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Corporate diversification and accrual and real earnings management: a non-linear relationship

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Corporate diversification and accrual and real earnings management: a non-linear relationship

Abstract

Purpose–This study aims to examine the non-linear relationship between corporate diversification and real and accrual earnings management, using a sample of 5,659 US firm-year observations for 1,221 firms covering the period from 2001 to 2012.

Design/methodology/approach–The authors employ various techniques and regressions to test the hypotheses. Following prior research, several proxies have been used to measure diversification, accrual earnings management, and real earnings management.

Findings–The study produces several important findings. First, the study provides evidence that diversified firms engage in real and accrual earnings management to manage their reported earnings upwards. These results are consistent with recent research (e.g., Farooqi et al. 2014; Jirapon et al., 2008) that finds that diversified firms engage in earnings manipulation. Second, and most importantly, the study contributes to the literature by providing the first evidence on a non-linear relationship between corporate diversification and earnings management. Specifically, the study provides evidence that diversified firms engage in accrual (real) earnings management, but this engagement is associated with level of diversification in a non-linear U shaped (inverted U shaped) relationship.

Research limitations/implication–Like all other studies, the current study has some limitations. The study was conducted only on the largest firms in the US that have market capitalization of more than $10 million; hence the findings may not be generalizable to small publicly traded firms. Further, the findings may not be generalizable to other markets given the unique characteristics of US markets such as the presence of very sophisticated investors.

Practical implications–This study provides some important implications for US regulators to revise their regulations to prevent diversified firms from using earnings management to manipulate reported earnings.

Originality/value–This study is the first in the US to examine the non-linear relationship between corporate diversification and earnings management. The study focuses on one of the most active, most attractive, and largest capital markets throughout the world, that of the US. Also, this study is one of the few studies that examine whether diversified firms use real activities manipulation to manage their reported earnings.

Keywords Diversification, Accrual Earnings Management, Real Earnings Management, Non-linear Relationship.

Paper type Research paper

1. Introduction

The evidence of earnings management practices is substantial (Dechow et al, 1998; Roychowdhury, 2006; among others). Executives may engage in earnings management to meet analysis expectations (Gunny, 2010), avoid losses (Burgstahler and Dichv, 1997; Roychowdhury, 2006), or maximize their personal benefits (Cheng and Warfield, 2005). Earnings management, though it may increase short-term earnings targets, is unlikely to increase long-term firm value (Alhadab et al., 2015; Roychowdhury, 2006).

A recent line of research (Farooqi, Harris, and Ngo, 2014; Jirapon, Kim, and Mathur, 2008; Lim, Thong, and Ding, 2008; among others) has been conducted to examine the link between corporate diversification and earnings management. Our study extends that research strand in two important ways. First, these studies report important evidence on the difference in level of earnings management between diversified and non-diversified firms but are totally silent on the level of earnings management at different levels of diversification. If firms are different at each level of diversification in terms of organization complexity, strategic goals, financial resources, and investment opportunities (e.g., see Beattie, 1980; Gort, 1962; Wan, Hoskisson, Short, and Yiu, 2011; among many others), then managers' motivations and abilities to use various techniques to manage earnings may be determined by level of corporate diversification. An illustration for this notion is the inverted U-shape relationship between degree of diversification and firms' performance widely reported in the literature (Fryxell and Barton, 1990; Palich, Cardinal, and Miller, 2000; Rumelt, 1974; among others). We have developed a theoretical framework to investigate the hypothesis that earnings management may relate to level of corporate diversification in a non-linear pattern. Second, previous studies only investigate impact of corporate diversification on either accrual earnings management (Jirapon et al., 2008; Lim et al., 2008) or real earnings management (Farooqi et al., 2014). While Jirapon et al. (2008) and El Mehdi and Seboui (2011) find that corporate diversification reduces accrual earnings management, Farooqi et al. (2014) show higher levels of real earnings management in diversified firms. The findings suggest that firms may use accrual and real earnings management as substitutes for each other (Zang, 2012), though the evidence may not be sufficient to establish how corporate diversification impacts firms' earning manipulation activities. Our second contribution is, that we simultaneously investigate the impact of corporate diversification on accrual and real activities earnings management and therefore are able to show novel evidence that managers of diversified firms use real and accrual earnings management as substitutes in managing earnings.

Using a sample of US firms from 2001 to 2012, our paper focuses on investigating the effects of industrial diversification on earnings management as the theoretical arguments and empirical analysis in the diversification literature (Berger and Ofek, 1995; Lang and Stulz, 1994; Rajan, Servaes, and Zingales, 2000; among many others) are developed on firms' industrial diversification (rather than geographical diversification).[1]

We show evidence that corporate diversification mitigates accrual earnings management, which is consistent with the findings of Jirapon et al. (2008) and El Mehdi and Seboui (2011). At the same time, we also show that diversified firms tend to use more real earnings management than single-segment firms, which is consistent with the research of Farooqi et al. (2014). More importantly, we find novel evidence of a non-linear relationship between corporate diversification, and accrual and real earnings management. Interestingly, we find that industrial diversification impacts accrual and real earnings management in the opposite way. More specifically, we find a U-shaped (an inverted U-shaped) relationship between corporate diversification and accrual (real) earnings management.

The remainder of this paper is organized as follows. Background information on diversification and earnings management, followed by hypothesis development, is provided in Section 2. Section 3 includes information about the data and research methodology used in this study.

[1] For this reason, corporate diversification is understood as industrial diversification throughout this paper.

Section 4 reports the main results of the research, while a robustness test is introduced in Section 5. Finally, Section 6 offers some concluding remarks on this study.

2. Background and hypothesis development

2.1 Earnings management and corporate diversification.

The line of research on the relationship between corporate diversification and earnings management was initiated by Jirapon et al. (2008) with their study in which they proposed two hypotheses: informational asymmetry and offsetting accruals. Their informational asymmetry hypothesis predicts higher earnings management in diversified firms because the complex structure of the firms makes earnings manipulations more difficult to detect. In contrast, the offsetting accruals hypothesis argues that imperfect correlation of divisional cash flows limits the flexibility of management to manipulate earnings. The authors find empirical evidence supporting the latter hypothesis, whereby firms operating in more than one industry have lower levels of accrual earnings management compared to firms that operate in a single industry. El Mehdi and Seboui (2011) replicate the approach of Jirapon et al. (2008) and report similar results. Lim et al. (2008) use similar arguments and find that diversification, as measured by a firm's number of segments, increases accrual earnings management in the specific seasoned equity offerings. Using a different proxy for earnings management, Farooqi, Harris, and Ngo (2014) find higher real earnings management in diversified firms compared to non-diversified firms.

Altogether, the studies in the literature are largely established on two main arguments—the informational asymmetry and offsetting accruals hypotheses—to investigate the impact of diversification on earnings management. Most of the studies (except Farooqi et al., 2014) focus on investigating impact of diversification on accrual earnings management. The results seem to suggest that diversified firms have higher levels of real earnings management and lower levels of accrual earnings management than non-diversified firms. It is not clear, however, whether the levels of earnings management change with the different levels of corporate diversification. In the next sub-section, we propose a new hypothesis and then combine it with the two key hypotheses in the literature to develop our hypothesis on the non-linear relationship between level of corporate diversification and of earnings management.

2.2 Free cash flow hypothesis

Further to two key hypotheses in previous studies, we develop a novel free cash flow hypothesis to investigate the impact of diversification on earnings management. This hypothesis is based on an argument from Chung et al. (2005) on free cash flow and earnings management. Chung et al. (2005) argue and show empirical evidence that firms with high free cash flow and low growth opportunities will be more likely to engage in earnings management to offset the low and/or negative earnings from their investments. The arguments are largely relevant in the context of corporate diversification.

In particular, firms at lower levels of diversification may have larger free cash flow than non-diversified firms (Nguyen, Cai, and McColgan, 2016), but they are also still at a growth stage with a wide range of available investment opportunities. Managers of diversified firms have both a portfolio of profitable investment opportunities and abundant financial resources to expend. Also, Stein (1997) argues that the managers' ability to pick the "winners" (i.e., projects with highest positive NPV) is better when they do not have to monitor too many projects. At low diversification levels, managers of diversified firms can be in a good position to invest in profitable projects and therefore do not need to manage their earnings.

When firms become more diversified and mature, their free cash flow may still increase, but their growth opportunities are limited. As such, Stulz (1990) argues that diversified firms will tend to invest too much in segments with poor investment opportunities. Jensen (1986) asserts that managers of firms with large free cash flow are more likely to undertake negative net present value investments. The implication of Jensen's assertion is that diversified firms will invest more in value-decreasing projects as their segments have access to free cash flow as part of a diversified firm. Inefficient cross subsidization within internal capital markets of diversified firms is widely documented (Lamont, 1997; Ozbas and Scharfstein, 2010; Shin and Stulz, 1998; among others). Empirical evidence also indicates that inefficient investments in internal capital markets positively relate to level of diversification (Berger and Ofek, 1995; Lang and Stulz, 1994; Rajan, Servaes, and Zingales, 2000). Thus, it is likely that managers of more diversified firms have to increase the extent of earnings management to cover the low income from these inefficient investments.

2.3 Level of diversification, and real and accrual earnings management

Upon the theoretical framework from these hypotheses reviewed above (i.e., our free cash flow hypothesis, and information asymmetry and offsetting accruals hypotheses), we develop two hypotheses to investigate specifically the relationship between corporate diversification and real and accrual earnings management. More specifically, at the low level of diversification, while the demand to manipulate earnings may be low as predicted by the free cash flow hypothesis, managers may just need to manipulate real activities as they prefer real to accrual earnings management (Graham et al., 2005; Gunny, 2010). A consequence is that managers may only use accrual earnings management as a "contingency" plan even though the offsetting accrual hypothesis suggests that low-diversified firms are in a better position to manage accrual earning. Also, as explained in the free cash flow hypothesis, investment opportunities are abundant at the low levels of diversification, so it may be easier for managers to justify their cut in real activities spending such as advertising or R&D. The information asymmetry hypothesis also suggests that low information asymmetry at a low level of diversification may make accrual manipulation easier to detect, given that such managers may not want to use discretionary accruals to manage earnings. The offsetting accrual hypothesis in general is more relevant to explain the accrual earning management. Accordingly, when levels of diversification increase, the impact of offsetting accrual increases which leads to lower level of accrual earning management. At low levels of diversification, managers may depend more on real earnings management than accrual earnings management. When the information asymmetry increases at the higher levels of diversification, managers may consequently rely more on accrual earnings management. It is also no longer easy for managers to manipulate spending on real activities when firms become more diversified with more free cash flow and fewer investment opportunities. Furthermore, that the marginal impact of diversification on correlations of cash flows is diminished at the higher levels of diversification (i.e., adding one more division to already highly diversified firms has trivial impact on correlations of cash flows) implies that the cash flows offsetting may be low at this level of diversification. At high levels of diversification, managers may use more accrual earnings management than real earnings management.

Altogether, it is likely that at low levels of diversification managers will use more real earnings management and less accrual earnings management up to the point where it is easier for managers to use accrual earnings management (than real earnings management). We, therefore, hypothesize that:

H1a: Relation between corporate diversification and real earnings management will be in an inverted U-shaped pattern. Diversification will increase level of real earnings management when degree of diversification is low. When firms become more diversified, real earnings management decreases.

H1b: Relation between corporate diversification and accrual earnings management will be in a U-shaped pattern. Diversification will reduce level of real earnings management when degree of diversification is low. When firms become more diversified, real earnings management increases.

3. Research methodology

3.1 Sample construction

The sample includes all US firms available from Compustat covering the period from 2001 to 2012. Following Berger and Ofek (1995), we exclude financial and utility firms but do not exclude firms with financial segments. Furthermore, all firm-year observations with missing data on any variables used in the regressions or market capitalization of less than $10 million are removed from the sample. For the integrity of segment data, only firm-year observations with sum of segment sales within 1% of a firm's total sales are kept in the sample. We further require that only firm-year observations with all earnings management proxies be retained. While these restrictions may reduce the sample size, this will allow for a very conservative test. The final sample consists of 5,659 firm-year observations for 1,221 firms over the period 2001-2012.[2]

Further, we follow prior literature and define the specialized firm as one that operates in a single two-digit SIC industrial segment, while diversified firms are those which operate in more than one two-digit SIC industrial segment. We report all variable definitions in Table 1.

3.2 Measuring accrual-based earnings management

We estimate discretionary accruals using the modified Jones model as suggested by Dechow et al. (1995). We run a cross-sectional regression for each year for all firms for each two-digit SIC industry category. This approach, in part, controls for changes in economic conditions that impact total accruals across different industry groups, but allows for coefficients to vary through time (Cohen and Zarowin, 2010; DeFond and Jiambalvo, 1994; Kasznik, 1999). Thus, the following cross-sectional regression is estimated for each two-digit SIC code industry-year group that has at least six observations (Athanasakou et al., 2011; Iqbal et al., 2009; Rosner, 2003).

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[2] Due to many missing values related to control variables included in the analysis of the trade-off between accrual and real earnings management, the sample size is reduced to just 5,659 firm-year observations over the period from 2001 to 2012. It is worth noting that our sample size is comparable to prior studies that examine the trade-off between real and accrual earnings management based on US data. For example, Zang (2012) examines the trade-off between real and accrual earnings management using a US sample that consists of 6,547 firm-year observations over the period 1987-2008.

$$\frac{TA_{i,t}}{ASSETS_{i,t-1}} = a_0 + \beta_1 \frac{1}{ASSETS_{i,t-1}} + \beta_2 \frac{\Delta SALES_{i,t}}{ASSETS_{i,t-1}} + \beta_3 \frac{PPE_{i,t}}{ASSETS_{i,t-1}} + \varepsilon_{\text{DA-MDJONES}} \quad (1)$$

Discretionary accruals (we denote it here after as *DA-MDJONES*) are measured as the residuals from equation 1.

Where *TA* is total accruals defined as earnings before extraordinary items minus cash flows from operations; Δ*SALES* is the change in sales during a year; *PPE* is the gross value of property, plant, and equipment scaled by total assets at the beginning of the year; and $ASSETS_{t-1}$ is total assets at the beginning of the year.[3]

3.3 Measuring real activities-based earnings management

Following prior research (e.g., Alhadab et al., 2016; Farooqi et al., 2014; Roychowdhury, 2006), three proxies of real earnings management are examined in this study: sales-based manipulations (abnormal cash flows from operations), discretionary expenses-based (abnormal discretionary expenses), and production cost-based (abnormal production cost). Sales-based manipulation aims to increase sales by offering more price discounts and/or more lenient credit terms, but at the expense of cash flows from operations (for more details, see, Roychowdhury, 2006). In the second scenario, discretionary expenses represent the sum of research and development expenses (R&D), advertising expenses, and selling, general, and administrative expenses (SG&A). Reducing discretionary expenses in the current period will boost reported earnings in the current period. The third activity is production cost-based manipulation, conducted by producing more units to lower the total cost of goods sold, which leads to an increase in the profit margin.

We follow prior research and estimate the three proxies of real earnings management based on models developed by Dechow, Kothari, and Watts (1998) and applied by Roychowdhury (2006). Later researchers such as Cohen et al. (2008), Cohen and Zarowin (2010), Zang (2012), and

[3] To provide comparable results with prior research, we follow Jirapon et al. (2008) and the absolute value of discretionary accruals [*ABS(DA-MDJONES*]. The results are qualitatively similar. Further, for robustness, we also use the piecewise linear variant of the Jones (1991) model as suggested by Ball and Shivakumar (2006) to estimate discretionary accruals. Ball and Shivakumar's (2006) model is based on the assumption that the relation between accruals and cash flows is not linear since managers recognize the unrealized losses immediately via accruals and delay the recognition of unrealized gains, and thus, the model was developed to control for the symmetric recognition of gains and losses (Jones et al. 2008). The results are qualitatively similar to those reported in the paper, but not reported for the sake of brevity. The unreported results are available upon request.

Alhadab et al. (2016) use these models to estimate real earnings management. Similar to our estimation of accruals earnings management, we first estimate the normal level of cash flows from operations, discretionary expenses, and production cost using the following cross-sectional regressions for each two-digit SIC code industry-year group that has at least six observations.

$$\frac{CFO_{i,t}}{ASSETS_{i,t-1}} = a_0 + \beta_1 \frac{1}{ASSETS_{i,t-1}} + \beta_2 \frac{SALES_{i,t}}{ASSETS_{i,t-1}} + \beta_3 \frac{\Delta SALES_{i,t}}{ASSETS_{i,t-1}} + \varepsilon_{\text{ABNCFO}} \qquad (2)$$

$$\frac{DISX_{i,t}}{ASSETS_{i,t-1}} = a_0 + \beta_1 \frac{1}{ASSETS_{i,t-1}} + \beta_2 \frac{SALES_{i,t-1}}{ASSETS_{i,t-1}} + \varepsilon_{\text{ABNDEXP}} \qquad (3)$$

$$\frac{PRODCST_{i,t}}{ASSETS_{i,t-1}} = a_0 + \beta_1 \frac{1}{ASSETS_{i,t-1}} + \beta_2 \frac{SALES_{i,t}}{ASSETS_{i,t-1}} + \beta_3 \frac{\Delta SALES_{i,t}}{ASSETS_{i,t-1}} + \beta_3 \frac{\Delta SALES_{i,t-1}}{ASSETS_{i,t-1}} + \varepsilon_{\text{ABNPROD}} \qquad (4)$$

where *CFO* is cash flows from operations scaled by total assets at the beginning of the year; $SALES_{i,t-1}$ is the sales during the previous year; $DISX_{it}$ is the sum of R&D, SG&A, and advertising expenses for firm $_i$ at period $_t$; $PRODCST_{i,t}$ is the sum of cost of goods sold and change in inventories for firm $_i$ at year $_t$.

Then, the abnormal levels of real earnings management proxies are calculated as the residuals from the above equations as follows: abnormal cash flows from operations (denoted hereafter as *ABNCFO*), abnormal discretionary expenses (denoted hereafter as *ABNDEXP*), and abnormal production cost (denoted hereafter as *ABNPROD*). Abnormal cash flows from operations and abnormal discretionary expenses are multiplied by -1 so they have the same interpretation as abnormal production cost and discretionary accruals.

Finally, we follow prior research (Cohen et al., 2008; Cohen and Zarowin, 2010; Farooqi et al., 2014; Sohn 2016; Zang, 2012) and construct one comprehensive measure of real earnings management (REM_{TOTAL}) to examine the total effect of real activities manipulation. REM_{TOTAL} is defined as the sum of abnormal cash flows from operations, abnormal discretionary expenses, and abnormal production cost.

3.4 Empirical models

To examine whether corporate diversification is associated with earnings management, we use the following regression:

$$EM = a + \gamma * Z + \beta * X + \varepsilon \qquad (5)$$

where the dependent variable (*EM*) represents proxies of discretionary accruals [*DA-MDJONES],* abnormal cash flows from operations (*ABNCFO*), abnormal discretionary expenses (*ABNDEXP*), abnormal production cost (*ABNPROD*), and the comprehensive measures of real earnings management (REM_{TOTAL}). The main independent variable of interest (*Z*) is a proxy for corporate diversification, namely number of segments (*NMSG*) and its square term ($NMSG^2$).

We further follow Zang (2012) and Farooqi et al. (2014) and add a set of control variables (*X*) that are found to be associated with the decision to manage earnings and to account as well for the costs/benefits of trading-off between accrual and real earnings management. Zang (2012) shows that managers use both real and accrual earnings management to manage earnings, and the choice of real vs. accrual earnings management depends on the costs and benefits of using each technique.

Starting with the cost of using real earnings management, four variables are added to the equation. Specifically, we control for market share at the beginning of the year ($MKTSHARE_{i,t-1}$), calculated as a firm's sales divided by total sales of its industry, while the Altman's Z-score at the beginning of the year ($ZSCORE_{i,t-1}$) is added to the equation to control for the firm's financial health.[4] Zang (2012) indicates that firms with good financial health and higher market share engage more in real earnings management. Institutional ownership ($INST_{i,t-1}$) and the marginal tax rate ($MTR_{i,t-1}$) at the beginning of the year are added to the equation since firms with a higher percentage of institutional ownership and a higher marginal tax rate are constrained from using real earnings management.

In terms of the cost of using accrual earnings management (discretionary accruals), we follow prior research (e.g., Farooqi et al., 2014; Zang, 2012, and add five control variables to the equation: ($BIG8_{i,t}$), ($ATENURE_{i,t}$), ($SOX_{i,t}$), ($CYCLE_{i,t-1}$), and ($NOA_{i,t-1}$). $BIG8_{it}$ is a dummy variable that equals 1 if the auditor is one of the big eight audit firms, and zero otherwise, while audit tenure (*ATENURE*) is a dummy variable that equals 1 if a firm is audited by the same

4 $ZSCORE_t$ = 0.3 NI /$Asset_t$ + Sales/ $Asset_t$ + 1.4 Retained Earnings/ $Asset_t$ + 1.2 Working Capital/ $Asset_t$ + 0.6 Stock Price × Shares Outstanding / Total $Liabilities_t$.

auditor for at least three consecutive years, and zero otherwise. Higher audit quality and long audit tenure are expected to constrained managers' ability to use discretionary accruals to manipulate reported earnings and, therefore, they may switch to using real earnings management. Cohen at al. (2008) show that US firms switch from using accrual earnings management to real activities due to the restrictive scrutiny that was imposed by the passage of Sarbanes-Oxley Act of 2002. Thus, a dummy variable (*SOX*) is added to the equation that equals 1 if the fiscal year is after 2003, and zero otherwise. The equation also controls for the flexibility of firms' accounting system to use accrual earnings management by adding the length of the operating cycle ($CYCLE_{i,t-1}$) and net operating assets ($NOA_{i,t-1}$) at the beginning of the year. Firms that extensively engaged in accruals earnings management in the previous year will find it hard to manage accruals in the current period (Zang 2012), and therefore they may switch to real activities if there is a strong incentive to manage earnings. The operating cycle is computed as days receivable plus days inventory less days payable at the beginning of the year, while net operating assets are calculated as shareholders' equity less cash and marketable securities plus total debt at the beginning of the year divided by lagged total assets.

Finally, the equation includes five control variables that are found to be associated with the decision to manage earnings, namely firm size ($FSIZE_{i,t}$), return on assets ($ROA_{i,t-1}$), market-to-book ratio ($MTB_{i,t}$), leverage ratio ($DEBTR_{i,t}$), and research and development expense ratio ($RNDR_{i,t}$). Firm size ($FSIZE_{i,t}$) is calculated as a natural logarithm of total assets and added to the equation to control for the size effect, since large firms may exhibit a higher level of information asymmetry and therefore a higher flexibility for managing earnings. The equation also controls for growth opportunities and information asymmetry by adding return on assets (*ROA*) at the beginning of the year, market-to-book ratio ($MTB_{i,t}$) calculated as market value of equity divided by book value of equity, leverage ratio ($DEBTR_{i,t}$) calculated as total debt divided by total assets, and research and development expense ratio ($RNDR_{i,t}$) calculated as research and development expense divided by total sales. Prior research indicates that proxies of accrual and real earnings management might be estimated with measurement errors and, therefore, these proxies could be correlated with a firm's characteristics such as size and growth. Thus, no prediction is made on the sign (+/-) of coefficients of these variables. The equation includes dummies to control for industry and time effects.

Regarding the trade-off between accrual and real earnings management, we follow Zang (2012) and add the unexpected real earnings management (*UNREM*) when discretionary accruals [*DA-MDJONES]* are the dependent variable in equation 5. The unexpected real earnings management

(*UNREM*) is calculated as the estimated residuals from equation 5 when the comprehensive measure of real earnings management (REM_{TOTAL}) is the dependent variable.

To test for our main hypothesis on the non-linear relationship between corporate diversification and accrual and real earnings management, we use equation 5. Thus, if the coefficients on (*NMSG*) and $(NMSG)^2$ in equation 5 are statistically significant, then this indicates that corporate diversification is associated with accrual and real earnings management in a non-linear relationship—U-shaped or inverted U-shaped, depending on the sign of the coefficient.

4. Results and discussion

4.1 Descriptive statistics

Table I provides descriptive statistics for all variables. Table I shows that discretionary accruals estimated using the modified Jones model (*DA-MDJONES*) range from -0.466 to 0.387 with mean (median) value of 0.003 (0.005). Table I also provides statistics for real earnings management proxies and shows that abnormal cash flows from operations (*ABNCFO*) range from -0.631 to 0.545 with mean (median) value of -0.007 (-0.009), abnormal discretionary expenses (*ABNDEXP*) range from -1.250 to 1.013 with mean (median) value of -0.008 (0.008), abnormal production cost (*ABNPROD*) ranges from -1.297 to 1.321 with mean (median) value of -0.013 (-0.013), and the aggregated measure of real earnings management (REM_{TOTAL}) ranges from -2.454 to 2.056 with mean (median) value of -0.027 (-0.017).

Further, Table I presents statistics for other variables and shows that the mean value number of segments (*NMSG*) is greater than its median value, suggesting that this variable is positively skewed and therefore raising concerns of a heteroskedasticity problem (e.g., Bepari et al. 2013). Hence, robust standard errors (clustered at the firm level) are calculated as consistent with Petersen (2009).

Table II provides the correlation matrix for main variables of interest and shows that discretionary accruals are positively associated with most of the real earnings management proxies. This in turn indicates that firms may use both accrual-based and real earnings management to manage earnings upwards to meet several incentives, suggesting that our analysis should account for the trade-off between these earnings management techniques. Table II also provides some preliminary evidence that accrual and real earnings management proxies are positively associated with diversification proxies (*NMSG)*, which we further investigate in the following section.

[Insert Table I and Table II]

4.2 Empirical results

Table III reports the results on the relationship between corporate diversification and different measures of real earnings management. Columns 1, 3, 5, and 7 present the results on the linear relationship between diversification and real earning management proxies, which is provided to compare with results from prior studies. We add the square term of the corporate diversification proxy to test for the non-linear relationship in columns 2, 4, 6, and 8.

Columns 2, 4, 6, and 8 of Table III provide evidence that firm diversification (proxied by number of segments) is associated with all proxies of real earnings management in an inverted U-shaped relationship. Specifically, the results show a positive and statistically significant coefficient of *NMSG* and a negative and statistically significant coefficient of $NMSG^2$ in all columns. These results suggest that diversification increases real earnings management in diversified firms with fewer than four segments, while for firms with more than four segments higher diversification actually reduces real earnings management.[5]

[5] From column IV, 4= (0.016/(2*0.002)).

[Insert Table III here]

Table IV reports the results on the relationship between corporate diversification and accrual earnings management. An analysis of this table indicates that firm diversification is associated with accrual earnings management in a U-shaped relationship, suggesting that diversification decreases accrual earnings management in diversified firms with fewer than three segments, while for firms with more than three segments higher diversification leads to increased accrual earnings management.[6]

By investigating accrual and real earnings management simultaneously, the evidence from our analysis seems to suggest that managers of diversified firms generally trade-off between accrual and real earnings management. For example, firms with higher levels of diversification prefer to manage earnings using more accrual earnings management as compared to real earnings management. This is due to the costs and benefits of using earnings management techniques. In other words, it seems that it is very costly for firms with higher levels of diversification to manipulate reported earnings using real earnings management and, therefore, they engage more in accrual earnings management to offset the shortfall of the desired profit (and vice versa).

In summary, our results not only provide new evidence on the non-linear relationship between diversification and earnings management, but also provide new evidence that diversified firms use both accrual and real earnings management as complementary tools to manipulate reported earnings.

[Insert Table IV here]

5. Robustness Test

For robustness we also repeat our test for the non-linear relationship (equation 5) using an adjusted Herfindahl index [*AdjHerfindal*] as an alternative proxy for corporate diversification. As the Herfindahl index moves in the opposite direction from level of diversification (i.e., the lower

[6] From column II, 3 = (0.014/(2*0.003)).

the Herfindahl index, the higher the degree of industrial diversification), we follow Lim et al. (2008) and use an adjusted Herfindahl that equals one minus the Herfindahl index as the measure of level of industrial diversification for easier interpretation of the results.[7]

Tables V and VI replicate the analysis with the number of segments replaced by the adjusted Herfindahl. The reported results are consistent with those reported in Tables III and IV where the coefficients on the main variables of interest (*AdjHerfindal* and *AdjHerfindal*^{2}) are in the same direction and level of significance with (*NMSG)* and (*NMSG*^{2}).[8]

[Insert Tables V and VI here]

6. Conclusions

We have examined whether corporate diversification is associated with accrual and real earnings management. While prior research focuses on the difference between diversified and non-diversified firms, our paper is the first to examine the non-linear relationship between corporate diversification and real and accrual earnings management.

We contribute to the literature by the following findings. First, we provide evidence on the relationship between corporate diversification and real and accrual earnings management. Recent research provides mixed evidence and, therefore, our findings contribute to this line of research by providing new evidence based on a large dataset. We show that diversified firms engage in real and accrual earnings management to manage their reported earnings upwards. Thus, our results are consistent with recent research (e.g., Farooqi et al. 2014; Jirapon et al., 2008) that finds that diversified firms engage in earnings manipulation. Second, and most importantly, we contribute to the literature by providing the first evidence on the non-linear relationship between corporate diversification and earnings management. Specifically, we provide the first evidence to

[7] We thank a referee for suggesting this measure.

[8] We have also repeated the analysis on the relationship between corporate diversification and accrual and real earnings management while controlling for geographical diversification proxy. The unreported results show similar evidence to those reported in the paper.

the literature that diversified firms engage in accrual (real) earnings management, but this engagement is associated with level of diversification in a non-linear U-shaped (inverted U-shaped) relationship.

The findings of this paper therefore provide a new avenue for future research to consider the non-linear relationship when addressing earnings management in diversified contexts. Future research, for example, can examine how earnings management affects diversified firms' value, but taking into account the U-shaped and inverted U shaped relationships.

Declaration of Conflicting Interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. There are no financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work.

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Table I.
Descriptive statistics for the sample over the period 2001-2012.

	Mean	Median	Std.Dev	Min	Max
DA-MDJONES	0.003	0.005	0.086	-0.466	0.387
ABNCFO	-0.007	-0.009	0.095	-0.631	0.545
ABNDEXP	-0.008	0.008	0.188	-1.250	1.013
ABNPROD	-0.013	-0.013	0.161	-1.297	1.321
REMTOTAL	-0.027	-0.017	0.331	-2.454	2.056
NMSG	1.568	1	0.993	1.000	8.000
$MKTSHARE_{t-1}$	0.062	0.015	0.119	0.000	0.891
$ZSCORE_{t-1}$	4.286	2.480	9.348	-76.754	310.201
$INST_{t-1}$	0.609	0.656	0.295	0.000	1.910
MTR_t	0.253	0 .311	0.111	0.000	0.390
$BIG8_t$	0.121	0	0.327	0.000	1.000
$ATENURE_t$	0.671	1	0.470	0.000	1.000
SOX_t	0.805	1	0.396	0.000	1.000
$CYCLE_{t-1}$	56.110	61.014	116.810	-1344.433	1504.977
NOA_{t-1}	1003.561	174.694	4168.421	-3371.555	90445.540
$FSIZE_t$	5.930	5.773	1.652	1.934	12.269
ROA_{t-1}	-0.009	0.040	0.242	-5.601	0.740
MTB_t	3.057	2.253	94.297	-4062.500	5710.526
$DEBTR_t$	0.023	0.001	0.056	0.000	0.869
$RNDR_t$	0.135	0.081	0.252	0.000	5.872
N	5659				

Notes: This table presents sample descriptive statistics for the sample. Where (*DA-MDJONES*) defined as discretionary accruals that estimated using the modified Jones model, (*ABNCFO*) are abnormal cash flows from operations, (*ABNDEXP*) are abnormal discretionary expenses, (*ABNPROD)* is abnormal production cost, (REM_{TOTAL}) is the comprehensive measures of real earnings management calculated as the sum of abnormal cash flows from operations, abnormal discretionary expenses, and abnormal production cost at the end of year *t* for firm *i*, ($NMSG_{i,t}$) is the number of industrial segments at the end of year *t* for firm *i*, ($MKTSHARE_{i,t-1}$) is market share at the beginning of the year calculated as a firm's sales divided by total sales of its industry, ($ZSCORE_{i,t-1}$) is the Altman's Z-score at the beginning of the year, ($INST_{i,t-1}$) is the percentage of institutional ownership at the beginning of the year, ($MTR_{i,t-1}$) is the marginal tax rate at the beginning of the year, ($BIG8_{i,t}$) is a dummy variable that equals 1 if the auditor is one of the big 8 audit firms, and zero otherwise, ($ATENURE_{i,t}$) is a dummy variable for audit tenure that equals 1 if a firm is audited by the same auditor for at least three consecutive years, and zero otherwise, ($SOX_{i,t}$) is a dummy variable that equals 1 if the fiscal year is after 2003, and zero otherwise, ($CYCLE_{i,t-1}$) is operating cycle at the beginning of the year that is computed as days receivable plus days inventory less days payable at the beginning of the year, ($NOA_{i,t-1}$) is net operating assets at the beginning of the year that are calculated as shareholders' equity less cash and marketable securities plus total debt at the beginning of the year divided by lagged total assets, ($FSIZE_{i,t}$) is firm size calculated as natural logarithm of total assets, ($ROA_{i,t-1}$) is return on assets at the beginning of the year, ($MTB_{i,t}$) is market to book ratio calculated as market value of equity divided by book value of equity, ($DEBTR_{i,t}$) is leverage ratio calculated as total debt divided by total assets, and ($RNDR_{i,t}$) is research and development expense ratio calculated as research and development expense divided by total sales.

Table II.
Correlations matrix.

	DA-MDJONES	*ABNCFO*	*ABNDEXP*	*ABNPROD*	REM_{TOTAL}	*NMSG*
DA-MDJONES	1					
ABNCFO	0.095***	1				
ABNDEXP	0.177***	-0.247***	1			
ABNPROD	-0.001	0.353***	0.531***	1		
REM_{TOTAL}	0.132***	0.324***	0.776***	0.909***	1	
NMSG	0.018*	-0.013	0.097***	0.062***	0.084***	1

Notes: Significant at: *10, * *5 and * * *1 percent levels; this table reports Pearson correlation matrix for all the variables. All variables are previously defined.

Table III.
The non-linear relationship between corporate diversification (proxied by number of segments) and real earnings management.

	1	2	3	4	5	6	7	8
Dependent Variable	REM_{TOTAL}	REM_{TOTAL}	*ABNCFO*	*ABNCFO*	*ABNDEXP*	*ABNDEXP*	*ABNPROD*	*ABNPROD*
Constant	-0.054	-0.117***	0.038***	0.032**	-0.109***	-0.136***	0.017	-0.013
	(-1.379)	(-2.909)	(3.165)	(2.567)	(-5.345)	(-6.338)	(0.856)	(-0.637)
NMSG	0.034***	0.111***	0.008***	0.016***	0.009***	0.042***	0.018***	0.054***
	(7.709)	(7.529)	(7.118)	(3.969)	(3.599)	(5.188)	(8.286)	(7.495)
$(NMSG)^2$		-0.015***		-0.002**		-0.007***		-0.007***
		(-5.693)		(-2.193)		(-4.457)		(-5.538)
$MKTSHARE_{t-1}$	-0.140***	-0.129***	0.021*	0.022*	-0.098***	-0.093***	-0.063***	-0.058***
	(-3.568)	(-3.325)	(1.815)	(1.924)	(-4.436)	(-4.242)	(-3.483)	(-3.207)
$ZSCORE_{t-1}$	-0.003***	-0.003***	-0.001***	-0.001***	-0.000	-0.000	-0.001***	-0.001***
	(-5.500)	(-5.371)	(-3.640)	(-3.629)	(-0.519)	(-0.465)	(-6.630)	(-6.531)
$INST_{t-1}$	-0.133***	-0.135***	0.002	0.002	-0.089***	-0.090***	-0.046***	-0.047***
	(-6.759)	(-6.921)	(0.358)	(0.311)	(-8.188)	(-8.310)	(-4.729)	(-4.864)
MTR_t	-0.037	-0.046	-0.226***	-0.227***	0.300***	0.296***	-0.110***	-0.115***
	(-0.573)	(-0.719)	(-11.654)	(-11.700)	(7.917)	(7.827)	(-3.553)	(-3.699)
$BIG8_t$	0.030**	0.031**	0.006	0.006	0.010	0.011	0.014*	0.014**
	(2.121)	(2.161)	(1.557)	(1.574)	(1.367)	(1.401)	(1.921)	(1.961)
$ATENURE_t$	-0.018*	-0.016	-0.003	-0.003	-0.007	-0.006	-0.008	-0.007
	(-1.717)	(-1.588)	(-1.002)	(-0.952)	(-1.235)	(-1.133)	(-1.582)	(-1.456)
SOX_t	0.033	0.034	0.002	0.002	0.015	0.015	0.016	0.016
	(1.318)	(1.337)	(0.287)	(0.293)	(1.035)	(1.048)	(1.307)	(1.328)
$CYCLE_{t-1}$	0.000***	0.000***	0.000	0.000	0.000***	0.000***	0.000***	0.000***
	(5.346)	(5.350)	(0.703)	(0.696)	(4.465)	(4.467)	(5.647)	(5.651)
NOA_{t-1}	-0.000***	-0.000***	-0.000***	-0.000***	-0.000	0.000	-0.000***	-0.000***
	(-6.229)	(-5.992)	(-6.493)	(-6.562)	(-0.316)	(0.241)	(-7.322)	(-7.098)
$FIZE_t$	0.024***	0.024***	0.002	0.002	0.012***	0.012***	0.009***	0.009***
	(5.087)	(5.124)	(1.610)	(1.619)	(4.944)	(4.961)	(4.082)	(4.108)
ROA_{t-1}	-0.061**	-0.060**	-0.058***	-0.058***	0.034*	0.035*	-0.037***	-0.036***
	(-2.453)	(-2.397)	(-5.177)	(-5.179)	(1.928)	(1.945)	(-3.030)	(-2.990)
MTB_t	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000**	-0.000**
	(-1.072)	(-1.050)	(1.574)	(1.591)	(-0.757)	(-0.752)	(-2.576)	(-2.477)
$DEBTR_t$	0.078	0.086	0.048**	0.049**	0.043	0.046	-0.013	-0.009
	(0.896)	(0.994)	(2.028)	(2.064)	(0.799)	(0.867)	(-0.333)	(-0.233)
$RNDR_t$	-0.110***	-0.105***	0.041***	0.042***	-0.146***	-0.144***	-0.006	-0.003
	(-3.293)	(-3.164)	(4.492)	(4.530)	(-4.943)	(-4.890)	(-0.471)	(-0.256)
N	5,659	5,659	5,659	5,659	5,659	5,659	5,659	5,659
Adj. R-squared	0.063	0.067	0.185	0.186	0.132	0.134	0.061	0.064

Notes: This table reports the results of regressions of corporate diversification (proxied by number of segments) on real earnings management. All models are controlled for industry and year effects. All variables are previously defined. ***, ** and *, indicate that estimates are significant at the 1%, 5%, and 10% level; T-statistics based on robust standard errors are reported in parentheses.

Table IV.
The non-linear relationship between corporate diversification (proxied by number of segments) and accrual earnings management.

	1	2
Dependent Variable	*DA-MDJONES*	*DA-MDJONES*
Constant	-0.035***	-0.024**
	(-2.983)	(-2.014)
NMSG	-0.001	-0.014***
	(-0.756)	(-3.458)
$(NMSG)^2$		0.003***
		(3.541)
$MKTSHARE_{t-1}$	-0.008	-0.009
	(-0.760)	(-0.945)
$ZSCORE_{t-1}$	-0.000**	-0.000**
	(-2.353)	(-2.394)
$INST_{t-1}$	-0.023***	-0.023***
	(-4.305)	(-4.229)
MTR_t	0.170***	0.172***
	(9.407)	(9.485)
$BIG8_t$	-0.002	-0.002
	(-0.581)	(-0.612)
$ATENURE_t$	-0.000	-0.000
	(-0.011)	(-0.097)
SOX_t	0.002	0.002
	(0.243)	(0.235)
$CYCLE_{t-1}$	-0.000	-0.000
	(-0.402)	(-0.389)
NOA_{t-1}	-0.000	-0.000
	(-0.063)	(-0.468)
$FIZE_t$	-0.002	-0.002
	(-1.575)	(-1.583)
ROA_{t-1}	-0.002	-0.003
	(-0.319)	(-0.348)
MTB_t	0.000	0.000
	(0.877)	(0.929)
$DEBTR_t$	-0.043*	-0.044*
	(-1.784)	(-1.844)
$RNDR_t$	-0.008	-0.009
	(-1.259)	(-1.391)
UNREM	0.029***	0.029***
	(6.272)	(6.271)
N	5,659	5,659
Adj. R-squared	0.041	0.043

Notes: This table reports the results of regressions of corporate diversification (proxied by number of segments) on accrual earnings management. (*UNREM*) is the unexpected real earnings management calculated as the estimated residuals from equation 5 when the comprehensive real earnings management (REM_{TOTAL}) is the dependent variable. All models are controlled for industry and year effects. All variables are previously defined. ***, ** and *, indicate that estimates are significant at the 1%, 5%, and 10% level; T-statistics based on robust standard errors are reported in parentheses.

Table V.
The non-linear relationship between corporate diversification (proxied by firm adjusted Herfindahl index) and real earnings management.

	1	2	3	4	5	6	7	8
Dependent Variable	REM_{TOTAL}	REM_{TOTAL}	*ABNCFO*	*ABNCFO*	*ABNDEXP*	*ABNDEXP*	*ABNPROD*	*ABNPROD*
Constant	-0.026	-0.027	0.045***	0.044***	-0.102***	-0.103***	0.031	0.031
	(-0.667)	(-0.706)	(3.669)	(3.666)	(-4.969)	(-4.999)	(1.576)	(1.545)
AdjHerfindal	0.151***	0.436***	0.033***	0.050***	0.040***	0.166***	0.078***	0.220***
	(8.050)	(6.021)	(6.581)	(2.809)	(3.891)	(4.353)	(8.575)	(6.326)
$(AdjHerfindal)^2$		-0.505***		-0.030		-0.224***		-0.252***
		(-4.256)		(-1.049)		(-3.547)		(-4.424)
$MKTSHARE_{t-1}$	-0.143***	-0.135***	0.021*	0.021*	-0.099***	-0.096***	-0.064***	-0.060***
	(-3.634)	(-3.442)	(1.819)	(1.866)	(-4.472)	(-4.320)	(-3.549)	(-3.319)
$ZSCORE_{t-1}$	-0.003***	-0.003***	-0.001***	-0.001***	-0.000	-0.000	-0.001***	-0.001***
	(-5.313)	(-5.412)	(-3.618)	(-3.616)	(-0.475)	(-0.504)	(-6.483)	(-6.554)
$INST_{t-1}$	-0.134***	-0.134***	0.002	0.002	-0.089***	-0.089***	-0.046***	-0.046***
	(-6.833)	(-6.865)	(0.313)	(0.312)	(-8.225)	(-8.258)	(-4.791)	(-4.807)
MTR_t	-0.039	-0.044	-0.226***	-0.227***	0.299***	0.296***	-0.111***	-0.114***
	(-0.603)	(-0.688)	(-11.654)	(-11.670)	(7.893)	(7.843)	(-3.580)	(-3.673)
$BIG8_t$	0.032**	0.032**	0.006*	0.006*	0.011	0.011	0.015**	0.015**
	(2.243)	(2.253)	(1.654)	(1.657)	(1.431)	(1.439)	(2.046)	(2.058)
$ATENURE_t$	-0.018*	-0.017	-0.003	-0.003	-0.007	-0.006	-0.008	-0.007
	(-1.713)	(-1.621)	(-1.021)	(-1.001)	(-1.215)	(-1.141)	(-1.581)	(-1.488)
SOX_t	0.036	0.034	0.003	0.003	0.016	0.015	0.017	0.017
	(1.404)	(1.336)	(0.363)	(0.349)	(1.068)	(1.015)	(1.403)	(1.335)
$CYCLE_{t-1}$	0.000***	0.000***	0.000	0.000	0.000***	0.000***	0.000***	0.000***
	(5.345)	(5.343)	(0.699)	(0.695)	(4.464)	(4.461)	(5.647)	(5.645)
NOA_{t-1}	-0.000***	-0.000***	-0.000***	-0.000***	-0.000	0.000	-0.000***	-0.000***
	(-5.758)	(-5.774)	(-6.276)	(-6.318)	(-0.004)	(0.169)	(-6.877)	(-6.795)
$FIZE_t$	0.024***	0.024***	0.002*	0.002*	0.012***	0.013***	0.010***	0.010***
	(5.235)	(5.276)	(1.732)	(1.738)	(5.014)	(5.037)	(4.233)	(4.265)
ROA_{t-1}	-0.061**	-0.060**	-0.058***	-0.058***	0.034*	0.034*	-0.037***	-0.036***
	(-2.467)	(-2.431)	(-5.188)	(-5.188)	(1.927)	(1.934)	(-3.051)	(-3.024)
MTB_t	-0.000	-0.000	0.000	0.000*	-0.000	-0.000	-0.000**	-0.000**
	(-1.050)	(-0.856)	(1.628)	(1.696)	(-0.759)	(-0.670)	(-2.480)	(-2.023)
$DEBTR_t$	0.085	0.084	0.050**	0.050**	0.045	0.044	-0.010	-0.010
	(0.980)	(0.971)	(2.093)	(2.091)	(0.835)	(0.828)	(-0.237)	(-0.248)
$RNDR_t$	-0.109***	-0.106***	0.042***	0.042***	-0.145***	-0.144***	-0.005	-0.004
	(-3.256)	(-3.194)	(4.501)	(4.512)	(-4.928)	(-4.901)	(-0.407)	(-0.299)
N	5,659	5,659	5,659	5,659	5,659	5,659	5,659	5,659
Adj. R-squared	0.063	0.066	0.185	0.185	0.132	0.133	0.061	0.063

Notes: This table reports the results of regressions of corporate diversification (proxied by firm adjusted Herfindahl index) on real earnings management. All models are controlled for industry and year effects. All variables are previously defined. ***, ** and *, indicate that estimates are significant at the 1%, 5%, and 10% level; T-statistics based on robust standard errors are reported in parentheses.

Table VI.

The non-linear relationship between corporate diversification (proxied by firm adjusted Herfindahl index) and accrual earnings management.

	1	2
Dependent Variable	*DA-MDJONES*	*DA-MDJONES*
Constant	-0.037***	-0.036***
	(-3.100)	(-3.085)
AdjHerfindal	-0.011**	-0.049***
	(-2.209)	(-2.703)
$(AdjHerfindal)^2$		0.068**
		(2.297)
$MKTSHARE_{t-1}$	-0.004	-0.006
	(-0.443)	(-0.553)
$ZSCORE_{t-1}$	-0.000**	-0.000**
	(-2.404)	(-2.393)
$INST_{t-1}$	-0.023***	-0.023***
	(-4.323)	(-4.325)
MTR_t	0.172***	0.172***
	(9.478)	(9.511)
$BIG8_t$	-0.002	-0.002
	(-0.629)	(-0.636)
$ATENURE_t$	-0.000	-0.001
	(-0.164)	(-0.211)
SOX_t	0.002	0.002
	(0.278)	(0.307)
$CYCLE_{t-1}$	-0.000	-0.000
	(-0.391)	(-0.381)
NOA_{t-1}	-0.000	-0.000
	(-0.124)	(-0.224)
$FIZE_t$	-0.002	-0.002
	(-1.518)	(-1.527)
ROA_{t-1}	-0.003	-0.003
	(-0.335)	(-0.347)
MTB_t	0.000	0.000
	(0.981)	(0.913)
$DEBTR_t$	-0.043*	-0.043*
	(-1.799)	(-1.796)
$RNDR_t$	-0.009	-0.009
	(-1.358)	(-1.407)
UNREM	0.029***	0.029***
	(6.262)	(6.287)
N	5,659	5,659
Adj. R-squared	0.042	0.042

Notes: This table reports the results of regressions of corporate diversification (proxied by firm adjusted Herfindahl index) on accrual earnings management. All models are controlled for industry and year effects. All variables are previously defined. ***, ** and *, indicate that estimates are significant at the 1%, 5%, and 10% level; T-statistics based on robust standard errors are reported in parentheses.