
Inventory	1.60***	-1.29***	-0.13	0.01	0.12	-0.22	0.25	-0.13	-0.44	0.22
(n = 4262)	(3.20)	(2.62)	(0.24)	(0.01)	(0.23)	(0.47)	(0.53)	(0.27)	(0.98)	(0.48)

We then check if director Blockholders can impact this earnings management by checking the distribution of the second digit of inventory for firms with and without director Blockholders. Table 7 reports our findings. The deviation of the zeroes in the second digit for the distribution seems to be primarily driven by firms without director Blockholders, as they report 1.74% more zeroes than should be expected. Meanwhile, there is no significant deviation for firms with director Blockholders. The finding suggests that director Blockholders can limit the management of inventory driven by rounding.

Table 7
Inventory for Firms with Positive Earnings
This table reports deviations from the expected proportions of the second digit of a firm's accounts receivable, accounts payable, and inventory. Only firms with positive earnings are reported. Director Blockholder firms refer to firms with at least one director Blockholder, while non-director Blockholder firms are those without director Blockholders. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Second Digit	0	1	2	3	4	5	6	7	8	9
Expected Proportion	11.97	11.39	10.88	10.44	10.03	9.67	9.34	9.04	8.76	8.50
(Percent of Sample)										
Total Sample	1.60**	-1.29***	-0.13	0.01	0.12	-0.22	0.25	-0.13	-0.44	0.22
(n = 4262)	(3.20)	(2.62)	(0.24)	(0.01)	(0.23)	(0.47)	(0.53)	(0.27)	(0.98)	(0.48)
Director Firms	0.28	1.37	-1.70	-0.24	-0.59	1.56	2.65*	-0.62	-1.87	-0.85
(n = 392)	(0.09)	(0.77)	(1.00)	(0.07)	(0.31)	(0.96)	(1.72)	(0.34)	(1.22)	(0.51)
Non-Director Firms	1.74***	-1.56***	0.03	0.03	0.19	-0.40	0.00	-0.08	-0.29	0.33
(n = 3875)	(3.30)	(3.03)	(0.04)	(0.04)	(0.36)	(0.82)	(-0.02)	(0.15)	(0.62)	(0.70)

5-CONCLUSION

This paper examines the impact of Blockholders sitting on the board of directors on earnings management. To do this, we analyze the second digit of earnings for multiple firms to find how the earnings of our sample deviate from the expected distribution of Benford's Law. Our findings suggest that director Blockholders can limit earnings management associated with rounding. We provide evidence that this finding is likely due to increased vigilance in monitoring, as firms without busy boards also have less earnings management than firms with busy boards. In addition, we also show that other Blockholders, such as officers and outside Blockholders, cannot limit this type of earnings management. Finally, we show that firms are willing to manage inventory numbers but find no evidence that they manage accounts receivable or accounts payable.

Our research contributes to the corporate governance literature by studying the board of directors and Blockholders. We show that Blockholders on the board of directors can positively influence a firm by limiting earnings management, particularly real earnings management caused by inventory manipulation. Our finding adds to the corporate governance literature, showing that director Blockholders should be considered in studies of real earnings management. We find that firms with negative earnings are more likely to engage in earnings management through rounding than firms with positive earnings. We add further evidence that outside Blockholders are limited in their ability to prevent earnings management in the firm. Future studies can build on this finding by analyzing other avenues through which director Blockholders can prevent various types of earnings management.

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APPENDIX

Deviations of Earnings for Director Blockholder Firms (First Digit)

This table reports deviations from the expected proportions of the first digit of a firm's earnings. Firms are separated into two samples based on whether they reported positive or negative earnings. Director Blockholder firms refer to firms with at least one director Blockholder, while non-director Blockholder firms are those without director Blockholders. Z-scores are reported below the deviations. (*, **, *** indicate significance at the 10%, 5%, and 1% level, respectively)

Positive Earnings

First Digit	1	2	3	4	5	6	7	8	9
Expected Proportion (Percent of Sample)	30.10	17.61	12.48	9.69	7.92	6.70	5.80	5.12	4.58
Total Sample	-0.68	-0.55	-0.01	0.93**	0.48	0.03	0.07	-0.20	-0.06
(n = 6250)	(1.16)	(1.13)	(0.01)	(2.47)	(1.39)	(0.05)	(0.22)	(0.70)	(0.21)
Director Firms	-1.39	2.22	-0.70	0.57	-0.23	0.48	0.53	-0.50	-0.99
(n = 585)	(0.69)	(1.36)	(0.45)	(0.39)	(0.13)	(0.39)	(0.46)	(0.45)	(1.04)
Non-Director Firms	-0.61	-0.84	0.06	0.97**	0.55	-0.02	0.03	-0.17	0.03
(n = 5665)	(0.98)	(1.64)	(0.11)	(2.45)	(1.52)	(0.04)	(0.06)	(0.56)	(0.08)

Negative Earnings

First Digit	1	2	3	4	5	6	7	8	9
Expected Proportion (Percent of Sample)	30.10	17.61	12.48	9.69	7.92	6.70	5.80	5.12	4.58
Total Sample	-3.69***	1.66	-0.78	0.36	1.55*	0.12	0.18	-0.38	0.99
(n = 1204)	(2.76)	(1.47)	(0.78)	(0.37)	(1.94)	(0.10)	(0.21)	(0.53)	(1.57)
Director Firms	-6.74	2.02	-4.08	5.26*	5.17*	-2.02	0.74	1.43	-1.77
(n = 107)	(1.41)	(0.42)	(1.13)	(1.68)	(1.80)	(0.64)	(0.12)	(0.45)	(0.65)
Non-Director Firms	-3.39**	1.63	-0.46	-0.12	1.20	0.32	0.13	-0.56	1.26*
(n = 1097)	(2.42)	(1.37)	(0.42)	(0.08)	(1.41)	(0.37)	(0.11)	(0.77)	(1.92)