How Does the Real Earnings Management Affect Firms Innovative? Evidence from U.S Firms

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Abstract: The relationship between innovation and real earnings management (REM) can be appraised according to two major approaches. One of these methods, commonly applied in the relevant literature, considers innovation as an instrument whereby earnings can be properly and effectively assessed. As for the second approach, on which our theoretical and empirical perspectives are constructed, it advances the idea that innovation stands as a stimulus to earnings management and as such it constitutes an evolutionary procedure of earnings management. This study aimed at providing an extension of previous research conducted in the earnings management area through an empirical investigation that treats the innovation activities' effects on real earnings management index (REMI), examined through a sample of 126 U.S. firms pertaining to the S&P 500 index observed over the period between 2000 and 2010. It is also worth noting that we proceeded with dividing the full sample into two sub-samples, in accordance with the R&D associated intensity median. Our results corroborate the hypothesis that innovative firms engage in upward trend manipulation of real earnings management.

INTRODUCTION

Real earnings management (REM) procedure is a practice that involves an intricate manipulation of the company's cash flows. It is actually closely associated with the firm's three relevant cash flow models, namely those emanating from investing, financing or even operating activities. In fact, managers detain various techniques available at their disposal, whereby these flows can be managed. Among these techniques, it is worth citing the real or artificial sale approach fit for manipulating investment flows, the securitization associated mode, which is relevant to managing the financing related cash flows/earnings and the discretionary expenses reduction procedure, as applied to manipulate the entire business related cash flows. In this respect, [1] considers discretionary spending as including the sum of advertising, research and development (R&D) and also, more generally, the entirety of recoded sales and administrative expenses (e.g., employee training, maintenance, etc.). He also states that executives may resort to reducing these discretionary spending in a bid to adjust reported profits towards an increasing trend and, especially, when these expenses do not seem to generate immediate incomes. Since, these expenses are generally represented in the form of liquidity, their reduction might engender a reduction in cash outflows and, consequently, an increase in abnormal operating cash flows regarding

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the income management period. [2] defines sales management as being attempts made by managers to temporarily increase sales, relevant to the current fiscal year, by offering price reductions or more flexible credit terms. He specifies that this technique consists of accelerating the timing of sales and / or generating unsustainable additional sales mainly through two action levers: handling discounts and granting more favorable credit terms. As far as the first lever is concerned, price reductions are limited over time as this sales management mode ceases as soon as the company decides to restore the old price policy. He also argues that these price reductions will generate abnormally high production costs relative to sales, which would, in turn, lead to lower corporate profit margins, while raising the company's total results.

As for the second lever, i.e. providing customers with rather flexible credit terms, it serves to generate lower operational cash flows and higher production costs in relation to the sales level. Additionally, there is also the overproduction technique of producing greater surpluses of goods than the level deemed necessary to meet the expected demand [3]. Such a technique is usually intended to display a lower cost of goods sold and, accordingly, managing earnings in accordance with an upwards oriented trend. According to [4] and following the overproduction strategy, general fixed costs turn out to be spread over greater amounts of produced units, thus reducing fixed unitary costs. He also underlines that the company will incur extra production and storage costs on surplus units recoverable during the same period through sales, which is likely to generate reduced operational cash flows.

Over the recent decades, however, a significant shift has been noticed in the nature of investment, marked with an intangible asset rather than tangible asset oriented tendency. In a bid to adapt to such a trend and maintain its sustainability, several companies, especially those pertaining to the high-tech industry, are enticed to allocate remarkable resources to promote their intangible assets, mainly R&D [5,6]. In this way, innovation turns out to stand as an important source of economic growth [7].As an outcome of the R&D related activities, innovation appears to be a specific process that helps in kindling the persistent issue of information asymmetry between managers and shareholders [8,9,10]. Thus, firms engaged in such an activity are likely to encounter some kind of external financial reporting difficulties [11]. Moreover and for the sake of reducing interest conflicts as well as information and knowledge asymmetry issues,

executives could appeal to undertaking certain choices relevant to investment and project financing decisions that sound conform with the shareholders' interests [12, 13].

In this regard, executives may resort to use their discretion to report their privately detained information concerning the expected business R&D success and future market benefits [14, 15]. Therefore, accounting as an information system is involved in consolidating such information proceeding relevant to highlighting these specifically advantageous assets.

In this context, [16, 17] document that leaders and directors, who are considered as opportunist, may profit from the informational privilege over the other users to maximize their wealth and sustain their positions. Similarly, executives try to benefit from the information asymmetry status vis-à-vis the associated shareholders on managing the firm earnings either upwards or downwards. In this sense, they can interfere with the formulation of accounting results through implicating options pertaining to investment, financing and operating decisions. Additionally, managers may also appeal to developing R&D strategies as a means to render their substitution a highly expensive process and increase their power within the firm [18, 19].

Nevertheless, a relevant question may arise concerning the convenience of such accounting choices in a company that accords too much importance to innovative investment projects. Even though these may stand valuable, they may turn out to be risky and kindle conflicts among the company partners. However, such projects may be considered as a means whereby the business survival and persistence process can be sustained [20].

Furthermore, it is worth noting that executives can exert a noticeable impact on making the R&D investment projects stand as successful undertakings through their accounting choices implemented in this area. Indeed, this procedure comes to be dubbed as the concept of real earnings management. The earnings management pertaining studies stand as part of the research area dealing with positive theory of accounting which aims to treat and investigate the accounting choices analyzed and observed within companies. Similarly, the manager can play a decisive and active role in shaping the company's innovation policy and strategy through accounting choices [21, 22, 23]. In this way, innovation represents a kind of commitment whereby excessive managerial confidence is expected to stand as a valuable potential.

Owing to the fact that innovative projects are usually characterized by increased uncertainty in the long time horizon, monetary flows might even generate greater risks which differ remarkably from the company systematic risk. This would certainly enhance and enrich REM actual status in many ways. Thus, managers in the innovative firms would find in these projects an additional means whereby they could increase their discretionary margins on REM. So, it would be very difficult for shareholders to detect the source behind such a handling of the accounting income. In this regard, the shareholders are faced with a moral risk and an unfavorable selection emanating from an unknown source. In short, the firms engaged in innovating practices seem very difficult to manage, owing mainly to the specificities characterizing their credits, especially with regard to accounting income handling matters. Managers usually rely on real-life practices, which are in their entirety, closely related to the innovative activities. Hence, the question that is worth raising at this level is:

Do firms engaged in innovative activities carry out the management of their earnings?

In fact, this work aimed at examining innovation activities influence on real earnings management.

The remainder of the paper is organized as follows. Section 2 is devoted to display the theoretical background and hypotheses development process. Section 3 exposes the applied research methodology. In section 4 we present and discuss the major empirical results. Finally, section 5 outlines the major concluding remarks.

Theoretical Background and Hypotheses Development
Theoretical Background: On defining earnings management, [24] state that: **"earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers"**. According to the agency theory, a special relationship proves to persist between the principal and the agent characterized by the prevalence of interest conflict between both parties [25]. A possible solution whereby these conflicts can be attenuated lies in the introduction of restrictive clauses, in the form of accounting ratios to limit the transfer and accumulation of wealth to the detriment of creditors. In fact, executives are most often enticed to increase earnings figures for the purpose of meeting these covenants [26]. Actually, the conflict gets intensified once directors appear to withhold

the incentives to increase their paper wealth (for instance through the maximization of bonuses) at the expense of the shareholders [27]. This is mostly predominant in the United States and Canada. In this regard, [28] claim that for the sake of benefiting from bank financing at a reduced cost, managers may appeal to making up the accounting data. However, very few empirical studies appear to validate such a hypothesis. In conjunction with the agency theory, the economic theory of the political process puts forward that accounting procedures are but the result of political pressure emanating from different groups affected by the company's published annual reports. According to [29], it may be in the manager's interest to favor the relation of a satisfactory result to the detriment of a long-term investment, whose net present value is positive but whose economic advantages will not be visible in the medium to long term account.

Most of the previous works, as appearing in the relevant literature, analyze the relevance of discretionary R&D capitalization in contrast with the signaling theory's background. It is worth highlighting that discretion implicated with R&D capitalization can be used by managers as a means for signaling their private information regarding success of their R&D projects to the market. This has made [30] argue that 'when a firm capitalizes expenditure and reports the amount as an asset in its financial statements, it signals good news'. In turn, [31] point out that in the Australian contexts, where capitalization of intangibles has been routine, analysts expect firms with relatively certain intangibles to signal this information by capitalizing them [32].

Most of the similar studies indicate that managers would not want to invest in R&D associated projects, for the major reason that the manager's remuneration seem to depend highly on the firm's performance, which is likely to negatively influence the success of R&D investment projects and bring a high risk rate. Such a state might well culminate in a crisis of confidence and further intensify managerial problems [33]. As for [34], they state that shareholders usually tend to judge managerial performance by means of financial objectives, such as returns on investment. Because investment in R&D is most often long-term targeted, its implementation could result in reducing current net income. For this reason, managers are often more inclined to undertake short-term projects with a quick income. This is especially true with regard to former managers. It is also worth mentioning, in this respect, that young managers usually tend to take greater risks than did former ones [35]. Fundamentally,

managers' behavior and preference are mostly influenced and guided by incentive compensation, supervision and regulatory requirements prevailing in firms [36, 37].

Analyzing the effect of ownership marking differences, [38] underline a clear distinction between state ownership, family business and financial institution. A significant proportion of institutional investors are negatively associated with the R&D intensity marking companies with widely distributed share capital. [39] uses information, which is collected from an independent rating agency, associated with corporate governance. In this respect, we can recall the positive accounting theory, initiated by [40, 41], which aims to predict and investigate accounting related practices. This theory justifies managers' frequent appeal to earnings management practices by the remarkable persistence of agency relations [42] as well as the predominance of opportunistic character in the behavior of managers.

In fact, the contractual incentives appear to have a strong association with the agency relationship binding managers and stakeholders, i.e. the creditors and shareholders. Among the factors suggested to explain the earnings management in the context of politico-contractual theory are managers' wealth maximization, debt cost minimization and political cost minimization. However, most studies have been conducted to examine REM impact from the exclusive perspective of debt cost minimization [43, 44, 45]. From a pure agency theory view point, it is suggested that one way whereby the agent's behavior could be monitored is the compensation contract that helps considerably in aligning both the principal) and the agent interests [46].

Real Earnings Management and Innovative Activities:
Some researchers tend to underline that R&D represents the major source of growth and competitiveness for a wide range of businesses and industries. Indeed, R&D capitalization sponsors suggest that managers can use their discretion to report their private information regarding the firm's R&D expected success, along with the market associated potential benefits [47, 48]. Based on empirical studies relevant to both the Australian and U.S. contexts, some researchers tend to stress that R&D capitalization is intended to provide relevant information content to shareholders [49]. In other contexts, empirical results have shown that the discretionary power associated with R&D capitalization can be used by opportunistic managers to increase their discretionary scopes [50, 51]. Indeed, the R&D activity is key to the company's competitiveness and continuous subsistence.

Leaders lie at the core of this process. They bear significant risks in the event of failure of such an activity and have a positive influence on innovation policy [52].

Previous research has shown that the R&D cost capitalization option is motivated by several factors [53, 54], standing as fundamental explanatory elements for the basic differences lying between firms on accounting for R&D expenses. In this respect, [55] has asserted that R&D capitalization decision depends highly on the firm specific factors, such as firm size, result sign and leverage effect for companies in the United Kingdom's context. According to international accounting standard (IAS38), the capitalization of R&D expenditure is compulsory once the restrictive conditions appear to be satisfied. By imposing these restrictions, the International Accounting Standards Board (IASB) could help mitigate the discretion involved in R&D capitalization [56, 57], which should be associated with capturing variables of the different earnings management strategies [58].

The objective of an agency contract lies in enticing managers to maximize the performance of their business and subsequently the shareholders' value. To this end, the agency contract may include a bonus remuneration awarded to executives depending on company performance. In this context, [59] indicate that the accounting result is a performance indicator on the basis of which the bonus is computed. As such, the manager may be enticed to manage the result to the upward trend so as to increase the bonus he is likely to be awarded. In this way, earnings management can be recognized as an opportunistic act of the leader [60], as his essential objective would consist in either maximizing his own remuneration or minimizing the costs likely to be incurred by the company. From another point of view, the accounting result is considered as an indicator or a proxy of the company's performance as intricately or cutely disseminated to the financial statements' readers.

In terms of information asymmetry, the signal transmitter (the manager) privately transmits hold information (the result) to a receiver (the investor) [61]. Therefore, the result is an indicator summarizing the company's performance over the past years. This performance can be compared with that of other companies or with the analysts' forecasts [62]. Beyond past information, the result may also contain forward-looking information [63]. In this regard, [64] reports that accruals may contain information on future cash flows. This makes it possible to determine part of the future result or earnings. Thus, it is possible for investors to take this signal into account in order to assess the company's potential performance and thus its value.

As a consequence and for agency problems to be restrained, the projects' quality to be highlighted and any innovation inherent constraints to be circumvented, we assume that managers in innovative companies are enhanced to manage the accounting results upwardly. According to [65], the R&D projects specificities help reinforce managerial latitude and may prompt certain managers to attempt evading discipline and control associated mechanisms.

The actual management of the business outcome or actual manipulation refers to actual decision-making undertaken by companies to influence cash flow and profits statuses. Whenever the goal is discovered to be inflating earnings, managers may then proceed with reducing discretionary spending, such as that pertaining to R&D, sales, advertising, maintenance, etc. They may also offer price reductions or tax credit conditions with the aim of promotion. These measures are taken to avoid losses, to meet / beat winning benchmarks [66-68] or to avoid covenant debt breach [66]. Companies with a high institutional ownership level [70] may have recourse to upcoming seasoned [71] and over-valued [72] shares offers.

Within the same line of thought, one could argue that real earnings management is based on the selection of the optimum decision-making moments/ timing in the exploitation phases (sales, R & D expenditure, financing decisions, borrowing, etc) and investment decisions (e.g., asset sales). It encompasses getting involved in deviant transactions throughout normal business operations, such as excess production, excessive discounts or price reductions, along with abnormal cuts on R&D. Executives usually aim to achieve short-term objectives or minimum earnings levels. This evokes, of course, the notion of "result threshold" .The major techniques applied to manipulate real activity as cited by [73], are mainly sales management, overproduction and discretionary spending cuts.

Accounting for R&D expenditure stands as a means of informing investors about the quality of innovative projects [74]. R&D expenditures are accounted for in two ways. First, they can be listed as fixed assets. This accounting mode as dubbed to R&D expenditure activation. An activated expenditure is the expenditure invested on projects regarding which the company is certain to generate future economic benefits. On the other hand, expenditures are expensed when they relate to projects for which future economic benefits are uncertain. As a matter of fact, the financial market has been documented to respond positively to activated R&D spending with respect to several earlier achieved results

regarding several contexts, such as Australia [75], United States [76]. In France, however, investors do not often seem to take into account, or negatively react, to activated R&D expenditure [77, 78].

More generally, the R&D activities' horizon is usually a long-term one with low success rate being often expected. However, once proved to be successful R&D run projects will generally yield large profit outcomes, even though the risk remains very high [79]. Thus, investment in R&D generates high returns coupled with high risk [80]. There are inevitably persistent conflicts prevailing between managers and investors regarding the R&D investment decisions, due mainly to the R&D different interests. Investors are therefore in a situation of information deficit insofar as it is difficult for them to appreciate the innovative projects quality. Such a situation appears to predominate mainly in the context of listed companies. Indeed, for unlisted companies, the shareholder and the manager are often embodied in the same person [81].

In the context of venture capital financing, contractual arrangements allow the financer to have access to the required information to assess the quality of innovative projects [82]. However, information asymmetry can be extended for listed companies [83]. On the one hand, majority shareholders and "big" investors enjoy the necessary means to learn about the innovative projects' quality with management teams [84]. On the other hand, outsiders do not necessarily have the time and the means to bear the cost of obtaining such information. Consequently, some investors turn out to be unable to assess the quality of innovative projects [85].

So, it follows that the actual persistent management mode generates a direct impact on the company's cash flow status, helping in rendering it too difficult to detect. So, managing outcomes in turn of the actual pursued decisions is rather a limited process. Indeed, the manager is constrained with optimizing decisions by, for instance, taking an asset sale date and transferring earnings results from one period to another or similarly adjusting production surpluses produced over a financial year by shifting the earnings result previously concluded to fit the following financial year's achieved earnings result. Other researchers show that REM can be achieved through sales of R&D expenditures [86] or disposals of assets [87]. [88] provide evidence suggesting that managers usually tend to opt for the actual outcome management practice rather than applying the accrual management mode mainly because the actual manipulation activities undertaken may turn out to stand as too hard to distinguish from optimal economic decisions and are, therefore, extremely elusive

to recognize. From a similar perspective, [89] has provided consistent evidence confirming that executives do often willingly manipulate the actual business concluded earnings with the aim of looking or discarding annual losses by offering discounts to temporarily increased sales, thus engaging in lower goods' overproduction costs sold, while aggressively reducing discretionary spending for the purpose of improving margins.

Based on the already highlighted ideas, it is clear that firms engaged in continuous innovation processes seem to display a favorable environment that further promotes the REM associated practices. Indeed, due to increased uncertainty predominantly characterizing the innovative projects, the long-term horizon cash flows may generate a high risk that differs in nature from the systematic risk facing the company, a situation that would enhance and solidify all modes and forms of real earnings management behavior and practices. In this way, managers of innovative firms find in these projects a favorable ground to kindle their discretionary margins in regard of real earnings management. It would therefore sound very difficult for shareholders to realize such manipulations of accounting result. In this sense, the shareholder is simultaneously exposed to both a moral hazard and adverse selection related hazard that are difficult to detect due to elusive and intricate practices.

In short, innovative firms are difficult to manage because of the specificities of their assets, especially in a context dominated by manipulation of the accounting earnings resulting from the persistence of practices and maneuver that are in their entirety, overwhelmingly linked to the elusive nature of innovation prospects. On the basis of these developments, the research predominant hypothesis is:

Hypothesis (H1): Innovative firms engage in upward trend manipulation of real earnings management.

Research Design

Sample Selection and Data Sources: To extend the relevant research, this study aimed to empirically investigate the influence of innovation activities on the real earnings management index among a sample of 126 American S&P 500 index observed over the period ranging between 2000 and 2010.

In should be noted that the R&D intensity is measured in the form of the annual R&D expenditures to sales ratio. Thus, our R&D intensity measured was depicted by activity sector. In this study, two main firm groups were considered, namely those characterized with low R&D intensity (below sample median of R&D

intensity) as well as those displaying high R&D intensity (above median rate). To distinguish these two firm categories, the [90] devised methodology was adopted. Indeed, [91] considers companies as marked with a high innovation potential if their R&D intensity proves to exceed the industry average for firms having reported positive R&D spending range.

Furthermore, the computation of the REMI entails the construction of two samples based on the companies' high or low innovative character. Thus, following the steps undertaken by [92], we proceeded with dividing the entire sample into companies with highly innovative potential (sample test) and a control sample that encompassed companies with less intensive innovation potential (sample control). For that reason, we used the control sample assuming that, as a normal status, the accounting behavior of low innovative companies, have no incentive to manage their accounting results.

Our initial sample consisted of S&P 500 index listed U.S. firms, observed over the period ranging from 2000 through 2010, relying on both of the datastream and edgarscan database extracted data, as they detain almost the entirety of documents filed by the S&P 500 listed companies.

To facilitate the data retrieval task, datastream offers the possibility to seek up to eight standard industrial codes (SIC) regarding each company, on the basis of revenue level drawn from each single industry. In other words, to retrieve the "SIC 1" on datastream for a certain company, it proceeds with providing the industry code in conformity with the company's highest share of revenue sources. In a next step, information on the industry classification was extracted from datastream concerning the entirety of companies making up in the whole Asset 4 ESG Universe and the American firms regarding which some necessary characteristics or information have been eliminated. A total of 126 companies were selected to form the entire study sample subject of observation over the twelve-year review period.

As illustrated in Table 1, the final test sample encompassed 73 firms along with 949 related observations, while the control sample consisted of 65 firms and 845 relevant observations. Similarly, the distributions of the sample firms by activity sector along with the observations percentage are shown in the same table.

Variables' Measurement
Dependent Variable Measurement
Proxy for REM: As part of the present work, detection of the real earnings management index (REMI) was based on

Table 1: Sample firms' industry distribution by R&D intensity industry-median.

Industry name SIC code*	Median RDI	Test sample	Control sample	Total sample
Textiles, Printing and Publishing	0.0134	7	9	16
Food	0.0234	5	5	10
Mining and Construction	0.0902	11	9	20
Durable Manufacturers	0.0422	16	14	30
Chemicals	0.0332	8	7	15
Pharmaceutical products	0.0911	6	4	10
Extractive Industries	0.0287	13	12	25
Computers	0.0855	7	5	12
Total		73	65	138

Note :We define industries according to the following bracketed four-digit SIC Codes : Mining and Construction (1000-1999); Food (2000-2111); Textiles, Printing and Publishing (2200-2796); Chemicals (2800-2824, 2840-2899); Pharmaceuticals (2830-2836); Extractive Industries (1300-1399, 2900-2999); Durable Manufacturers (3000-3999); Computers (3570-3579, 3670-3679 and 7370-7379).

the sum of abnormal operating cash flows (AbnCFO), abnormal production costs (AbnPROD) and abnormal discretionary expenses (Abn DISX).

In that respect, [93] and on founding works of [94] dvanced study, propose a real earnings management associated index equivalent to the sum of the three REM activity related measures, as already calculated by: abnCFO + abnPROD + abnDISX. Firms with a high REM index display a high level of overall REM (see appendix n°1).

In this context, we applied [95] model to estimate the firms' real earnings management level in the period ranging from 2000 to 2010. We started by estimating the normal level of cash flows as emanating respectively from operations, production costs and discretionary expenditures by performing the following regression models relevant to each year per industry. Then, we proceeded with deriving the regression residuals, in terms of these models, as proxies for abnormal cash flows as emanating respectively from operations, abnormal production costs and abnormal discretionary expenditures in consistence with the most prominently elaborated research works [96, 97]. Most of the study sample subject firms engaging in REM seem to be characterized with low abnormal operation-stemming cash flows along with high abnormal production cost and low abnormal discretionary expenditures.

Cash flow from operations, high abnormal production cost and low abnormal discretionary expenditures.

- The operations' cash flow associated model is as follows:

$$\frac{CFO_{it}}{A_{i,t-1}} = k_1 \frac{1}{A_{i,t-1}} + k_2 \frac{SALE_{i,t}}{A_{i,t-1}} + k_3 \frac{\Delta SALE_{i,t}}{A_{i,t-1}} + \varepsilon_{it} \quad (2)$$

The production costs' relevant model is:

$$\frac{PROD_{it}}{A_{i,t-1}} = k_1 \frac{1}{A_{i,t-1}} + k_2 \frac{SALE_{i,t}}{A_{i,t-1}} + k_3 \frac{\Delta SALE_{i,t}}{A_{i,t-1}} + k_4 \frac{\Delta SALE_{i,t-1}}{A_{i,t-1}} + \varepsilon_{it} \quad (3)$$

As for the discretionary expenditures' relating model, it is constructed as follows:

$$\frac{DISX_{it}}{A_{i,t-1}} = k_1 \frac{1}{A_{i,t-1}} + k_2 \frac{SALE_{i,t-1}}{A_{i,t-1}} + \varepsilon_{it}$$

The variables' denotation, as appearing in these models, are the following: t stands for a period indicator, i denotes a firm indicator, CFO designates cash flow from operations, SALE represents the annual sale revenues and □SALE denotes the sales shift relevant to the amount of sales concluded in the previous period. PROD is the sum of the cost of goods sold and the change of inventory cost. DISX is discretionary expenses as measured by the sum of selling and administrative expenses. $A_{i,t-1}$ is total assets in the previous period. Otherwise, to capture total level of earnings management as a comprehensive proxy, we multiply abnormal CFO and abnormal DISX by -1 and then construct REM by summing Abnormal Production, Abnormal CFO and Abnormal DISX.

The Independent Variable: The independent variable, as represented by R&D intensity, is measured under the form of R&D investments to the firm sales ratio, extracted from the datastream database, as a proxy of the firm's innovation level [98]. This operationalization proves to testify the importance extent allotted to R&D in respect of the firm's overall strategy. This variable is lagged by each

Table 2: variables measurement summary.

Variables	Abbreviation	Measerments	Authors
Real earnings management index	REMI	Real earnings management index, which equals the sum of the standardized measure of abnormal cash flows, abnormal over-production inventory and abnormal discretionary expenses.	Cohen *et al*. (2008)
R&D intensity	RDI	R&D intensity = R&D/sales	Lundstrom(2002)
Market to Book ratio	MTB	Market to Book ratio as measured by dividing the market value of equity by equity book value .	
Leverage	LEV	Total debt to total assets.	Klein (2002)
Firm Size	SIZE	Natural logarithm of total assets.	Klockand *et al*. (2004)

single year in the panel structure in order to allow for temporal manifestations of our advanced presumption effects.

As highlighted in the relevant literature, earnings can be manipulated by appealing either to accounting accruals or to real activities [99]. Accrual-based earnings management has no apparent direct effect on cash flows, while real activity based earnings management proves to remarkably affect firm cash flows and accruals as well [100]. Considering the illusive nature of innovation and earnings management strategy, innovative firms are more likely to get involved in real earnings management because they just require low level cash flow volatility. Inversely, however, R&D promoting firms are more likely to engage in real earnings management.

Control Variables: For empirical analysis purposes, a number of control variables were also included to ensure greater robustness and validity of results. Thus, the control variables as implemented in this study were the firm size (SIZE), the market to book ratio (MTB) as well as firm leverage (LEV). In fact, several authors appear to document that these variables might influence the innovative firms' REM process.

Model Specification: For an empirical assessment of our major advanced hypothesis, the envisaged relevant regression model is conceived to stand as follows:

$$REM_{it} = \alpha_0 + \alpha_1 RDI_{it} + \alpha_2 MTB_{it} + \alpha_3 SIZE_{it} + \alpha_4 LEV_{it} + \square_{it}$$
(I)

where:

REM_{it}: Designates real earnings management index of firm i in year t;

RDI_{it}: Represents research and development intensity of firm i in year t;

MTB_{it}: Denotes market to bookof firm i in year t;

$SIZE_{it}$: Represents the log size of firm i of year t;

LEV_{it}: Is the firm's leverage ratio defined as the total debt to total assets ratio relevant year t.

α_0, α_1, α_2, α_3 and α_4: are the parameters subject of estimation; $\square_{it}$: indicates random error.Concerning the indices i and t, they correspond to the study associatingfirm and period components of the study.

The entirety of appalied variables are depicted in given Table 2.

RESULT AND DISCUSSION

As a first step, we depicted the descriptive statistics relevant to the entirety of variables subject of study. Then, we highlighted the main differences marking the variables which distinguish the two sub-samples depending on the R&D intensity rate within the company: a high intensity (group 1) and a low intensity (group 2) in accordance with the median R&D expenditures. In a subsequent step, the multivariate regression analysis was performed on panel data with the aim of empirically testing the above stated hypothesis.

Descriptive Statistics and Mean Difference Tests: Table 3 depicts a summary of the statistics of the variables used in our regression. Indeed, the descriptive analysis reveals that the mean (median) REMI is -0.002 (0.067) for the entire sample, 0.033 (0.145) for the test sample and about -0.052 (0.099) for the control sample.

Regarding the remaining control variables, the mean (median) associated with firm size is roughly equal to 8.301 (6.360) and the leverage ratio mean (median) is approximately equal to 0.244 (0.232). A rate of 2.350 (2.125) corresponds to Market-to-Book ratio. Leverage is defined in terms of debt as divided by total assets. The mean (median) leverage is equal to 0.244 (0.232). Concerning the variables distribution, they are identically performed as those documented in the relevant literature [101]. Noteworthy, however, is that the mean size sound to be large suggesting that American firms are characterized with a high equity market value.

Table 4 illustrates the variables' mean differences distinguishing the noticeably innovative firms and the low innovating one. We conducted a bivariate test to compare

Table 3: Descriptive statistics.

Variables	Statistics	Full sample	Test sample	Control sample
REMI	Mean	-0.002	0.033	-0.052
	Median	0.067	0.145	0.099
SIZE	Mean	8.301	12.245	7.784
	Median	6.360	11.412	7.125
LEV	Mean	0.244	0.230	0.257
	Median	0.232	0.205	0.252
MTB	Mean	2.350	2.750	2.149
	Median	2.125	2.545	2.021
RDI	Mean	0.075	0.087	0.059
	Median	0.065	0.054	0.052

Table 4: Variables' average differences

Panel A: The explanatory variables' recorded mean with respect to R&D intensity.

Variables	Level of innovative firms	Number of observations (firms-years)	Average
REMI	More R&D intensive 1	949	-0.0339
	Less R&D intensive 0	845	-0.0255
MTB	More R&D intensive 1	949	0.1453
	Less R&D intensive 0	845	0.1223
LEV	More R&D intensive 1	949	0.2088
	Less R&D intensive 0	845	0.2502
SIZE	More R&D intensive 1	949	11.48
	Less R&D intensive 0	845	13.61

Panel B: The independent sample's relevant test.

R & D intensity	Hypothesis	Test of Levene on the equality of the variances		T-test event toaverage means equality		
		F	Sig	t	Sig	AverageDifference
REMI	The equal variance assumption	23.286	0.000	1.872	0.084	6.49
	The unequal-variance assumption			3.592	0.000	6.49
MTB	The equal variance assumption	8.550	0.012	0.811	0.419	5.750
	The unequal-variance assumption			1.914	0.042	5.750
LEV	The equal variance assumption	2.537	0.057	1.982	0.058	9.202
	The unequal-variance assumption			1.860	0.079	9.202

tests administered on independent samples to check whether any differences do persist as to the characteristics marking the REMI with respect to both the high and low innovative firms. The average difference test is administered to both firm groups. The first step to take consisted in dividing the sample into two firm groups in terms of the sample median. As highlighted through panels A and B of Table 4, a significant difference in REMI is noticeable between both firm groups at a threshold of 1%. The results also indicate that firms with an R & D intensity exceeding the median value appear to be more remarkably implicated in the REM (with an average recorded REMI of 0.0339, compared to 0.0255 for the other firms). Through observation of the average difference, it is deemed significant on noticing the mean difference implemented test (for unequal variance assumptions, t-student= 3.592, p-value = 0.000).

The same table also illustrates a significant difference in MTB between both firm groups, noted to persist at a threshold of 5%, indicating that firms with an R&D intensity exceeding the median value tend to score higher market to book ratio (with an average MTB range of (0.1453) much greater than (0.1223). Nevertheless, the average difference proves to be even more pronounced on examining the mean difference test (for unequal variance assumptions, t-student = 1.914, p-value=0.042).

Regarding the other variables, the statistical tests prove to reveal the persistence of a significant difference marking both firm groups subject of the sample study.

Multivariate Analysis: The multiple regression models estimation entails absolute absence of any multicolinearity problem between the independent variables. The pairwise correlation matrix as figuring on

Table 5: The pearson correlations matrix as resultant from the independent and control variables along with the VIF coefficients.

	RDI	MTB	LEV	SIZE	VIF
RDI	1				1.20
MTB	0.171[a]	1			1.45
LEV	-0.124[a]	0.235[a]	1		1.52
SIZE	0.452[a]	0.125	-0.156	1	2.50

All variables are as defined in Table 1.[a]Represents significance at 0.01 level, respectively.

Table 6: Multi-variable estimation regression results

$$REM_{it}=\alpha_0 + \alpha_1 IRD_{it} + \alpha_3 MTB_{it} + \alpha_4 SIZE_{it} + \alpha_5 LEV_{it} + \square_{it}(I)$$

Variables	Full sample		Test sample		Control sample	
	Coef.	T-student	Coef.	T-student	Coef.	T-student
RDI	0.125	1.45	0.144	2.99***	-0.064	2.07**
MTB	0.513	2.46*	0.008	2.13**	0.051	1.78***
SIZE	0.014	1.12	0.125	1.45	0.011	1.34
LEV	0.164	1.78***	0.020	1.96**	0.037	2.42
Firm fixed effects	Included	Included	Included	Included	Included	Included
Year fixed effects	Included	Included	Included	Included	Included	Included
Number of observations	1794		949		845	
F	97.125		45.147		35.02	
Prob> F	0.000		0.000		0.000	
Homogeneity test	F = 6.458		F = 3.325		F = 2.562	
	Prob> F= 0.000		Prob> F= 0.001		Prob> F= 0.03	
Hausman test	Chi2 = 22.56		Chi2 = 19.72		Chi2 = 18.47	
	Prob> Chi2=0.01		Prob> Chi2=0.05		Prob> Chi2=0.07	
Heteroscedasticity test	Chi2 = 1.56		Chi2 = 1.26		Chi2 = 1.36	
	Prob> Chi2=0.15		Prob> Chi2=0.18		Prob> Chi2=0.16	
R-squared	0.11		0.09		0.08	
Adjusted R-squared	0.09		0.08		0.07	

Where REM stands for the aggregated real earnings management measure through incorporation of abnormal production, abnormal CFO and abnormal discretionary expenses. SIZE designates the total assets' natural log. LEV denotes total debt as divided by total assets. RDI represents the R&D associated expenses divided by total sales.

Model (I) helps in investigating the relationship binding REMI and R&D intensity in the presence of the three other control variables. MTB, SIZE and LEV. The Asterisks ***, ** and * appearing close to a coefficient indicate the significance levels of 1%, 5% and 10%, respectively.

Table 5, indicates that no correlation between the independent and control variables exceeding the value of 0.5 seems to persist. Besides, the variance inflation factors (VIFs) do not appear to exceed a limit of 3. Consequently, one could deduce absence of bivariate multi-colinearity.

Table 6 reports the regression analysis results associated with Hypothesis 1, which tests the relationship between R&D intensity and firm REM activities. As part of this study, a multivariate regression analysis on panel data is used to empirically test this hypothesis. Prior to proceeding with the estimation models' specification, a number of test procedures were implemented. In addition, the sample jointly combines both individual and time series data. This seems likely to generate a risk of homogeneity on the sample, which might lead to inconvenient estimators on using the MCO regression. Regarding the multivariate analysis, two econometric tests were performed on the model, namely the homogeneity test and the Hausman test. The former is intended to test

the presence of any individual effect, culminating in "F-Statistic". Thus, once the "p-value" proves to be lower than the significance level, an individual effect would then persist. Indeed, the F-statistics associated probability assumption (Table 6) allows us to reject the non-relevance hypothesis of individual effects regarding our applied data, at 1% significance level. This result does actually confirm the presence of individual effects, testifying the sample's heterogeneous character (full sample, test sample and control sample). Subsequently, a Hausman test was also performed in order to specify whether a random effect model or rather a fixed effect one need to be applied. The value provided following administration of the Chi-square test (the Chi-square p-values reached in regard of the full sample, test sample and control sample are respectively 0.01, 0.5 and 0.07), allowing us to accept the implementation of the MCO estimator regarding the fixed-effects model, while rejecting the MCG estimator as provided by the random-effect model. In a second stage,

a panel-level heteroskedasticity test needeed to be performed through the application of the Breusch-Pagan test, as shown in Table 6. The Breush-Pagan test, as performed on the study model, detected no heteroscedasticity problem with respect to the three samples.

The adjusted R2 relevant to the full sample is of a rate of 9%, which is consistent with the previously elaborated works as documented in the relevant literature, dealing with R&D influence on earnings management (Shust, 2015; Jeppson and Salerno, 2017). Concerning both the test and the control samples, the adjusted R^2 appears to be remarkably different. Indeed, the 8% rate relevant to the REMI variation has its explanation in the R&D intensity along with other control variables related to the in innovative firms' case. As for the control sample, the associated adjusted R^2 is equal to only a 7 % rate. The R&D intensity's effect on real earnings management is tested separately for each single sample. Table 7 reports the regression estimation results. Actually, the coefficient is positive (coef. =0.144) and significant at l% level for the test sample, but negative (coef = - 0.123) and significant at 5% level concerning the control sample, while proving non significant with respect to the entire sample (t-student = 1.230, p-value = 0.154). Accordingly, our hypothesis stipulating that innovative firms engage in upward REM is strongly supported. This finding is consistent with those found by [102] and [103]. Thus, it follows that throughout the start-up phase attached to the innovative investment project, information asymmetries between managers and shareholders along with the invertors' perceived risk appear to be highly significant. This situation seems to lead managers to manage the accounting results upwardly in a bid to signal and highlight a satisfactorily good quality associated with innovative projects, i.e., the higher the R & D expenditure, the stronger the incentives for the REM will be. In sum, it is clear that most companies engaged in an innovative initiative and activities have recourse to an upward management of the accounting results. Furthermore, the results pertaining to some of the subsample firms' pertinent control variables seem to involve a higher R&D intensity ratio (test sample), in a harmonious conformity with the whole firm-year sample associated results (control sample). Hence, a positive association proves to persist between the leverage ratio and REM in regard of the three samples, at the 0.01 level (the test sample, β = 0.020, t-student = 1.96 and p-value = 0.032; the control sample, β = 0.037, t-student = 2.42, p-value = 0.012 and the total sample, β = 0.037, t-student = 2.52, p-value = 0.012). This finding corroborates the argument advancing that

most companies witnessing a high leverage state tend to resort to REM associated practices in order to avoid the violation of debt covenants.

As for the firm size variable, it proves to positively and non significantly influence the REMI with regard to the three samples. This finding reveals that this variable turns out to have no explanatory power on our model. Based on table 6, we can conclude that the MTB variables seem to have a positive and significant level of less than 0.05 for the sample test, while to bear no significance for the total and control samples. As for the market-to-book ratio, it has a noticeable significance in explaining the innovative firm's REM. This finding implies that this variable proves to have a significantly greater influence on the REM process with respect to the high-tech characterized companies rather than the low-tech ones.

CONCLUSIONS

This work aimed to investigate the impact of innovation activities on real earnings management. The underlying motivation lies in the observation that several empirical studies appear to demonstrate a relationship between the real earnings management and the pertinent characteristics of innovative firms. However, little interest has been paid to investigate such a noticeable bi-directional relationship with respect to the influential U.S. innovative firm's case/context. In a bid to fill such a prominent gap in the relevant literature, we carried out this study to investigate the relationship between innovation and REM associated procedures, as examined through a sample of 73 listed U.S. firms during the period between 2000 and 2012.

The study findings prove to reveal critical information regarding the innovative firm's management strategy and the REMs association concerning the U.S. context. Indeed, innovative firms that usually appeal to manipulated earnings most often tend to intensify their involvement in R&D activities. In this regard, a substantial effort has been made to collect the U.S. firms which are highly or weakly intensive in R&D. Our basic idea consists in studying the REM procedures as implemented by such innovative firms. For this reason, several statistical tests were applied to evaluate the practiced model. The model associated results reveal that there is a persistence of a predominant market-to-book ratio that tends to play a critical role in determining the REM optimal/ actual level. Finally, firm size along with the leverage seems to have no significant effect on the earnings management index.

As a matter of fact, this study has some limitations, due mainly to data constraints. Second, no robustness tests have so far been implemented to confirm advanced hypotheses in an absolutely effective way. Moreover, only innovation related output has been adopted by the innovative firm actual status. However, such a limitation should, by no means significantly influence our results findings.

Thus, a future work will investigate the relationship binding the CEO's personal characteristics (age, overconfidence, etc) and earnings management with regard to innovative firms using more detailed data should that information turn to be available.

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