BOSTON UNIVERSITY

SCHOOL OF MANAGEMENT

Dissertation

RESIDUAL INCOME-BASED COMPENSATION:

INVESTMENT ACTIVITIES AND DISCONTINUATION DECISION

by

TING-TING LIN

B.B.A., National Chengchi University, Taiwan, 1991
M.B.A., National Chengchi University, Taiwan, 1994

Submitted in partial fulfillment of the

requirements for the degree of

Doctor of Business Administration

2004

UMI Number: 3113363

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

APPROVED BY

First Reader

Alison Kirby Jones, Ph.D.
Associate Professor of Accounting (Chair)

Second Reader

Krishnagopal Menon, Ph.D.
Professor of Accounting

Third Reader

Donald Smith, Ph.D.
Associate Professor of Finance and Economics

ACKNOWLEDGEMENTS

I have been truly blessed to have so many great people in my life that I can hardly use words to express my gratitude. I would first like to thank my dissertation advisor, Alison Kirby Jones, for her guidance throughout this project. This research would not have become a reality without her continuing support. She spent numerous hours patiently helping me straighten out the research questions and the logic of my thinking. She also made the time we worked together so much fun. Alison is the kind of person that one would hope to have as a good friend and a mentor. I am truly fortunate to have her as my dissertation advisor.

I would also like to thank my committee members Krishnagopal Menon and Donald Smith for their valuable comments. Krish has always been a great source of inspiration ever since the first day I came to the doctoral program. His brilliance in quick thinking never ceases to amaze me. Don's comments on my work are always insightful. His encouragement helped me greatly in the completion of the dissertation.

I have benefited tremendously from discussions with my colleagues and other professors. Holly Johnston was always there for me, particularly when I struggled with the data and the empirical tests. I am really grateful for her generosity. Alberto Fernandez shared with me his insights and enthusiasm for Managerial Accounting research. Megan MacGarvie kindly spent time to help me understand ways to deal with the panel data. Kumar Sivakumar was always very responsive whenever I encountered Financial Accounting questions. Patricia Doherty has such a big heart and has always spared time to listen to the ups and downs of my teaching experience. Hung-Jen Wang at MIT provided the much-needed technical support so I could collect my data efficiently. To all of them, I express my sincere gratitude.

My years at Boston University has been a great journey. I am truly thankful to people who have generously helped me in various ways over the years. Particularly noteworthy are my fellow graduate students: Wan-Ying Lin, Karen Otto, Anne Jones, Jimmy Mistry, Cagnur Kaytmaz Balsari, Sangkyu Lee, Xiaowen Jiang, Meng Yan, and John Neumann. It has been a great pleasure to share time with them in the doctoral program. I would also like to thank Shang-Sheng Liu and Yu-Hua Tseng for making their home available for me to stay when I returned from Ohio to Boston. Their hospitality gave me the peace of mind during the final stage of the dissertation.

Finally, I can not thank enough my husband Chao-Yang Lee for his support in times of difficulty and for his love to share his life with me for the past fifteen years. His contribution to the completion of this dissertation is immensurable. I am also indebted to my mother Hsue Chen for her unconditional love and trust in me. Without her, I would not have had the opportunities to pursue my dreams. If there is anything that I regret, it is that my father Kuo-Hsiang Lin did not live to see my accomplishment of completing the doctoral degree. He had been the greatest cheerleader in my life and I am sure he would have been very proud.

RESIDUAL INCOME-BASED COMPENSATION:

INVESTMENT ACTIVITIES AND DISCONTINUATION DECISION

(Order No.)

TING-TING LIN

Boston University School of Management, 2004

Major Professor: Alison Kirby Jones, Ph.D., Associate Professor of Accounting

ABSTRACT

Proponents of Residual Income (RI) have argued that the incentive properties of RI motivate investment choices superior to those selected under traditional accounting measures. The current research empirically examines whether adopting RI in the compensation plan corrects investment problems. The research question is analyzed for a sample of 169 non-service RI-adopting firms. Post-adoption investment activities, operating performance and delivered residual income levels of these firms are analyzed to investigate (1) if the investment level is more sensitive to the investment opportunity set (IOS) after the RI adoption than before, (2) whether the subsequent decision to discontinue RI is associated with lower effectiveness of RI adoption, and (3) what factors explain the discontinuation decision.

The empirical results show that the investment sensitivity of RI-adopting firms does not significantly change after RI adoption. This puzzling result remains after adding

industry competitors to control for the relation between investment and IOS. Further analysis however shows that the lower sensitivity is driven by the discontinuing firms. For the continuing firms, the investment sensitivity indeed increases significantly.

The empirical results regarding RI adoption consequences are mixed and sensitive to the model specification. There is evidence indicating that continuing firms with prior over-investment (under-investment) problems significantly reduce (increase) investment levels after RI adoption, while discontinuing firms have significantly less investment correction. There is also evidence that continuing firms have significantly higher employee productivity and delivered residual income, while discontinuing firms have significantly lower levels of both.

Finally, the results suggest that RI firms that include RI in a long-term compensation plan are less likely to discontinue the use of RI. However, there seems to be no significant difference between continuing and discontinuing firms on the other firm characteristics that are hypothesized to affect the effectiveness of RI adoption, and the discontinuation decision. Hence, the reason why the realized benefit is lower for discontinuing firms remains mostly unclear. Overall, the results suggest that adopting RI corrects the investment problems for continuing firms, but not for discontinuing firms. The implication is that such lack of benefit may be a factor in firms' decision to discontinue the use of RI.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Due to recent added pressures on corporate managers to create shareholder value, there has been an explosion of interest in performance metrics that can better measure and motivate shareholder value creation. Residual Income (RI) is among the popular measures that are widely adopted and discussed.[1] Although the RI concept has existed for decades,[2] it has resurfaced, due to advocacy from leading consulting firms, such as Stern Stewart and Co., and Boston Consulting Group, and its adoption by many high-profile corporations, including Coca-Cola Company and Eli Lilly & Co.[3]

There are many interesting research issues surrounding the RI measure. Much of the research debates whether RI (or a more popular version, EVA®) is empirically more closely related to stock returns than are accounting measures (Chen & Dodd, 1997; Biddle, Bowen, & Wallace, 1998; Ho, Hui, & Li, 2000). Other research focuses on the use of RI measure for internal planning and control purposes. For example, some research empirically assesses whether the decision to adopt RI measure in executive compensation contracts is related to various firm characteristics (Garvey & Milbourn

---

[1] Different names are used for the same notion of Residual Income, such as Stern Stewart's Economic Value Added® (EVA®), and Economic Profits. In this study, Residual Income will be used to refer to all the metrics that measure the same underlying economic concept of profits above cost of capital.
[2] "Residual income has been recommended as an internal measure of business-unit performance (Solomons, 1965) and as an external performance measure for financial reporting (Anthony, 1973, 1982a, b)." Biddle et al., pp. 302.
[3] Many stories of successful implementation are closely reported in the business press. For example, Coca-Cola increased its EVA by an average of 27% annually & its stock returned about 200% since the inception of EVA in 1987 to the middle of 1993 (Tully, 1993).

2000; Lovata & Costigan, 2002). Others build theoretical models to understand if RI provides better incentives for managerial investment activities (Anctil, 1996; Rogerson, 1997; Reichelstein, 1997). Theoretical models of investment incentive show that investment cost allocation across periods that is consistent with RI measure motivates managers to choose the optimal level of investment. Empirically, however, research on whether RI adoption indeed improves a firm's performance has produced mixed results (Wallace, 1997; Kleiman, 1999; Hogan & Lewis, 2001, Balachandran, 2003). For RI-adopting firms that are presumed to have an over-investment problem prior to adoption due to the incomplete inclusion of cost of equity by accounting earnings, Wallace's (1997) evidence indicates that managers have become more selective in their investment projects. Balachandran (2003) further hypothesizes that firms might potentially have an over- or under-investment problem, depending on the performance measure utilized prior to RI adoption. He finds evidence that a significant difference exists in firms' investing and financing activities between firms switching to RI from returns and those switching from earnings.[4] However, he does not observe a significant incentive effect within each group of firms. Finally, when the overall impact of RI adoption on long-run operating and stock performances is analyzed, Wallace (1997) and Hogan & Lewis (2001) show that RI adopting firms do not perform significantly better than control firms.

One of the purposes of this study is to extend the literature on the internal managerial use of the RI measure and investment activities, and to examine empirically

[4] For detailed arguments of the investment problems resulting from the use of different performance measures, refer to Section 3.1.

whether adopting a RI measure in the compensation plan corrects the investment problems that the RI measure is intended to solve. Traditional accounting-based performance measures are criticized for their incomplete consideration of the cost of capital, thus providing incentives for managers to over- or under-invest. Proponents of RI measure argue that since RI incorporates a complete accounting of the cost of capital employed, RI provides proper incentives for the selection of investment projects (Anctil, 1996; Rogerson, 1997; Reichelstein, 1997). If RI indeed provides proper incentives for the optimal level of investment, then the investment level subsequent to RI adoption should be significantly more sensitive to the measure of the firm's investment opportunity set than it is before the RI adoption. Moreover, after switching to the RI measure, one should observe the subsequent investment activities change, in the direction corresponding to the pre-adoption over- or under-investment problem. However, except for Wallace (1997) and Balachandran (2003), there has been little empirical evidence on the validity of the claim that the RI measure motivates a more appropriate level of investment.

Since the reappearance of RI in recent years, there have also been numerous adopters that have decided to discontinue the use of the RI measure.[5] The discontinuation sample of firms provides a natural opportunity to examine the discontinuation decision that the earlier research could not have done due to a lack of time-series data. If the RI

[5] Out of a group of 169 RI adopters identified in this study, 104 firms had discontinued the use of RI measure by the end of 2001. Of these 104 firms, 36 firms discontinued due to either mergers and acquisitions or filing for bankruptcy, leaving 68 RI adopters that voluntarily discontinued the use of RI measure.

measure indeed provides proper incentives for the optimal level of investment, what explains the decision of some RI adopting firms to discontinue the use of RI measure? Both Garvey and Milbourn (2000) and Lovata and Costigan (2002) find that firms with certain operating environment and corporate governance structure are more likely to adopt the RI measure. If firms are making rational decisions, then the firms that discontinue the use of RI measure most likely perceived low benefits from the RI measure. The reasons those discontinuing firms perceived less benefit of RI measure could be because they either did not have as severe an agency problem regarding investment as those that continue to use it, or the circumstances that led to severe investment-related agency problems no longer exist. On the other hand, some firms may perceive less benefit simply because RI measure did not bring about the desired effect on managers' investment activities. Examining whether discontinuing firms experience less benefit of RI adoption, and identifying the factors that might explain the decision to discontinue the use of RI help us to understand what distinguishes firms that continue the use of the RI measure from those that discontinue using it. Such analysis also provides further evidence on how firms view the incentive effect of RI adoption on investment activities.

This study intends to answer the overall question—does adopting RI as a performance measure in the top management compensation plan indeed correct the investment problem for which RI is intended as a solution? More specifically:

(1) Are investment levels after adopting RI-based compensation plan significantly more sensitive to investment opportunities set (IOS) than before adoption? Is the investment sensitivity to IOS less for discontinuing firms than for continuing firms?

(2) Is the RI adoption effectiveness on investment correction and performance improvement lower for discontinuing firms than for continuing firms?

(3) Can the decision to discontinue the use of RI as a performance measure in the compensation plan be explained by the factors that might affect the effectiveness of RI adoption?

Using key word search of proxy statements, a total of 169 non-service firms are identified to have adopted RI in the compensation plans from 1986 to 2000. The sample includes firms across a broad range of industry categories and accounts for 3.08% of total average COMPUSTAT firms in the same period. Following Balachandran (2003), the RI adopting sample is partitioned by the firm's performance measure prior to switching to the RI measure. Due to either a lack of proxy statements or no clear specification of the prior measure used in the available proxy statements, only 125 out of the 169 RI adopting firms are included in the partition. The 65 (60) firms switching from return (earnings) measures are hypothesized to have a potential under-investment (over-investment) problem prior to RI adoption. The RI adopting sample is also partitioned based on the firm's decision to continue or discontinue the use of RI in the compensation plan. Among the 169 RI adopting firms, I identify 71 firms as the continuing sample and 98 as discontinuing sample. The two sample partitions are used throughout the analysis to test the overall RI adoption impact and the differential RI adoption effectiveness for discontinuing firms, and to contrast the factors that might affect the lower effectiveness.

A fixed asset investment model similar to the ones used by Shin and Kim (2002) and Gertner, Powers, and Scharfstein (2002) is used to examine the changed investment sensitivity to IOS after RI adoption. Empirical results show that the investment levels of RI-adopting firms become less sensitive to IOS after RI adoption. These unexpected results remain after adding industry competitors to control for the trend of the relation between investment and IOS. A dummy variable, *DROP*, is then incorporated in the model to test the differential change in sensitivity between discontinuing and continuing firms. Further analysis shows that the lower sensitivity is driven by the firms that subsequently discontinue the use of RI. For the continuing firms, the investment sensitivity indeed increases significantly.

Following Wallace (1997) and Balachandran (2003), two model specifications of testing RI adoption effectiveness are used to test the overall RI adoption consequences and the differential effectiveness between discontinuing and continuing firms. Wallace model utilizes a long-term 4-year post-adoption window, while Balachandran model features a short-term one-year post-adoption window. Two dummy variables are used to indicate prior investment problems and discontinuation decisions. Empirical results are mixed and sensitive to the model specifications. When the Balachandran model is used, the evidence indicates that continuing firms with prior over-investment (under-investment) problems significantly reduce (increase) investment levels after RI adoption, while discontinuing firms have significantly less investment correction than the continuing firms. The same pattern of results also shows for the Wallace model, but the coefficients are not all significant. In terms of delivered residual income, Wallace model shows that continuing firms have significantly higher delivered residual income, while discontinuing firms have significantly lower of that than the continuing firms. The long post-adoption period defined in Wallace model is consistent with the fixed asset investment model used in the sensitivity test, and the results are consistent with sensitivity findings. Finally, both models show that continuing firms have significantly higher employee productivity after adoption, while discontinuing firms show significantly less improvement in employee productivity than do the continuing firms.

Several firm characteristics are hypothesized to influence the effectiveness of RI adoption. These are agency costs, the degree of leverage, the age of assets, and including RI in a multi-year compensation plan. These factors are tested in a logistic regression model predicting the decision to discontinue using of RI. Only one factor, *MULTIYR*, indicating whether the firm uses RI in a multi-year compensation plan, significantly negatively affects the discontinuation decision. Namely, firms without RI in a long-term compensation plan are more likely to discontinue the RI in the compensation plan. The other factors, degree of Leverage, capital intensity, and whether the firm hired a consulting firm to help the RI installation process, are significantly consistent with the hypothesis only in some of the measurement periods.

Overall, the results of the study contribute to the literature by providing the evidence that adopting RI in the compensation plan indeed corrects the investment problems for firms that continue to use the measure. For continuing firms, RI adoption helps to increase investment sensitivity to IOS and increase (decrease) investment level when under-investment problem (over-investment) existed prior to adoption. There is also a significant positive employee productivity improvement after RI adoption. In the long-run, investing at the more optimal level helps to improve the delivered residual income. The study also documents the lower adoption effectiveness of firms that discontinue the RI measure, as evidenced in lower investment sensitivity to IOS, less investment correction, less employee productivity and less delivered residual income than the continuing firms. Finally, the evidence suggests that the two groups of firms are not much different in the hypothesized factors that might influence the adoption effectiveness. Only one factor indicating the use of RI in the long-term compensation plan is a consistent predictor. Hence, the reason why there is less adoption effectiveness for discontinuing firms remain unclear.

The remainder of this dissertation is organized as follows. Chapter 2 reviews the prior literature, with the focus on the managerial use of the RI measure, including the incentive properties of RI and the empirical evidence on the RI adoption. Chapter 3 develops the theory and the hypotheses, while Chapter 4 describes the RI sample, model specifications to test the hypotheses, variable measurements, and the expectations of the coefficients. Chapter 5 reports and discusses the empirical results and the robustness tests. Finally, Chapter 6 contains a summary of the study, a discussion of the limitations and contributions of the study, and suggestion for future research directions.

CHAPTER 2

LITERATURE REVIEW

2.1 Value-Based Management

A growing emphasis on creating shareholder value has shifted the focus of managerial accounting practices from narrowly defined financial decisions to a strategic management approach. Ittner and Larcker (2001) recently use the value-based management (VBM) framework to assess the empirical research in managerial accounting. Among the 'new' tools proposed under the VBM framework, Residual Income (RI) financial management system has gained widely acceptance.

The concept of RI has existed for decades. As early as in 1920s, General Motors used a variant of the RI approach, while a case study of General Electric in 1955 shows that the RI concept was in place (Bromwich & Walker, 1998). However, RI has attracted great interest by companies world-wide, mainly due to the marketing efforts of Stern Stewart consulting firm and their variant of RI, Economic Value Added, trademarked EVA®. O'Hanlon and Peasnell (1998) conclude in their review of the contribution of Stern Stewart's EVA® financial management system that "...Their ideas on how best to adjust and use accounting numbers to serve specific management ends are sufficiently thoughtful and arresting to warrant being included amongst the more significant contributions of recent years to management accounting." However, not everyone sees their system as flawless. Mouritsen (1998) criticized RI based financial management system for its lacking in a clear vision on how firms should devise their growth strategy and develop the unique competitive capabilities.

2.2 The Residual Income Measure

Residual Income for period t, denoted RI_t, is measured by subtracting the capital charge of the invested capital from the earned profits:

$$RI_t = \pi_t - k \times B_t \qquad (1)$$

Where, π_t is net operating profit before interest and after tax (NOPAT), k is weighted average cost of capital (WACC), and B_t is the invested capital employed during the period t. RI can also be expressed as a comparison between profitability and the cost of invested capital:

$$\begin{aligned} RI_t &= \pi_t - k \times B_t \\ &= [(\pi_t \div B_t) - k] \times B_t \\ &= (ROI_t - k) \times B_t \qquad (2) \end{aligned}$$

Either way, the rationale of RI is that if the returns of the invested capital are greater than the required rate of return of the invested capital, i.e., the capital charge for the use of the capital in investments, the residual income will be positive and the value is created. On other hand, if the generated returns cannot cover the cost of the invested capital, a negative RI means that value is destroyed.

Based on the discounted dividend valuation model, Ohlson (1995) and Feltham and Ohlson (1995) formally show that the value of a firm can be expressed as the current invested capital plus the stream of future abnormal earnings (i.e., residual income), discounted by the firm's cost of capital.

$$V_t = B_t + \sum_{\tau=1}^{\tau=\infty} \frac{RI_{t+\tau}}{(1+k)^{\tau}} \tag{3}$$

Equation (3) holds true, as long as the accounting clean surplus relationship is satisfied. The value creation can then formally be linked to RI by assessing the excess of market value over invested capital—'Market Value Added' (MVA) as shown in Equation (4). Hence, the MVA maximization equals to maximizing the future stream of RIs.

$$MVA_t = V_t - B_t = \sum_{\tau=1}^{\tau=\infty} \frac{X_{t+\tau}}{(1+k)^{\tau}} \tag{4}$$

2.3 Capital Market Research

Since the RI-based financial management system mainly aims at providing better incentives for managers to create value for the shareholders, the consulting firms often market their system by making claims that their measure is superior to traditional accounting measures in reflecting value creation. Much of the academic research initially tried to empirically test the claims, such as "...Forget ESP, ROE and ROI. EVA is what drives stock prices" (Stern Stewart advertisement in HBR, Nov/Dec, 1995) or "EVA stands well out from the crowd as the single best measure of wealth creation on a contemporaneous basis" (Stewart, 1994).

In the less sophisticated research design, Milunovich and Tseui (1996) and Lehn and Makhija (1997) use simply univariate test and conclude that market value added is more highly correlated with EVA than with various accounting measures, such as earnings per share, returns on equity, and free cash flow. When the more complex regression models are examined, the evidence of contemporaneous value relevance of EVA measure is less conclusive. For a sample of UK firms, Stark & Thomas (1997) find that RI measure is more highly correlated with market value than accounting earnings in the model that controls for R&D expenditure and the book value of assets. They conclude that the capital charge element of RI measure does provide incremental value beyond earnings in explaining the market value. Also, Chen and Todd (1997) find that EVA® measures do provide more information value in explaining stock returns. However, a comparison between EVA® and RI shows that the accounting adjustments made by Stern Stewart does not contribute significant information value. Moreover, accounting profit measures still provide unique information value in addition to those provided by EVA measure. So they conclude that the claim to totally abandon accounting measures is not warranted.

Biddle, Bowen, and Wallace (1997) did a similar comprehensive test on the value relevance of all components of Stern Stewart's EVA®. They decompose EVA as follow:

$$EVA = CFO + Accruals + ATInt - CapChg + AcctAdj \qquad (5)$$

Where,

CFO = Cash flow from Operating,

Accruals = Accounting accruals, such as depreciation,

AtInt = the after tax interest expenses,

CapChg = the capital charge of all invested capital, and

AcctAdj = Stern Stewart's capital adjustments (i.e., asset re-valuation) and the adjustment of operating profits.

They test the relative information content and incremental information content of each component of EVA in an attempt to assess if EVA, or which of its components, contributes more to the market returns than accounting earnings. They find that accounting earnings (i.e., earnings before extraordinary item = CFO + Accruals) in general have the highest relative information content, and the capital charge and accounting adjustments provided by Stern Stewart's EVA® only add insignificant incremental value beyond accounting earnings in explaining stock returns. Hence, they conclude that their evidence rejects the claim that EVA outperforms accounting earnings in tracking value creation.

Ho, Hui, and Li (2000) tries to extend the results of Biddle et al. (1997) and show that the value relevance of EVA is higher than earnings in certain circumstances. They reason that the tremendous amount of R&D, advertising, and marketing expenditures in the Internet sector lead to a great divergence between accounting earnings and the EVA. Hence, they hypothesize that EVA measure is a better performance measure for the activities of the Internet sector and should provide higher information content than earnings. Their results are consistent with their hypothesis. They also find that the importance of the accounting adjustments (i.e., R&D and marketing valuation) depends on the activities of different type of Internet firms (i.e., P/C firms or e-tailers). Overall, their evidence indicates that EVA is a better measure of firm performance in some circumstances, such as in Internet sector, because accounting earnings are less representative to the underlying economic reality of the sector and, therefore, the accounting adjustments of EVA become more value relevant.

2.4 Internal Managerial Use of Residual Income

Despite the interests in the value relevance debate on RI versus accounting measures, the internal use of RI measure as a monitoring and motivating tool does not necessarily require it to be a preferable measure of the firm value (Gjesdal, 1982; Paul, 1992). Otherwise, the incentive system aiming at motivating value creation should solely rely on stock returns as a performance measure. Sloan (1993) demonstrate that both stock return and accounting earnings are noisy measures of manager's actions, and each captures different dimension of managerial efforts. Including accounting earnings in compensation contract can improve the contracting efficiency by shield managers from the stock return fluctuation that is beyond their control. Hence, for the purpose of selecting a performance measure for internal use, the statistical relation between the measure and the stock returns is less of concern.

However, Garvey and Milbourn (2000) formally demonstrate that the correlation between a performance measure and the stock returns actually captures signal content of the effect of managerial efforts on the measure. Accordingly, the strength of the correlation dictates the value of the performance measure in the compensation contract. They also empirically show that, deriving from their theoretical model, the measure of 'value-added' of Stern Stewart's EVA® is significantly related to the firm's actual decision to adopt it as an internal performance measure. Some criticize that Garvey and Milbourn (2000) do not model the specific difference between accounting measures and EVA®, and that they also assume the signal properties of EVA® that can reflect managerial efforts are unknown, so the incremental value of adding EVA® to the compensation contract has to come from its correlation to stock returns. In this case, the EVA® can be any other measure which has some correlation with stock returns. If firms know of the signal properties of EVA®, then whether EVA® is more highly correlated with stock returns again becomes less important (Rajan, 2000).

2.4.1 Residual Income and Investment Incentives

The value relevance research does not answer the question of the incentive consequences of adopting RI measure for internal managerial use. Regardless of if RI is more highly correlated with stock returns contemporaneously than accounting measures, the question for using RI as an internal performance measure should center on why and how does adopting RI motivate managers to engage in value creating activities. The answer to the question can be examined from the metric properties of the RI measure.

One of the most commonly heard criticisms of RI is that it is only a single period performance measure. The use of RI still subjects managers to the myopic investment problem. O'Hanlon & Peasnell (1998) show that single period RI does not always equal single period excess market value; therefore, using RI as a single-period performance measurement is not always optimal. However, the theoretical work done by Anctil (1996), Rogerson (1997), Reichelstein (1997), and Anctil et al. (1998), examines the exact incentive properties of RI and validates it as an effective single-period performance measure.

Rogerson (1997) asks the question of how to allocate investment cost[6] so that managers are motivated in every period to invest at optimal levels. The investment cost in his model includes "... that period's depreciation plus an imputed interest cost calculated

[6] This essentially works as selecting an proper depreciation rule.

by multiplying the interest imputation rate by the remaining (nondepreciated) book value of the investment." (p. 771). He shows that there exists a unique investment cost allocation rule so that managers are always motivated to select the efficient investment level. This cost allocation rule is set by "...choosing an interest imputation rate equal to the firm's cost of capital and choosing the depreciation rule... so that the total cost allocation to each period is proportional to the relative productivity of the asset in each period." (p. 773). This cost allocation rule is in general consistent with computation of RI measure, although measuring NOPAT usually does not conform to the productivity-based depreciation rule. Regardless, he shows that given a certain cost allocation rule, RI in each period is enough to provide correct incentives for efficient investment level.

Reichelstein (1997) compares the investment incentive effect of various linier combinations of accounting measures, with RI as one possible alternative. He extends Rogerson's (1997) results by showing that, with a unique depreciation schedule, RI is the only measure that achieves goal congruence in investment. This result holds true even when the manager's discount rate is different from the owner's.

Anctil (1996) and Anctil et al. (1998) characterize the RI investment incentive as a capital budgeting problem. Their analysis results show that myopically maximizing RI in each subsequent period is enough to achieve the efficient investment level that is encouraged by the theoretically more optimal criterion of NPV project selection. Moreover, maximizing single period RI does not require a lot of information coordination between divisions about the future cash flows. However, their results are based on two assumption of asset accounting. One is the full capitalization of investment expenditures and the other is a depreciation policy that corresponds to the physical productivity of assets. Without conforming to these two asset accounting policies, single period RI maximization might not lead to the optimal investment level.

Taken together, this line of theoretical work has demonstrated the connection between metric properties of the RI measure and its incentive effect. More specifically, it shows that, in combination with a unique asset valuation policy and a specific investment cost allocation rule, RI can be an effective single period performance measure to motivate managers to select efficient investment levels. By contrast, accounting earnings do not impute an interest charge for the equity capital. Since less investment cost is charged before using RI, firms tend to over-invest. Everything else held constant, switching to RI measure should motivate managers to invest less. However, if the unique policy and rule are not utilized, particularly the valuation of assets and the depreciation policy, RI would not necessarily properly motivate the managers to invest at the optimal level. For example, in Rogerson's (1997) model, the firm should assign more depreciation to the later periods than to the early periods. Using either one of the common accounting depreciation rules -- straight-line or accelerated -- pushes too much cost of investment to the early periods, and makes the investment look too costly, leading to under-investment. To the extreme, the GAAP R&D expensing policy is a form of complete depreciation in the current period. This would lead to under-investment in the R&D assets, unless a more appropriate R&D cost allocation rule is utilized in RI computation.

2.4.2 The Implementation of Residual Income

Reichelstein (1997) points out that although his model focuses on capital assets, the unique asset accounting policy that makes RI an optimal measure can also be applied to other kinds of assets, such as inventory and receivables. For purposes of the implementation of EVA®, Stern Stewart Consulting firm's variant of RI, it recommends making numerous adjustments to accounting assets and NOPAT, in an attempt to allow RI to approximate value maximization. The full list includes almost 150 adjustments.[7] O'Hanlon and Peasnell (1998) classified the accounting adjustments to reflect three purposes:

a. to undo accounting conservatism;
b. to discourage earnings management; and
c. to immunize performance measurement against past accounting 'errors.'

On the surface, most of the adjustments are consistent with a few theoretical works cited here, however, some forces deter firms from accepting all the adjustments. For example, Young (1999) suggest that deviating away from GAAP numbers bears an

[7] Young (1999) identifies the most commonly proposed accounting adjustments: Non-recurring gains and losses, R&D capitalization, deferred taxes, provisions for warranties and bed debts, LIFO reserves, goodwill, depreciation, and operating leases.

organizational cost to most firms, mainly due to the weakened confidence and the confusion about the accounting system, and the inconsistency between internal managerial and external capital market evaluation. Also, some firms find that most of the adjustments do not generate a significantly qualitative difference in the RI measure and the accounting measures. The number of the recommended accounting adjustments have therefore reduced from the original 10 or 12 items to 6 or less currently. Stern Stewart also does not recommend universal accounting adjustments for every firm. They perform a few adjustments based on the firm's operational environment, and only if the adjustments are material and meaningful, and can be understood by the non-financial employees.

Due to the practical difficulty of completely conforming to the unique asset accounting rule specified in the theoretical work, a window of opportunity still exists for managers to engage in myopic investment behavior. To this end, a 'Bonus Bank' feature is designed into many compensation schedules. This feature delays a portion of the compensation payment to future periods, and causes no bonus to be paid out if the balance of the Bonus Bank becomes negative. The Compensation Committee Report in Crane Co.'s proxy statement illustrates the "Bonus Bank" mechanism:

> *The Company's annual incentive awards are based on the EVA increase or decrease for a business unit during the year both absolutely and compared to the prior year, thereby motivating managers to focus on*

continuous value improvement. Awards are uncapped to provide maximum incentive to create value. but, there is also a downward exposure since annual awards whether positive or negative, are credited to a notional "bank account," only a percentage of which is paid out in any year. The balance in a bank account is thus subject to decrease if the EVA is determined to be negative in subsequent years. and to forfeiture if a participant leaves the Company. The vulnerable bank account concept gives the annual incentive compensation program a longer-term perspective and provides participants with ownership incentives as the account balances build or decline. (p.11-12).

One disadvantage of the "Bonus Bank" feature is that it exposes managers to higher risk in award payment; hence, the overall compensation package might have to increase in value to compensate the generally risk-averse managers for their additional risk exposure. It is generally observed that firms adopting EVA® usually increase their overall compensation package value. The use of the "Bonus Bank" feature might be one of the reasons.

2.4.3 The Adoption Decision

The RI-based compensation plan is proposed either by the CEO of the firm or the compensation committee, and has to be approved by the shareholders. Companies sometimes disclose the consulting firm that helps to institute the RI-based incentive system. In some cases, a special variant of RI, EVA® by Stern Stewart, Co., is implemented. The RI incentive system is usually administered by the Compensation Committee of the company.

Although the incentive properties of RI measure could theoretically benefit all firms, the implementation of a RI system could be time-consuming and entails great effort from top management.[8] Hence, similar to the cost and benefit trade-off for the adoption of a non-financial performance measure in the compensation plan (Ittner, et al., 1997), various firm characteristics would affect the benefit of adopting RI measure and ultimately affect the adopting decision.

Garvey and Milbourn (2000) empirically identify which factors explain the firms' RI adoption decisions. Their main focus is a theoretically derived relative measure of the correlation between EVA® and abnormal stock returns and the correlation between accounting earnings and abnormal stock returns. According to their model, this measure captures the incremental value of adding EVA® in the compensation contracts. They find a positive relationship between this measure and the adoption decision, which indicates that the higher relative correlation increases the value of EVA® measure and prompts firms to adopt it. Out of the other control variables that might affect the adoption decision, only capital intensity, measured by the ratio of plant, property, and equipment to total assets, is positively related to the adoption decision. This indicates that firms with

[8] Stewart (1995) points out that "For an enterprise with sales under $250 million, becoming an EVA company takes four to five months. For companies with up to $1 billion in sales, it could take six to nine months. And for a very large company, it could take a couple of years."

higher tangible assets benefit more from carefully managing their assets, which is consistent with the RI incentives.[9]

Lovata and Costigan (2002) contrast a group of 115 RI adopting firms with a group of 1271 non-adopting firms in the same industry that the RI adopting firms operate in. They hypothesize that firms with higher agency costs and pursuing a defender strategy are more likely to adopt RI in their compensation plan. They also show that the adoption decision is associated with a higher percentage of institutional investors ownership, possibly indicating that RI is part of a control mechanism promoted by the more financial savvy institutional investors. Finally, they find that for a given level of insider ownership, larger firms are more likely to be the adopters, even though size alone does not affect the adoption decision. The overall finding is consistent with the view that firms perceive more value-creating benefit from RI incentives when potential agency conflicts are more severe. The finding is also consistent with the criticism of Mouritsen (1998), that RI-based financial management system is less helpful for firms that compete on non-financial capabilities, such as technology, innovation, and human capital. However, as the Lovata and Costigan note in their conclusion, it is not clear if the perceived benefit of RI measures indeed translates to the actual realization of better firm performances.

---

[9] In an interview about how Eli Lilly & Co. implements the EVA® measure, the CEO, Randall Tobias, emphasizes the importance of focusing on capital expenditure due to the capital intensive nature of a pharmaceutical company. EVA® measure helps to bring attention to managing capital investment more efficiently (Martin, 1996).

These two papers provide evidence consistent with their hypothesis that firms decide to adopt RI in their compensation plan based on an assessment of their operating environment and corporate governance structure, and on evaluating whether the benefit from the incentive properties of RI measure out-weighs the cost of implementation.

2.4.4 Consequences of Residual Income Adoption

So far, the literature that is interested in the internal use of the RI measure examines the theoretical incentive properties of the RI measure and shows that it is linked to value maximization. Also, it has been shown that perceived benefit of the incentive effect of RI measure explains the adoption decision. The consulting firms have tried to put the measure into reality by making accounting adjustments and creating "Bonus Bank" feature for a long-term focus. The question then arises as to whether the RI adoption indeed brings the desired impact on the investment activities and actual better performance?

2.4.4.1 Empirical Evidence

The first study to test the RI adoption impact is Wallace (1997). He hypothesizes and tests whether managerial decisions in investing, financing and operating activities change in a direction consistent with RI incentives after RI adoption in the compensation plan. His empirical tests are based on the assumption that the incentive effect of adopting RI is in the direction of correcting an over-investment problem that firms experienced prior to adoption. He compares the change in the activity level surrounding RI adoption for 40 RI adopting firms with a sample of non-adopting control firms that is selected based on industry affiliation and pre-adoption total assets size. His evidence suggests that RI adopting firms dispose of more assets, increase new investment less, repurchase more shares, and utilize assets more intensively than their counterpart control firms. In his sensitivity test, Wallace finds that these behavioral changes are more pronounced for firms that actually adopt RI in their compensation plan, than for a sample of firms that utilize RI only in their decision making, but do not include RI in their compensation plan. This provides some evidence for the assertion that RI works only if it is included in the compensation plan.[10] Wallace also addresses the question: Do you get what you pay for? Assuming a constant 12% cost of capital across the sample, he finds that RI adopting firms improve RI more significantly than do the control firms. However, he does not find superior stock return performance for his RI adopting firm, compared to the stock returns of both control firms and the market portfolio return. He only finds weak evidence that the shareholders' wealth increases in the period surrounding the RI plan adoption.

Hogan and Lewis (2000) assess the long-term performance of firms adopting RI in the compensation plan.[11] The notable contribution of their study is that they match RI adopting sample with the control firms that is not only selected by industry affiliation and size, but also the pre-adoption performance (i.e., the ratio of operating income before depreciation/total assets). This controls for the possible mean reversion effect of a firm's

---

[10] Stern Stewart's in-house research in 1999 indicates that among all the EVA® adopting firms, 10 firms that do not include RI in the compensation contract produce the least impressive stock return performance, only 1% more wealth than their competitors.
[11] The authors use Economic Profits to refer to RI and its variants, such as EVA®.

performance after RI adoption. In their performance regression, they also control for other compensation and board composition characteristics. They document improved operating performance, measured both by cash flow related performance measures and by investment-related performance measures. However, if the improvement of the performance is compared to the matched-control firms, the improvement is not significantly greater. They also do not find any significantly greater stock returns performance of RI adopting firms relative to either the value-weighted market returns or the matched-control firms.

On the other hand, Stern Stewart's in-house research finds that EVA® adopting firms outperform their competitors greatly, producing 49% more overall stock returns in five years after adoption. The comparison is made to a group of up to 10 competitors in the same 4-digit SIC industry and with similar market capitalization. Kleiman (1999) also finds significant higher abnormal stock return performance for RI adopting firms. He finds that RI adopting firms outperform both their close competitors, selected by industry affiliation and pre-adoption total sales size, and the median competitors in the same 4-digit SIC industry. He then tries to assess the sources of the superior performance. He finds that RI adopting firms dispose of more assets than the median for the S&P 500 index, although the data pattern shows that the RI adopting firms consistently dispose more assets even before RI adoption. Unlike Wallace (1997), he does not find less new investment by RI adopting firms. He also finds that RI adopting firms tried to reduce cash conversion cycle before and throughout the RI adoption period, although the improvement is not significantly different from the median of the S&P 500 firms. Finally, he shows that employee productivity, measured by operating profit margin before depreciation per employee, significantly improves following the RI plan adoption, and it is not caused by the change of number of employees in the same period of time.

More recently, Balachandran (2003) challenges the assumption that RI adopting firms experienced only over-investment problem prior to adoption. He posits that firms that used accounting earnings in their compensation plan prior to switching to RI measure are more likely to have over-investment problem, due to the lack of cost of equity expensing. On the other hand, firms that used return type of measures in their compensation plan prior to switching to RI measure are more likely to have a under-investment problem. As a classic example in almost every managerial accounting textbook, when managers are evaluated by return type measures, such as return on assets, they have an incentive to maximize the overall return of their divisions, and may have an incentive to potentially not invest in some projects that might reduce the current return, despite their positive residual income and value to the firm. This leads to an under-investment problem. Balachandran shows that 60% of Wallace's RI adopting firms switched to RI from accounting earnings. The higher proportion of the possible over-investing firms in the sample explains the findings in Wallace (1997). On the other hand, only 49% of RI adopting firms switching from earnings in Kleiman's sample, which explains why Kleiman does not find less new investment for his sample.[12]

Balachandran's refined hypothesis reflects the differential incentive effect of RI adoption on firm's investing and financing activities, depending on the prior investment problems facing the firms. He also used a different model than Wallace (1997) to test the incentive effect. More specifically, the RI adopting firm's own past incremental activities are used as the benchmark of no RI incentive effect to compare with the incremental activities associated with RI incentive. His results are mixed. The incentive effect after RI adoption within the sub-samples of over- or under-investment groups are mostly not significant in the model specifications. However, he finds a significant difference in investing and financing activities between the two sub-samples that is consistent with the hypothesis. More specifically, the firms switching from earnings (i.e., potential over-investing firms) decrease their net investment level significantly more than the firms switching from returns (i.e., potential under-investing firms), even though by comparing to the firm's own history when no RI incentive was present, the reduction of the investment level for over-investing firms or increase of the investment level for under-investing firms are not significant.

---

[12] However, this sample composition comparison is only for 75% and 59% of the total RI adopting firms for Wallace (1997) and Kleiman (1999), respectively. The rest of the firms in the sample can not be identified as using earnings or returns prior to RI adoption due to a lack of proxy statements or no specification provided by firms themselves in the available proxy statements..

Balachandran's tests are a joint test of the incentive effect of adopting RI and of the validity of using prior performance measure as an indication of potential prior investment problem. Even though his evidence does not provide a clear-cut incentive effect of RI adoption within the two sub-samples, it suggests that there is a systematic difference in the investing activities after RI adoption between firms switching from different prior performance measures to RI measure, and the differential effect in investment activities between two sub-samples is consistent with the RI incentive.

The above research papers rely on the firm's proxy statement to identify their adoption of RI measure, and use publicly available data to assess the adoption impact on overall firm performance. Other research methods have been used to examine the adoption impact. Wallace (1998) sent a questionnaire to firms identified in Wallace (1997) as RI adopters, and asked one member of the executive management team to indicate the extent of the RI utilization and the impact it had on their decisions. Consistent with the RI incentives, all firms responded that they use the RI measure in their capital budgeting activities, i.e., to select new investment projects and sell off the under-performing old assets. More than half of the firms use RI measure for working capital management and financial decisions.[13] The majority of the firms also report a greater awareness of the capital charge after the RI adoption. The firms also responded to the question of RI implementation by emphasizing the importance of top management

[13] 100% of the responded firms indicate the use of RI in their capital budgeting activities, while 86% use the measure for working capital management and 64% use it for financing decisions.

support and keeping the system simple enough for employees to understand. Several firms respond that the major dissatisfaction with RI is its complexity.

Through a proprietary access to a RI adopting firm, Riceman, Cahan, and Lal (2002) assess the impact of RI adoption on the performance of individual managers. They hypothesize that managers with RI bonuses and who better understand the EVA concept will outperform other managers. Manager performance is a self-rating in overall performance and in 8 sub-dimensions of performance, such as planning, coordinating, supervising and negotiating, etc. Riceman et al find that understanding of the RI concept is not always high, corresponding to a 'D' using an American grading system.[14] Despite the low level of understanding, their evidence does show that managers with RI bonus plan and who do understand the RI concept outperform their peers. Further analysis shows that this interaction has very different effects on managers in different areas of employment. For example, the performance of managers in Customer Support does not seem to be affected by the RI bonuses and the degree of understanding of the measure. This indicates that adoptions may not have a universal positive impact throughout the firm. Finally, they show that the interactive effect is significant only in the sub-group of managers where their main information sources on RI are from their supervisor, indicating that a manager's performance is affected by the fact that their supervisor understands the measure and is a strong advocate.

[14] Although the authors caution that their conclusion may result from the relative newness of the RI system in the case company.

2.4.4.2 Assessment of the Empirical Evidence

Taken altogether, empirical research on the RI adoption impact is not conclusive. It seems that the overall inference of the RI adoption impact and performance depends on the research design used to assess the benchmark performance. Except for Balachandran (2003), all the other studies use a control sample to help rule out confounding factors that might affect the outcome. However, it is difficult for a researcher to select a well-managed control sample. There could still be several sources of systematic bias introduced in the control sample selection. (Barber & Lyon, 1996; Barber & Lyon, 1997; Kothari & Warner, 1997; Lyon, Barber, & Tsai, 1999). On the other hand, the self-controlled approach Balachandran (2003) used is easily susceptible to an overall industry trend effect. Therefore, using multiple control approaches should help draw a more definitive conclusion regarding the incentive effect of RI.

While the effect of RI adoption on overall firm performance is difficult to assess, also lacking is more direct evidence that adopting RI leads to an optimal level of investment. Theoretical work on the incentive properties of RI measure provides predictions on the kind of investment problems that RI measure is adopted to correct, thereby allowing tests to see if there indeed is correction. Balachandran's (2003) work comes close to providing the evidence on the investment level correction after RI adoption, depending on the potential prior investment problems. However, the question of RI incentive effectiveness remains due to the results that show a lack of significant change within each sub-sample. It is worth exploring further to see if there are other factors affecting the benefit realization of RI adoption. Moreover, exploring other measures of investment correction could provide further evidence of whether RI measure provides proper incentives for efficient investment.

Finally, none of the prior research contrasts the impact of RI adoption between firms that continue to use the measure and firms that subsequently decide to discontinue the use of the measure. In their survey paper on the innovation in the performance measurement, Ittner and Larcker (1997) particularly mention that a growing number of firms have since abandoned the RI measure in their compensation plan. If the assessed benefit prompts the RI adoption decision as shown in the two aforementioned adoption decision papers (Garvey and Milbourn, 2000; Lovata and Costigan, 2002), what accounts for the factors leading to the decision to discontinue the use of RI measure? Given the inconclusive evidence on the RI incentive effect so far, a contrast between continuing and discontinuing RI adopters could help reveal if discontinuing adopters experience lower benefit, and shed some light on the inconclusive results of RI incentive effectiveness. Furthermore, it could further our understanding of what helps bring intended benefit of the RI measure and what not.

CHAPTER 3

THEORY AND HYPOTHESES

As outlined above, the purpose of the study is to empirically assess the relationship between the use of an RI measure and its effects on levels of investment. One avenue of inquiry is to examine whether firms' investment activities are consistent with the incentives provided by RI-based compensation plan. This is considered in Section 3.1. Another is to explore whether RI adopting firms that subsequently decide to discontinue the use of RI in the compensation plan exhibit lower realized adoption benefits than the RI adopting firms that continue the use of RI. This is considered in Section 3.2. Finally, Section 3.3 examines four firm characteristics that might affect the RI adopting firms' decision to discontinue the use of RI.

3.1 Investment Consequences

One of the main advantages of using RI over traditional accounting-based performance measures lies in the incentives created for investment. There are two factors in the use of accounting measures that might generate non-optimal investment levels. The first relates to the incomplete inclusion of cost of equity in accounting earnings. The second relates to using profitability ratios, such as ROA, rather than dollar profit amounts.

The underlying assumption in Wallace's (1997) analysis is that all RI adopting firms had an over-investment problem prior to adoption. The hypothesized over-investment problem arises due to accounting earnings deducting only the cost of debt (i.e., interest expenses) and ignoring the cost of equity. However, shareholder value is created only when the return on investment is greater than the cost of all capital. Therefore, in order to maximize accounting earnings, managers are inclined to take on projects that might increase earnings, but not enough to cover the cost of equity capital, resulting in an over-investment problem. The inclusion of cost of both debt and equity in RI computations motivates managers to be more selective in their choice of investment projects, thereby mitigating the over-investment problem.

In addition to the incomplete inclusion of the cost of capital in accounting earnings causing an over-investment incentive problem, further problems are created when using a ratio such as return on investment (ROA) as the basis for measuring and rewarding performance. The percentage nature of accounting performance measures such as ROA may give a manager incentives to under-invest. This too can be rectified by the use of RI.

When an investment center manager is evaluated and rewarded based on Return on Assets (ROA), the manager has incentives to forgo investment projects for which the ROI (Return on Investment, $ROI_{project}$) is lower than the target ROA of the firm/division.[15] However, if the forgone investment projects have greater returns than the cost of capital employed and therefore have positive RI, the missed investment opportunities are detrimental to shareholder' value creation. When a manager fails to invest in positive RI projects in an attempt to maximize ROA of the firm/division, there is an under-investment problem. Summarizing, an under-investment problem is likely to occur when both (i) managers are rewarded based on ROA, and (ii) Required Rate of Return < $ROI_{project}$ < Current ROA. Utilizing an RI measure in this case can motivate managers to take on all positive RI projects, thereby mitigating the problem of under-investment caused by ROA incentives.

Hence, as also argued in Balachandran (2003), firms adopting RI might not only use it to mitigate an over-investment problem as originally argued by Wallace (1997), but also to mitigate an under-investment problem. For firms hypothesized to have an over-investment problem prior to RI adoption, RI might help to indicate that returns of some of the previous investments do not meet the cost of the capital used. In order to maximize RI, the managers will likely sell-off those investments to avoid negative RI, resulting in an increase in asset disposition after RI adoption. Similarly compared with the pre-adoption period, managers of firms with a pre-adoption over-investment problem will likely now invest less in new investments, due to the consideration of cost of all capital in

[15] Millennium Chemicals Inc.'s senior vice president and CFO John Lushefski was quoted in an article as saying, "We thought return-on-asset formulas drove organizations to high returns, but didn't necessarily increase the value of the company. We had too many divisional executives who failed to spend money on capital projects with more than satisfactory returns because those projects would have lowered the average return [on assets] of their particular business." (Myers, 1997).

the RI measure. These two activities should lead to lower overall net investment level after RI adoption for potential over-investors.

On the other hand, for firms that are hypothesized to have an under-investment problem prior to RI adoption, levels of new investment will likely increase after RI adoption, in light of the RI incentive that calls for investing in all positive RI projects. Similarly, the retention of existing investments will likely increase, because the RI criterion makes more existing investments look more appealing than they looked prior to RI adoption. More investment retention means that asset dispositions will likely decrease.

In short, either over-investment or under-investment problems could result from the use of traditional accounting measures in a compensation plan. Hence one can expect that the adoption of RI measure should help mitigate both over- and under-investment problems, and bring firms' investment levels back to their optimal levels. Thus in general we should expect that investment levels are more closely related to investment opportunities after RI adoption than before.

<u>Hypothesis 1</u>:

Investment levels of firms adopting Residual Income-based compensation are more sensitive to the investment opportunity set after RI adoption than they were prior to RI adoption.

3.2 The Discontinuation Decision

Despite theoretical arguments and some empirical evidence favoring the adoption of RI-based compensation, the implementation of a financial management system to support RI-based compensation is less straightforward than one based on traditional accounting-based measures.[16] In order for the RI measure to provide effective incentives, managers and employees must understand the measure and know how their decisions/behaviors affect the measure. Successful implementation requires long-term commitment from top management, and intensive training for employees. In fact, in an article to refute critics of his version of RI, EVA®, Stewart (1995) argued that some of the common mistakes in implementing the EVA measure may lead to the failure of EVA. Thus given the costs of implementing EVA there is a tradeoff between the benefits provided by RI incentives and the cost of designing and maintaining the system and the cost of organizational changes. As mentioned in Chapter 1, forty percent of one hundred sixty-nine identified RI adopters in this study have made a voluntary decision to discontinue the use of RI in the compensation plan. It is very likely that this tradeoff is considered when firms make their RI adoption and their RI continuation decisions. If so, one would expect the decision to discontinue the use of RI to be related to low realized benefits from utilizing the RI measure. In other words, RI adopting firms that actually experienced less realized benefits will be more likely to discontinue the use of the RI measure and look for other mechanisms to motivate managers' investment project

[16] One of the reasons cited by AT&T to discontinue the use of EVA® measure is that many business units felt that the measure is similar to the traditional accounting measures but too complex for its employees to understand well the action implications (Ittner & Larcker, 1998).

selection. More specifically, when comparing RI adopting firms that subsequently decided to discontinue the use of RI with those choosing to continue the use of RI, it is expected that levels of realized benefits for discontinuing RI firms are lower than those for continuing RI firms. These lower levels of realized benefits would be evident in lower investment sensitivity to IOS after RI adoption, lower investment correction conditional in the firms' prior investment problems, and less improvement in operating and delivered residual income performance.

Hypothesis 2:

RI adopting firms that subsequently discontinue the use of RI in the compensation plan would exhibit lower levels of realized benefits from utilizing RI than those adopters that continue the use of RI.

H2a: RI adopting firms that subsequently discontinue the use of RI in the compensation plan would exhibit less sensitivity to the investment opportunity set after RI adoption than those RI adopting firms that continue the use of RI.

H2b: RI adopting firms that subsequently discontinue the use of RI in the compensation plan would exhibit less investment correction corresponding to their prior investment problems than those RI adopting firms that continue the use of RI.

H2c: RI adopting firms that subsequently discontinue the use of RI in the compensation plan would exhibit less improvement in operating and delivered residual income performance than those RI adopting firms that continue the use of RI.

3.3 Firm Characteristics Favoring RI Discontinuation

Hypothesis 2 argues that discontinuing RI firms experienced lower levels of realized benefits from utilizing RI than did continuing firms. This raises the possibility that there are firm characteristics that differ between the two groups of firms and that might be producing their differing levels of realized benefits. Garvey and Milbourn (2000) and Lovata and Costigan (2002) reasoned that the extent to which an RI measure provides incremental information on a manager's action and therefore expected benefits to the firm depends on several firm characteristics reflecting the degree of a firm's agency problems and its operating environment. They provided evidence that levels of these firm characteristics indeed differ significantly between RI adopters and non-adopters. Their results might be interpreted to suggest that such firms characteristics affect the expected benefits firms have from adopting RI and therefore their RI adoption decision. This logic is further examined here in the context of the decision to discontinue. In particular, one would expect the decision to discontinue the use of RI to be related to those same firms characteristics as influencing adoption, but with the opposite signs.

Hypothesis 3:

RI adopting firms with characteristics not favoring the effectiveness of RI adoption are more likely to discontinue the use of RI in the compensation plan than are those adopters whose characteristics do favor the effectiveness of RI adoption.

Prior evidence suggests four firm characteristics that might determine the effectiveness of adopting an RI measure, therefore the likelihood of discontinuation: agency costs, the degree of leverage, the age of assets, and including RI in a multi-year compensation plan. These factors may have always favored discontinuation since RI adoption, or may have changed overtime from initially favoring adoption to later favoring discontinuation.

Agency cost. As argued in Lovata and Costigan (2002), firms with higher agency cost are expected to benefit more from RI adoption. As ownership by the top management team declines, the information asymmetry and the potential conflict of interests between top management team and the shareholders increase. By the same token, among RI adopting firms the greater the percentage of management ownership, the less severe is the agency problem, and the less important it is to rely on the incentive system to align management's interests with shareholders. Hence, a firm is more likely to discontinue use of a RI measure if its ownership percentage by the top management team is greater than the firms that continue to use the RI measure.

H3a: RI adopting firms with high percentage levels of management ownership are more likely to discontinue the use of RI-based compensation plan than those with low percentage levels of management ownership.

Degree of leverage. If a firm's degree of leverage is high, it means that the capital cost of its investment projects comes mostly from the cost of debt, and the cost of equity capital is relatively minimal. For these firms, the majority of the cost of capital is captured in the accounting earnings in the form of interest expense. Hence, the investment incentives provided by accounting earnings are very similar to those by the RI measure. In this case, the higher degree of leverage suggests a lower potential investment problem, and therefore, less incremental value from adopting or continuing the use of the RI measure. Hence, a firm is more likely to discontinue the use of RI measure if its level of leverage is greater than the firms that continue to use the RI measure. Garvey and Milbourn (2000) tested this hypothesis, but did not find that the leverage variable is significantly related to the firm's RI adoption decision.

H3b: RI adopting firms with high levels of leverage are more likely to discontinue the use of RI-based compensation plan than those with low levels of leverage.

Age of assets. One of the advantages of some versions of the RI measure is the adjustment to the historical cost-based depreciation to more closely capturing the replacement cost-based depreciation, which should form a more informative investment cost figure and provide better investment incentives (Rogerson, 1997; Young, 1999). Biddle et al. (1997) analyzed whether Stern Stewart's accounting adjustments provide incremental value in explaining stock returns. For the overall sample, the adjustments provide positive, but not economically significant value. However, it is conceivable that depending on how old a firm's assets are, the adjustments would be more or less valuable. The historical cost of younger assets is closer to their replacement cost, so, the need to rely on the RI adjustment to provide optimal incentives is less. Hence, firms with younger assets are more likely to benefit less from the RI measure and therefore more likely discontinue using RI as a performance measure.

H3c: RI adopting firms with new assets are more likely to discontinue the use of RI-based compensation plan than those with old assets.

Including RI in a multi-year compensation plan. Stewart (1995) argued that common mistakes in the implementation of the measure are to blame if the measure does not bring the desired impact on manager's behaviors and firm's performances. Those common mistakes include lack of training and commitment from top management, and not using the RI measure as the cornerstone of the overall financial system, etc. Therefore, how the firm structures the RI-based compensation plan also affects the realized benefit of adopting RI. As mentioned in Section 2.4.2, a more effective plan calls for utilization of the RI measure in a long-term compensation payout. The multi-year feature serves to remedy both a manager's possible myopic investment behaviors and the inappropriate

GAAP investment cost allocation, i.e., depreciation rule, in the RI computation. To include RI in a long-term compensation payout also signals the long-term commitment to the use of the measure. Therefore, it is likely that firms that use RI in a long-term plan will benefit more from the incentive property of the RI measure, and are less likely to discontinue the use of RI.

H3d: RI adopting firms not using RI in a multi-year compensation plan are more likely to discontinue the use of RI-based compensation plan than those using RI in a multi-year compensation plan.

CHAPTER 4

METHODOLOGY

The main research objectives are to examine (1) if there is an increased sensitivity of investment to the investment opportunity set after the RI adoption, (2) if the RI adoption effectiveness is lower for the firms that discontinue the use of RI in the compensation plan, and (3) if the decision to discontinue the use of RI measure in the compensation is related to factors that affect the benefit of the RI measure. This section describes the RI sample selection and partitions, the research design to test the hypotheses, including the empirical models and variable measurements, and finally the expected signs on the coefficients.

4.1 Residual Income Sample and Control Sample

To empirically test the hypotheses, it is necessary to identify which firms adopted the RI measure in their compensation plan. The procedures I used for identifying RI adopting firms are outlined in Section 4.1.1. Among the identified RI adopting firms, I further partition the sample based on the firms' decisions to either continue the use of RI measure in the compensation plan or discontinue it. This is outlined in Section 4.1.2. Finally, section 4.1.3 describes another sample partition based on the performance measure used prior to adopting RI. Their prior performance measure is a proxy indicating the firm's potential investment problem prior to RI adoption. Panel A of Table 1 describes the sample selection criteria detailed in the following sections.

4.1.1 Overall Residual Income Sample

The sample of firms adopting Residual Income in their compensation plan is identified through 3 sources. First, the list of adopting firms in the three relevant papers are collected (Wallace, 1997; Hogan & Lewis, 1999; and Kleiman, 1999). Second, a list of EVA® adopting firms was obtained from the web page of the leading consulting firm, Stern Steward, & Co.[17] Finally, a search in the LEXIS/NEXIS and Thomson Research[18] databases for company's proxy statement in SEC filings and reports section is conducted, using the following keywords: Residual Income, RI, economic value added, EVA, value added, economic profit, capital cost, cost of capital, and capital charge.

The proxy statements of all the identified firms were checked to verify their adoption and the adoption year. Only firms that explicitly employ the RI measure in their compensation plan are included. If they mention RI as one of the possible performance measures and do not indicate the actual use, those firms are excluded. This makes sure the managers are indeed provided strong incentives from RI measure. Also, regardless of how the firm names its residual income measure in the proxy statement, as long as it adopts the economic concept of profits above cost of capital in its compensation plan, it is included in the RI sample. The total RI adoption sample from 1986 to 2000 consists of 192 firms. From this sample, 7 financial firms (i.e., SIC from 6000 to 6999) and 16 service firms (i.e., SIC from 7000 to 8999) are excluded, because of the different nature

[17] http://www.sternstewart.com/evaabout/evacomp.shtml

[18] The Thomson Research database used to be called Global Access database.

of their business, and the less significant asset base and capital investment in their business.[19] The final sample consists of 169 RI adopting firms, with adoption years ranging from 1986 to 2000. The list of RI adopting firms is given in Appendix A.

Panel B of Table 1 describes the RI sample by industry.[20] A broad spectrum of industry categories are represented in the final RI sample, with durable manufacturers contains the highest percentage of 44%. Overall, just over 3% of the total average COMPUSTAT firms adopted the RI measure in their compensation plan. Panel C of Table 1 shows the RI sample by adoption year. The adoption year is identified as the first year the RI measure is officially used in the compensation plan, as indicated in the proxy statement. A steadily growing number of firms have adopted RI since 1993, corresponding to the marketing effort of the leading consulting firms. However, since 1998, the number of newly adopting firms has rapidly declined, with only 5 firms identified as RI adopters in 2000, indicating perhaps the market for RI adoption is saturating.

4.1.2 Control Sample

In the following analysis, a control sample is utilized to rule out confounding effects, such as general trends in industry investment activities and the overall relation between investment levels and the investment opportunity set. With only 40 RI adopting

[19] This sample selection differs from the prior RI adoption research, which all included service firms in their samples.
[20] Industry classification was determined following Barth, et al. (1998).

firms in his sample, Wallace (1997) was able to select a single matched control firm for each adopter. For the current sample of 169 firms, with many firms in the same 4-digit SIC code, it is more difficult to select a single sensible matching control firm. The alternative is to include all the non-RI adopting competitors in the same 4-digit SIC code, and control for their differences in the regression models. One drawback of this alternative is that it makes complete data collection for one control variable, change of management ownership, very costly.[21] Since, the evidence in Wallace (1997) shows that this particular control variable is not very influential to the results, the management ownership control variable has been omitted.

Non-RI adopting firms in the same 4-digit SIC code as the RI adopting firms are selected to form the control sample. Since there are cases of multiple RI adopting firms in the same 4-digit SIC code, I randomly split and assigned an equal number of non-RI adopting firms from the same 4-digit SIC industry to the each RI adopting firms. The control firms are then aligned with the RI adopting event timeline for the corresponding RI adopting firm. With the required data for computation, the final control sample consists of 2,742 firms. The distribution of these control firms by industry and adoption year is reported in Appendix B.

---

[21] The management ownership data used in the later analysis for 169 RI-adopting firms are extracted from the EXECUCOMP database, and are supplemented by hand collection through reading the firms' proxy statements. However, out of the 2,742 control firms, the EXECUCOMP database has management ownership data for only 677 firms, which would lead to a great amount of missing value in the regression.

Panel A of Table 4 reports descriptive statistics on the RI adopting sample and the control sample one year prior to RI adoption, and the two-tailed p-value for both mean t-statistics and median Wilcoxon tests. It can be seen that the RI adopting firms are significantly larger in size than the control firms. Both t tests of the differences in means and Wilcoxon test of the difference in median for total assets and total sales show significant differences at 1% level. No other t-statistics are significant. However, from the Wilcoxon tests, RI adopting firms have higher median levels of investment activities, with significantly higher asset disposal and marginally higher new investment and net investment levels. RI adopting firms also seem to have better operating performance, noting significantly higher ROI and total asset turnover. Cash conversion cycle performance and operating margin before depreciation per employee performance also are marginally better for RI adopting firms. However, the residual income performance is not significantly different for the two samples on either tests.

4.1.3 Partitioning RI Sample Based on the Discontinuing Decision

To test if there is a significant difference between the firms continuing to use RI measure and those discontinuing it, the overall RI sample is further partitioned based on the discontinuation decision. Panel A of Table 2 shows the distribution of each sub-sample over the duration of adoption. RI adopting firms' proxy statements are examined to identify the last year that RI is used in the compensation plan and to determine the duration of the adoption. The proxy statements are also examined to verify that the discontinuing firms switch back to traditional accounting measures in the post-discontinuing period. Figure 1 uses a RI adopting firm with three years of adoption to illustrate the timeline of the RI adoption and discontinuation events. The firm adopts RI at year 0, which is its first year of adoption. Year –1 is one year prior to adoption, and year +1 is one year after adoption, and also the second year of adoption. The firm last uses the RI measure in the compensation plan in year +2, the third year of adoption, which is also its last year of the RI adoption. Starting in year +3 is the post discontinuation period.

There are 65 firms that continue the use of RI measure until 2001. They are classified in the continuing sample. An argument could be made that, among these 65 firms, some late adopters, such as the 12 firms adopting RI in 1999 and 2000, respectively, might end up discontinuing the measure in the near feature. Therefore, including these firms in the continuing sample will bias against findings consistent with the hypothesis. The remaining 104 firms are identified to have discontinued the use of RI in the compensation plan. Of these 104 firms, 36 firms stopped the use of RI involuntarily, due to external events, such as bankruptcy, or merger and acquisition, leaving 68 firms that voluntarily chose to discard the RI measure in the compensation plan. I include the 6 involuntarily discontinuing firms with adoption duration at least for 5 years in the continuing sample, on the assumption that long continuing adoption potentially reflects the effectiveness of RI adoption similar to the continuing firms.[22]

[22] The reason to choose 5 years of adoption as the cut-off duration is from the observation that 80% of the discontinuing firms discarded the RI measure in the first 4 years of adoption. See Panel A of Table 2. It seems to suggest that firms perceive that 4 years is a long enough period to test the realized benefit of RI adoption. Moreover, 4 years of adoption is specified in the following analysis as the post-adoption period.

Since the sample size is relatively small, in order not to lose the data points, I include the remaining 30 involuntarily discontinuing firms in the discontinuing sample, on the assumption that the effectiveness of the RI adoption is similar to the voluntarily discontinuing firms.[23]

To sum up, there are 71 firms in the continuing sample, including 65 continuing firms and 6 long adopters that involuntarily discontinued using RI in a later period. There are 98 firms in the discontinuing sample, including 68 voluntarily discontinuing firms and 30 short adopters that involuntarily discontinued using RI. Panel B and Panel C of Table 2 show the distribution of each sub-sample across industries and adoption year. Panel B of Table 4 also contrasts the two sub-samples one year prior to the RI adoption (at year –1). The table reports the means and medians of the dependent variables, that are used in the empirical tests, for overall RI sample and each sub-sample, and the *p*-values for two-tailed tests of differences between means or medians for the sub-sample for these variables. The two sub-samples are not significantly different prior to RI adoption, except that the discontinuing sample has marginally higher asset disposition on both tests and significantly lower return on investment on Wilcoxon median test.

4.1.4 Partitioning RI Sample Based on the Prior Performance Measure

Following Balachandran (2003), RI adopting firms are also partitioned based on whether they switched to RI from an earnings type measure or a returns type measure. As

[23] I later performed a sensitivity test excluding all 36 involuntarily discontinuing firms. The results can be found in Section 5.4.2. They are qualitatively similar to the results including these firms as denoted here.

outlined in Section 3.1, this distinction is used to proxy for their potential investment problem prior to adopting RI. Firms with prior measures such as EPS, operating profits, pre-tax income, EPS growth, etc. are classified as switching from earnings, and are hypothesized to have over-investing problem prior to adopting RI. Firms with prior measures such as return on assets, return on equity, return on total capital, return on investment, etc. are classified as switching from returns, and hypothesized to have under-investing problem prior to adoption RI. Consistent with Balachandran (2003), firms that used a combination of both earning and return type of measures are classified as switching from returns, on the assumption that the incentive provided by returns potentially outweighs that by earnings. As noted in Balachandran (2003), this classification will weaken the findings of firms switching from returns, since those firms' managers are balancing opposing incentives created by using earnings and return, leading to less of an under-investment problem than for the return firms alone. Finally, 44 RI adopting firms can not be classified because their proxy statements for the period are not available, or because they disclose only general financial terms in the proxy statements. For a sample description of each type of a prior measure used, refer to Appendix C.

In summary, 65 firms switched from returns to the RI measure, including 23 firms switching from returns and 42 firms switching from both returns and earnings. These 65 firms are hypothesized to have an under-investment problem prior to RI adoption. 60 firms switched from earnings to the RI measure, and are hypothesized to have an over-investment problem prior to RI adoption. Panel A and Panel B of Table 3 show the distribution of each sub-sample across industries and adoption year.

Panel C of Table 4 contrasts the two sub-samples one year prior to the RI adoption. The table reports the means and medians of variables for the overall RI sample and each sub-sample, and the two-tailed test of differences between means or medians of these variables by sub-samples. The two sub-samples are not significantly different in any of the variables prior to RI adoption.

Panel C of Table 3 shows that, for the 125 firms whose prior performance measure can be identified, the prior performance measure does not seem to be related to a firm's decision to continue or discontinue the use of RI. A test of equal frequency distribution in all cells yields a Chi-square value of 2.0718, with a p-value of 0.3549. Thus, the hypothesis of equal frequency distribution cannot be rejected, lending statistical support to the observation that there is no relation between prior performance measure and the discontinuation decision.

4.2 Investment Sensitivity to Investment Opportunities Set after RI Adoption

Hypothesis 1 posits that the RI adopting firms' investments are more sensitive to the investment opportunities set (IOS) after RI adoption than before. Hypothesis 2a predicts that the RI discontinuing decision is more likely to be associated with a lower effectiveness from the RI adoption. Hence, one should observe a lower investment sensitivity to the IOS after RI adoption for the discontinuing firms than continuing firms. Hypothesis 1 is tested by employing a fixed asset investment model, similar to the one used in Gertner, Powers, and Scharfstien (2002) and Shin and Kim (2002). The model, the variable measurements, and the expectations on the coefficients are detailed in Section 4.2.1. The test to control for the general trend of the relation between investment and IOS in the market is described in 4.2.2. Finally, the test of the difference in investment sensitivity between the continuing sample and the discontinuing sample is described in Section 4.2.3.

4.2.1 Fixed Asset Investment Model

Gertner et al. (2002) and Shin and Kim (2002) both used fixed asset investment models to test for differential investment sensitivity to IOS following significant events. Gertner et al. (2002) tested whether the sensitivity increased after corporate spin-offs, as a way to infer whether the internal fund allocation had become more efficient after spin-offs. Shin and Kim (2002) tested whether firms are less efficient in their investment in fourth quarters, as reflected in lower investment sensitivity to IOS in the fourth quarter than in the other three quarters. Their model is modified to test if RI adoption has helped motivate an investment level close to the optimum as resulted in higher sensitivity to IOS after RI adoption than before. The resulting model specification is:

$$NetInv_{it} = \beta_{0i} + \beta_1 \times FACIOS_{it} + \beta_2 \times After + \beta_3 \times FACIOS_{it} \times After + \beta_4 \times CF_{it} + \beta_5 \times DWC_{it} + \beta_6 \times IndNetInv_{jt} + \sum_s \gamma_s \times Year_t + \varepsilon_{it} \qquad (6)$$

where, i is the ith RI adopting firm, and t is the year –3 to +3 relative to adoption year 0.

In equation (6), $NetInv_{it}$, the ratio of net investment to total assets at the beginning of year t, is regressed on several fixed asset investment determinants identified in the literature. The net investment level is measured by the sum of new investment, i.e., capital expenditure and acquisition, minus asset disposition, i.e., sales of property, plant, and equipment.[24] The economic determinants of the investment level include $FACIOS_{it}$, the measurement of IOS, with the measurement details described below. Fixed asset investment theory predicts that the firm should invest more when the IOS is abundant. Therefore, it is expected that $NetInv_{it}$ is positively correlated with $FACIOS_{it}$, i.e., β_1 is positive. The *AFTER* dummy variable takes the value of 1 if the variables are measured in the post-adoption period (year 0, +1, +2, and +3), and 0 if in the pre-adoption period, i.e., year –1, –2 and –3. More specifically, omitting the other control variables in the model, the specification of equation (6) in pre-adoption period and post-adoption period can be represented as:

$$E[NetInv_{it} \mid AFTER = 0] = \beta_{0i} \quad + \beta_1 \times FACIOS_{it} \qquad (7)$$

$$E[NetInv_{it} \mid AFTER = 1] = (\beta_{0i} + \beta_2) \quad + (\beta_1 + \beta_3) \times FACIOS_{it} \qquad (8)$$

Comparing equations (7) and (8), it is clear that the coefficient, β_3, on the interaction term between *AFTER* and $FACIOS_{it}$ reflects the difference in the investment sensitivity to IOS

[24] The measurement of the net investment level follows Balachandran (2003), and is consistent with the measurement of the two separate investment activities, new investment and asset disposition, in Wallace (1997).

after RI adoption relative to prior to RI adoption. Hypothesis 1 predicts that if RI measure effectively provides incentives to adjust toward the optimal level of investment, the sensitivity of investment to the IOS is greater after the RI adoption. Therefore, β_3 is expected to be positive, indicating a stronger relation between investment level and the measure of IOS after RI adoption.

The relation between a firm's IOS and its financing, dividend, and compensation policies has been the focal point of much accounting research (Smith and Watts, 1992; Gaver and Gaver, 1993; Baber, Janakiraman, and Kang, 1996). Since a firm's IOS is unobservable, the measurement of the IOS construct has been an issue. Smith and Watts (1992) showed that their test results are sensitive to the selection of different variables to proxy for IOS. Gaver and Gaver (1993) tried to remedy the issue by utilizing a composite factor score of various proxies to measure the IOS, which has since become the standard approach to measure IOS in the accounting literature. Baber et al. (1996) and Kallapur and Trombley (1999) officially tested the predictive ability of different composite factor scores of IOS indicators on the future investment and growth. In addition, Adam and Goyal (2002) used a real option framework to value the publicly disclosed mineral deposits and use this valuation of growth options to test the validity of several IOS indicators. Findings in these papers are summarized in Kallapur and Trombley (2001), "… In particular, price-based IOS proxies exhibit superior performance to investment-based and variance-based proxies in a forecasting setting." However, one concern about using only price-based IOS proxies in the composite factor score is that, in the late

1990's, the market prices went through a volatile fluctuation, which is believed to have little to do with the increase or decrease of the real investment opportunities. Therefore, adding some non-price related indicators that are related to firm's individual growth might help to more closely capture the real investment opportunities.

The variable $FACIOS_{it}$, for firm i at time t, is then measured by the confirmatory factor score of the following indicators:[25] (1) *market-to-book ratio of total assets (MBTA)*, measured by market value of total assets over book value of total assets, (2) *market-to-book ratio of total equity (MBE)*, measured by market value of total equity over book value of total equity, (3) *sales growth (SG)*, measured by the percentage of total sales growth from the previous year, (4) *growth of market value of total assets (MVATG)*, measured by the percentage of growth of market value of total assets from the previous year, and (5) *growth of book value of total assets (BVATG)*, measured by the percentage of growth of market value of total assets from the previous year. Each variable is winsorized at 1% tails to remove the extreme values. The confirmatory factor analysis is then conducted to get the factor loadings of each indicators on the latent construct of IOS, and the composite factor score based on the original value of each variable and these loadings are computed to form a measure of each firm's IOS. The confirmatory factor analysis is run by each year lined by the event time. The data variance retained by the resulting single factor for each year ranges from 42% to 47% of the data variance in the testing period. The Cronbach Alphas between the 5 indicators

[25] For the detailed measurement and the corresponding COMPUSTAT data item numbers, refer to Appendix D.

range from 0.65 to 0.72 for the testing period, showing an adequate internal consistency between these 5 indicators.

There are other control variables in the model to control for the factors that might affect the investment level. CF_{it} is total asset-normalized net operating cash flow and proxies for the firm's financing constraints of external funding. Fazzari et al (1988) argue that firms prefer using its internally generated funds for investment because the cost of internal funding is lower than external funding when information asymmetry exists between external capital market and managers. Hence, if a firm faces financial constraints in external funding, it is expected that the $NetInv_{it}$ is positively related to CF_{it}, i.e., β_4 is positive. DWC_{it}, is the change of total assets-normalized working capital from year t-1 to year t, and is another proxy for the firm's financing constraints. Because working capital competes with fixed asset investment for a certain pool of funds, when facing financial constraints, an increase in working capital will reduce the fixed asset investment (Fazzari et al., 1993). The changes in working capital, therefore, should be negatively related to investment level, i.e., β_5 is negative. It is assumed that firms face financial constraints to some extent, so the relationship between the investment and the two variables exist. However, if firms can freely access the external capital market, no such relationship might be observed, in which case, the coefficients on these two variables would not be expected to be significant. $IndNetInv_{jt}$, is the median investment level normalized by total assets at the beginning of period t computed for the randomly assigned control firms in the 4-digit SIC industry *j* in which RI adopting firm *i* is operating. This controls for the industry wide effect on the individual firm's investment level. Finally, to allow for the yearly effect in the investment level, calendar year dummy variables, $Year_s$, are added in the regression.[26] For example, $Year_{1986} = 1$ if the variable is measured in 1986; otherwise 0, etc. The regression also includes the fixed firm effect, which is essentially the same as running ordinary least square regression with firm dummy variables.

4.2.2 Comparing the Sensitivity Change with Control Firms

One potential confounding explanation of the finding from the tests above is that the change of investment sensitivity to IOS is driven by the overall change of that relation for all firms. Hence, if there indeed is an observed increase of sensitivity after RI adoption, it might not be attributed to the incentive effect of RI adoption. On the other hand, as mentioned earlier, the late 90's market fluctuation might compromise the information content of a firm's market price on reflecting its real investment opportunity. This potentially would weaken the correlation between investment and IOS, which has nothing to do with the RI incentive. Hence, the test results will be biased against the finding of improved sensitivity, i.e., β_3 on the interaction term of $FACIOS_{it}$ and *AFTER* would be more likely to be negative or less positive. This weakened correlation is more serious for firms adopting RI close to the late 90's; however, the overall test on the changed sensitivity will be affected.

[26] Since there are 19 calendar years, 18 year dummy variables are created.

To disentangle the potentially confounding factors, the control sample as denoted in Section 4.1.2 is utilized. The regression variables are then computed based on data matched in calendar time to the event timeline for the RI-adopting firms, i.e., in year –3, -2, -1, 0, +1, +2, and +3. The dummy variable, *RI*, is added to the specification of fixed asset investment model, with the value of 1 for RI adopting firms, and 0 for control firms. The resulting model takes the form of:

$$\begin{aligned} NetInv_{it} = \beta_{0i} & + \beta_1 \times FACIOS_{it} + \beta_2 \times After + \beta_3 \times FACIOS_{it} \times After + \beta_4 \times RI \\ & + \beta_5 \times RI \times FACIOS_{it} + \beta_6 \times RI \times After + \beta_7 \times RI \times FACIOS_{it} \times After \\ & + \beta_8 \times CF_{it} + \beta_9 \times DWC_{it} + \beta_{10} \times IndNetInv_{jt} + \textstyle\sum_s \gamma_s \times Year_t + \varepsilon_{it} \end{aligned} \quad (9)$$

Focusing on the variables of interest, the coefficients of equation (9) can be reduced as:

$$E[NetInv_{it} \mid After = 0, RI = 0] = \beta_{0i} \quad + \beta_1 \times FACIOS_{it} \quad (10)$$

$$E[NetInv_{it} \mid After = 0, RI = 1] = \beta_{0i} + \beta_4 \quad + (\beta_1 + \beta_5) \times FACIOS_{it} \quad (11)$$

$$E[NetInv_{it} \mid After = 1, RI = 0] = \beta_{0i} + \beta_2 \quad + (\beta_1 + \beta_3) \times FACIOS_{it} \quad (12)$$

$$E[NetInv_{it} \mid After = 1, RI = 1] = \beta_{0i} + \beta_2 + \beta_4 + \beta_6 \quad + (\beta_1 + \beta_3 + \beta_5 + \beta_7) \times FACIOS_{it} \quad (13)$$

The comparison between equations (10) and (12) shows that β_3 captures the change in sensitivity between net investment levels and IOS simply due to the changed time period after RI adoption (*RI* = 0 and *After* = 0 and 1), while the comparison between equations (11) and (13) shows that ($\beta_3 + \beta_7$) captures the change in sensitivity between net investment levels and IOS (*RI* = 1 and *After* = 0 and 1). It is also clear that β_7 measures the incremental change of the sensitivity for RI adopting firms over control firms. It is expected that β_7 is significantly greater than zero, indicating a stronger sensitivity between net investment levels and IOS after RI adoption for RI adopting firms than for control firms.

4.2.3 Comparing the Sensitivity Change between Continuing and Discontinuing Firms

Hypothesis 2a posits that RI adopting firms' decisions to discontinue the use of RI are related to the less changed sensitivity to IOS after RI adoption. This is tested similar to the main tests of changed investment sensitivity for overall RI adopting sample. A dummy variable, *Drop*, is added to the fixed investment model in equation (6). *Drop* takes the value of 1 for discontinuing RI adopting firms, and 0 for continuing RI adopting firms. The formulated regression model takes the form of:

$$\begin{aligned} NetInv_{it} = \beta_{0i} &+ \beta_1 \times FACIOS_{it} + \beta_2 \times After + \beta_3 \times FACIOS_{it} \times After + \beta_4 \times Drop \\ &+ \beta_5 \times Drop \times FACIOS_{it} + \beta_6 \times Drop \times After + \beta_7 \times Drop \times FACIOS_{it} \times After \\ &+ \beta_8 \times CF_{it} + \beta_9 \times DWC_{it} + \beta_{10} \times IndNetInv_{jt} + \textstyle\sum_s \gamma_s \times Year_t + \varepsilon_{it} \qquad (14) \end{aligned}$$

Without reference to the control variables, the model can be reduced as follows:

$$E[NetInv_{it} \mid After = 0, Drop = 0] = \beta_{0i} + \beta_1 \times FACIOS_{it} \qquad (15)$$

$$E[NetInv_{it} \mid After = 0, Drop = 1] = \beta_{0i} + \beta_4 + (\beta_1 + \beta_5) \times FACIOS_{it} \qquad (16)$$

$$E[NetInv_{it} \mid After = 1, Drop = 0] = \beta_{0i} + \beta_2 + (\beta_1 + \beta_3) \times FACIOS_{it} \qquad (17)$$

$$E[NetInv_{it} \mid After = 1, Drop = 1] = \beta_{0i} + \beta_2 + \beta_4 + \beta_6 + (\beta_1 + \beta_3 + \beta_5 + \beta_7) \times FACIOS_{it} \qquad (18)$$

From the comparison of equations (15) and (17), it is clear that β_3 evaluates the change in sensitivity between net investment levels and IOS after RI adoption for continuing firms (*Drop* = 0 and *After* = 0 and 1), and β_3 is expected to be greater than zero, reflecting a stronger sensitivity to IOS after RI adoption for continuing firms. The comparison of equations (16) and (18) reveals that ($\beta_3 + \beta_7$) measures the change in sensitivity between net investment levels and the IOS after RI adoption for discontinuing firms (*Drop* = 1 and *After* = 0 and 1). There is no expected sign for ($\beta_3 + \beta_7$), because the sensitivity could increase, decrease, or stay the same after RI adoption for discontinuing firms. Finally, β_7 measures the incremental change in sensitivity for discontinuing firms over continuing firms. According to Hypothesis 2e, discontinuing firms have lower realized benefits of adopting RI. Therefore, it is expected that discontinuing firms have less increase of sensitivity to IOS after RI adoption than continuing firms, i.e., β_7 is negative.

Similar to the concern of overall trend in the relation between net investment levels and IOS, the changed investment sensitivity for each decision group is compared to their control firms. The control firms are partitioned based on the discontinuation decision of their corresponding RI adopting firms. The dummy variable, *RI*, is then added to the fixed investment model in equation (14) to capture the incremental change of sensitivity between each decision group with their control firms. The formulated model takes the form of:

$$
\begin{aligned}
NetInv_{it} = \beta_{0i} &+ \beta_1 \times FACIOS_{it} + \beta_2 \times After + \beta_3 \times FACIOS_{it} \times After + \beta_4 \times RI \\
&+ \beta_5 \times RI \times FACIOS_{it} + \beta_6 \times RI \times After + \beta_7 \times RI \times FACIOS_{it} \times After \\
&+ \beta_8 \times Drop + \beta_9 \times Drop \times FACIOS_{it} + \beta_{10} \times Drop \times After \\
&+ \beta_{11} \times Drop \times FACIOS_{it} \times After + \beta_{12} \times Drop \times RI + \beta_{13} \times Drop \times RI \times FACIOS_{it} \\
&+ \beta_{14} \times Drop \times RI \times After + \beta_{15} \times Drop \times RI \times FACIOS_{it} \times After \\
&+ \beta_{16} \times CF_{it} + \beta_{17} \times DWC_{it} + \beta_{18} \times IndNetInv_{jt} + \textstyle\sum_s \gamma_s \times Year_t + \varepsilon_{it} \qquad (19)
\end{aligned}
$$

The similar comparison on the reduced forms of equation (19) between different dummy variable groups yield the following predictions. First, β_3 reflects the changed investment sensitivity to IOS after RI adoption for continuing control firms ($RI = 0$ and $Drop = 0$), and there is no sign expectation for this coefficient. ($\beta_3 + \beta_7$) reflects the changed investment sensitivity to IOS after RI adoption for continuing RI firms ($RI = 1$ and $Drop = 0$), and β_7 measures the incremental change in sensitivity to IOS for continuing RI firms over continuing control firms. It is expected that both ($\beta_3 + \beta_7$) and β_7 are greater than zero, indicating greater overall sensitivity to IOS after RI adoption and greater increased sensitivity over control firms, respectively. β_{11} reflects the incremental change in sensitivity for discontinuing control firms over continuing control firms ($RI = 0$ and $Drop = 1$), and there is no expectation for this coefficient. ($\beta_{11} + \beta_{15}$) reflects the incremental change in sensitivity after RI adoption for discontinuing RI firms ($RI = 1$ and $Drop = 1$) over continuing RI firms, and is expected to be negative, indicating a weaker increase of investment sensitivity than continuing RI firms. β_{15} measures the incremental change in sensitivity for discontinuing RI firms over discontinuing control firms. It is expected that β_{15} is negative, indicating a weaker increase of investment sensitivity than discontinuing control firms.

4.3 Comparing RI Adoption Effectiveness between Continuing and Discontinuing Firms

Wallace (1997) first hypothesized the effect of RI adoption on the firms' investing, financing and operating activities and the delivered RI. Balachandran (2003) further hypothesized that the effect on investing and financing activities, and return on investment (ROI) depends on the adopting firm's prior investment problems. One of the reasons that Balachandran did not find significant investment correction for each sub-sample could result from the assumption that the adoption effect is non-differential across firms. However, as argued in the hypothesis development section, this may not be true; particularly in light of the fact that many firms have decided to discard the RI measure, indicating the effect might be less for some firms, and eventually prompted them to discontinue the use of RI. Therefore, this study tries to extend both Balachandran's and Wallace's models to examine if the adoption effect is lower for the discontinuing firms than the continuing firms.

As mentioned in the section assessing the empirical results of RI adoption to-day, the results are sensitive to the model specification. Hence, to conduct a more complete assessment of the RI adoption effect, two model specifications similar to Wallace (1997) and Balachandran (2003) are employed.

4.3.1 Model Specification Using Long Window Comparison

The first model specification is similar to Wallace (1997), who used a long-term pre- and post-adoption window and a matched pair control sample. His model is specified as follows:

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 DLVRG + \beta_3 DOWN \qquad (20)$$

Where, *DDepVar* is the change in the variable of interest, i.e., new investment, share repurchases, etc., between post-adoption period, i.e., four years of RI adoption, and pre-adoption period, i.e., five years prior to RI adoption. It measures the average four years of incentive effect of RI adoption, and compare that to the average 5 years of *DDepVar* level without the RI incentive. In computing *DDepVar*, only years when RI is in use are included in the 4 year averages to make sure the average levels after RI adoption reflect the true impact of RI adoption. For example, a firm with 2 years of adoption will have the 2 year average levels after RI adoption. See Figure 2 for the illustration of the variable measurement timeline. *RI* takes the value 1 for RI adopting firms, and 0 for control firms, which are assigned to each RI adopting firms the same way as described in Section 4.1.2. The coefficient of *RI*, i.e., β_1, measures the adoption effect for RI firms relative to the control firms. *DLVRG* and *DOWN* are two control variables representing the change in leverage and management ownership, which might affect the change of the *DDepVar*.[27]

Also, since a more refined hypothesis on the adoption effect depends on the firm's prior investment problem, a dummy variable, *PRIOREARN*, can be added to the model to capture the differential effect of adoption. Also, since the current study utilizes all the competitors in the same 4-digit SIC code as a control sample, the differences in firms characteristics should be controlled for in the model. The resulting model is specified as:

[27] However, as explained in Section 4.1.2, it is very costly to include the control variable, *DOWN*, change in management ownership, in the regression, because it would lead to a great amount of missing value. Thus, this control variable is omitted.

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 PRIOR + \beta_3 RI \times PRIOREARN + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it} \quad (21)$$

PRIOREARN takes the value of 1 if firms switching from earnings to RI, indicating that the presence of an over-investment problem prior to RI adoption; 0 if firms switching from returns to RI, indicating an under-investment problem. $LOGTA_{t-1}$ controls for the size of the firms and is measured by the natural log of total assets one year prior to RI adoption, i.e., year –1. All other control variables are measured in the same period as *DDepVar*, i.e., changes between four years post-adoption period and five years pre-adoption period. *DEMPL* is the change of number of employees. It controls for operational changes and the possibility of downsizing. This control is important to distinguish between investment reduction caused by correcting an over-investment problem and investment reduction caused by a firm's downsizing strategy. *DADGPPE* is the change in age of fixed assets, and is measured by the ratio of accumulated depreciation to gross value of property, plant, and equipment. Firms with more depreciated assets, i.e., older fixed assets and, hence, higher *ADGPPE* ratio, are more likely to be making more replacement investments. It distinguishes the increased investment due to RI incentives, from routine replacement investments. *DMBTA*, *DSG*, *DCF*, and *DDWC* are four control variables defined the same way as in the fixed asset investment model described in Section 4.2.1. They control for determinants of the investment level. Finally, the model includes calendar year and industry fixed effects, using dummy variables, $Year_s$ and SIC_u. $Year_s$ are calendar year dummy variables described in Section 4.2.1. SIC_u are the industry dummy variables to capture industry differences in investment levels. In order to keep the regression parsimonious, instead of creating dummy variables for all 4-digit SIC codes, an industry grouping developed by Barth et al. (1998) is followed, where non-service industries are grouped into 11 categories, and 10 industry dummy variables are created, i.e., u = 1 to 10.

4.3.1.1 Testing Performance Improvement between Continuing and Discontinuing Firms

To test if the adoption effect is significantly different for the continuing and discontinuing firms, a dummy variable, *DROP*, is added to the model specification. DROP takes the value of 1 if RI adopting firms and corresponding control firms are in the discontinuing sample; 0 if in the continuing sample. For operating activities and delivered residual income, the adoption effect does not depend on the prior investment problems. According to Hypothesis 2g, the operating performance and delivered residual income should be lower for the discontinuing firms than for continuing firms. The model specification for this test is:

$$\begin{aligned} DDepVar = {} & \beta_0 + \beta_1 RI + \beta_2 DROP + \beta_3 RI \times DROP + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG \\ & + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF \\ & + \beta_{11} DDWC + \textstyle\sum_s \gamma_s \times Year_s + \textstyle\sum_u \eta_u \times SIC_u + \varepsilon_{it} \end{aligned} \qquad (22)$$

Following Wallace (1997), Kleiman (1999) and Hogan and Lewis (2000), operating performance is measured by *Assets Turnover (ATOVER)*, *Cash Conversion*

Cycle (CCC)[28], and *Operating Margin before Depreciation per Employee (OMBDPE).* These measures are used to proxy for the firm's operating efficiency. *Delivered residual income* (*RIN*)is another dependent variable in this model specification. Omitting the control variables, equation (22) can be represented as:

$$E[DDepVar \mid RI = 0, DROP = 0] = \beta_0 \quad (23)$$

$$E[DDepVar \mid RI = 0, DROP = 1] = \beta_0 + \beta_2 \quad (24)$$

$$E[DDepVar \mid RI = 1, DROP = 0] = \beta_0 + \beta_1 \quad (25)$$

$$E[DDepVar \mid RI = 1, DROP = 1] = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (26)$$

Comparing equations (23) and (25), where the data are contrasted between continuing RI adopting firms (*RI* = 1, *DROP* = 0) and corresponding non-RI adopting firms (*RI* = 0, *Drop* = 0), the operating performance of continuing RI adopting firms relative to the control firms is captured by β_1. Similarly, the contrast between equations (24) and (26) makes it clear that the operating performance of discontinuing RI adopting firms relative to the control firms is captured by ($\beta_1 + \beta_3$). According to hypothesis 2c, the operating performance and delivered residual income is higher for continuing firms than for discontinuing firms. Hence, it is expected that β_1 is positive, reflecting a higher operating performance and delivered residual income after RI adoption. Also, β_3 is negative, indicating a lower effectiveness of RI adoption for discontinuing firms than for continuing firms. Depending on how negative β_3 is, the overall operating performance

[28] Cash Conversion Cycle is defined as days in accounts receivable plus days in inventory, minus days in accounts payable.

and delivered residual income for discontinuing firms could be positive or negative, i.e., $(\beta_1 + \beta_3)$ could be positive or negative.

4.3.1.2 Testing Investment Correction between Continuing and Discontinuing Firms

Differential effect of adoption depending on the prior investment problem is hypothesized for investing activities. Thus, the model specification has both *PRIOREARN* and *DROP* dummy variables.

$$\begin{aligned} DDepVar = {} & \beta_0 + \beta_1 RI + \beta_2 PRIOR + \beta_3 RI \times PRIOREARN \\ & + \beta_4 DROP + \beta_5 DROP \times RI + \beta_6 DROP \times PRIOREARN + \beta_7 DROP \times RI \times PRIOREARN \\ & + \beta_8 LOGTA_{t-1} + \beta_9 DLVRG + \beta_{10} DEMPL + \beta_{11} DADGPPE + \beta_{12} DMBTA \\ & + \beta_{13} DSG + \beta_{14} DCF + \beta_{15} DDWC + \textstyle\sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it} \end{aligned} \qquad (27)$$

Following Wallace (1997) and Balachandran (2003), the investing activities are measured by *Asset Disposition, New Investment, and Net Investment.* Again, omitting the control variables, equation (27) can be represented as:

$$E[DDepVar \mid RI=0, PRIOREARN=0, DROP=0] = \beta_0 \qquad (28)$$
$$E[DDepVar \mid RI=0, PRIOREARN=0, DROP=1] = \beta_0 + \beta_4 \qquad (29)$$
$$E[DDepVar \mid RI=1, PRIOREARN=0, DROP=0] = \beta_0 + \beta_1 \qquad (30)$$
$$E[DDepVar \mid RI=1, PRIOREARN=0, DROP=1] = \beta_0 + \beta_1 + \beta_4 + \beta_5 \qquad (31)$$

$$E[DDepVar \mid RI=0, PRIOREARN=1, DROP=0] = \beta_0 + \beta_2 \qquad (32)$$
$$E[DDepVar \mid RI=0, PRIOREARN=1, DROP=1] = \beta_0 + \beta_2 + \beta_4 + \beta_6 \qquad (33)$$

$$E[DDepVar \mid RI=1, PRIOREARN=1, DROP=0] = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (34)$$

$$E[DDepVar \mid RI=1, PRIOREARN=1, DROP=1] = \beta_0+\beta_1+\beta_2+\beta_3+\beta_4+\beta_5+\beta_6+\beta_7 \quad (35)$$

First, looking at firms switching from returns (*PRIOREARN* = 0, potential under-investing firms), the change of *DDepVar* for continuing RI adopting firms (*RI* = 1, *DROP* = 0) relative to the corresponding control firms (*RI* = 0, *DROP* = 0) are captured in β_1, i.e., equations (28) and (30). Since these RI firms are hypothesized to have prior under-investing problem, depending on the *DDepVar*, the expectations for β_1 are:

Assets Disposition:	$\beta_1 < 0$
New Investment:	$\beta_1 > 0$
Net Investment:	$\beta_1 > 0$

On the other hand, the change of *DDepVar* for the discontinuing firms (*RI* = 1, *DROP* = 1) relative to corresponding control firms (*RI* = 0, *DROP* = 1) is captured in ($\beta_1 + \beta_5$), i.e., equations (29) and (31). Hypothesis 2b posits that the investment problem correction is less for the discontinuing firms than continuing firms. Therefore, it is expected that β_5 would take the opposite sign to β_1, which reflects less *DDepVar* change after RI adoption.

Assets Disposition:	$\beta_5 > 0$
New Investment:	$\beta_5 < 0$

Net Investment: $\beta_5 < 0$

As for the overall impact of RI adoption for the discontinuing firms, i.e., $(\beta_1 + \beta_5)$, it depends on how opposite β_5 is to β_1. The discontinuing firms might have as severe or less investment problem after RI adoption, but the investment correction should be less than continuing firms.

When looking at the firms switching from earnings (*PRIOREARN* = 1, potential over-investing firms), the change of *DDepVar* for continuing firms (*RI* = 1, *DROP* = 0) relative to their control firms (*RI* = 0, *DROP* = 0) is captured in $(\beta_1 + \beta_3)$. Since these are potential over-investing firms prior to RI adoption, the expectations of $(\beta_1 + \beta_3)$ are:

Assets Disposition: $(\beta_1 + \beta_3) > 0$ and $\beta_3 > 0$

New Investment: $(\beta_1 + \beta_3) < 0$ and $\beta_3 < 0$

Net Investment: $(\beta_1 + \beta_3) < 0$ and $\beta_3 < 0$

Since β_1 reflects the change of *DDepVar* for the under-investing RI firms, β_3 reflects the difference in the change of *DDepVar* between the under-investing firms and over-investing firms. For example, under-investing firms are hypothesized to increase the net investment level after RI adoption, i.e., $\beta_1 > 0$, while over-investing firms are hypothesized to decrease investment level after RI adoption, i.e., $(\beta_1 + \beta_3) < 0$. Therefore, it is clear that the change of investment level for over-investing firms should be significantly less than that for under-investing firms, i.e., $\beta 3 < 0$.

Finally, the change of *DDepVar* for discontinuing RI firms (*RI* = 1, *DROP* = 1) relative to their control firms (*RI* = 0, *DROP* = 1) is captured in $(\beta_1 + \beta_3 + \beta_5 + \beta_7)$. According to Hypothesis 2b, discontinuing firms exhibit less investment correction than continuing firms, and the effect is mainly captured in $(\beta_5 + \beta_7)$. Hence, it is expected that $(\beta_5 + \beta_7)$ is of the opposite sign to $(\beta_1 + \beta_3)$.

Assets Disposition:	$(\beta_5 + \beta_7) < 0$
New Investment:	$(\beta_5 + \beta_7) > 0$
Net Investment:	$(\beta_5 + \beta_7) > 0$

The overall impact of RI adoption for discontinuing over-investing firms, i.e., $(\beta_1 + \beta_3 + \beta_5 + \beta_7)$ depends on how opposite $(\beta_5 + \beta_7)$ is to $(\beta_1 + \beta_3)$. Similar to discontinuing under-investing firms, these discontinuing firms might have as severe or less investment problem after RI adoption, but the investment correction should be less than continuing firms.

4.3.2 Model Specification Using Short Window Comparison

Another model specification similar to Balachandran (2003) is utilized. A short-term one-year post-adoption window and the firm's own past investment change are used as the control to test the impact of RI adoption. His basic model specification is:

$$DNetInv = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER \times PRIOREARN \qquad (36)$$

Where, *DNetInv* is the net investment level defined the same as in Wallace (1997); however, its pre- and post-adoption period is defined differently. The change of net investment level in the post-adoption period is the change between the adoption year and one year prior to adoption, i.e., from year –1 to year 0. it measures the incentive impact of adoption. The change of net investment level in the pre-adoption period is used to control for the normal investment change without the RI incentive. It is measured as the change between two year prior to adoption and three year prior to adoption, i.e., from year –3 to year –2.[29] See Figure 3 for the illustration of the variable measurement timeline. *AFTER* is a dummy variable, taking the value of 1, indicating the firm is under the RI incentive period, and 0, indicating the old incentive period. *PRIOREARN* is the dummy variable, taking the value of 0, if firms switch from returns, and hence potential under-investing firms, and 1, if firms switch from earnings, and hence potential over-investing firms. The model specification can be represented as:

[29] As argued in Balachandran (2003), the reason of not using change between year –2 and year –1 is because managers might have already been influenced by the RI incentives in year -1, even though RI has not been officially adopted. This makes the period a less valid comparison.

$$E[DNetInv \mid AFTER = 0, PRIOREARN = 0] = \beta_0 \quad (37)$$

$$E[DNetInv \mid AFTER = 0, PRIOREARN = 1] = \beta_0 + \beta_2 \quad (38)$$

$$E[DNetInv \mid AFTER = 1, PRIOREARN = 0] = \beta_0 + \beta_1 \quad (39)$$

$$E[DNetInv \mid AFTER = 1, PRIOREARN = 1] = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (40)$$

As most of the comparisons mentioned before, for firms switching from returns (*PRIOREARN* = 0, potential under-investing firms), β_1 measures the impact of RI adoption (*AFTER* = 1) compared to the firm's past net investment level change (*AFTER* = 0), which is expected to be positive, i.e., $\beta_1 > 0$. While $(\beta_1 + \beta_3)$ measures the impact of RI adoption (*AFTER* = 1) compared to the firm's past net investment level change (*AFTER* = 0) for the firms switching from earnings (*PRIOREARN* = 1, potential over-investing firms). This is expected to be negative, i.e., $(\beta_1 + \beta_3) < 0$. Finally, β_3 measures the difference in the change of net investment level between under- and over-investing firms, and this is expected to be negative, i.e., $\beta_3 < 0$.

Even though the RI firm's own past investment activities change is used as the base for comparison, there are still other factors that might influence the change in both periods. The control variables added to the basic model in equation (36) are similar to those in the long window comparison model, and mostly followed Balachandran (2003). These variables control for the factors affecting RI adoption, and hence affecting the level of investment change, i.e., *LVRG*, *ADGPPE*, *MBTA*, and factors related to the operational environment that might affect the investment, i.e., *DLVRG*, *DEMPL*, *DMBTA*, *LOGTS*, *DSG*, *DCF*, *DDWC*, and *MULTIYR*. For variable definition and measurements, see Appendix D. I also added the variable, *IndDNetInv*, to control for the industry wide change of investment level corresponding to the pre- and post-adoption period. It is measured by the median change of investment level of the control firms assigned to each RI adopting firms. These control variables are included in all the regressions outlined below.

4.3.2.1 Testing Performance Improvement between Continuing and Discontinuing Firms

For operating activity measures and delivered RI, the improvement does not depend on the prior investment problem. Hence, to test hypothesis 2c that discontinuing firms would show less performance improvement, a dummy variable, *DROP*, is incorporated to the basic model without *PRIOREARN* dummy variable to test the difference of change of performance between continuing and discontinuing firms.

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 DROP + \beta_3 AFTER \times DROP \quad (41)$$

The model specifications can be represented by contrasting data for the two dummy variables:

$$E[DDepVar \mid AFTER = 0, DROP = 0] = \beta_0 \quad (42)$$
$$E[DDepVar \mid AFTER = 0, DROP = 1] = \beta_0 + \beta_2 \quad (43)$$
$$E[DDepVar \mid AFTER = 1, DROP = 0] = \beta_0 + \beta_1 \quad (44)$$
$$E[DDepVar \mid AFTER = 1, DROP = 1] = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (45)$$

As in the comparisons mentioned throughout this section, the performance improvement of continuing firms (*DROP* = 0) in the post-adoption period (*AFTER* = 1) relative to the pre-adoption period (*AFTER* = 0) is measured by β_1. It is expected that β_1 is positive, reflecting better performance under RI adoption by continuing firms. Furthermore, the performance improvement of discontinuing firms (*DROP* = 1) between two periods is captured in ($\beta_1 + \beta_3$). According to Hypothesis 2c, it is expected that β3 is negative, reflecting a lower performance improvement for discontinuing firms than for continuing firms. Overall performance improvement for discontinuing firms, i.e., ($\beta_1 + \beta_3$), could be positive or negative, showing the effectiveness of RI adoption for this group of firms.

4.3.2.2 Testing Investment Correction between Continuing and Discontinuing Firms

To test if the discontinuing firms have less investment correction after RI adoption, a dummy variable, *DROP*, is added to the model in equation (36), which is specified as:

$$\begin{aligned} DNetInv = {} & \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER \times PRIOREARN \\ & + \beta_4 DROP + \beta_5 DROP \times AFTER + \beta_6 DROP \times PRIOREARN \\ & + \beta_7 DROP \times AFTER \times PRIOREARN \end{aligned} \tag{46}$$

Contrasting data for three dummy variables, the model can be represented as:

$$E[DNetInv \mid AFTER = 0, PRIOREARN = 0, DROP = 0] = \beta_0 \tag{47}$$

$$E[DNetInv \mid AFTER=0, PRIOREARN=0, DROP=1] = \beta_0 + \beta_4 \quad (48)$$

$$E[DNetInv \mid AFTER=1, PRIOREARN=0, DROP=0] = \beta_0 + \beta_1 \quad (49)$$

$$E[DNetInv \mid AFTER=1, PRIOREARN=0, DROP=1] = \beta_0 + \beta_1 + \beta_4 + \beta_5 \quad (50)$$

$$E[DNetInv \mid AFTER=0, PRIOREARN=1, DROP=0] = \beta_0 + \beta_2 \quad (51)$$

$$E[DNetInv \mid AFTER=0, PRIOREARN=1, DROP=1] = \beta_0 + \beta_2 + \beta_4 + \beta_6 \quad (52)$$

$$E[DNetInv \mid AFTER=1, PRIOREARN=1, DROP=0] = \beta_0 + \beta_1 + \beta_2 + \beta_3 \quad (53)$$

$$E[DNetInv \mid AFTER=1, PRIOREARN=1, DROP=1] = \beta_0+\beta_1+\beta_2+\beta_3+\beta_4+\beta_5+\beta_6+ \beta_7 \quad (54)$$

The coefficient expectations operate in a similar fashion to those mentioned above. The incentive impact on the change of net investment level after RI adoption for continuing and discontinuing firms with two different prior investment problems are compared with the pre-adoption period when RI incentive is absent. The continuing under-investing firms are expected to have a net investment level increase relative to pre-adoption period, i.e., $\beta_1 > 0$, while discontinuing under-investing firms are expected to show less of a net investment increase than the continuing firms, i.e., $\beta_5 < 0$. The overall effect of adoption on net investment level change is reflected in $(\beta_1 + \beta_5)$. As for the continuing over-investing firms, the net investment level is expected to decrease relative to pre-adoption period, i.e., $(\beta_1 + \beta_3) < 0$, while the net investment level for discontinuing firms is expected to show less of a correction than continuing firms, i.e., $(\beta_5 + \beta_7) > 0$. Finally, the overall effect of adoption on net investment change is reflected in $(\beta_1 + \beta_3 + \beta_5 + \beta_7)$.

4.4 Firm Characteristics Favoring RI Discontinuation

Hypothesis 2 states that firms with less effectiveness of using RI measure would be more likely to discontinue its use. The previous sections describe the tests to examine if the discontinuing firms indeed have lower adoption effectiveness than the continuing firms, such as less investment sensitivity to IOS and less investment correction or less performance improvement. In this section, firm characteristics that might explain the lower adoption effectiveness are examined.

4.4.1 The Empirical Models

Several factors are hypothesized to impact the effectiveness of RI adoption. A logistic regression is used to contrast these factors between continuing firms and the discontinuing firms. Several control variables that might affect the decision to discontinue the use of RI are also included.

$$DC_i = \alpha_0 + \alpha_1 OWN_i + \alpha_2 LVRG_i + \alpha_3 ADGPPE_i + \alpha_4 MULTIYR_i + \alpha_5 CapInts_i + \alpha_6 CEO_i + \alpha_7 CLIENT_i + \varepsilon_i \quad (55)$$

DC_i, is the discontinuation classification of RI adopting firms, taking value of 1 if the firm is classified in the discontinuing sample, and 0 if the firm is classified in the continuing sample. Consistent with the adoption effectiveness analysis in the previous sections, the continuing sample consists of 71 firms, with 65 firms continuing to use RI up to year 2001, and 6 firms adopting RI longer than 5 years and subsequently discontinuing RI due to external events. The discontinuing sample includes 98 firms, with

68 firms making a voluntary decision to discontinue RI and 30 firms adopting RI for less than 4 years and subsequently discontinuing RI due to external events.

According to Hypotheses 3a to 3d, four firm characteristics might affect the RI adoption effectiveness. OWN_i, proxies for the agency cost facing the RI adopting firms, and is measured by the percentage of total shares outstanding owned by top management and directors as a group.[30] As argued in hypothesis 3a, the higher the percentage of ownership, the less agency problem, which might reduce the importance to rely on the incentive system, such as an RI incentive system. Hence it is expected that there is a positive relationship between OWN_i and the decision to discontinue, i.e., α_1 is positive. $LVRG_i$, is the firm's degree of leverage, and is measured by the ratio of long-term debt to total assets. As argued in hypothesis 3b, a higher degree of leverage reduces the incremental value of RI measure. Therefore, it is expected that there is a positive relationship between $LVRG_i$ and the discontinuing decision, i.e., α_2 is positive. $ADGPPE_i$, is the age of a firm's assets, which is proxied by the ratio of accumulative depreciation to the gross value of property, plant, and equipment. The younger the assets, the less they are depreciated, and hence lower ratio of $ADGPPE_i$. According to hypothesis 3c, younger assets in place decrease the need for depreciation adjustment, and hence the lower incremental value of RI measure. Thus, there will be a negative relationship between $ADGPPE_i$ and the decision to discontinue, i.e., α_3 is negative. Finally, how the RI measure is incorporated in the firm's incentive system also is

[30] The measurement periods for the hypothesized variables and control variables used in the logistic model are described in Section 4.4.2.

hypothesized to play a role in the effectiveness of its adoption. $MULTIYR_i$ takes the value of 1 if firms have a 'bonus bank' feature or use RI in a long-term incentive plan, and 0 if none of the above exists for the firms. As argued in the Literature section and in Hypothesis 3d, using multiple-year RI results mitigates the potential horizon problem that is not addressed in RI measurement. Also, the lack of long-term feature in the RI compensation plan might also reflect the firm's lack of long-term commitment to the measure. Hence, it is expected there is a negative relationship between the use of multiple-year feature in the RI compensation plan and the discontinuation decision, i.e., $\alpha_4 < 0$.

Three control variables are included in the logistic regression. First, $CapInts_i$, proxies for the firm's capital intensity, and is measured by the ratio of gross value of property, plant, and equipment to the total assets. Garvey and Milbourn (2000) found that capital intensity explains the firm's RI adoption decisions, which indicates RI is more beneficial when the firm has higher stake in managing their capital assets. $CapInts_i$ is then added to the model to control for the impact of lower capital intensity on the discontinuation decision. α_5 is expected to be negative, i.e., the lower $CapInts_i$, the more likely a firm is to discontinue the use of RI. Second, *CEO*, measures organizational leadership change, and takes the value of 1 if there is a CEO change prior to or during the year of discontinuation decision. Adopting a new performance measure in the compensation plan is similar to many organizational change processes. Without the support of top management to champion the adoption, it is more likely to fail, and lead to the discontinuation decision. Finally, a dummy variable, $CLIENT_i$, is added to the model to capture the effect of using consulting firms relative to develop the RI incentive system in-house. $CLIENT_i$ takes the value 1 if the RI adopting firms indicate in their proxy statements that a consulting firms was hired to install the incentive system. Arguably, the experience of a consulting firm might help the firm to better understand the measure and tailor the installed incentive system. Hiring a consulting firm may also indicate stronger commitment to the installation of the new incentive system. Therefore, it is expected that hiring a consulting firm is less likely to lead to discontinuation, i.e., α_7 is negative.

4.4.2 Measurement Periods

The final issue to consider is which periods should be used to contrast these two groups of firms? Figure 4 depicts the measurement time periods discussed below. It can be argued that the continuing and discontinuing firms are inherently different prior to the RI adoption, which would motivate the comparison between both groups around the RI adoption, i.e., Comparison (A) in Figure 4. On the other hand, it is also possible that the discontinuing firms are similar to continuing firms around the RI adoption, and had operational environment change since then, which made the continuation of RI less appealing. For example, the discontinuing firm might adopt RI to address the lack of consideration of equity cost from traditional accounting measures, when, at the time, the low leverage made the adoption sensible. After RI adoption, however, the leverage level might increase to a level where the traditional accounting measures do not produce biased investment incentive, and the firm decided to discontinue the use of RI. In this scenario, the discontinuing firm would show a higher leverage than continuing firms only around the RI discontinuation period, not around the RI adoption period. This would motivate two comparison periods, which focus on the circumstances around RI discontinuation for discontinuing firms, instead of around RI adoption. The first one is between the period around RI discontinuation for discontinuing firms and the corresponding adoption duration time period for continuing firms, which is the Comparison (B) in Figure 4. This comparison takes a look at the operational environment at the same duration of adoption between discontinuing firms and continuing firms. The other one is between the period around RI discontinuation for discontinuing firms and the period of RI adoption for continuing firms, which is the Comparison (C) in Figure 4. This measurement period compares the environment surrounding RI adoption and the environment surrounding RI discontinuation. Each of the three comparison periods shed lights on the difference between the two groups of firms. However, regardless of the measurement periods, the coefficient expectations are the same as outlined in the previous section.

CHAPTER 5

EMPIRICAL RESULTS

This chapter reports on and discusses the empirical results of testing the hypotheses. The results for Hypothesis 1 and Hypothesis 2a regarding the investment sensitivity to IOS after RI adoption and the differential sensitivity between continuing and discontinuing firms are reported in Section 5.1. The results for Hypotheses 2b and 2c regarding RI adoption impact for all RI firms, and for the partitioned continuing and discontinuing firms on investing activities, operating activities and delivered residual income are reported in Section 5.2. Section 5.3 presents the results for Hypotheses 3a to 3d regarding firm characteristics that might affect the decision to discontinue the use of RI. Finally Section 5.4 describes the robustness checks and results.

5.1 Investment Sensitivity to Investment Opportunities after RI Adoption

As outlined in Section 4.2.1, a fixed asset investment model is used to test the changed investment sensitivity to IOS from RI adoption. In Panel A of Table 5, the first column on RI adopting firms reports the coefficient estimates of this test for 169 RI firms. The overall model is significant at 1% level ($F = 3.87$, p-value = 0.000), with an adjusted R-square of 0.377. The coefficient on $FACIOS_{it}$ is significantly positive (β = 0.159, p-value = 0.000), indicating a strong association between net investment level and IOS in the period of three years prior to the RI adoption for all RI firms. Also, the coefficients on the financial constraint variables are significant and in directions consistent with the prior literature. In other words, the net investment level is positively associated with higher operating cash flow (β = 0.113, *p*-value = 0.063), and is negatively associated with increased working capital (β = -0.139, *p*-value = 0.000). However, contrary to expectation, the coefficient on the interaction term of $FACIOS_{it}$ and *AFTER* is negative, but not significant so (β = -0.003, *p*-value = 0.808). This result suggests that the association between investment and IOS in the period is reduced by adopting RI, but not significantly so.

The second column in Panel A of Table 5 reports the test results when control firms are added to the model to control for the general trend in the relation between investment and IOS. It shows that the investment sensitivity to IOS in the period after RI adoption for the control firms has slightly increased, i.e., the coefficient on the interaction term of $FACIOS_{it}$ and *AFTER* is insignificantly positive (β = 0.003, *p*-value = 0.217 in a two tailed test). The coefficient on the interaction term of *RI* dummy variable, $FACIOS_{it}$ and *AFTER* is negative, indicating that RI adopting firms have less improvement in investment sensitivity after RI adoption than control firms, but it is not statistically significant (β = -0.003, p-value = 0.883). This suggests that for overall RI sample, even after controlling for the trend in the relation between investment and IOS, adopting RI does not seem to improve the investment sensitivity to IOS. Therefore, Hypothesis 1 is not supported by the data.

Next, the changed investment sensitivity to IOS between continuing firms and discontinuing firms is compared. Panel B of Table 5 reports the results of the fixed asset investment model run for 169 RI firms with *DROP* dummy variables, and after adding control firms. It is clear from the first Column that the investment is more sensitivity to IOS after adoption than before for the continuing firms (β = 0.068, *p*-value = 0.002). The interaction term between *DROP* dummy variable, $FACIOS_{it}$ and *AFTER* is significantly negative, indicating that the investment sensitivity to IOS after RI adoption is significantly less for discontinuing firms than for continuing firms (β = -0.132, *p*-value = 0.000). Although not reported in Table 5, the further test shows that the overall sensitivity to IOS after RI adoption for the discontinuing firms is in fact significantly negative (0.068 + (-0.132) = -0.064, p-value = 0.000).[31] So, the continuing firms have significantly greater investment sensitivity improvement after RI adoption and the discontinuing firms actually have worse investment sensitivity to IOS after RI adoption. This suggests that the slight negative change of investment sensitivity for the overall RI adopting sample as opposed to the expected positive change is mostly driven by the discontinuing firms.

Columns (2) in Panel B of Table 5 report the results of the fixed asset investment after adding the control firms. First, it shows that the investment sensitivity slightly increased for control firms of both continuing and discontinuing firms, but not statistically significant so (β on $FACIOS_{it} \times AFTER$ = 0.001, *p*-value = 0.786) and

---

[31] The further analysis is conducted to test if the sum of the coefficients on $FACIOS_{it} \times AFTER$ and $DROP \times FACIOS_{it} \times AFTER$ is significantly different from zero, which indicates the changed sensitivity to IOS after RI adoption for discontinuing firms.

discontinuing firms (β on *DROP*× $FACIOS_{it}$×*AFTER* = 0.08, *p*-value = 0.252). Second, the changed investment sensitivity of continuing RI firms is significantly greater than that of control firms (β on *RI*×$FACIOS_{it}$×*AFTER* = 0.078, *p*-value = 0.003), while it is significantly lower than the control firms for the discontinuing firms (β on *DROP*×*RI*×$FACIOS_{it}$×*AFTER* = -0.153, *p*-value = 0.000). Finally, though not reported in the table, the further tests confirm with the test results for only RI firm sample that the overall change in investment sensitivity after RI adoption is significantly positive for continuing firms (0.001 + 0.078 = 0.079, *p*-value = 0.004), and is significantly negative for discontinuing firms (0.008 + (-0.153) = -0.145, *p*-value = 0.000).[32]

Overall, the test results do not support Hypothesis 1, which states that the investment levels are more sensitive to IOS after RI adoption than before for all RI adopting firms. However, the results indicate that only firms that continue to use RI in the compensation plan show significant improvement of investment sensitivity after RI adoption, while firms that later discontinue RI actually have worse investment sensitivity from RI adoption. This result supports Hypothesis 2a that discontinuing firms exhibit less investment sensitivity to IOS after RI adoption, and that this lower RI adoption effectiveness probably plays a role in the firms' decision to discontinue the use of RI.

---

[32] The further analyses are conducted to test (1) if the sum of the coefficients on $FACIOS_{it}$×*AFTER* and *RI*× $FACIOS_{it}$×*AFTER* is significantly different from zero, which indicates the changed sensitivity to IOS after RI adoption for continuing firms, and (2) if the sum of the coefficients on *DROP*×$FACIOS_{it}$×*AFTER* and *DROP*×*RI*× $FACIOS_{it}$×*AFTER* is significantly different from zero, which indicates the changed sensitivity to IOS after RI adoption for discontinuing firms

5.2 Comparing RI Adoption Effectiveness between Continuing and Discontinuing Firms

Given that incorporation of the ultimate continue/discontinue RI decision refined the Hypothesis 1 results regarding investment sensitivity to investment opportunities, analysis in this section pursues a similar refinement vis-à-vis original tests reported by Wallace (1997) and Balachandran (2003). These results therefore test Hypotehsis 2b regarding the differential effectiveness of RI adoption on investing activities between continuing and discontinuing firms, and Hypothesis 2c regarding the differential operating performance and delivered residual income improvement between continuing and discontinuing firms. Given the different testing specifications used in the two prior studies, I first replicate the tests in those studies before introducing the new independent variable, *DROP*.

5.2.1 Model Specifications Using Long Window Comparison

Wallace (1997) used a long window pre-and post-adoption comparison and a matched pairs control sample.[33] First, Table 6 replicates Wallace (1997) and tests the RI adoption impact relative to control firms by pooling all RI adopting firms together. Some of my findings differ from those in Wallace. Like Wallace, I find marginally significant higher asset disposition (Panel A, β on RI in Sales of PPE column = 0.003, *p*-value = 0.086). However, in contrast to Wallace, I find significant new and net investment level (Panel A, β on RI in New Investment column = 0.028, *p*-value = 0.021; β of RI in Net

[33] As noted in Section 4.1.2, the current study uses a different approach to construct a control sample. All competitors in the same 4-digit SIC code as RI-adopting firms are included in the control sample, and the differences in firm characteristics are controlled for in the regression models.

Investment column = 0.027, p-value = 0.028). From Panel B of Table 6, compared to the control firms, the overall RI sample shows a shortened cash conversion cycle (β on RI in Cash Conversion Cycle = -8.67, p-value = 0.055) and greater OMBD per employee (β on RI in OMBD per Employee = 10.262, p-value = 0.084). The RI firms also show more greatly improved residual income performance than do the control firms, but the difference is not statistically significant (β on RI in the Residual Income column = 7.305, p-value = 0.175).

As noted in Balachandran (2003), Wallace's sample consists of more firms switching from earnings, which may contribute to his findings that are more consistent with prior over-investment problem. Recall that in Table 3, the current sample has slightly more firms switching from returns, which may explain the higher new and net investment level after RI adoption. It indicates the importance for a prediction on investment effect of RI adoption based on the prior investment problem. Therefore, in Table 7, a dummy variable, *PRIOREARN*, indicating the prior performance measurement used and hence hypothesized prior investment problem, is added to test the differential RI adoption impact on investing activities, and delivered residual. *PRIOREARN* takes the value 1, for firms switching from earnings to RI and 0 for firms switching from returns to RI. Firms switching from earnings (returns) to RI are hypothesized to have an over-investment (under-investment) problem prior to RI adoption. β_1 measures the impact of RI adoption on the dependent variables for under-investing firms, while ($\beta_1 + \beta_3$) for over-investing firms. Thus, β_3 reflects the difference in impact between the two groups of firms. Panel A shows that, under-investing firms have less asset disposition (β_1 = -0.002, *p*-value = 0.258), while over-investing firms have higher asset disposition (β_1+ β_3 = 0.002, *p*-value = 0.212). However, compared to the control firms, these changes are not significant. In the new and net investment level tests, under-investment firms show a marginally significant higher investment level (β_1 for new investment = 0.024, *p*-value = 0.095, and β_1 for net investment = 0.026, *p*-value = 0.080). Conversely, the over-investment firms decrease their new investment and net investment levels, even though it is not statistically significant (β_1 + β_3 for new investment = 0.020, *p*-value = 0.291, and β_1 + β_3 for net investment = 0.019, *p*-value = 0.320). Panel B of Table 7 shows that the under-investing firms significantly increased the delivered residual income after RI adoption, when compared with the control firms (β_1 = 22.460, *p*-value = 0.033), while the over-investing firms actually slightly reduced their delivered residual income, but not significantly (β_1 + β_3 = -3.197, *p*-value = 0.798). This is consistent with the findings regarding the change in investment patterns. Over-investing firms do not seem to have as great a benefit from investment correction due to adopting RI as do the under-investing firms. Therefore their delivered residual income does not show improvement.

Finally, the tests of differential RI adoption effectiveness between continuing and discontinuing firms are reported in Table 8 and Table 9. From Panel A of Table 8, the continuing firms show an insignificantly lower asset turnover (β_1 = -0.013, *p*-value = 0.762) and shorter cash conversion cycle (β_1 = -8.845, *p*-value = 0.138). Contrary to expectation, the discontinuing firms show better asset turnover performance than do continuing firms, but not significantly so ($\beta_1 + \beta_3$ on asset turnover = 0.047, *p*-value = 0.219). The cash conversion cycle performance for the discontinuing firms is almost identical to that for continuing firms ($\beta_1 + \beta_3$ of cash conversion cycle = -8.341, *p*-value = 0.236). However, the results of operating margin before depreciation (OMBD) per employee, a measure of employee productivity, are consistent with the hypothesis 2c. The continuing firms show significant improvement after RI adoption, when compared to the control firms (β_1 = 37.977, *p*-value = 0.000), and the discontinuing firms have much less improvement of OMBD per employee than do the continuing firms (β_3 = -48.715, *p*-value = 0.000), consistent with the observed decline in performance after RI adoption ($\beta_1 + \beta_3$ = -10.738, *p*-value = 0.263). Panel B of Table 8 presents the results on delivered residual income. Consistent with Hypothesis 2c, the continuing firms marginally improve their delivered residual income after initial RI adoption (β_1 = 18.331, *p*-value = 0.059), while the ultimately discontinuing firms show a marginally worse delivered residual income after RI adoption than do the continuing firms (β_3 = -19.704, *p*-value = 0.097), resulting in slightly lower delivered residual income after RI adoption ($\beta_1 + \beta_3$ = -1.373, *p*-value = 0.892).

The tests of differential effectiveness on investing activities and delivered residual income, conditional on the prior investment problem are reported in Table 9. Panel A of Table 9 shows that the continuing firms have the investment activities changes consistent with the their prior investment problems. For example, continuing firms with prior under-investment problem have lower asset disposition (β_1 = -0.000, *p*-value = 0.498), and higher new investment levels ($\beta_1 = 0.044$, p-value = 0.048) and net investment levels ($\beta_1 = 0.045$, p-value = 0.046) after RI adoption, while continuing firms with prior over-investment problem have higher asset disposition ($\beta_1 + \beta_3 = 0.003$, p-value = 0.190), and lower new investment levels ($\beta_1 + \beta_3 = -0.023$, p-value = 0.223) and net investment levels ($\beta_1 + \beta_3 = -0.026$, p-value = 0.200) after RI adoption. The signs on the coefficients are consistent with the expectation, even though they are not significant for the over-investment firms. However, the levels of new investment and net investment change for over-investing continuing firms are significantly less than those of under-investing continuing firms (β_3 on New Investment = -0.067, p-value = 0.046, and (β_3 on Net Investment = -0.071, p-value = 0.039). This is consistent with Balachandran's finding that the difference in investment level changes between the under- and over-investment groups is statistically significant.

When looking at the discontinuing firms (with *DROP* dummy variable), β_5 measures the differential investment activities impact for firms with prior under-investment problem, while $\beta_5 + \beta_7$ is for firms with prior over-investment problem. The negative β_5 coefficients show that discontinuing firms with an under-investment problem have less asset disposition ($\beta_5 = -0.003$, p-value = 0.583), less new investment level change ($\beta_5 = -0.035$, p-value = 0.162) and less net investment level change ($\beta_5 = -0.034$, p-value = 0.175) than the under-investment continuing firms, while the ($\beta_5 + \beta_7$) coefficients show that discontinuing firms with over-investment problem have insignificant less asset disposition ($\beta_5 + \beta_7 = -0.003$, p-value = 0.321), significant higher new investment level change ($\beta_5 + \beta_7 = 0.071$, p-value = 0.033) and significant higher net investment level change ($\beta_5 + \beta_7 = 0.073$, p-value = 0.029) than the over-investing continuing firms. Overall, the results support Hypothesis 2b and seem to suggest a pattern that continuing firms have greater investment correction consistent with the prior investment problem than the discontinuing firms. More specifically, the results are more prominent with under-investing continuing firms which show the significant investment correction consistent with their prior investment problem, and with over-investing discontinuing firms which have significantly less investment correction than their counterpart continuing firms.

Panel B of Table 9 reports the differential impact on delivered residual income for continuing and discontinuing firms conditional on the prior investment problem. It shows that continuing firms with prior under-investment problem slightly improve the delivered residual income after RI adoption ($\beta_1 = 21.859$, *p*-value = 0.107), while those with prior over-investment problem show insignificantly less improvement ($\beta_3 = -14.004$, *p*-value = 0.596), and overall slightly positive improvement in delivered residual income ($\beta_1 + \beta_3 = 7.856$, *p*-value = 0.348). The under-investing discontinuing firms have similar delivered residual income performance to the continuing firms, as the difference between the two groups is not small and insignificant ($\beta_5 = 0.305$, *p*-value = 0.990). However, as expected, the over-investing discontinuing firms have worse delivered residual income than the continuing firms, even though not in a statistical sense ($\beta_5 + \beta_7 = -17.996$, *p*-value = 0.239).

Overall, the evidence using the long window comparison period similar to Wallace (1997) lends partial support to Hypothesis 2b. For the statistically significant results, the investment correction is consistent with the prior investment problem for the under-investing continuing firms, and the correction is significantly greater for the continuing firms with over-investment problem than for their counterpart discontinuing firms. Hypothesis 2c is more strongly supported. The continuing firms have significantly greater employee productivity and marginally significant greater improvement in delivered residual income than the discontinuing firms.

5.2.2 Model Specifications Using Short Window Comparison

Further tests on Hypothesis 2b and 2c are conducted using Balachandran's (2003) testing specification, where RI adopting firms' past activities and performance are used as the control, and a short-term one year post-adoption period is used to assess the adoption impact.

Table 10 reports the results of the RI adoption impact pooling all RI adopting firms. The findings are similar to those described in the previous sections. Panel A of Table 10 indicates that the RI adopting firms increase net investment level marginally after RI adoption (β_1 in Net Investment column = 0.044, *p*-value = 0.08), and the resulting delivered residual income also increases marginally (β_1 in Residual Income column = 33.588, *p*-value = 0.094). Moreover, Panel B of Table 10 shows that the RI adopting firms as a whole improve on asset turnover (β_1 = 0.007, *p*-value = 0.335) and employee productivity (β_1 = 1.453, *p*-value = 0.287), and also shorten the cash conversion cycle (β_1 = -1.476, *p*-value = 0.356), but these performance improvements are not significantly different from prior to the RI adoption.

Next, the *PRIOREARN* dummy variable indicating the performance measure used prior to RI adoption and proxying for the prior investment problem is added to test the differential impact of RI adoption. Table 11 shows that firms with a prior under-investment problem increase the net investment level after RI adoption (β_1 = 0.020, *p*-value = 0.262), while firms with a prior over-investment problem decrease their net investment level after RI adoption ($\beta_1 + \beta_3$ = -0.025, *p*-value = 0.3). Similar to Balachandran (2003), these within groups changes are not significant. However, I also do not find the difference between the changed net investment level significant (β_3 = -0.045, *p*-value = 0.156), although the direction is consistent with hypothesis that over-investment firms decrease the net investment level more than the under-investment firms. Also consistent with Balachandran (2003), the delivered residual income increases both for under-investment and over-investment firms (β_1 = 14.318, *p*-value = 0.368, and $\beta_1 + \beta_3$ = 68.769, *p*-value =0.141). Balachandran speculates that the reason why these improvements are not significant is due to the smaller sample size after sample partition based on prior performance measure used and therefore lack of statistical power.

Finally, the results of testing Hypothesis 2b and 2c regarding differential adoption effectiveness between continuing and discontinuing firms are reported in Table 12 and Table 13. Table 12 presents the results on operating activities and delivered residual income. Panel A of Table 12 shows similar findings to those in Table 8 using the Wallace's (1997) testing specification. The continuing firms show improvement on asset turnover ($\beta_1 = 0.01$, p-value = 0.353), cash conversion cycle ($\beta_1 = -4.584$, p-value = 0.234), and employee productivity ($\beta_1 = 7.609$, p-value = 0.031), while discontinuing firms perform worse than the continuing firms on all three measures (β_3 for asset turnover = -0.004, p-value = 0.55, β_3 for cash conversion cycle = 5.217, p-value = 0.261, and β_3 for OMBD per employee = -10.276, p-value = 0.025). Panel B of Table 12 shows the results on delivered residual income. Contrary to expectation, the short-term RI adoption impact for the discontinuing firms is greater than for the continuing firms ($\beta_3 = 6.472$, p-value = 0.901), but this difference is not statistically significant. Therefore, Hypothesis 2c is only supported when employee productivity is used as the performance measure.

Panel A of Table 13 reports the tests of Hypothesis 2b regarding the differential effectives on investment correction between continuing and discontinuing firms conditional on the prior investment problem. The same pattern of investment correction as seen in Table 9 using Wallace's (1997) testing specification is observed, and the comparisons are all significant. More specifically, continuing firms with prior under-investment problem significantly increase net investment level ($\beta_1 = 0.076$, p-value =

0.049), while continuing firms with prior over-investment problem significantly decrease net investment level ($\beta_1 + \beta_3$ = -0.125, *p*-value = 0.008). On the other hand, discontinuing firms with either prior under-investment problem or prior over-investment problem all have less investment correction (β_5 = -0.107, *p*-value = 0.045, and $\beta_5 + \beta_7$ = 0.156, *p*-value = 0.008). The results on the delivered residual income is reported in Panel B of Table 13. Continuing firms with either prior under-investment problem or prior over-investment problem show positive improvement in delivered residual income (β_1 = 40.750, *p*-value = 0.260, and $\beta_1 + \beta_3$ = 10.752, *p*-value = 0.403). The results also show that discontinuing firms with prior under-investment problem perform worse than the continuing counterparts (β_5 = -52.258, *p*-value = 0.273); however, the discontinuing firms with prior over-investment problem actually performance better than the continuing firms ($\beta_5 + \beta_7$ = 92.027, *p*-value = 0.508). Not surprisingly, the p-values show that these comparisons do not differ statistically.

5.2.3 Comparing Results of Two Model Specifications

Overall, the results between the two model specifications are very consistent in terms of operating performance, but less consistent regarding the investment correction and the changes in delivered residual income. Results from both specifications show a significant improvement in employee productivity after RI adoption for continuing firms, and significantly worse employee productivity for discontinuing firms than for continuing firms. For the other two operating performances, both models show the same pattern as observed in employee productivity, but they are not statistically significant.

Recall that one of the major differences between the two model specifications is the length of post-adoption window used. It seems that the investment correction of adopting RI in the short term is significantly consistent with the prior investment problem for the continuing firms, and less so for the discontinuing firms. However, in the long-run, the investment correction for over-investing continuing firms and the under-investing discontinuing firms are as expected, but not significant.

As for the delivered residual income, it is reasonable to think that the bottom-line results would not be affected by the investment activities in the short-term, therefore, the results of using a long-term post-adoption window is more valid than the short-term window, which indicates that the continuing firms have greater delivered residual income than the discontinuing firms. In fact, the discontinuing firms have marginally worse delivered residual income after RI adoption than before. These results are also consistent with the investment sensitivity tests reported in Section 5.1. The continuing firms increase their investment sensitivity to IOS after RI adoption, while the sensitivity actually decreases for the discontinuing firms.

Overall, the results are considered to support Hypothesis 2b and Hypothesis 2c, which state that investment correction and performance improvement is less for discontinuing firms than for the continuing firms.

5.3 Firm Characteristics Favoring RI Discontinuation

Panels A through C of Table 14 report the results of logistic regressions predicting a firm's discontinuation decision, using three different measurement periods. As argued in Section 4.4.2, since the firm characteristics might be in favor of RI discontinuation around initial RI adoption or might change overtime towards favoring RI discontinuation around RI discontinuation, the logistic regression models are run separately at various measurement periods. The three different measurement periods depicted in Figure 4 correspond to the thee panels of results reported here in Table 14. Also, one year prior to and the year of RI adoption and RI discontinuation are used to test the differences between the two groups of RI firms around the adoption and the discontinuation. Hypothesis 3a states that firms with lower agency conflict, as computed by a higher management ownership percentage, may rely less on the financial incentive system to align manager's interests with shareholders, therefore, making it more likely that such firms will discontinue the use of RI. However, from the three panels, OWN_i, measuring the agency conflicts facing the firms, has negative relationship with the discontinuation decision, i.e., lower management ownership is associated with the discontinuation decision, although none of the association is statistically significant. These results do not support the hypothesis that the degree of agency plays a role in the discontinuation decision. Hence, Hypothesis 3a is not supported by the data.

Hypothesis 3b posits that RI adopting firms with higher leverage, and hence lower owner's equity, are more likely to discontinue the use of RI, since higher leverage makes the lack of consideration of equity cost in traditional accounting measures less of a problem to be remedied by RI. The results show that discontinuing firms have somewhat higher leverage, $LVRG_i$, around RI adoption (Panel A), and also have significantly higher leverage in the year of discontinuation compared to the continuing firms around RI adoption (Panel C). However, when two groups of firms are aligned with the same duration of adoption, discontinuing firms have lower leverage than the continuing firms, although this is not statistically significant (Panel B). Hence, it seems to suggest that higher leverage around discontinuation than around adoption contributes to the discontinuation decision. Hence, Hypothesis 3b is partially supported.

Hypothesis 3c states that RI adopting firms with younger assets, i.e., $ADGPPE_i$, lower ratio of accumulated depreciation to gross value of property, plant, and equipment, are more likely to discontinue the RI due to the less need of adjusting the asset value to the current value. From the three panels, none of the coefficients are statistically significant, and the directions are also mixed. The results do not support the hypothesis that the age of assets contributes to the discontinuation decision. Hence, Hypothesis 3c is not supported by the data.

Finally, Hypothesis 3d predicts that RI adopting firms that include RI in a multiple-year compensation plan are less likely to discontinue the use of RI. Thus, a negative relationship between $MULTIYR_i$ and the discontinuation decision is expected. In all three data panels, $MULTIYR_i$ is significantly and negatively correlated with the discontinuation decision. This suggests that not including RI in the long-term compensation plan contributes to the subsequent termination of the use of RI. The results might also indicate that the "bonus bank" feature introduced by the leading consulting firm not only has theoretical justification, but also has some realized merits, if the use of the long-term feature coincides with higher benefit and less likelihood of discontinuing the use of RI. Hence, these results provide strong support for Hypothesis 3d.

The two control variables, $CapInts_i$ and CEO_i, do not show a significant or consistent relationship with the discontinuation decision. However, $CLIENT_i$, an indicator of whether firms hired a consulting firm to help the RI installation process, is significantly and negatively related to the discontinuation decision in Panel B. In the other two panels, coefficients are also negative, but not statistically significant. It seems to suggest that firms that hired a consulting firm are less likely to discontinue the use of RI, although the result is weak.

Overall, the logistic regression results show that there is much more to be explored about the factors affecting the discontinuation decision. The only factor that is robustly consistent with the hypothesis is $MULTIYR_i$, denoting the inclusion of RI in the long-term compensation plan. So, only Hypothesis 3d is supported by the empirical tests. Leverage level (Hypothesis 3b) and whether a consulting firm is hired to install the RI measure (Control variable) both only significantly affect the discontinuation decision in one of the three measurement periods. Management ownership (Hypothesis 3a), age of assets (Hypothesis 3c), capital intensity (Control variable), and CEO turnover (Control variable) do not seem to affect the discontinuation decision.

5.4 Robustness Checks

In this section, the robustness checks of the empirical results and some extended analysis are conducted.

5.4.1 Comparing Investment Sensitivity to IOS between Firms Switching from Earnings and Returns

The theory does not predict differential changed investment sensitivity between firms with different prior investment problems. However, from the long-term post-adoption window tests of investment correction and delivered residual income in Section 5.2.1, the data suggest that firms with a prior over-investment problem have less investment correction (both Panel A of Table 7 and Table 9) and have less performance improvement than the firms with prior under-investment problem (Panel B of Table 7). This raises the question whether there is a difference in changed sensitivity to IOS after RI adoption for firms with different prior investment problems. More specifically, given the results so far, it is expected that the change in sensitivity to IOS after RI adoption for over-investing firms should not be as significant as that for under-investing firms. The same fixed asset investment model with *DROP* and *RI* dummy variables are utilized, and the results are reported in Table 15. Panel A of Table 15 reports the results for partitioning the sample based on the prior performance measures, and without *DROP* dummy variable. It is clear that, investment is significantly more sensitive to IOS after RI adoption only for firms switching from returns (β on $FACIOS_{it}$×*AFTER* = 0.072, *p*-value = 0.002), and not for firms switching from earnings (β on $FACIOS_{it}$×*AFTER* = -0.002, *p*-value = 0.922). Also, the changed sensitivity for firms switching from returns is significantly higher than that of the control firms (β on *RI*×$FACIOS_{it}$×*AFTER* = 0.115, *p*-value = 0.000), while it is not significant for firms switching from earnings (β on *RI*×$FACIOS_{it}$×*AFTER* = -0.021, *p*-value = 0.336).

Panel B of Table 15 reports the further test results of the changed sensitivity to IOS between continuing and discontinuing firms, partitioned by their prior performance measure. First, in looking at firms switching from returns, only continuing firms have significantly increase investment sensitivity to IOS after RI adoption (β on $FACIOS_{it}$×*AFTER* = 0.138, *p*-value = 0.000). The effect is also significantly higher than for the control firms (β on *RI*×$FACIOS_{it}$×*AFTER* = 0.183, *p*-value = 0.000). The discontinuing firms have a significantly lower changed sensitivity to IOS than the continuing firms (β on *DROP*×$FACIOS_{it}$×*AFTER* in RI firms only Column = -0.187, *p*-value = 0.000), and it is significantly less than the control firms (β on *DROP*×*RI*×$FACIOS_{it}$×*AFTER* = -0.223, *p*-value = 0.001) The further test shows that the overall incremental change in sensitivity is significantly negative than the continuing firms (0.003 + (-0.223) = -0.22, p-value = 0.001). This is consistent with the results of overall sample not partitioned based on their prior performance measure. However, this pattern is not observed in the firms switching from earnings. The continuing firms do not seem to increase the investment sensitivity to IOS after RI adoption (β on $FACIOS_{it}$×$AFTER$ = -0.028, p-value = 0.343), and it is not significantly different from the control firms (β on RI×$FACIOS_{it}$×$AFTER$ = -0.048, p-value = 0.218). The discontinuing firms have a non-significantly higher sensitivity than the continuing firms (β on $DROP$×$FACIOS_{it}$×$AFTER$ in RI firms only Column = 0.044, p-value = 0.214), and it is also not significantly different from the control firms (β on $DROP$×RI×$FACIOS_{it}$×$AFTER$ = 0.035, p-value = 0.458).

Overall, the test results complement the investment correction and delivered residual income results. The firms with prior under-investment problem have greater improvement in investment sensitivity to IOS after RI adoption than the control firms, and this is reflected in greater investment correction and delivered residual income after RI adoption than control firms. The comparison between continuing and discontinuing firms is less consistent with the previous results. Although the results here show significantly less improvement in investment sensitivity to IOS for discontinuing firms with prior under-investment firms, the investment correction and delivered residual income performance is not significantly different between continuing and discontinuing under-investing firms. Finally, although the changed investment sensitivity to IOS is not significant between continuing and discontinuing firms with prior over-investment problems, previous results suggest that discontinuing over-investing firms actually have significantly less investment correction and slightly less delivered residual income performance. So, it shows that partitioning the sample based on prior performance measure yield consistent results between change in investment sensitivity and investment correction and delivered residual income. However, when further partitioning the sample based on firms' discontinuation decision, the results are less consistent.

5.4.2 Including only Voluntarily Discontinuing Firms in the Sample

In Section 4.1.2, the group of RI adopting firms that discontinue the use of RI due to external events are classified to either discontinuing sample or continuing sample, depending on the duration of adoption. The nature of the reasons for discontinuation might make this group of firms different in their investing activities and performance improvement. Hence, I did the major analysis in the paper by excluding those firms totally in the sample. To expedite the reports of the results, only key variables are presented in the following tables.

Table 16 reports the investment sensitivity results. In all three panels, the major coefficient estimates are similar to the previous results when involuntarily discontinuing firms are included. The conclusions remain the same. First, from Panel A of Table 16, overall RI sample does not seem to increase investment sensitivity to IOS after IOS and it is not significantly different from control firms. Second, from Panel B of Table 16, continuing firms increased the investment sensitivity to IOS after RI adoption significantly more than the control firms, while discontinuing firms significantly decreased the sensitivity, and it is also significantly less than the control firms.

Four panels in Table 17 reports the differential investment activities and performance improvements between continuing and discontinuing firms using Wallace (1997) model, while four panels in Table 18 reports the same tests using Balachandran (2003) model. The results are qualitatively similar to those with involuntarily discontinuing firms included. The only notably difference is the reduction of the significance level in the investment correction tests in Panel C of Table 17, probably due to a smaller sample size. More specifically, under-investing continuing firms only increase the new investment and net investment levels marginally, and the over-investing discontinuing firms have insignificantly less investment correction, where the less correction used to be significant. The other difference in coefficient estimation is in Panel D of Table 17. The under-investing discontinuing firms used to show almost identical delivered residual income performance to their counterpart continuing firms. However, the performance is much less without the involuntarily discounting firms, although it is not statistically significant.

Finally, three panels in Table 19 reports the logistic regression results of testing factors affecting the discontinuation decision. The coefficient estimates are all in the same direction, but the significance levels are reduced probably because of the smaller sample size. Particularly, the variable, *MULTIYR*, is not always a significant predictor as in the previous results, but it still consistently have a negative relation to the discontinuation decision.

So, the tests of excluding involuntarily discontinuing firms provide reassurance that the results reported previously are not driven by the involuntarily discontinuing firms. Also, despite the nature of the reasons for discontinuation, these two groups of discontinuing firms do not exhibit much differential RI adoption impact, except that the involuntarily discontinuing firms may have worse delivered residual income performance after RI adoption as suggested by the data in Panel B of Table 17.

5.4.3 The Impact of Discontinuing RI

Since the evidence suggests that the discontinuing RI firms did not exhibit the effectiveness of adopting RI, it is interesting to examine the impact on their investment activities and performances after they discontinue the use of RI. For the 68 voluntarily discontinuing firms, the post-RI discontinuation period of investment activities and performances are compared with the post-RI adoption period and with the pre-RI adoption period. The results of key variables are reported in Table 20 to Table 22.

Table 20 presents the investment sensitivity to IOS after RI discontinuation. The same fixed asset investment model is used to contrast the changed investment sensitivity in the period of 3 years post discontinuation for 68 discontinuation firms. Panel A shows that the discontinuing firms have greater investment sensitivity to IOS after RI discontinuation relative to the period after RI adoption (β on $FACIOS_{it} \times AFTER$ = 0.055, p-value = 0.002), and it is also greater than the control firms (β on $RI \times FACIOS_{it} \times AFTER$

= 0.074, p-value = 0.021). Recall that the discontinuing firms significantly decrease the sensitivity after RI adoption. Hence, Panel B shows that the sensitivity after RI discontinuation is still slightly lower than that prior to RI adoption (β on $FACIOS_{it}$×$AFTER$ = -0.014, p-value = 0.482), and it is not significantly different from that of control firms ((β on RI×$FACIOS_{it}$×$AFTER$ = 0.001, p-value = 0.976). It suggests that after discontinuing RI, these firms found a way to improve their investment sensitivity and at least regress back to the performance in the pre-RI adoption period.

Table 21 reports the results using long post-adoption window specification similar to Wallace (1997). The dependent variables are computed as the difference in variables between three-year average in the post-RI discontinuation period and either four-year average in the post-RI adoption period or five-year average in the pre-RI adoption period. Panel A shows that after RI discontinuation, the net investment levels for under-investing firms increase slightly (β_1 = 0.025, p-value = 0.466) and they also further increase for over-investing firms ($\beta_1 + \beta_3$ = 0.011, p-value = 0.755). However, these changes are not statistically significant. The employee productivity, measured by operating margin before depreciation per employee, continues to get worse (β_1 = -17.132, p-value = 0.079). The overall delivered residual income slightly goes up for overall sample (β_1 = 0.103, p-value = 0.994), and it is greater for under-investing firms (β_1 = 22.035, p-value = 0.374) than for over-investing firms ($\beta_1 + \beta_3$ = -20.114, p-value = 0.431).

Panel B compares the post-discontinuation period with pre-adoption period. Since the incentive effect on investment correction is not significant for the discontinuing firms after RI adoption, and the post discontinuation does not seem to change effectively, the post-discontinuation investment levels remain similar to prior to RI adoption (β_1 = -0.004, p-value = 0.898, and $\beta_1 + \beta_3$ = 0.003, p-value = 0.928). However, the employee productivity is still worse than prior to RI adoption (β_1 = -34.511, p-value = 0.013). Overall delivered residual income remains similar to prior to RI adoption for both under-investing and over-investing firms (β_1 = 3.958, p-value = 0.883 and $\beta_1 + \beta_3$ = 18.077, p-value = 0.514).

Finally, Table 22 presents the results using short post-adoption window model specification similar to Balachandran (2003). The post-RI discontinuation period is measured as the change in variables between one year after discontinuation and the year of discontinuation, while the post-RI adoption and pre-RI adoption are measured the same as before. Panel A shows that the investment activities or performances after RI discontinuation do not significantly change. However, it suggests that, although not significantly, the employee productivity shows signs of improvement right after the RI discontinuation ($\beta 1$ = 1.362, p-value = 0.730); therefore, when comparing the post-RI discontinuation with pre-RI adoption investment, the worse employee productivity is less severe (See Panel B, $\beta 1$ = -10.297, p-value = 0.412). However, when looking at the long-term impact of discontinuation in Wallace model, the overall employee productivity still significantly decreases. The delivered residual income results are mixed. Recall from

Panel D of Table 18, the discontinuing firms with prior under-investment problems have negative delivered residual income after RI adoption and firms with prior over-investment problems actually have positive delivered residual income. Panel A of Table 22 shows that these prior under-investment firms increase delivered residual income after discontinuing RI (β_1 = 10.636, *p*-value = 0.936), while over-investment firms further decrease delivered residual income ($\beta_1 + \beta_3$ = -150.382, *p*-value = 0.466). Hence, together, Panel B of Table 22 shows that both firms increase their delivered residual income after RI discontinuation when compared to pre-RI adoption period. Although, none of the above coefficient estimates are statistically significant. As argued before, the resulting delivered residual income may not reflect the strength of investment activities correction or employee productivity in the short run, which makes the results using Balachandran model less valid.

Overall, these tests seem to suggest that after discontinuing the use of RI, although firms' investment activities do not correct greatly, it is somehow enough to increase the investment sensitivity to IOS and help them return to pre-adoption levels. However, three years after RI discontinuation, the employee productivity continues to significantly decrease, in addition to the reduction after post-RI adoption period. The delivered residual income does not seem to reflect the increase in investment sensitivity, and it remains similar throughout the pre-adoption, post-adoption, and post-discontinuation periods for both over-investing and under-investing firms.

CHAPTER 6

CONCLUSIONS

6.1 Summary of Study

The purpose of this study is to empirically address the question—does adopting RI as a performance measure in top management compensation plans correct investment problems? The research question is examined from several aspects. First, the post RI adoption investment activities and performances are analyzed. More specifically, the RI adoption impact on investment sensitivity to IOS, investment level correction conditional in the investment problem prior to RI adoption, and operating and delivered residual income performances is empirically assessed. Second, the differential impact of RI adoption between firms that continue the use of RI and firms that subsequently discontinue the use of RI is contrasted to examine whether the RI adoption effectiveness is lower for the discontinuing firms. Finally, firm characteristics hypothesized to affect the effectiveness of RI adoption are examined to test if they are related to the discontinuation decision.

Hypothesis 1 predicts that the investment sensitivity to IOS should increase after RI adoption, if the incentive properties of RI motivate improved selection of investment projects. The empirical results show that the investment levels of the overall RI-adopting sample are not more or less sensitive to IOS after RI adoption. These unexpected results remain after randomly assigning industry competitors to control for the trend of the relation between investment and IOS. However, when the overall sample of RI-adopting firms is partitioned based on their discontinuation decision, further analysis shows that the observed lower sensitivity is driven by the subset of firms that subsequently discontinue the use of RI. For the continuing firms, the investment sensitivity indeed increases significantly, and also more so than for the control firms. Moreover, when the overall sample of RI firms is partitioned based on their prior investment problem, it shows that only firms with prior under-investment problems exhibit improvement in sensitivity, and the discontinuing under-investment firms also have significantly lower sensitivity than the continuing under-investment firms. This pattern is not observed for firms with prior over-investment problem.

Two model specifications are used to test the overall RI adoption consequences and the differential effectiveness between discontinuing and continuing firms. The two model specifications follow Wallace (1997) and Balachandran (2003) respectively and differ in two aspects. First, they differ in the selection of the benchmark to control for the incentive effect without RI. The Wallace (1997) specification uses matched single competitors without RI plan in the same industry as a control, whereas the Balachandran (2003) specification uses firms' own past history as a control. Second, they differ in the selection of the time period for observing effects from RI adoption. The Wallace (1997) specification uses a long window of four years of RI adoption as the post-RI adoption period, while the Balachandran (2003) specification uses a short window of one year of RI adoption as the post-RI adoption period. The Wallace (1997) specification is referenced to as the long window model specification, and the Balachandran (2003) specification as the short window model specification. Empirical results are mixed and sensitive to the model specification used. Considering the investment changes using the short window model specification, the evidence indicates that continuing firms with prior over-investment (under-investment) problems significantly reduce (increase) investment levels after RI adoption, while discontinuing firms have significantly less investment correction than the continuing firms. A similar pattern of results also show when using a long window model specification, but the coefficients are only significant for under-investing continuing firms and for over-investing discontinuing firms. Generalizing, the results from both short and long window model specifications support the hypothesis that RI adoption leads to investment corrections conditional in prior investment problems. Considering the results of operating performance, both short and long window model specifications show that the continuing firms have significantly higher employee productivity, while discontinuing firms have significantly lower of this performance improvement than the continuing firms. However, with respect to delivered residual income, the results from the long and short window model specifications differ: significant improvements in residual income are observed only under the long window model specification. The effect on delivered residual income may simply take longer to emerge than the one-year time period utilized in the short window model specification. Overall, there is evidence to support Hypothesis 2a, 2b, and 2c that the lower RI adoption effectiveness may play a role in their decision to discontinue the use of RI.

Hypothesis 3a to 3d posit that several factors influence the effectiveness of RI adoption. These factors are tested in a logistic regression model to predict the decision of discontinuing the use RI, and several time periods are used to make the comparison between two groups of firms. Only one factor, *MULTIYR*, indicating whether the firm uses RI in a long-term compensation plan, significantly negatively affects the discontinuation decision. Namely, firms not having RI in a long-term compensation plan are more likely to discontinue the RI in the compensation plan. It indicates that the way the RI measure is structured in the compensation plan to alleviate manager's myopic investment decisions plays an important role in the realized benefit of adopting RI. It also suggests that the firm's commitment to use RI in the long-run might help them to gain more benefits from utilizing RI. For the rest of the variables in the model, such as degree of leverage, capital intensity, and whether the firm hired a consulting firm to help the RI installation process, are significantly consistent with the hypothesis only in some of the measurement periods. Therefore, it remains unclear what contributes to the lower effectiveness of RI adoption for the discontinuing firms.

6.2 Contributions and Limitations

Most of the prior literature has focused on the claim of RI superiority by examining the incremental information content of RI to stock returns than accounting measures. However, for the managerial use of RI, the incentive properties of the RI measure and its adoption consequences on manager's decisions are more important questions. Overall, the results of this study contribute to the literature by providing more refined empirical evidence on the RI adoption consequences in investment activities and operating and delivered residual income performance. First, the current study extends the previous literature by partitioning the RI adoption firms based on their decision to continue or discontinue the use of RI. The refinement in the tests produces results that are hypothesized but not found in Balachandran (2003); namely, that RI motivates investment level changes in the direction consistent with hypothesized prior investment problems. Second, the current study brings to the literature a new means for detecting the investment effectiveness of RI adoption; namely, the change in investment sensitivity to investment opportunity set. Examining investment sensitivity change has the advantage over examining investment level changes, because the former approach provides the evidence of investment improvement without having to sign the predicted direction of investment correction.

Finally, comparing adopting firms that continue the use of RI with adopting firms that discontinue the use of RI also provides evidence that there is differential impact of adoption. In particular, not incorporating the RI measure in the long-term compensation plan may limit the benefit of RI incentives and hence is highly associated with the discontinuation decision. The evidence here is consistent with the Contingency Theory of Management Control System design. Any given control mechanism will not generate a universal effect on all firms. Other organizational variables must be aligned to generate the desired benefit.

There are however several caveats to the current research. The sample selection process only identifies firms that self-proclaim the use of RI in their proxy statements. Firms that actually use economic profit above cost of all capital as a performance measure in compensation but do not specify it in their proxy statement, are not included in the RI adopting sample; instead, they are included in the control sample, potentially biasing against the finding of results.

When testing the impact of RI adoption on investment correction conditional on the prior investment problems, one is conducting a joint test between adoption impact and the validity of the proxy for prior investment problems. It could be argued that earnings type measures could potentially also lead to an under-investment problem, due to conservative accounting practices, such as R&D expensing. One of the accounting adjustments of EVA® which aims to undo accounting conservatism should also correct this under-investment problem. In addition, using returns type measures may lead to over-investment problems, as well as under-investment problems. If the current returns on investment (ROI) is lower than the cost of capital, in order to maximize ROI, managers will have incentives to invest in all projects with returns higher than the current ROI, despite the fact that the returns are lower than the cost of capital. This leads to an over-investment problem. Hence, the evidence presented in the current study on investment level correction should be interpreted with caution. Even though in the current study, the test hypothesis regarding adoption impact and the maintained hypothesis regarding the validity of the proxy for prior investment problem are jointly supported, there is no guarantee that the same proxy will be valid in other samples.

6.3 Future Directions

Several extensions of the current study are possible. First, it remains unclear what causes the lower RI adoption effectiveness for the firms that subsequently discontinue the use of RI. The two prior RI adoption decision studies seemed to suggest that these adopting firms made a rational decision in that they indeed should benefit from the Rl measure. Given the evidence in the current study that the discontinuing adopters perform worse than the continuing adopters, it would be interesting to further explore other factors that might explain the differential performances, particularly the corporate governance variables. The monitoring mechanism, such as the board composition, and the percentage of institutional investors, might impact the implementation practices of the RI measure, and hence the effectiveness of RI adoption.

Second, a natural extension is to examine the impact on investment activities of other changes in performance measurement system. More specifically, recent adoptions of the Balanced Scorecard raise the question of whether the incorporation of non-financial performance measures motivates managers to focus more on value-enhancing activities. It would be interesting to empirically assess whether firms adopting the Balanced Scorecard also improve their investment sensitivity to the investment opportunity set and whether the improvement is significantly higher than those that subsequently discontinue the adoption of the Balanced Scorecard.

Third, Wallace (1997) observed significantly positive abnormal stock returns in the months coinciding with the filing of proxy statements. This is probably the first time the public learns of the RI adoption. However, Wallace did not find that the RI adopting firms significantly outperform the control firms in the period of two years surrounding RI adoption. Another approach to examining the market's reaction to the RI adoption would be to test the stock price reaction to the unexpected investment. Following the signaling theory of unexpected capital expenditure (Kerstein and Kim 1995), if the market believes that the RI incentives are going to motivate a more efficient investment level, we should observe a more positive price reaction to favorable unexpected investment following RI adoption.

Finally, the current study focuses on the RI adoption consequences in terms of investment activities. Wallace (1997) and Balachandran (2003) both also examine the adoption consequences on financing decisions. Wallace (1997) found a change in share repurchases consistent with a prior over-investment problem. After comparing to control firms, Balachandran (2003) only found a difference of change in share repurchases between two different prior investment problem groups of firms, but not for each group of firms. A possible extension is similar to the approach of controlling for factors affecting the change of investment. The real impact of RI adoption on financing activities can be assessed more accurately by adding variables that influence manager's share repurchases decision. Barth and Kasznik (1999) and Dittmar and Dittmar (2002) provide an input of a list of possible variables to control for.

TABLE 1
Distributions of Residual Income Sample and Control Firm Sample

Panel A: RI Sample Distribution by Selection

Firms Identified as RI Adopters	192
Omitting Financial and Service Firms (SIC=6000 to 8999)	(23)
Firms in Full RI Sample Analysis	169
Omitting Firms with proxy statements either unavailable or not specifying the performance measure used prior to RI	(44)
Firms in over- or under-investment Analysis	125

Panel B: RI Sample Distribution by Industry

SIC Code	Industry Grouping[a]	# of RI Firms	% of Total Sample	# of Firms in Industry[b]	% of Firms in Industry
1000-1999, except 1300-1399	Mining & Construction	3	1.78	128	2.34
2000-2111	Food	6	3.55	137	4.38
2200-2799	Textiles, Printing & Publishing	16	9.47	423	3.78
2800-2824, & 2840-2899	Chemicals	11	6.51	191	5.76
2830-2836	Pharmaceuticals	6	3.55	337	1.78
2900-2999, & 1300-1399	Extractive Industries	8	4.73	370	2.16
3000-3999, except 3570-3579, & 3670-3679	Durable Manufacturers	74	43.79	1690	4.38
3570-3579, & 3670-3679	Computers	6	3.55	441	1.36
4000-4899	Transportation	8	4.73	528	1.52
4900-4999	Utilities	13	7.69	412	3.16
5000-5999	Retail	18	10.65	829	2.17
Total		169	100.00	5,486	3.08

a. Industry classification was determined following Barth, et al. (1998).
b. The number of firms in each industry category are the average number of Compustat firms in each industry category for the years 1986 to 2000.

TABLE 1 (Continued)

Panel C: RI Sample Distribution by Adoption Year

Year of Adoption[a]	# of RI Firms	% of Sample	Cumulative % of Sample
1986	1	0.59	0.59
1987	1	0.59	1.18
1989	1	0.59	1.77
1990	1	0.59	2.36
1991	3	1.78	4.14
1992	4	2.37	6.51
1993	14	8.28	14.79
1994	17	10.06	24.85
1995	26	15.38	41.23
1996	29	17.16	57.39
1997	27	15.98	73.37
1998	25	14.79	88.16
1999	15	8.88	97.04
2000	5	2.96	100.00
Total	169	100.00	100.00

a. Year of adoption refers to the first year the RI measure is explicitly stated to be used in the compensation plan in firm's proxy statement.

TABLE 1 (Continued)

Panel D: Control Firm Sample Distribution by Industry

SIC Code	Industry Grouping[a]	# of Control Firms	% of Total Sample
1000-1999, except 1300-1399	Mining & Construction	82	2.99%
2000-2111	Food	63	2.30%
2200-2799	Textiles, Printing & Publishing	153	5.58%
2800-2824, & 2840-2899	Chemicals	118	4.30%
2830-2836	Pharmaceuticals	239	8.72%
2900-2999, & 1300-1399	Extractive Industries	316	11.52%
3000-3999, except 3570-3579, & 3670-3679	Durable Manufacturers	905	33.01%
3570-3579, & 3670-3679	Computers	113	4.12%
4000-4899	Transportation	245	8.94%
4900-4999	Utilities	218	7.95%
5000-5999	Retail	290	10.58%
Total		2,742	100.00%

a. Industry classification was determined following Barth, et al. (1998).

TABLE 1 (Continued)

Panel E: Control Firm Sample Distribution by Adoption Year

Year of Adoption[a]	# of Control Firms	% of Sample	Cumulative % of Sample
1986	3	0.11%	0.11%
1987	42	1.53%	1.64%
1989	10	0.36%	2.01%
1990	11	0.40%	2.41%
1991	26	0.95%	3.36%
1992	80	2.92%	6.27%
1993	207	7.55%	13.82%
1994	220	8.02%	21.85%
1995	558	20.35%	42.20%
1996	385	14.04%	56.24%
1997	540	19.69%	75.93%
1998	274	9.99%	85.92%
1999	278	10.14%	96.06%
2000	108	3.94%	100.00%
Total	2,742	100.00%	100.00%

a. Year of adoption refers to the first year the RI measure is explicitly stated to be used in the compensation plan in firm's proxy statement.

TABLE 2
Residual Income Sample Distribution by Continuation Decision

Panel A: Distribution by Duration of Adoption and Continuation Decision

Duration[a]	Continuing Firms[b]	Voluntarily Discontinuing Firms[c]	Involuntarily Discontinuing Firms[d]	Total
1	0	14	12	26
2	4	11	8	23
3	8	18	9	35
4	12	11	1	24
5	10	7	3	20
6	11	3	2	16
7	8	1	0	9
8	5	2	0	7
9	1	1	0	2
10	1	0	1	2
11	2	0	0	2
12	1	0	0	1
15	1	0	0	1
16	1	0	0	1
Total	65	68	36	169

a. Duration refers to the time period from the first year of RI adoption to the last year, or to year 2001, RI is used in the compensation plan.
b. Continuing firms are identified as those that continue the use of RI measure up till 2001.
c. Voluntarily discontinuing firms are identified as those that gave up RI and switched to measures other than RI in the compensation plan.
d. Involuntarily discontinuing firms are identified as those that external events ended the RI adoption, such as going bankrupt, acquired by other firms, or going private.

TABLE 2 (Continued)

Panel B: Distribution by Industry and Continuation Decision

SIC Code	Industry Grouping[a]	Continuing Sample[b]	Discontinuing Sample[c]	Total RI Sample
1000-1999, except 1300-1399	Mining & Construction	1	2	3
2000-2111	Food	2	4	6
2200-2799	Textiles, Printing & Publishing	9	7	15
2800-2824, & 2840-2899	Chemicals	5	6	11
2830-2836	Pharmaceuticals	3	3	6
2900-2999, & 1300-1399	Extractive Industries	1	7	8
3000-3999, except 3570-3579, & 3670-3679	Durable Manufacturers	35	39	74
3570-3579, & 3670-3679	Computers	1	5	6
4000-4899	Transportation	2	6	8
4900-4999	Utilities	3	10	13
5000-5999	Retail	9	9	18
Total		71	98	169

a. Industry classification was determined following Barth, et al. (1998).
b. Continuing sample consists of 65 firms that continue the use of RI up till 2001 and 6 firms that involuntarily discontinued the use of RI after at least 5 years of adoption.
c. Discontinuing sample consists of 68 firms that voluntarily discontinue the use of RI and 30 firms that involuntarily discontinue the use of RI for less than 4 years of adoption.

TABLE 2 (Continued)

Panel C: Distribution by Adoption Year and Continuation Decision

Year of Adoption	Continuing Sample	Discontinuing Sample	Total RI Sample
1986	1	0	1
1987	1	0	1
1989	1	0	1
1990	1	0	1
1991	2	1	3
1992	1	3	4
1993	4	10	14
1994	5	12	17
1995	9	17	26
1996	12	17	29
1997	10	17	27
1998	12	13	25
1999	8	7	15
2000	4	1	5
Total	71	98	169

TABLE 3
Residual Income Sample Distribution by Switching from Returns/Earnings Sub-samples

Panel A: Distribution by Industry and Switching from Returns/Earnings Sub-samples

SIC Code	Industry Grouping[a]	Switching from Returns[b]	Switching from Earnings[c]	Total RI Sample
1000-1999, except 1300-1399	Mining & Construction	1	2	3
2000-2111	Food	2	3	5
2200-2799	Textiles, Printing & Publishing	7	5	12
2800-2824, & 2840-2899	Chemicals	4	2	6
2830-2836	Pharmaceuticals	2	2	4
2900-2999, & 1300-1399	Extractive Industries	3	3	6
3000-3999, except 3570-3579, & 3670-3679	Durable Manufacturers	29	25	54
3570-3579, & 3670-3679	Computers	3	1	4
4000-4899	Transportation	4	2	6
4900-4999	Utilities	4	6	10
5000-5999	Retail	6	9	15
Total		65	60	125

a. Industry classification was determined following Barth, et al. (1998).
b. Switching from Returns sample consists of firms that used Returns (i.e., percentage type of measures) or both Returns and Earnings (i.e., profit type of measures) in the compensation plan prior to RI adoption.
c. Switching from Earnings sample consists of firms that used Earnings in the compensation plan prior to RI adoption.

TABLE 3 (Continued)

Panel B: Distribution by Adoption Year and Switching from Returns/Earnings Sub-samples

Year of Adoption	Switching from Returns	Switching from Earnings	Total RI Sample
1986	0	1	1
1987	0	0	0
1989	0	0	0
1990	1	0	1
1991	0	1	1
1992	2	0	2
1993	4	1	5
1994	4	7	11
1995	16	7	23
1996	6	15	21
1997	13	11	24
1998	12	9	21
1999	7	4	11
2000	0	4	4
Total	65	60	125

Panel C: Distribution by Continuation Decision and Switching from Returns/Earnings Sub-samples

	Switching from Returns	Switching from Earnings	Total RI Sample
Continuing Sample	29	20	49
Voluntarily Discontinuing Sample	25	25	50
Involuntarily Discontinuing Sample	11	15	26
Total RI Sample	65	60	125

The test of equal frequency in all cells in this table results in a Chi-square value of 2.0718, with a p-value of 0.3549. Thus, the null hypothesis of equal frequency cannot be rejected.

TABLE 4
Descriptive Statistics of RI Sample, Control Sample, and Sub-Samples One Year Prior to RI Adoption

Panel A: RI Sample versus Control Firm Sample

	Full RI Sample (n=169)		Control Sample (n=2,742)		Difference between Two Samples	
Variables[a]	Mean (σ^2)	Median	Mean (σ^2)	Median	Mean t-stat *p*-value	Median Wilcoxon *p*-value
Total Assets[b]	3062.5 (6342.8)	910.32	1917.5 (5559.1)	170.34	0.035**	0.000***
Total Sales[b]	3217.7 (7198.4)	1179.96	1447.5 (4740.1)	199.92	0.000***	0.000***
Return on Investment	0.047 (0.541)	0.094	0.096 (3.21)	0.083	0.846	0.013**
Sales of PPE	0.008 (0.023)	0.002	0.006 (0.020)	0.000	0.207	0.000***
New Investment	0.100 (0.091)	0.072	0.116 (0.182)	0.066	0.266	0.061*
Net Investment	0.095 (0.086)	0.070	0.111 (0.180)	0.062	0.257	0.079*
Asset Turnover	1.306 (0.728)	1.219	1.208 (0.869)	1.058	0.172	0.004***
Cash Conversion Cycle	96.67 (63.54)	90.47	90.32 (105.17)	76.61	0.464	0.058*
OMBD per Employee[b]	45.14 (106.35)	25.29	37.97 (92.92)	20.08	0.370	0.061*
Residual Income[b]	-38.55 (177.55)	-6.56	-34.19 (281.37)	-3.43	0.847	0.493

a. Variables are measured one year prior to RI adoption. For variables description and measurements, refer to Appendix D.
b. in millions in 2001 dollars.

*, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 4 (Continued)

Panel B: Continuing/Discontinuing Sub-sample

	Continuing Sample (n=71)		Discontinuing Sample (n=98)		Difference between Sub-samples	
Variables[a]	Mean (σ^2)	Median	Mean (σ^2)	Median	Mean t-stat *p*-value	Median Wilcoxon *p*-value
Total Assets[b]	2328.3 (3613.3)	853.7	3587.0 (7701.3)	805.4	0.206	0.861
Total Sales[b]	2690.3 (3995.8)	1271.5	3594.4 (8804.0)	1016.0	0.424	0.400
Return on Investment	0.013 (0.815)	0.101	0.078 (0.113)	0.082	0.440	0.016**
Sales of PPE	0.004 (0.008)	0.001	0.012 (0.030)	0.012	0.085*	0.087*
New Investment	0.104 (0.088)	0.074	0.095 (0.091)	0.072	0.545	0.326
Net Investment	0.101 (0.089)	0.070	0.088 (0.082)	0.065	0.340	0.316
Asset Turnover	1.413 (0.811)	1.254	1.254 (0.719)	1.183	0.189	0.175
Cash Conversion Cycle	102.95 (64.44)	93.03	90.30 (63.10)	86.35	0.219	0.297
OMBD per Employee[b]	26.97 (37.51)	21.27	48.44 (120.62)	20.95	0.173	0.961
Residual Income[b]	-14.25 (103.79)	-2.70	-28.07 (275.28)	-6.67	0.690	0.182

a. Variables are measured one year prior to RI adoption. For variables description and measurements, refer to Appendix D.
b. in millions in 2001 dollars.

*, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 4 (Continued)

Panel C: Switching from Returns/Earnings Sub-sample

	Switching from Returns (n=65)		Switching from Earnings (n=60)		Difference between Sub-samples	
Variables	Mean (σ^2)	Median	Mean (σ^2)	Median	Mean t-stat *p*-value	Median Wilcoxon *p*-value
Total Assets	3768.9 (5932.6)	1560.5	3540.1 (8222.4)	798.1	0.859	0.397
Total Sales	4167.1 (7574.7)	1784.8	3634.7 (8813.5)	1156.9	0.718	0.309
Return on Investment	0.095 (0.068)	0.095	0.083 (0.134)	0.096	0.522	0.778
Sales of PPE	0.012 (0.032)	0.001	0.008 (0.019)	0.001	0.528	0.368
New Investment	0.097 (0.075)	0.073	0.112 (0.112)	0.077	0.387	0.836
Net Investment	0.090 (0.070)	0.070	0.107 (0.106)	0.075	0.278	0.662
Asset Turnover	1.314 (0.663)	1.291	1.373 (0.832)	1.184	0.666	0.871
Cash Conversion Cycle	92.54 (56.01)	92.07	100.78 (74.59)	95.26	0.493	0.803
OMBD per Employee	34.84 (38.56)	23.36	38.52 (75.24)	19.63	0.735	0.362
Residual Income[b]	-43.59 (202.29)	-6.73	-2.03 (296.63)	-9.96	0.361	0.594

a. Variables are measured one year prior to RI adoption. For variables description and measurements, refer to Appendix D.
b. in millions in 2001 dollars.

*, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 5
Investment Sensitivity to Investment Opportunity Set after RI Adoption for RI Sample, Continuing / Discontinuing Sub-sample, and Control Firms

Panel A: RI Sample and Control Firm Dummy Variables

	Expected Sign	RI Firms		Expected Sigh	Adding Control Firms Dummy Variables	
Intercet		0.037 (0.529)			0.087 (0.161)	
$FACIOS_{it}$	+	0.159 (0.000)	***	+	0.085 (0.000)	***
AFTER		0.015 (0.377)			-0.004 (0.558)	
$FACIOS_{it}$×AFTER	+	**-0.003 (0.808)**			**0.003 (0.217)**	
RI					-0.041 (0.600)	
RI ×FACIOS					0.066 (0.000)	***
RI ×AFTER					-0.005 (0.663)	
RI ×FACIOS ×AFTER				+	**-0.003 (0.883)**	
$CF_{i,t}$	+	0.113 (0.063)	*	+	0.048 (0.000)	***
$DWC_{i,t}$	-	-0.139 (0.000)	***	-	-0.070 (0.000)	***
$IndNetInv_{j,t}$	+	0.031 (0.388)		+	0.683 (0.000)	***
Adjusted R^2		0.377			0.431	

The dependent variable is Net $Investment_t$ / $Assets_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. The regressions include year dummy variables and firm fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 5 (Continued)

Panel B: RI Sample with Continuing / Discontinuing Dummy Variables and Control Firm Dummy Variables

	Expected Sign	RI Firms with Drop Dummy Variables		Expected Sigh	Adding Control Firms Dummy Variables	
Intercet		0.073 (0.248)			0.068 (0.268)	
FACIOS	+	0.147 (0.000)	***	+	0.070 (0.000)	***
AFTER		0.052 (0.011)	**		-0.000 (0.987)	
FACIOS×AFTER	+	**0.068 (0.002)**	***		**0.001 (0.786)**	
RI					0.010 (0.904)	
RI×FACIOS					0.060 (0.012)	**
RI×AFTER					0.025 (0.151)	
RI×FACIOS×AFTER				+	**0.078 (0.003)**	***
DROP		-0.203 (0.041)	**		0.052 (0.529)	
DROP×FACIOS		0.017 (0.463)			0.025 (0.000)	***
DROP×AFTER		-0.060 (0.002)	***		-0.003 (0.679)	
DROP×FACIOS×AFTER	-	**-0.132 (0.000)**	***		**0.008 (0.252)**	
DROP×RI					-0.245 (0.102)	
DROP×RI×FACIOS					0.005 (0.857)	
DROP×RI×AFTER					-0.057 (0.018)	**
DROP×RI×FACIOS ×AFTER				-	**-0.153 (0.000)**	***
$CF_{i,t}$	+	0.093 (0.101)		+	0.042 (0.001)	***
$DWC_{i,t}$	-	-0.139 (0.000)	***	-	-0.071 (0.000)	***
$IndNetInv_{j,t}$	+	0.046 (0.333)		+	0.687 (0.000)	***
Adjusted R^2		0.410			0.435	

The dependent variable is Net Investment$_t$ / Assets$_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***Drop*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and firm fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 6
Incentive Effect after RI Adoption for Full RI Sample: Long Term Window Specification

Panel A: Investing Activities

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 LOGTA_{t-1} + \beta_3 DLVRG + \beta_4 DEMPL + \beta_5 DADGPPE + \beta_6 DMBTA + \beta_7 DSG + \beta_8 DCF + \beta_9 DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables		
	Sales of PPE	New Investment	Net Investment
Intercept	-0.003	-0.015	-0.013
	(0.311)	(0.496)	(0.572)
RI	**0.003**	**0.028**	**0.027**
	(0.086) *	**(0.021)** **	**(0.028)** **
$LOGTA_{t-1}$	-0.000	-0.000	-0.000
	(0.984)	(0.837)	(0.847)
DLVRG	-0.000	0.017	0.018
	(0.986)	(0.338)	(0.326)
DEMPL	0.000	0.022	0.022
	(0.617)	(0.000) ***	(0.000) ***
DADGPPE	0.011	-0.236	-0.246
	(0.0048) **	(0.000) ***	(0.000) ***
DMBTA	-0.000	0.002	0.003
	(0.654)	(0.267)	(0.244)
DSG	0.000	0.002	0.002
	(0.633)	(0.114)	(0.128)
DCF	-0.000	-0.099	-0.099
	(0.789)	(0.000) ***	(0.000) ***
DDWC	-0.000	0.000	0.000
	(0.967)	(0.490)	(0.487)
Adjusted R^2	0.015	0.161	0.163

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 6 (Continued)

Panel B: Operating Activities and Delivered Residual Income

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 LOGTA_{t-1} + \beta_3 DLVRG + \beta_4 DEMPL + \beta_5 DADGPPE$$
$$+ \beta_6 DMBTA + \beta_7 DSG + \beta_8 DCF + \beta_9 DDWC$$
$$+ \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables							
	Asset Turnover		Cash Conversion Cycle		OMBD per Employee		Residual Income	
Intercept	-0.123		2.429		-18.127		-21.106	
	(0.023)	**	(0.806)		(0.185)		(0.141)	
RI	**0.022**		**-8.670**		**10.262**		**7.305**	
	(0.229)		**(0.055)**	*	**(0.084)**	*	**(0.175)**	
$LOGTA_{t-1}$	-0.008		-0.651		2.546		1.373	
	(0.072)	*	(0.425)		(0.024)	**	(0.246)	
DLVRG	-0.073		-7.481		-26.915		-42.035	
	(0.095)	*	(0.351)		(0.015)	**	(0.000)	***
DEMPL	0.016		3.873		1.091		-7.783	
	(0.034)	**	(0.007)	***	(0.576)		(0.000)	***
DADGPPE	0.717		51.651		-75.220		8.701	
	(0.000)	***	(0.000)	***	(0.000)	***	(0.679)	
DMBTA	0.027		-0.445		-0.708		4.246	
	(0.000)	***	(0.646)		(0.597)		(0.003)	***
DSG	-0.003		-0.801		-0.085		0.104	
	(0.145)		(0.065)	*	(0.887)		(0.868)	
DCF	0.045		2.094		18.472		9.984	
	(0.073)	*	(0.645)		(0.003)	***	(0.131)	
DDWC	-0.000		0.006		0.016		-0.017	
	(0.003)	***	(0.631)		(0.383)		(0.365)	
Adjusted R^2	0.087		0.024		0.051		0.037	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 7
Incentive Effect after RI Adoption with PRIOREARN Dummy Variable: Long Term Window Specification

Panel A: Investing Activities

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI{\times}PRIOREARN + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables								
	Sales of PPE			New Investment			Net Investment		
	Expected Sign			Expected Sign			Expected Sign		
Intercept		-0.002			-0.031			-0.030	
		(0.566)			(0.229)			(0.252)	
RI(β_1)	-	**-0.002**		+	**0.024**		+	**0.026**	
		(0.258)			**(0.095)**	*		**(0.080)**	*
PRIOREARN		-0.002			0.014			0.016	
		(0.039)	**		(0.125)			(0.080)	*
RIxPRIOREARN(β_3)	+	**0.004**		-	**-0.004**		-	**-0.007**	
		(0.149)			**(0.437)**			**(0.392)**	
($\beta_1 + \beta_3$)	+	**0.002**		-	**0.020**		-	**0.019**	
		(0.212)			**(0.291)**			**(0.320)**	
$LOGTA_{t-1}$		0.000			-0.001			-0.001	
		(0.473)			(0.802)			(0.758)	
DLVRG		-0.002			0.031			0.033	
		(0.338)			(0.094)	*		(0.075)	*
DEMPL		0.000			0.020			0.020	
		(0.437)			(0.000)	***		(0.000)	***
DADGPPE		0.015			-0.222			-0.236	
		(0.000)	***		(0.000)	***		(0.000)	***
DMBTA		0.000			0.000			0.000	
		(0.944)			(0.834)			(0.835)	
DSG		0.000			0.004			0.004	
		(0.505)			(0.009)	***		(0.011)	**
DCF		-0.000			-0.098			-0.097	
		(0.793)			(0.000)	***		(0.000)	***
DDWC		-0.000			0.000			0.000	
		(0.894)			(0.396)			(0.387)	
Adjusted R^2		0.016			0.169			0.174	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. for The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 7 (Continued)

Panel B: Residual Income

$$DResIncome = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI{\times}PRIOREARN + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \textstyle\sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income	
Intercept		-16.494	
		(0.334)	
RI(β₁)	+	**22.460**	
		(0.033)	**
PRIOREARN		1.959	
		(0.749)	
RI×PRIOREARN(β₃)		**-25.657**	
		(0.132)	
(β₁ + β₃)	+	**-3.197**	
		(0.798)	
$LOGTA_{t-1}$		0.051	
		(0.970)	
DLVRG		-41.223	
		(0.001)	***
DEMPL		-9.829	
		(0.000)	***
DADGPPE		13.090	
		(0.579)	
DMBTA		3.796	
		(0.012)	**
DSG		0.198	
		(0.857)	
DCF		8.058	
		(0.238)	
DDWC		-0.016	
		(0.402)	
Adjusted R^2		0.039	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. for The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 8
Incentive Effect after RI Adoption with DROP Dummy Variable: Long Term Window Specification

Panel A: Operating Activities

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 DROP + \beta_3 RI\times DROP + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables								
	Asset Turnover			Cash Conversion Cycle			OMBD per Employee		
	Expected Sign			Expected Sign			Expected Sign		
Intercept		-0.119			2.206			-19.817	
		(0.029)	**		(0.824)			(0.146)	
RI(β_1)	+	**-0.013**		-	**-8.845**		+	**37.977**	
		(0.762)			**(0.138)**			**(0.000)**	***
DROP		-0.018			2.593			-3.983	
		(0.396)			(0.497)			(0.449)	
RI×DROP(β_3)	-	**0.060**		+	**0.504**		-	**-48.715**	
		(0.292)			**(0.481)**			**(0.000)**	***
(β_1 + β_3)		**0.047**			**-8.341**			**-10.738**	
		(0.219)			**(0.236)**			**(0.263)**	
$LOGTA_{t-1}$		-0.008			-0.637			2.462	
		(0.071)	*		(0.436)			(0.029)	**
DLVRG		-0.073			-7.447			-27.144	
		(0.095)	*		(0.354)			(0.014)	**
DEMPL		0.016			3.939			1.162	
		(0.042)	**		(0.006)	***		(0.551)	
DADGPPE		0.716			51.303			-72.209	
		(0.000)	***		(0.000)	***		(0.000)	***
DMBTA		0.027			-0.493			-0.666	
		(0.000)	***		(0.612)			(0.619)	
DSG		-0.004			-0.793			-0.081	
		(0.137)			(0.067)	*		(0.892)	
DCF		0.045			2.002			18.446	
		(0.068)	*		(0.660)			(0.003)	***
DDWC		-0.000			0.006			0.016	
		(0.003)	***		(0.639)			(0.376)	
Adjusted R^2		0.087			0.023			0.060	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***DROP*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 8 (Continued)

Panel B: Residual Income

$$DResIncome = \beta_0 + \beta_1 RI + \beta_2 DROP + \beta_3 RI{\times}DROP + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income	
Intercept		-21.338	
		(0.137)	
RI(β_1)	+	**18.331**	
		(0.059)	*
DROP		-6.252	
		(0.259)	
RI×DROP(β_3)	-	**-19.704**	
		(0.097)	*
($\beta_1 + \beta_3$)		**-1.373**	
		(0.892)	
$LOGTA_{t-1}$		1.312	
		(0.268)	
DLVRG		-42.167	
		(0.000)	***
DEMPL		-7.868	
		(0.000)	***
DADGPPE		10.479	
		(0.618)	
DMBTA		4.351	
		(0.002)	***
DSG		0.092	
		(0.883)	
DCF		10.142	
		(0.125)	
DDWC		-0.017	
		(0.372)	
Adjusted R^2		0.039	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***DROP*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 9
Incentive Effect after RI Adoption with DROP and PRIOREARN Dummy Variables: Long Term Window Specification

Panel A: Investing Activities

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI\times PRIOREARN + \beta_4 DROP + \beta_5 DROP\times RI + \beta_6 DROP\times PRIOREARN + \beta_7 DROP\times RI\times PRIOREARN + \beta_8 LOGTA_{t-1} + \beta_9 DLVRG + \beta_{10} DEMPL + \beta_{11} DADGPPE + \beta_{12} DMBTA + \beta_{13} DSG + \beta_{14} DCF + \beta_{15} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables								
	Sales of PPE			New Investment			Net Investment		
	Expected Sign			Expected Sign			Expected Sign		
Intercept		-0.003			-0.044			-0.041	
		(0.299)			(0.117)			(0.145)	
RI(β_1)	-	**-0.000**		+	**0.044**		+	**0.045**	
		(0.498)			**(0.048)**	**		**(0.046)**	**
PRIOREARN		-0.000			0.033			0.033	
		(0.811)			(0.030)	**		(0.029)	**
RI×PRIOREARN(β_3)	+	**0.003**		-	**-0.067**		-	**-0.071**	
		(0.256)			**(0.046)**	**		**(0.039)**	**
($\beta_1 + \beta_3$)	+	**0.003**		-	**-0.023**		-	**-0.026**	
		(0.190)			**(0.223)**			**(0.200)**	
DROP		0.002			0.015			0.013	
		(0.128)			(0.255)			(0.321)	
DROP×RI (β_5)	+	**-0.003**		-	**-0.035**		-	**-0.034**	
		(0.583)			**(0.162)**			**(0.175)**	
DROP×PRIOREARN		-0.003			-0.031			-0.028	
		(0.181)			(0.111)			(0.148)	
DROP×RI×PRIOREARN(β_7)	-	**0.000**		+	**0.106**		+	**0.106**	
		(0.965)			**(0.022)**	**		**(0.022)**	**
($\beta_5 + \beta_7$)	-	**-0.003**		+	**0.071**		+	**0.073**	
		(0.321)			**(0.033)**	**		**(0.029)**	**
$LOGTA_{t-1}$		0.000			-0.001			-0.001	
		(0.575)			(0.662)			(0.631)	
DLVRG		-0.002			0.032			0.034	
		(0.347)			(0.089)	*		(0.071)	*
DEMPL		0.000			0.020			0.020	
		(0.370)			(0.000)	***		(0.000)	***
DADGPPE		0.015			-0.221			-0.235	
		(0.000)	***		(0.000)	***		(0.000)	***
DMBTA		0.000			0.001			0.001	
		(0.904)			(0.725)			(0.731)	
DSG		0.000			0.004			0.004	
		(0.488)			(0.009)	***		(0.011)	**
DCF		-0.000			-0.098			-0.098	
		(0.727)			(0.000)	***		(0.000)	***
DDWC		-0.000			0.000			0.000	
		(0.874)			(0.408)			(0.397)	
Adjusted R^2		0.015			0.170			0.175	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 9 (Continued)

Panel B: Residual Income

$$DResIncome = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI \times PRIOREARN + \beta_4 DROP + \beta_5 DROP \times RI + \beta_6 DROP \times PRIOREARN + \beta_7 DROP \times RI \times PRIOREARN + \beta_8 LOGTA_{t-1} + \beta_9 DLVRG + \beta_{10} DEMPL + \beta_{11} DADGPPE + \beta_{12} DMBTA + \beta_{13} DSG + \beta_{14} DCF + \beta_{15} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income	
Intercept		-17.854	
		(0.332)	
RI(β_1)	+	**21.859**	
		(0.107)	
PRIOREARN		2.669	
		(0.791)	
RI×PRIOREARN(β_3)		**-14.004**	
		(0.596)	
($\beta_1 + \beta_3$)	+	**7.856**	
		(0.348)	
DROP		-5.152	
		(0.545)	
DROP×RI (β_5)	-	**0.305**	
		(0.990)	
DROP×PRIOREARN		-0.041	
		(0.997)	
DROP×RI×PRIOREARN(β_7)		**-18.301**	
		(0.599)	
($\beta_5 + \beta_7$)	-	**-17.996**	
		(0.239)	
$LOGTA_{t-1}$		0.087	
		(0.950)	
DLVRG		-41.206	
		(0.001)	***
DEMPL		-9.999	
		(0.000)	***
DADGPPE		13.514	
		(0.568)	
DMBTA		3.858	
		(0.012)	**
DSG		0.188	
		(0.864)	
DCF		8.355	
		(0.223)	
DDWC		-0.016	
		(0.410)	
Adjusted R^2		0.037	

RI takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 10
Incentive Effect after RI Adoption for Full RI Sample: Short Term Window Specification

Panel A: Investing Activities and Residual Income

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 IndDDepVar_j + \beta_3 LVRG + \beta_4 DLVRG + \beta 5 DEMPL + \beta_6 ADGPPE + \beta_7 MBTA + \beta_8 DMBTA + \beta_9 LOGTS + \beta_{10} DSG + \beta_{11} DCF + \beta_{12} DDWC + \beta_{13} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Net Investment		Residual Income	
Intercept	0.140		2.542	
	(0.262)		(0.985)	
AFTER	**0.044**		**33.588**	
	(0.080)	*	**(0.094)**	*
IndDDepVar	-0.117		0.034	
	(0.735)		(0.879)	
LVRG	-0.062		56.024	
	(0.555)		(0.603)	
DLVRG	0.486		-241.772	
	(0.004)	***	(0.153)	
DEMPL	0.009		-14.713	
	(0.000)	***	(0.000)	***
ADGPPE	-0.425		-46.934	
	(0.001)	***	(0.721)	
MBTA	0.020		23.769	
	(0.331)		(0.261)	
DMBTA	0.005		-14.115	
	(0.859)		(0.613)	
LOGTS	-0.004		0.795	
	(0.691)		(0.930)	
DSG	0.038		-0.425	
	(0.000)	***	(0.960)	
DCF	0.023		89.003	
	(0.426)		(0.489)	
DDWC	-0.001		-0.592	
	(0.270)		(0.629)	
MULTIYR	0.013		36.237	
	(0.652)		(0.213)	
Adjusted R^2	0.302		0.257	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 10 (Continued)

Panel B: Operating Activities

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 IndDDepVar_j + \beta_3 LVRG + \beta_4 DLVRG + \beta 5DEMPL + \beta_6 ADGPPE + \beta_7 MBTA + \beta_8 DMBTA + \beta_9 LOGTS + \beta_{10} DSG + \beta_{11} DCF + \beta_{12} DDWC + \beta_{13} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables					
	Asset Turnover		Cash Conversion Cycle		OMBD per Employee	
Intercept	0.010		-47.923		-0.069	
	(0.910)		(0.016)	**	(0.996)	
AFTER	**0.007**		**-1.476**		**1.453**	
	(0.335)		**(0.356)**		**(0.287)**	
IndDDepVar	0.026		-0.040		0.188	
	(0.542)		(0.134)		(0.013)	**
LVRG	0.015		-7.625		-6.932	
	(0.837)		(0.646)		(0.523)	
DLVRG	-0.582		159.512		-24.223	
	(0.000)	***	(0.000)	***	(0.156)	
DEMPL	-0.001		0.205		-0.250	
	(0.477)		(0.497)		(0.198)	
ADGPPE	0.022		-1.212		3.920	
	(0.803)		(0.953)		(0.768)	
MBTA	-0.011		-3.550		0.441	
	(0.435)		(0.274)		(0.837)	
DMBTA	0.031		24.541		-3.597	
	(0.091)	*	(0.000)	***	(0.207)	
LOGTS	-0.011		2.273		1.074	
	(0.073)	*	(0.109)		(0.243)	
DSG	0.052		-4.193		1.380	
	(0.000)	***	(0.002)	***	(0.109)	
DCF	-0.095		170.844		31.431	
	(0.280)		(0.000)	***	(0.017)	**
DDWC	0.000		-0.011		-0.053	
	(0.703)		(0.954)		(0.670)	
MULTIYR	-0.050		-1.155		-2.410	
	(0.012)	**	(0.798)		(0.415)	
Adjusted R^2	0.422		0.523		0.145	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 11
Incentive Effect on Investing Activities and Residual Income after RI Adoption with PRIOREARN Dummy Variable: Short Term Window Specification

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER{\times}PRIOREARN + \beta_4 IndDDepVar_j + \beta_5 LVRG + \beta_6 DLVRG + \beta_7 DEMPL + \beta_8 ADGPPE + \beta_9 MBTA + \beta_{10} DMBTA + \beta_{11} LOGTS + \beta_{12} DSG + \beta_{13} DCF + \beta_{14} DDWC + \beta_{15} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Net Investment			Residual Income		
	Expected Sign			Expected Sign		
Intercept		0.119			-49.126	
		(0.300)			(0.758)	
AFTER(β_1)	+	**0.020**		+	**14.318**	
		(0.262)			**(0.368)**	
PRIOREARN		0.017			-34.591	
		(0.614)			(0.458)	
AFTER×PRIOREARN(β_3)	-	**-0.045**			**54.451**	
		(0.156)			**(0.187)**	
($\beta_1 + \beta_3$)	-	**-0.025**		+	**68.769**	
		(0.300)			**(0.141)**	
IndDDepVar		-0.164			0.015	
		(0.592)			(0.951)	
LVRG		-0.026			89.867	
		(0.789)			(0.488)	
DLVRG		0.449			-352.988	
		(0.007)	***		(0.109)	
DEMPL		0.007			-16.470	
		(0.000)	***		(0.000)	***
ADGPPE		-0.340			5.650	
		(0.004)	***		(0.971)	
MBTA		-0.001			24.053	
		(0.944)			(0.348)	
DMBTA		-0.036			-43.913	
		(0.187)			(0.269)	
LOGTS		0.001			6.101	
		(0.889)			(0.600)	
DSG		0.283			108.491	
		(0.000)	***		(0.085)	*
DCF		-0.101			-173.162	
		(0.492)			(0.382)	
DDWC		-0.000			-0.313	
		(0.753)			(0.817)	
MULTIYR		0.060			39.859	
		(0.028)	**		(0.280)	
Adjusted R^2		0.429			0.276	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 12
Incentive Effect after RI Adoption with DROP Dummy Variable: Short Term Window Specification

Panel A: Operating Activities

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 DROP + \beta_3 AFTER{\times}DROP + \beta_4 IndDDepVar_j + \beta_5 LVRG + \beta_6 DLVRG + \beta_7 DEMPL + \beta_8 ADGPPE + \beta_9 MBTA + \beta_{10} DMBTA + \beta_{11} LOGTS + \beta_{12} DSG + \beta_{13} DCF + \beta_{14} DDWC + \beta_{15} MULTIYR + \textstyle\sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables								
	Asset Turnover			Cash Conversion Cycle			OMBD per Employee		
	Expected Sign			Expected Sign			Expected Sign		
Intercept		-0.009			-47.542			-1.709	
		(0.920)			(0.019)	**		(0.899)	
AFTER(β_1)	+	**0.010**		-	**-4.584**		+	**7.609**	
		(0.353)			**(0.234)**			**(0.031)**	**
DROP		0.038			0.217			0.513	
		(0.162)			(0.973)			(0.899)	
AFTER×DROP(β_3)	-	**-0.004**		+	**5.217**		-	**-10.276**	
		(0.550)			**(0.261)**			**(0.025)**	**
(β_1 + β_3)		**0.006**			**0.633**			**-2.667**	
		(0.899)			**(0.762)**			**(0.125)**	
IndDDepVar		0.029			-0.040			0.202	
		(0.492)			(0.128)			(0.007)	***
LVRG		0.019			-7.539			-6.895	
		(0.792)			(0.651)			(0.521)	
DLVRG		-0.567			158.639			-21.543	
		(0.000)	***		(0.000)	***		(0.207)	
DEMPL		-0.001			0.216			-0.274	
		(0.529)			(0.475)			(0.155)	
ADGPPE		0.023			-1.744			4.501	
		(0.800)			(0.933)			(0.732)	
MBTA		-0.008			-3.350			0.161	
		(0.563)			(0.308)			(0.940)	
DMBTA		0.032			24.422			-3.599	
		(0.083)	*		(0.000)	***		(0.203)	
LOGTS		-0.010			2.342			0.951	
		(0.094)	*		(0.100)			(0.298)	
DSG		0.051			-4.218			1.387	
		(0.000)	***		(0.002)	***		(0.105)	
DCF		-0.097			169.934			33.582	
		(0.273)			(0.000)	***		(0.010)	**
DDWC		0.000			-0.007			-0.058	
		(0.655)			(0.973)			(0.634)	
MULTIYR		-0.045			-0.772			-3.074	
		(0.026)	**		(0.866)			(0.299)	
Adjusted R^2		0.430			0.525			0.168	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 12 (Continued)

Panel B: Residual Income

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 DROP + \beta_3 AFTER{\times}DROP + \beta_4 IndDDepVar_j + \beta_5 LVRG + \beta_6 DLVRG + \beta_7 DEMPL + \beta_8 ADGPPE + \beta_9 MBTA + \beta_{10} DMBTA + \beta_{11} LOGTS + \beta_{12} DSG + \beta_{13} DCF + \beta_{14} DDWC + \beta_{15} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income	
Intercept		18.638	
		(0.889)	
AFTER(β_1)	+	**29.507**	
		(0.234)	
DROP		-30.841	
		(0.448)	
AFTER×DROP (β_3)	-	**6.472**	
		(0.901)	
($\beta_1 + \beta_3$)		**35.979**	
		(0.420)	
IndDDepVar		0.074	
		(0.743)	
LVRG		50.299	
		(0.642)	
DLVRG		-252.744	
		(0.140)	
DEMPL		-14.787	
		(0.000)	***
ADGPPE		-46.240	
		(0.726)	
MBTA		21.456	
		(0.314)	
DMBTA		-15.019	
		(0.592)	
LOGTS		0.076	
		(0.993)	
DSG		0.026	
		(0.998)	
DCF		89.133	
		(0.490)	
DDWC		-0.631	
		(0.607)	
MULTIYR		32.311	
		(0.273)	
Adjusted R^2		0.260	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 13
Incentive Effect after RI Adoption with DROP and PRIOREARN Dummy Variables: Short Term Window Specification

Panel A: Investing Activities

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER \times PRIOREARN + \beta_4 DROP + \beta_5 DROP \times AFTER + \beta_6 DROP \times PRIOREARN + \beta_7 DROP \times AFTER \times PRIOREARN + \beta_8 IndDDepVar_j + \beta_9 LVRG + \beta_{10} DLVRG + \beta_{11} DEMPL + \beta_{12} ADGPPE + \beta_{13} MBTA + \beta_{14} DMBTA + \beta_{15} LOGTS + \beta_{16} DSG + \beta_{17} DCF + \beta_{18} DDWC + \beta_{19} MULTIYR + \Sigma_s \gamma_s \times Year_s + \Sigma_u \eta_u \times SIC_u + \varepsilon_{it}$$

		Net Investment		
	Expected Sign			
Intercept		0.101	(0.398)	
AFTER(β_1)	**+**	**0.076**	**(0.049)**	**
PRIOREARN		0.077	(0.166)	
AFTERxPRIOREARN(β_3)	**-**	**-0.201**	**(0.002)**	***
($\beta_1 + \beta_3$)	**-**	**-0.125**	**(0.008)**	**
DROP		0.049	(0.282)	
DROPxAFTER (β_5)	**-**	**-0.107**	**(0.045)**	**
DROPxPRIOREARN		-0.106	(0.127)	
DROPxAFTERxPRIOREARN(β_7)	**+**	**0.263**	**(0.002)**	***
($\beta_5 + \beta_7$)	**+**	**0.156**	**(0.008)**	***
IndDDepVar		-0.188	(0.540)	
LVRG		-0.011	(0.906)	
DLVRG		0.407	(0.015)	**
DEMPL		0.007	(0.000)	***
ADGPPE		-0.338	(0.004)	***
MBTA		-0.001	(0.957)	
DMBTA		-0.047	(0.088)	*
LOGTS		0.002	(0.860)	
DSG		0.282	(0.000)	***
DCF		-0.137	(0.345)	
DDWC		-0.000	(0.725)	
MULTIYR		0.065	(0.018)	**
Adjusted R^2		0.455		

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 13 (Continued)

Panel B: Residual Income

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER{\times}PRIOREARN + \beta_4 DROP + \beta_5 DROP{\times}AFTER + \beta_6 DROP{\times}PRIOREARN + \beta_7 DROP{\times}AFTER{\times}PRIOREARN + \beta_8 IndDDepVar_j + \beta_9 LVRG + \beta_{10} DLVRG + \beta_{11} DEMPL + \beta_{12} ADGPPE + \beta_{13} MBTA + \beta_{14} DMBTA + \beta_{15} LOGTS + \beta_{16} DSG + \beta_{17} DCF + \beta_{18} DDWC + \beta_{19} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income		
Intercept		-33.626	(0.841)	
AFTER **(β_1)**	+	**40.750**	**(0.260)**	
PRIOREARN		-17.702	(0.817)	
AFTER×PRIOREARN **(β_3)**		**-29.998**	**(0.756)**	
($\beta_1 + \beta_3$)	+	**10.752**	**(0.403)**	
DROP		-20.695	(0.738)	
DROP×AFTER **(β_5)**	-	-52.258	(0.273)	
DROP×PRIOREARN		-25.752	(0.786)	
DROP×AFTER×PRIOREARN **(β_7)**		144.285	(0.254)	
($\beta_5 + \beta_7$)	-	92.027	(0.508)	
IndDDepVar		0.029	(0.909)	
LVRG		88.510	(0.500)	
DLVRG		-379.448	(0.093)	*
DEMPL		-16.968	(0.000)	***
ADGPPE		17.907	(0.910)	
MBTA		21.273	(0.420)	
DMBTA		-52.901	(0.190)	
LOGTS		6.288	(0.592)	
DSG		113.647	(0.074)	**
DCF		-204.136	(0.308)	
DDWC		-0.428	(0.753)	
MULTIYR		38.454	(0.306)	
Adjusted R^2			0.285	

AFTER takes the value of 1 for period after RI adoption; 0 period prior to RI adoption. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0 switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 14

Logistic Regression for Firm Characteristics Affecting the Discontinuation Decision: Model Predicts of Probability of Discontinuing RI

$$DC_i = \alpha_0 + \alpha_1 OWN_i + \alpha_2 LVRG_i + \alpha_3 ADGPPE_i + \alpha_4 MULTIYR_i$$
$$+ \alpha_5 CapInts_i + \alpha_6 CEO_i + \alpha_7 CLIENT_i + \varepsilon_i$$

Panel A: Comparison around RI Adoption

		One Year Prior to RI Adoption			The RI Adoption Year		
	Expected Sign	Coefficient (p-value)			Coefficient (p-value)		
Intercept		0.703	(0.612)		0.371	(0.767)	
OWN_i	+	-0.248	(0.462)[a]		-0.280	(0.312)[a]	
$LVRG_i$	+	0.412	(0.421)		2.123	(0.151)	
$ADGPPE_i$	-	-0.325	(0.444)		0.819	(0.683)[a]	
$MULTIYR_i$	-	-1.073	(0.023)	**	-0.892	(0.032)	**
$CapInts_i$	-	0.288	(0.690)[a]		-0.610	(0.189)	
CEO_i	+	-0.235	(0.707)[a]		-0.786	(0.204)[a]	
$CLIENT_i$	-	-0.442	(0.198)		-0.201	(0.339)	
Chi-square		8.509	(0.290)		9.570	(0.214)	

a. Two-tailed probabilities are reported for these *p*-values. The other probabilities are reported for the one-tailed tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 14 (Continued)

Panel B: Comparison around RI Discontinuation

	Expected Sign	One Year Prior to RI Discontinuation Coefficient (p-value)			The RI Discontinuation Year Coefficient (p-value)		
Intercept		0.773	(0.457)		1.217	(0.243)	
OWN_i	+	-0.116	(0.607)[a]		-0.181	(0.397)[a]	
$LVRG_i$	+	-0.504	(0.740)[a]		-0.506	(0.727)[a]	
$ADGPPE_i$	-	0.059	(0.974)[a]		-1.014	(0.275)	
$MULTIYR_i$	-	-0.640	(0.068)	*	-0.693	(0.054)	*
$CapInts_i$	-	-0.168	(0.389)		0.062	(0.918)[a]	
CEO_i	+	0.198	(0.384)		0.043	(0.472)	
$CLIENT_i$	-	-0.697	(0.049)	**	-0.653	(0.060)	*
Chi-square		8.070	(0.326)		8.916	(0.259)	

Panel C: Comparison around RI Adoption for Continuing Firms, around RI Discontinuation for Discontinuing Firms

	Expected Sign	One Year Prior to RI Adoption / Discontinuation Coefficient (p-value)			The RI Adoption / Discontinuation Year Coefficient (p-value)		
Intercept		0.529	(0.680)		0.095	(0.936)	
OWN_i	+	-0.211	(0.479)[a]		-0.222	(0.402)[a]	
$LVRG_i$	+	2.072	(0.138)		3.333	(0.043)	**
$ADGPPE_i$	-	0.775	(0.723)[a]		1.234	(0.533)[a]	
$MULTIYR_i$	-	-0.722	(0.074)	*	-0.838	(0.038)	**
$CapInts_i$	-	-0.416	(0.275)		-0.869	(0.0995)	*
CEO_i	+	-0.723	(0.246)[a]		-0.506	(0.394)[a]	
$CLIENT_i$	-	-0.598	(0.113)		-0.365	(0.225)	
Chi-square		9.830	(0.198)		11.150	(0.132)	

a. Two-tailed probabilities are reported for these *p*-values. The other probabilities are reported for the one-tailed tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 15

Investment Sensitivity to Investment Opportunity Set after RI Adoption for RI Firms, Switching from Returns/Earnings Sub-samples and Control Firms

Panel A: No *DROP* Dummy Variable

		Switching from Returns		**Switching from Earnings**	
	Expected Sign	**RI Firms**	**Adding Control Firms Dummy Variables**	**RI Firms**	**Adding Control Firms Dummy Variables**
Intercept		0.148 (0.014) **	0.106 (0.127)	0.073 (0.278)	0.119 (0.031) **
$FACIOS_{it}$	+/+	0.147 (0.000) ***	0.092 (0.000) ***	0.059 (0.000) ***	0.058 (0.000) ***
AFTER		0.060 (0.011) **	0.008 (0.448)	-0.013 (0.582)	-0.008 (0.343)
$FACIOS_{it}\times AFTER$	+/?	**0.072 (0.002)** ***	**-0.004 (0.562)**	**-0.002 (0.922)**	**0.014 (0.006)** ***
RI			0.019 (0.837)		-0.056 (0.438)
$RI\times FACIOS_{it}$			0.010 (0.719)		0.005 (0.803)
$RI\times AFTER$			0.038 (0.060) *		-0.024 (0.148)
$RI\times FACIOS_{it}\times AFTER$	/+		**0.115 (0.000)** ***		**-0.021 (0.336)**
$CF_{i,t}$	+/+	-0.053 (0.681)	0.083 (0.000) ***	0.125 (0.127)	0.022 (0.139)
$DWC_{i,t}$	-/-	-0.222 (0.000) ***	-0.062 (0.000) ***	0.016 (0.824)	-0.037 (0.000) ***
$IndNetInv_{j,t}$	+/+	-0.059 (0.611)	0.594 (0.000) ***	0.353 (0.028) **	0.828 (0.000) ***
Adjusted R^2		0.473	0.392	0.262	0.515

The dependent variable is Net $Investment_t$ / $Assets_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. The regressions include year dummy variables and firm fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 15 (Continued)

Panel B: *DROP* Dummy Variable

	Expected Sign	Switching from Returns: RI Firms	Switching from Returns: Adding Control Firms Dummy Variables	Switching from Earnings: RI Firms	Switching from Earnings: Adding Control Firms Dummy Variables
Intercept		0.162 (0.005) ***	0.259 (0.000) ***	0.151 (0.030) **	0.122 (0.028) **
$FACIOS_{it}$	+/+	0.139 (0.000) ***	0.080 (0.000) ***	0.147 (0.000) ***	0.037 (0.000) ***
AFTER		0.088 (0.000) ***	0.005 (0.667)	-0.033 (0.254)	-0.018 (0.107)
$FACIOS_{it}$×AFTER	+/?	**0.138 (0.000)** ***	**-0.001 (0.950)**	**-0.028 (0.343)**	**0.016 (0.053)** *
RI			-0.137 (0.144)		-0.021 (0.772)
$RI×FACIOS_{it}$			0.008 (0.808)		0.098 (0.009) ***
RI×AFTER			0.078 (0.005) ***		-0.031 (0.216)
$RI×FACIOS_{it}$×AFTER	/+		**0.183 (0.000)** ***		**-0.048 (0.218)**
DROP		-0.036 (0.560)	-0.150 (0.089) *	-0.023 (0.710)	-0.004 (0.960)
$DROP×FACIOS_{it}$		-0.004 (0.912)	0.022 (0.024) **	-0.130 (0.000) ***	0.032 (0.000) ***
DROP×AFTER		-0.079 (0.002) ***	0.008 (0.483)	0.053 (0.048) **	0.015 (0.165)
$DROP×FACIOS_{it}$×AFTER		**-0.187 (0.000)** ***	**0.003 (0.834)**	**0.044 (0.214)**	**0.005 (0.662)**
DROP×RI			0.115 (0.390)		0.002 (0.984)
$DROP×RI×FACIOS_{it}$			0.008 (0.883)		-0.141 (0.002) ***
DROP×RI×AFTER			-0.100 (0.014) **		0.024 (0.475)
$DROP×RI×FACIOS_{it}$×AFTER	/-		**-0.223 (0.001)** ***		**0.035 (0.458)**
$CF_{i,t}$	+	-0.129 (0.142)	0.076 (0.000) ***	0.067 (0.264)	0.017 (0.196)
$DWC_{i,t}$	-	-0.208 (0.000) ***	-0.063 (0.000) ***	-0.034 (0.317)	-0.039 (0.000) ***
$IndNetInv_{j,t}$	+	-0.027 (0.806)	0.597 (0.000) ***	0.328 (0.033) **	0.808 (0.000) ***
Adjusted R^2		0.541	0.396	0.316	0.521

The dependent variable is Net $Investment_t$ / $Assets_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0 non-RI adopting firms. ***Drop*** takes the value of 1 for discontinuing firms; 0 continuing firms. The regressions include year dummy variables and firm fixed effects. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 16

Robustness Checks on Investment Sensitivity to Investment Opportunity Set after RI Adoption without Involuntarily Discontinuing Firms

Panel A: RI Sample and Control Firm Dummy Variables

	Expected Sign	**RI Firms**		**Expected Sigh**	**Adding Control Firms Dummy Variables**	
Intercet		0.037 (0.543)			0.107 (0.077)	*
$FACIOS_{it}$	+	0.189 (0.000)	***	+	0.087 (0.000)	***
$FACIOS_{it} \times AFTER$	+	**-0.010 (0.520)**			**0.004 (0.344)**	
$RI \times FACIOS_{it} \times AFTER$				+	**-0.005 (0.792)**	
Adjusted R^2		0.413			0.403	

The dependent variable is Net $Investment_t$ / $Assets_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. The regressions include year dummy variables and firm fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 5 are run with the models and they show similar signs and magnitudes as reported in Table 5. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 16 (Continued)

Panel B: RI Sample with Continuing / Discontinuing Dummy Variables and Control Firm Dummy Variables

	Expected Sign	RI Firms with Drop Dummy Variables		Expected Sigh	Adding Control Firms Dummy Variables	
Intercet		0.072 (0.272)			0.040 (0.505)	
$FACIOS_{it}$	+	0.156 (0.000)	***	+	0.075 (0.000)	***
$FACIOS_{it}$×AFTER	+	**0.058 (0.007)**	***		**-0.001 (0.819)**	
RI×$FACIOS_{it}$×AFTER				+	**0.082 (0.000)**	***
DROP×$FACIOS_{it}$×AFTER	-	**-0.148 (0.000)**	***		**0.017 (0.040)**	**
DROP×RI×$FACIOS_{it}$ ×AFTER				-	**-0.185 (0.000)**	***
Adjusted R^2		0.442			0.408	

The dependent variable is Net $Investment_t$ / $Assets_{t-1}$. ***RI*** takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and firm fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 5 are run with the models and they show similar signs and magnitudes as reported in Table 5. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 17
Robustness Checks on Incentive Effect after RI Adoption without Involuntarily Discontinuing Firms: Long Term Window Specification

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 DROP + \beta_3 RI{\times}DROP + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

Panel A: Operating Activities with *DROP* Dummy

	Dependent Variables								
	Asset Turnover			Cash Conversion Cycle			OMBD per Employee		
	Expected Sign			Expected Sign			Expected Sign		
Intercept		-0.111			0.803			-18.854	
		(0.050)	*		(0.939)			(0.231)	
RI(β_1)	+	**-0.003**		-	**-9.923**		+	**42.084**	
		(0.950)			**(0.126)**			**(0.001)**	***
RI×DROP(β_3)	-	**0.023**		+	**0.384**		-	**-55.046**	
		(0.718)			**(0.487)**			**(0.002)**	***
(β_1 + β_3)		**0.020**			**-9.539**			**-12.962**	
		(0.658)			**(0.2558)**			**(0.305)**	
Adjusted R^2		0.085			0.024			0.061	

Panel B: Residual Income with *DROP* Dummy

		Residual Income	
	Expected Sign		
Intercept		-30.315	
		(0.047)	**
RI(β_1)	+	**22.925**	
		(0.034)	**
RI×DROP(β_3)	-	**-22.471**	
		(0.096)	*
(β_1 + β_3)		**0.454**	
		(0.970)	
Adjusted R^2		0.039	

RI takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 8 are run with the models and they show similar signs and magnitudes as reported in Table 8. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 17 (Continued)

Panel C: Investing Activities with *PRIOREARN* and *DROP* dummies

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI\times PRIOREARN + \beta_4 DROP + \beta_5 DROP\times RI + \beta_6 DROP\times PRIOREARN + \beta_7 DROP\times RI\times PRIOREARN + \beta_8 LOGTA_{t-1} + \beta_9 DLVRG + \beta_{10} DEMPL + \beta_{11} DADGPPE + \beta_{12} DMBTA + \beta_{13} DSG + \beta_{14} DCF + \beta_{15} DDWC + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables							
	Sales of PPE		New Investment			Net Investment		
	Expected Sign		Expected Sign			Expected Sign		
Intercept		-0.002		-0.052			-0.050	
		(0.566)		(0.081)	*		(0.091)	*
***RI*(β_1)**	-	**0.000**	+	**0.037**		+	**0.038**	
		(0.968)		**(0.091)**	*		**(0.089)**	*
***RI×PRIOREARN*(β_3)**	+	**0.002**	-	**-0.065**		-	**-0.067**	
		(0.375)		**(0.059)**	*		**(0.054)**	*
(β_1 + β_3)	+	**0.002**	-	**-0.028**		-	**-0.029**	
		(0.324)		**(0.191)**			**(0.178)**	
***DROP×RI* (β_5)**	+	**-0.003**	-	**-0.025**		-	**-0.023**	
		(0.559)		**(0.260)**			**(0.278)**	
***DROP×RI×PRIOREARN*(β_7)**	-	**0.000**	+	**0.072**		+	**0.071**	
		(0.997)		**(0.112)**			**(0.114)**	
(β_5 + β_7)	-	**-0.003**	+	**0.046**		+	**0.048**	
		(0.317)		**(0.145)**			**(0.136)**	
Adjusted R^2		0.012		0.174			0.178	

RI takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 9 are run with the models and they show similar signs and magnitudes as reported in Table 9. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 17 (Continued)

Panel D: Residual Income with *PRIOREARN* and *DROP* Dummies

	Residual Income	
	Expected Sign	
Intercept		-24.335
		(0.238)
RI(β_1)	+	**23.023**
		(0.119)
RI×PRIOREARN(β_3)		**-7.601**
		(0.397)
(β_1 + β_3)	+	**15.422**
		(0.243)
DROP×RI (β_5)	-	**-21.999**
		(0.212)
DROP×RI×PRIOREARN(β_7)		**9.235**
		(0.822)
(β_5 + β_7)	-	**-12.764**
		(0.338)
Adjusted R^2		0.027

RI takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 9 are run with the models and they show similar signs and magnitudes as reported in Table 9. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 18
Robustness Checks on Incentive Effect after RI Adoption without Involuntarily Discontinuing Firms: Short Term Window Specification

Panel A: Operating Activities

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 DROP + \beta_3 AFTER{\times}DROP + \beta_4 IndDDepVar_j + \beta_5 LVRG + \beta_6 DLVRG + \beta_7 DEMPL + \beta_8 ADGPPE + \beta_9 MBTA + \beta_{10} DMBTA + \beta_{11} LOGTS + \beta_{12} DSG + \beta_{13} DCF + \beta_{14} DDWC + \beta_{15} MULTIYR + \textstyle\sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Dependent Variables						
	Asset Turnover		Cash Conversion Cycle		OMBD per Employee		
	Expected Sign		Expected Sign		Expected Sign		
Intercept		-0.087		-32.502		2.162	
		(0.372)		(0.168)		(0.887)	
AFTER(β_1)	+	**0.014**	-	**-3.629**	+	**7.649**	
		(0.325)		**(0.308)**		**(0.044)**	**
AFTER×DROP(β_3)	-	**-0.010**	+	**0.130**	-	**-8.168**	
		(0.403)		**(0.495)**		**(0.087)**	*
(β_1 + β_3)		**0.004**		**-3.499**		**-0.519**	
		(0.893)		**(0.763)**		**(0.231)**	
Adjusted R^2		0.476		0.581		0.182	

Panel B: Residual Income

	Expected Sign	Residual Income
Intercept		-45.181
		(0.782)
AFTER(β_1)	+	**44.170**
		(0.181)
AFTER×DROP (β_3)	-	**9.786**
		(0.880)
(β_1 + β_3)		**53.956**
		(0.304)
Adjusted R^2		0.280

AFTER takes the value of 1 for periods after RI adoption; 0, prior to RI adoption. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 12 are run with the models and they show similar signs and magnitudes as reported in Table 12. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 18 (Continued)

Panel C: Investing Activities with *PRIOREARN* and *DROP* Dummies

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER \times PRIOREARN + \beta_4 DROP + \beta_5 DROP \times AFTER + \beta_6 DROP \times PRIOREARN + \beta_7 DROP \times AFTER \times PRIOREARN + \beta_8 IndDDepVar_j + \beta_9 LVRG + \beta_{10} DLVRG + \beta_{11} DEMPL + \beta_{12} ADGPPE + \beta_{13} MBTA + \beta_{14} DMBTA + \beta_{15} LOGTS + \beta_{16} DSG + \beta_{17} DCF + \beta_{18} DDWC + \beta_{19} MULTIYR + \Sigma_s \gamma_s \times Year_s + \Sigma_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Net Investment	
Intercept		0.133	
		(0.300)	
***AFTER*(β_1)**	+	**0.068**	
		(0.073)	*
***AFTER×PRIOREARN*(β_3)**	-	**-0.181**	
		(0.006)	***
(β_1 + β_3)	-	**-0.113**	
		(0.019)	**
***DROP×AFTER* (β_5)**	-	**-0.099**	
		(0.073)	*
***DROP×AFTER×PRIOREARN*(β_7)**	+	**0.220**	
		(0.015)	**
(β_5 + β_7)	+	**0.121**	
		(0.046)	**
Adjusted R^2		0.540	

AFTER takes the value of 1 for periods after RI adoption; 0, prior to RI adoption. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 13 are run with the models and they show similar signs and magnitudes as reported in Table 13. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 18 (Continued)

Panel D: Residual Income

$$DResInc = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER{\times}PRIOREARN + \beta_4 DROP + \beta_5 DROP{\times}AFTER + \beta_6 DROP{\times}PRIOREARN + \beta_7 DROP{\times}AFTER{\times}PRIOREARN + \beta_8 IndDResInc_j + \beta_9 LVRG + \beta_{10} DLVRG + \beta_{11} DEMPL + \beta_{12} ADGPPE + \beta_{13} MBTA + \beta_{14} DMBTA + \beta_{15} LOGTS + \beta_{16} DSG + \beta_{17} DCF + \beta_{18} DDWC + \beta_{19} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

	Expected Sign	Residual Income
Intercept		-62.126
		(0.753)
AFTER(β_1)	+	**42.889**
		(0.268)
AFTER×PRIOREARN (β_3)		**-23.804**
		(0.822)
($\beta_1 + \beta_3$)	+	**19.085**
		(0.806)
DROP×AFTER (β_5)	-	-80.922
		(0.213)
DROP×AFTER×PRIOREARN (β_7)		236.948
		(0.115)
($\beta_5 + \beta_7$)	-	156.026
		(0.271)
Adjusted R^2		0.314

AFTER takes the value of 1 for periods after RI adoption; 0, prior to RI adoption. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. ***DROP*** takes the value of 1 for discontinuing firms; 0, continuing firms. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 13 are run with the models and they show similar signs and magnitudes as reported in Table 13. *P*-values are reported in parentheses. One-tailed probabilities are reported for tests of directional expectations, and two-tailed probabilities for other tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 19
Robustness Checks on Logistic Regression for Firm Characteristics Affecting the Discontinuation Decision without Involuntarily Discontinuing Firms: Model Predicts of Probability of Discontinuing RI

$$DC_i = \alpha_0 + \alpha_1 OWN_i + \alpha_2 LVRG_i + \alpha_3 ADGPPE_i + \alpha_4 MULTIYR_i + \alpha_5 CapInts_i + \alpha_6 CEO_i + \alpha_7 CLIENT_i + \varepsilon_i$$

Panel A: Comparison around RI Adoption

		One Year Prior to RI Adoption			The RI Adoption Year	
	Expected Sign	Coefficient	(p-value)		Coefficient	(p-value)
Intercept		1.363	(0.385)		0.867	(0.535)
OWN_i	+	-0.999	(0.184) [a]		-0.401	(0.268) [a]
$LVRG_i$	+	-2.169	(0.391) [a]		-1.460	(0.561) [a]
$ADGPPE_i$	-	-2.044	(0.228)		-0.910	(0.348)
$MULTIYR_i$	-	-0.978	(0.070)	*	-0.694	(0.103)
$CapInts_i$	-	1.028	(0.227) [a]		0.554	(0.492) [a]
CEO_i	+	-0.006	(0.768) [a]		-0.122	(0.852) [a]
$CLIENT_i$	-	-0.723	(0.136)		-0.457	(0.210)
Chi-square		10.762	(0.149)		6.287	(0.507)

a. Two-tailed probabilities are reported for these *p*-values. The other probabilities are reported for the one-tailed tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 19 (Continued)

Panel B: Comparison around RI Discontinuation

	Expected Sign	One Year Prior to RI Discontinuation Coefficient (p-value)			The RI Discontinuation Year Coefficient (p-value)		
Intercept		0.939	(0.439)		0.544	(0.641)	
OWN_i	+	-0.345	(0.533) [a]		-0.181	(0.482) [a]	
$LVRG_i$	+	-1.657	(0.363) [a]		-0.797	(0.633) [a]	
$ADGPPE_i$	-	-1.289	(0.272)		-1.214	(0.267)	
$MULTIYR_i$	-	-0.538	(0.151)		-0.442	(0.1863)	
$CapInts_i$	-	0.456	(0.512) [a]		0.793	0.249) [a]	
CEO_i	+	0.205	(0.393)		0.298	(0.330)	
$CLIENT_i$	-	-0.832	(0.055)	*	-0.969	(0.028)	**
Chi-square		8.016	(0.331)		9.20	(0.239)	

Panel C: Comparison around RI Adoption for Continuing Firms, around RI Discontinuation for Discontinuing Firms

	Expected Sign	One Year Prior to RI Adoption / Discontinuation Coefficient (p-value)			The RI Adoption / Discontinuation Year Coefficient (p-value)		
Intercept		0.308	(0.827)		-0.420	(0.760)	
OWN_i	+	-0.380	(0.367) [a]		-0.218	(0.472) [a]	
$LVRG_i$	+	0.506	(0.409)		2.527	(0.129)	
$ADGPPE_i$	-	0.357	(0.884) [a]		1.098	(0.633) [a]	
$MULTIYR_i$	-	-0.742	(0.104)		-0.717	(0.093)	*
$CapInts_i$	-	0.253	(0.743) [a]		-0.229	(0.376)	
CEO_i	+	-0.525	(0.478) [a]		-0.191	(0.778) [a]	
$CLIENT_i$	-	-0.666	(0.131)		-0.483	(0.204)	
Chi-square		8.306	(0.306)		7.686	(0.361)	

a. Two-tailed probabilities are reported for these *p*-values. The other probabilities are reported for the one-tailed tests. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 20
Investment Sensitivity to Investment Opportunity Set after RI Discontinuation

Panel A: Post-RI Discontinuation vs. Post-RI Adoption

	RI Firms		Adding Control Firms Dummy Variables	
Intercet	0.039		0.162	
	(0.916)		(0.049)	**
FACIOS$_{it}$	0.073		0.118	
	(0.000)	***	(0.000)	***
FACIOS$_{it}$***×AFTER***	**0.055**		**-0.016**	
	(0.002)	***	**(0.016)**	**
RI ×FACIOS ×AFTER			**0.074**	
			(0.021)	**
Adjusted R^2	0.420		0.415	

Panel B: Post-RI Discontinuation vs. Pre-RI Adoption

	RI Firms		Adding Control Firms Dummy Variables	
Intercet	-0.015		0.088	
	(0.830)		(0.236)	
FACIOS$_{it}$	0.167		0.106	
	(0.000)	***	(0.000)	***
FACIOS$_{it}$***×AFTER***	**-0.014**		**-0.010**	
	(0.482)		**(0.134)**	
RI ×FACIOS ×AFTER			**0.001**	
			(0.976)	
Adjusted R^2	0.534		0.429	

The dependent variable is Net Investment$_t$ / Assets$_{t-1}$. ***AFTER*** takes the value of 1 for period of 3 years after RI discontinuation in both Panels; 0, for period of 3 years after RI adoption in Panel A and for period of 3 years prior to RI adoption in Panel B. The regressions include year dummy variables and firm fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 5 are run with the models. *P*-values are reported in parentheses. Two-tailed probabilities are reported for all tests, since there is no a prior expectation of the coefficient directions. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 21
Effect after RI Discontinuation: Long Term Window Specification

$$DDepVar = \beta_0 + \beta_1 RI + \beta_2 PRIOREARN + \beta_3 RI{\times}PRIOREARN + \beta_4 LOGTA_{t-1} + \beta_5 DLVRG + \beta_6 DEMPL + \beta_7 DADGPPE + \beta_8 DMBTA + \beta_9 DSG + \beta_{10} DCF + \beta_{11} DDWC + \textstyle\sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

Panel A: Post-RI Discontinuation vs. Post-RI Adoption

	Dependent Variables			
	Net Investment	OMBD per Employee	Residual Income	
Intercept	-0.043	-33.602	39.501	32.401
	(0.143)	(0.004) ***	(0.018) **	(0.1260
RI(β_1)	**0.025**	**-17.132**	**0.103**	**22.035**
	(0.466)	**(0.079)** *	**(0.994)**	**(0.374)**
RI×PRIOREARN(β_3)	**-0.014**			**-42.114**
	(0.772)			**(0.228)**
(β_1 + β_3)	**0.011**			**-20.114**
	(0.755)			**(0.431)**
Adjusted R^2	0.099	0.069	0.039	0.058

Panel B: Post-RI Discontinuation vs. Pre-RI Adoption

	Dependent Variables			
	Net Investment	OMBD per Employee	Residual Income	
Intercept	-0.029	-24.713	8.410	5.587
	(0.338)	(0.184)	(0.697)	(0.832)
RI(β_1)	**-0.004**	**-34.511**	**8.200**	**3.958**
	(0.898)	**(0.013)** **	**(0.611)**	**(0.883)**
RI×PRIOREARN(β_3)	**0.007**			**14.119**
	(0.875)			**(0.709)**
(β_1 + β_3)	**0.003**			**18.077**
	(0.928)			**(0.514)**
Adjusted R^2	0.124	0.130	0.090	0.096

RI takes the value of 1 for RI adopting firms; 0, non-RI adopting firms. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 6 and 7 are run with the models. *P*-values are reported in parentheses. Two-tailed probabilities are reported for all tests, since there is no a prior expectation of the coefficient directions. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

TABLE 22
Effect after RI Discontinuation: Short Term Window Specification

$$DDepVar = \beta_0 + \beta_1 AFTER + \beta_2 PRIOREARN + \beta_3 AFTER{\times}PRIOREARN + \beta_4 DROP + \beta_5 DROP{\times}AFTER + \beta_6 DROP{\times}PRIOREARN + \beta_7 DROP{\times}AFTER{\times}PRIOREARN + \beta_8 IndDDepVar_j + \beta_9 LVRG + \beta_{10} DLVRG + \beta_{11} DEMPL + \beta_{12} ADGPPE + \beta_{13} MBTA + \beta_{14} DMBTA + \beta_{15} LOGTS + \beta_{16} DSG + \beta_{17} DCF + \beta_{18} DDWC + \beta_{19} MULTIYR + \sum_s \gamma_s \times Year_s + \sum_u \eta_u \times SIC_u + \varepsilon_{it}$$

Panel A: Post-RI Discontinuation vs. Post-RI Adoption

	Dependent Variables					
	Net Investment	OMBD per Employee	Residual Income			
Intercept	-0.044	-16.908	-546.227		-852.433	
	(0.723)	(0.285)	(0.048)	**	(0.033)	**
AFTER(β_1)	**0.020**	**1.362**	**-93.403**		**10.636**	
	(0.644)	**(0.730)**	**(0.182)**		**(0.936)**	
AFTER ×PRIOREARN(β_3)	**-0.049**				**-161.018**	
	(0.362)				**(0.320)**	
($\beta_1 + \beta_3$)	**-0.029**				**-150.382**	
	(0.643)				**(0.466)**	
Adjusted R^2	0.397	0.328	0.270		0.352	

Panel B: Post-RI Discontinuation vs. Pre-RI Adoption

	Dependent Variables				
	Net Investment		OMBD per Employee	Residual Income	
Intercept	0.251		-23.272	215.732	37.661
	(0.038)	**	(0.634)	(0.356)	(0.906)
AFTER(β_1)	**-0.025**		**-10.297**	**26.768**	**54.727**
	(0.520)		**(0.412)**	**(0.655)**	**(0.601)**
AFTER ×PRIOREARN(β_3)	**-0.018**				**14.856**
	(0.731)				**(0.916)**
($\beta_1 + \beta_3$)	**-0.043**				**69.583**
	(0.440)				**(0.692)**
Adjusted R^2	0.560		0.502	0.453	0.583

AFTER takes the value of 1 for period of 1 year after RI discontinuation in both Panels; 0, for period of 1 year after RI adoption in Panel A and for period of 1 year prior to RI adoption in Panel B. ***PRIOREARN*** takes the value of 1 for RI firms switching from Earnings; 0, switching from Returns. The regressions include year dummy variables and industry fixed effects. Although the coefficients are not reported here, all other variables appearing in Table 10 and 11 are run with the models. *P*-values are reported in parentheses. Two-tailed probabilities are reported for all tests, since there is no a prior expectation of the coefficient directions. *, **, *** indicate significant coefficients at the 10 %, 5 %, and 1 % levels, respectively. For variables description and measurements, refer to Appendix D.

FIGURE 1
The RI Adoption and Discontinuation Events Timeline with an RI Adopting Firm with Three Years of Adoption

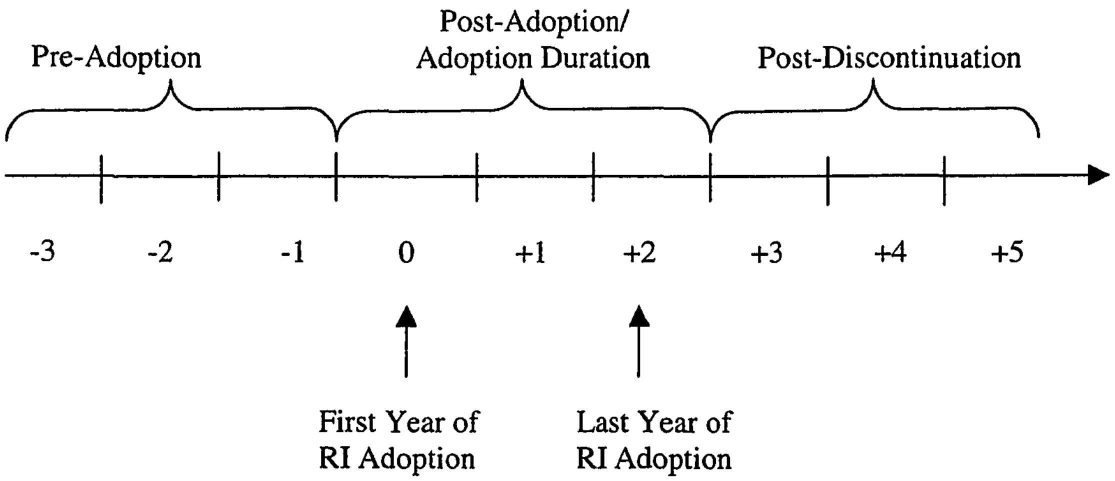
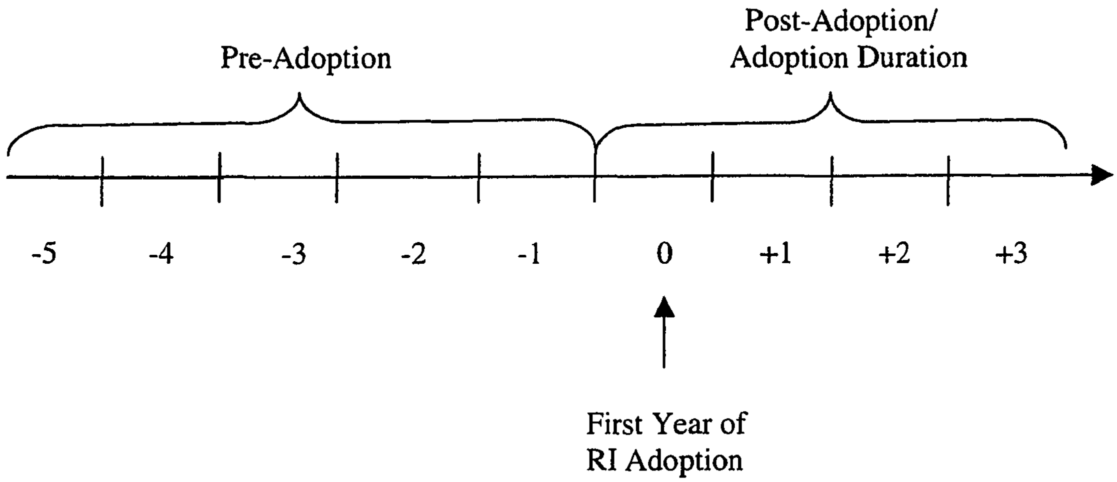
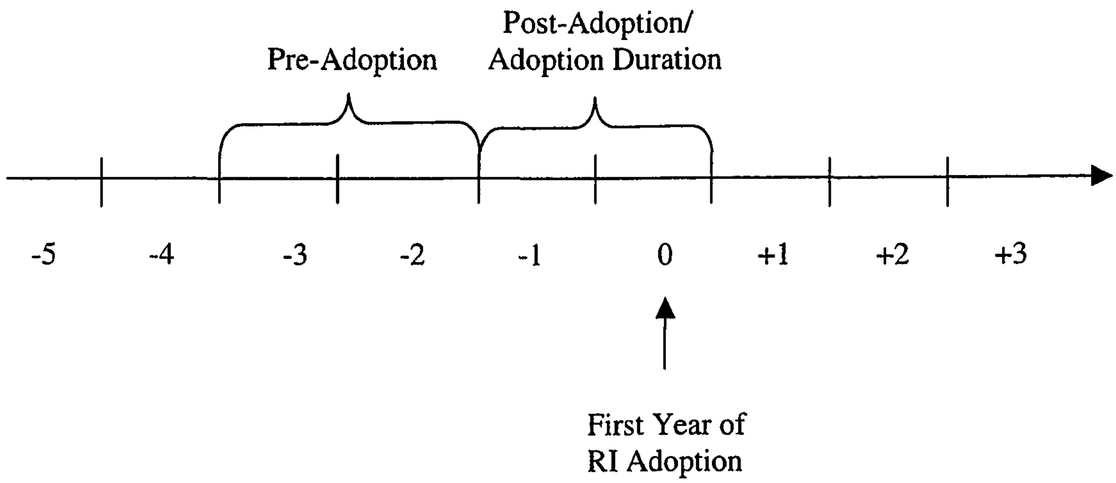


FIGURE 2
Variable Measurement Timeline for Long Term Window Specification



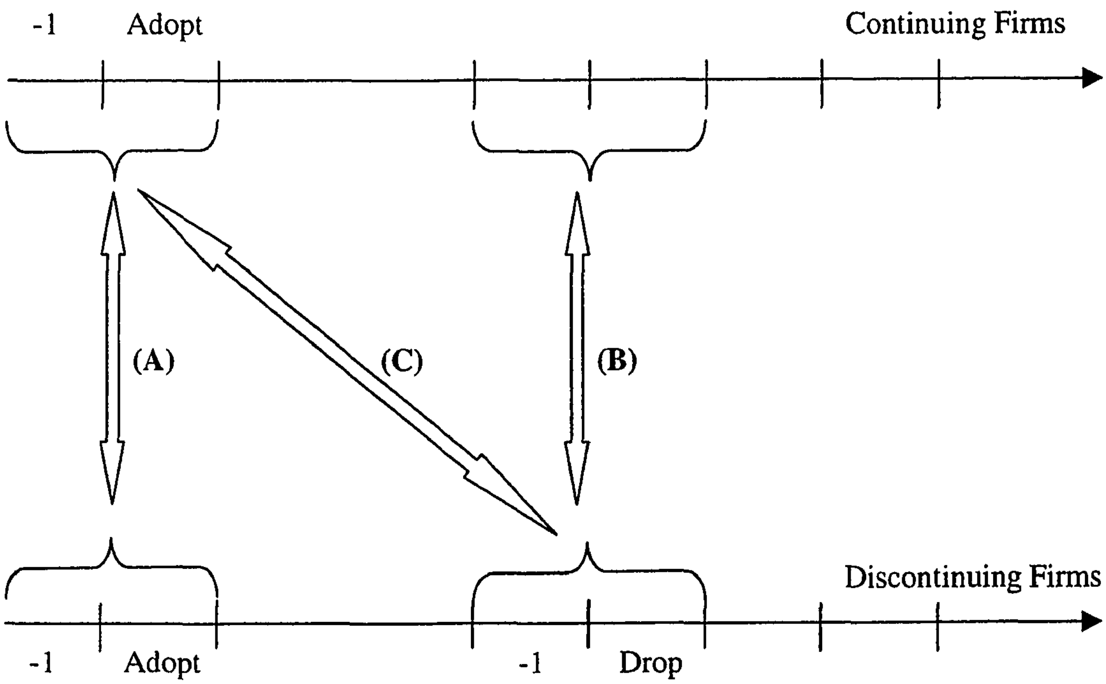
In Wallace (1997) model, pre-adoption period is defined as from year –5 to year –1, and post-adoption period is defined as from year 0 to year +3, where the duration of adoption is at least 4 years. In the shorter duration of adoption, such as the firm illustrated in Figure 1, the post-adoption period is from year 0 to the last year of adoption.

FIGURE 3
Variable Measurement Timeline for Short Term Window Specification



In Balachandran (2003) model, pre-adoption period is defined as from year –3 to year –2, and post-adoption period is defined as from year –1 to year 0.

FIGURE 4
Variable Measurement Timeline for Comparison between Continuing Firms and Discontinuing Firms



Comparison (A): between one year prior to and the year of RI adoption for both groups.
Comparison (B): between one year prior to and the year of RI discontinuation for discontinuing firms and the corresponding duration time period of continuing firms
Comparison (C): between one year prior to and the year of RI adoption for continuing firms and one year prior to and the year of RI discontinuation for discontinuing firms.

APPENDICES

Appendix A List of RI firms

Year of Adoption	SIC	Ticker Symbol	Company Name
1986	2600	GP	GEORGIA-PACIFIC GROUP
1987	3559	MZ	MILACRON INC
1989	4931	AES1	CILCORP INC
1990	3490	CR	CRANE CO
1991	2040	OAT	QUAKER OATS CO
1991	3510	BGG	BRIGGS & STRATTON
1991	3564	DCI	DONALDSON CO INC
1992	1311	COG	CABOT OIL & GAS CORP
1992	2820	WLM	WELLMAN INC
1992	2870	VGR.	VIGORO CORP
1992	3411	BLL	BALL CORP
1993	2621	SPP.1	SCOTT PAPER CO
1993	2721	CDMS	CADMUS COMMUNICATIONS CORP
1993	2834	SHR.1	SCHERER (R P)/DE
1993	3050	FCY	FURON CO
1993	3350	JAH	JARDEN CORP (ALLTRISTA CORP)
1993	3532	JOYG	JOY GLOBAL INC
1993	3690	DUR.	DURACELL INTERNATIONAL
1993	3714	ATU	ACTUANT CORP (Applied Power)
1993	3714	3HLMMQ	HAYES LEMMERZ INTL INC
1993	3714	VAT	VARITY CORP
1993	4011	CSX	CSX CORP
1993	4213	AFWY	AMERICAN FREIGHTWAYS CORP
1993	4813	T	AT&T CORP
1993	5000	GWW	GRAINGER (W W) INC
1994	2080	KO	COCA-COLA CO
1994	2590	9895B	KINETIC CONCEPTS INC
1994	2821	EMN	EASTMAN CHEMICAL CO
1994	2835	ISTR	INCSTAR CORP
1994	2835	MURXF	INTL MUREX TECH CORP
1994	2860	LYO	LYONDELL CHEMICAL CO
1994	3021	3LAGR	L A GEAR INC
1994	3312	ATI	TELEDYNE INC
1994	3360	MATW	MATTHEWS INTL CORP
1994	3530	MTW	MANITOWOC CO
1994	3541	GLE.1	GLEASON CORP
1994	3580	PMI.1	PREMARK INTERNATIONAL INC
1994	3714	TEN	TENNECO AUTOMOTIVE INC

Appendix A List of RI firms (Continued)

Year of Adoption	SIC	Ticker Symbol	Company Name
1994	3823	UNII.	UNIT INSTRUMENTS INC
1994	3826	BEC	BECKMAN COULTER INC
1994	4400	TUG	MARITRANS INC
1994	5912	RXR	REVCO D.S. INC
1995	1311	PZE	PENNZENERGY CO
1995	2761	WCS	WALLACE COMPUTER SVCS INC
1995	2810	KLU1	KAISER ALUMINUM & CHEMICAL
1995	2810	3KLUCQ	KAISER ALUMINUM CORP
1995	2834	LLY	LILLY (ELI) & CO
1995	2870	GRO	MISSISSIPPI CHEMICAL CORP
1995	3060	GY	GENCORP INC
1995	3089	ACK	ARMSTRONG HOLDINGS INC
1995	3310	3IIIN	INSTEEL INDUSTRIES
1995	3490	CRI	CORE INDUSTRIES INC
1995	3571	SQNT	SEQUENT COMPUTER SYSTEMS INC
1995	3621	APR	AMERICAN PRECISION INDS
1995	3678	AMP	AMP INC
1995	3751	HUF	HUFFY CORP
1995	3826	PKI	PERKINELMER INC
1995	3841	GDT	GUIDANT CORP
1995	4213	KLLM	KLLM TRANSPORT SERVICES INC
1995	4812	PCS	SPRINT Wireless
1995	4813	FON	SPRINT Long-Distance
1995	4931	ILA	UTILICORP UNITED INC (Aquila Inc)
1995	5045	3ICOP	INACOM CORP
1995	5110	BCC	BOISE CASCADE CORP
1995	5110	BOP	BOISE CASCADE OFFICE PDS CP
1995	5141	FLM	FLEMING COMPANIES INC
1995	5141	PFGC	PERFORMANCE FOOD GROUP CO
1995	5331	TGT	TARGET CORP
1996	1400	CZM.	CALMAT CO
1996	2090	MKC	MCCORMICK & CO
1996	2711	KRI	KNIGHT-RIDDER INC
1996	2750	DNY	DONNELLEY (R R) & SONS CO
1996	2750	WRC.2	WORLD COLOR PRESS INC
1996	2820	ZOLT	ZOLTEK COS INC
1996	2911	MUR	MURPHY OIL CORP
1996	2911	KSF	QUAKER STATE CORP
1996	2911	MRO	USX Marathon Oil Group
1996	3089	TUP	TUPPERWARE CORP

Appendix A List of RI firms (Continued)

Year of Adoption	SIC	Ticker Symbol	Company Name
1996	3140	KSWS	K-SWISS INC
1996	3220	LBY	LIBBEY INC
1996	3312	X	USX Steel Group
1996	3350	OLN	OLIN CORP
1996	3490	WTS	WATTS INDUSTRIES
1996	3540	3FNSTE	FANSTEEL INC/DE
1996	3564	CLC	CLARCOR INC
1996	3578	VFI	VERIFONE INC
1996	3612	SPW	SPX CORP
1996	3679	AATT	AAVID THERMAL TECHNOLOGIES
1996	3714	STRT	STRATTEC SECURITY CORP
1996	3822	HON.Z	HONEYWELL INC
1996	3823	DHR	DANAHER CORP
1996	3825	TEK	TEKTRONIX INC
1996	3826	HACH	HACH CO
1996	3861	3PRDQE	POLAROID CORP
1996	4911	D	DOMINION RESOURCES INC
1996	4911	GXP	KANSAS CITY POWER & LIGHT (Great Plains Energy Inc)
1996	4911	9989B	PACIFICORP
1997	1311	UTH.	UNION TEXAS PETRO HLDGS INC
1997	1531	PHM	PULTE HOMES INC
1997	2085	BF.B	BROWN-FORMAN -CL B
1997	2520	KBALB	KIMBALL INTERNATIONAL -CL B
1997	2520	MLHR	MILLER (HERMAN) INC
1997	2670	AVY	AVERY DENNISON CORP
1997	2834	BOL	BAUSCH & LOMB INC
1997	2834	PHA	MONSANTO CO (Pharmacia corp)
1997	3089	RBD	RUBBERMAID INC
1997	3480	PRMX	PRIMEX TECHNOLOGIES INC
1997	3523	CSE	CASE CORP
1997	3561	ITT	ITT INDUSTRIES INC
1997	3612	MAG	MAGNETEK INC
1997	3630	WHR	WHIRLPOOL CORP
1997	3661	ADCT	ADC TELECOMMUNICATIONS INC
1997	3825	DATM	DATUM INC
1997	3841	BDX	BECTON DICKINSON & CO
1997	3861	ULTK	ULTRAK INC
1997	3861	XRIT	X-RITE INC
1997	4213	AHI	ALLIED HOLDINGS INC
1997	4911	ETR	ENTERGY CORP

Appendix A List of RI firms (Continued)

Year of Adoption	SIC	Ticker Symbol	Company Name
1997	4931	ENA	ENOVA CORP
1997	4950	ALW	ALLWASTE INC
1997	4953	WMI	WASTE MANAGEMENT INC
1997	4955	3SKLNQ	SAFETY-KLEEN CORP
1997	5072	SST	SHELTER COMPONENTS CORP
1997	5090	JOUT	JOHNSON OUTDOORS INC
1998	1381	NE	NOBLE DRILLING CORP
1998	2060	HSY	HERSHEY FOODS CORP
1998	2522	SCS	STEELCASE INC
1998	2540	KNAP	KNAPE & VOGT MFG CO
1998	2631	CSAR	CARAUSTAR INDUSTRIES INC
1998	2810	MCH	MILLENNIUM CHEMICALS INC
1998	2890	GLK	GREAT LAKES CHEMICAL CORP
1998	3250	DTL	DAL-TILE INTERNATIONAL INC
1998	3334	RLM	REYNOLDS METALS CO
1998	3530	CMCO	COLUMBUS MCKINNON CORP
1998	3533	VRC	VARCO INTERNATIONAL INC
1998	3555	BLD	BALDWIN TECHNOLOGY
1998	3561	FLS	FLOWSERVE CORP
1998	3580	TNC	TENNANT CO
1998	3585	HSM	HUSSMANN INTERNATIONAL INC
1998	3690	SMP	STANDARD MOTOR PRODS
1998	3714	3FDMLQ	FEDERAL-MOGUL CORP
1998	3743	MPO	MOTIVEPOWER INDUSTRIES INC
1998	3861	EK	EASTMAN KODAK CO
1998	4931	MTP	MONTANA POWER CO
1998	4931	NMK	NIAGARA MOHAWK HOLDINGS INC
1998	5140	IMC	INTL MULTIFOODS CORP
1998	5211	WLHN	WOLOHAN LUMBER CO
1998	5311	JCP	PENNEY (J C) CO
1998	5945	TOY	TOYS R US INC
1999	1311	NEV	NUEVO ENERGY CO
1999	2030	BFO	BESTFOODS
1999	2273	SHX	SHAW INDUSTRIES INC
1999	2800	ARJ	ARCH CHEMICALS INC
1999	3310	CLQ	COLD METAL PRODUCTS INC
1999	3310	WOR	WORTHINGTON INDUSTRIES
1999	3470	MSC	MATERIAL SCIENCES CORP
1999	3570	HPQ	HEWLETT-PACKARD CO
1999	3585	SEC	SPECIALTY EQUIPMENT COS INC

Appendix A List of RI firms (Continued)

Year of Adoption	SIC	Ticker Symbol	Company Name
1999	3663	3ADAPQ	ADAPTIVE BROADBAND CORP
1999	3679	TNL	TECHNITROL INC
1999	3743	TRN	TRINITY INDUSTRIES
1999	4924	EWST	ENERGY WEST INC
1999	5031	HBP	HUTTIG BLDG PRODS INC
1999	5661	GCO	GENESCO INC
2000	1700	MTRX	MATRIX SERVICE CO
2000	2670	LDL	LYDALL INC
2000	3823	SMTR	SMARTIRE SYSTEMS INC
2000	5411	WFMI	WHOLE FOODS MARKET INC
2000	5731	BBY	BEST BUY CO INC

Appendix B Control Sample Distribution by SIC and Adoption Year

Panel A: Randomly Assigned Control Firms

SIC	Adoption YEAR	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
1311	1992	187	3.01	187	3.01
1311	1995	187	3.01	374	6.02
1311	1997	186	3.00	560	9.02
1311	1999	187	3.01	747	12.03
1381	1998	71	1.14	818	13.18
1400	1996	40	0.64	858	13.82
1531	1997	98	1.58	956	15.40
1700	2000	49	0.79	1005	16.19
2030	1999	32	0.52	1037	16.70
2040	1991	33	0.53	1070	17.24
2060	1998	29	0.47	1099	17.70
2080	1994	17	0.27	1116	17.98
2085	1997	2	0.03	1118	18.01
2090	1996	40	0.64	1158	18.65
2273	1999	17	0.27	1175	18.93
2520	1997	3	0.05	1178	18.98
2522	1998	15	0.24	1193	19.22
2540	1998	6	0.10	1199	19.31
2590	1994	6	0.10	1205	19.41
2600	1986	3	0.05	1208	19.46
2621	1993	48	0.77	1256	20.23
2631	1998	20	0.32	1276	20.55
2670	1997	30	0.48	1306	21.04
2670	2000	29	0.47	1335	21.50
2711	1996	36	0.58	1371	22.08
2721	1993	39	0.63	1410	22.71
2750	1996	79	1.27	1489	23.99
2761	1995	16	0.26	1505	24.24
2800	1999	19	0.31	1524	24.55
2810	1995	32	0.52	1556	25.06
2810	1998	15	0.24	1571	25.31
2820	1992	8	0.13	1579	25.43
2820	1996	7	0.11	1586	25.55
2821	1994	34	0.55	1620	26.10
2834	1993	88	1.42	1708	27.51
2834	1995	89	1.43	1797	28.95
2834	1997	177	2.85	1974	31.80
2835	1994	128	2.06	2102	33.86
2860	1994	40	0.64	2142	34.50
2870	1992	18	0.29	2160	34.79
2870	1995	19	0.31	2179	35.10
2890	1998	41	0.66	2220	35.76
2911	1996	81	1.30	2301	37.07
3021	1994	11	0.18	2312	37.24
3050	1993	10	0.16	2322	37.40

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel A: Randomly Assigned Control Firms (Cont'd)

SIC	Adoption YEAR	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
3060	1995	23	0.37	2345	37.77
3089	1995	37	0.60	2382	38.37
3089	1996	36	0.58	2418	38.95
3089	1997	37	0.60	2455	39.55
3140	1996	31	0.50	2486	40.05
3220	1996	7	0.11	2493	40.16
3250	1998	13	0.21	2506	40.37
3310	1995	4	0.06	2510	40.43
3310	1999	7	0.11	2517	40.54
3312	1994	40	0.64	2557	41.19
3312	1996	39	0.63	2596	41.82
3334	1998	8	0.13	2604	41.95
3350	1993	17	0.27	2621	42.22
3350	1996	16	0.26	2637	42.48
3360	1994	3	0.05	2640	42.53
3411	1992	14	0.23	2654	42.75
3470	1999	12	0.19	2666	42.94
3480	1997	15	0.24	2681	43.19
3490	1990	17	0.27	2698	43.46
3490	1995	17	0.27	2715	43.73
3490	1996	16	0.26	2731	43.99
3510	1991	16	0.26	2747	44.25
3523	1997	26	0.42	2773	44.67
3530	1994	4	0.06	2777	44.73
3530	1998	5	0.08	2782	44.81
3532	1993	6	0.10	2788	44.91
3533	1998	33	0.53	2821	45.44
3540	1996	37	0.60	2858	46.04
3541	1994	9	0.14	2867	46.18
3555	1998	18	0.29	2885	46.47
3559	1987	104	1.68	2989	48.15
3561	1997	6	0.10	2995	48.24
3561	1998	6	0.10	3001	48.34
3564	1991	14	0.23	3015	48.57
3564	1996	14	0.23	3029	48.79
3570	1999	10	0.16	3039	48.95
3571	1995	96	1.55	3135	50.50
3578	1996	40	0.64	3175	51.14
3580	1994	22	0.35	3197	51.50
3580	1998	21	0.34	3218	51.84
3585	1998	20	0.32	3238	52.16
3585	1999	19	0.31	3257	52.46
3612	1996	6	0.10	3263	52.56
3612	1997	7	0.11	3270	52.67
3621	1995	30	0.48	3300	53.16

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel A: Randomly Assigned Control Firms (Cont'd)

SIC	Adoption YEAR	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
3630	1997	17	0.27	3317	53.43
3661	1997	184	2.96	3501	56.39
3663	1999	174	2.80	3675	59.20
3678	1995	21	0.34	3696	59.54
3679	1996	46	0.74	3742	60.28
3679	1999	45	0.72	3787	61.00
3690	1993	34	0.55	3821	61.55
3690	1998	34	0.55	3855	62.10
3714	1993	62	1.00	3917	63.10
3714	1994	20	0.32	3937	63.42
3714	1996	20	0.32	3957	63.74
3714	1998	21	0.34	3978	64.08
3743	1998	5	0.08	3983	64.16
3743	1999	5	0.08	3988	64.24
3751	1995	12	0.19	4000	64.43
3822	1996	12	0.19	4012	64.63
3823	1994	20	0.32	4032	64.95
3823	1996	21	0.34	4053	65.29
3823	2000	21	0.34	4074	65.62
3825	1996	46	0.74	4120	66.37
3825	1997	46	0.74	4166	67.11
3826	1994	25	0.40	4191	67.51
3826	1995	24	0.39	4215	67.90
3826	1996	25	0.40	4240	68.30
3841	1995	76	1.22	4316	69.52
3841	1997	76	1.22	4392	70.75
3861	1996	15	0.24	4407	70.99
3861	1997	28	0.45	4435	71.44
3861	1998	14	0.23	4449	71.67
4011	1993	50	0.81	4499	72.47
4213	1993	32	0.52	4531	72.99
4213	1995	31	0.50	4562	73.49
4213	1997	32	0.52	4594	74.00
4400	1994	37	0.60	4631	74.60
4812	1995	142	2.29	4773	76.88
4813	1993	168	2.71	4941	79.59
4813	1995	169	2.72	5110	82.31
4911	1996	143	2.30	5253	84.62
4911	1997	48	0.77	5301	85.39
4924	1999	80	1.29	5381	86.68
4931	1989	17	0.27	5398	86.95
4931	1995	16	0.26	5414	87.21
4931	1997	17	0.27	5431	87.48
4931	1998	32	0.52	5463	88.00
4950	1997	8	0.13	5471	88.13

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel A: Randomly Assigned Control Firms (Cont'd)

SIC	Adoption YEAR	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
4953	1997	48	0.77	5519	88.90
4955	1997	59	0.95	5578	89.85
5000	1993	5	0.08	5583	89.93
5031	1999	10	0.16	5593	90.09
5045	1995	82	1.32	5675	91.41
5072	1997	13	0.21	5688	91.62
5090	1997	27	0.43	5715	92.06
5110	1995	32	0.52	5747	92.57
5140	1998	61	0.98	5808	93.56
5141	1995	26	0.42	5834	93.98
5211	1998	29	0.47	5863	94.44
5311	1998	45	0.72	5908	95.17
5331	1995	64	1.03	5972	96.20
5411	2000	117	1.88	6089	98.08
5661	1999	23	0.37	6112	98.45
5731	2000	32	0.52	6144	98.97
5912	1994	47	0.76	6191	99.73

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel B: Randomly Assigned Control Firms with Required Data

sic	year	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
1311	1992	62	2.26	62	2.26
1311	1995	65	2.37	127	4.63
1311	1997	55	2.01	182	6.64
1311	1999	59	2.15	241	8.79
1381	1998	36	1.31	277	10.10
1400	1996	14	0.51	291	10.61
1531	1997	46	1.68	337	12.29
1700	2000	22	0.80	359	13.09
2030	1999	16	0.58	375	13.68
2040	1991	10	0.36	385	14.04
2060	1998	12	0.44	397	14.48
2080	1994	5	0.18	402	14.66
2085	1997	1	0.04	403	14.70
2090	1996	19	0.69	422	15.39
2273	1999	4	0.15	426	15.54
2522	1998	8	0.29	434	15.83
2540	1998	2	0.07	436	15.90
2590	1994	3	0.11	439	16.01
2600	1986	3	0.11	442	16.12
2621	1993	17	0.62	459	16.74
2631	1998	12	0.44	471	17.18
2670	1997	15	0.55	486	17.72
2670	2000	13	0.47	499	18.20
2711	1996	19	0.69	518	18.89
2721	1993	14	0.51	532	19.40
2750	1996	34	1.24	566	20.64
2761	1995	9	0.33	575	20.97
2800	1999	11	0.40	586	21.37
2810	1995	13	0.47	599	21.85
2810	1998	6	0.22	605	22.06
2820	1992	5	0.18	610	22.25
2820	1996	3	0.11	613	22.36
2821	1994	21	0.77	634	23.12
2834	1993	46	1.68	680	24.80
2834	1995	45	1.64	725	26.44
2834	1997	96	3.50	821	29.94
2835	1994	52	1.90	873	31.84
2860	1994	22	0.80	895	32.64
2870	1992	7	0.26	902	32.90
2870	1995	8	0.29	910	33.19
2890	1998	22	0.80	932	33.99
2911	1996	39	1.42	971	35.41
3021	1994	7	0.26	978	35.67
3050	1993	4	0.15	982	35.81
3060	1995	10	0.36	992	36.18

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel B: Randomly Assigned Control Firms with Required Data (Cont'd)

sic	year	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
3089	1995	16	0.58	1008	36.76
3089	1996	14	0.51	1022	37.27
3089	1997	11	0.40	1033	37.67
3140	1996	18	0.66	1051	38.33
3220	1996	4	0.15	1055	38.48
3250	1998	3	0.11	1058	38.58
3310	1995	3	0.11	1061	38.69
3310	1999	3	0.11	1064	38.80
3312	1994	26	0.95	1090	39.75
3312	1996	27	0.98	1117	40.74
3334	1998	2	0.07	1119	40.81
3350	1993	11	0.40	1130	41.21
3350	1996	8	0.29	1138	41.50
3360	1994	3	0.11	1141	41.61
3411	1992	6	0.22	1147	41.83
3470	1999	5	0.18	1152	42.01
3480	1997	3	0.11	1155	42.12
3490	1990	11	0.40	1166	42.52
3490	1995	4	0.15	1170	42.67
3490	1996	8	0.29	1178	42.96
3510	1991	6	0.22	1184	43.18
3523	1997	11	0.40	1195	43.58
3530	1994	1	0.04	1196	43.62
3530	1998	2	0.07	1198	43.69
3532	1993	2	0.07	1200	43.76
3533	1998	16	0.58	1216	44.35
3540	1996	20	0.73	1236	45.08
3541	1994	2	0.07	1238	45.15
3555	1998	11	0.40	1249	45.55
3559	1987	42	1.53	1291	47.08
3561	1997	5	0.18	1296	47.26
3561	1998	2	0.07	1298	47.34
3564	1991	10	0.36	1308	47.70
3564	1996	8	0.29	1316	47.99
3570	1999	5	0.18	1321	48.18
3571	1995	37	1.35	1358	49.53
3578	1996	14	0.51	1372	50.04
3580	1994	5	0.18	1377	50.22
3580	1998	10	0.36	1387	50.58
3585	1998	7	0.26	1394	50.84
3585	1999	7	0.26	1401	51.09
3612	1996	1	0.04	1402	51.13
3612	1997	4	0.15	1406	51.28
3621	1995	17	0.62	1423	51.90
3630	1997	6	0.22	1429	52.12

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel B: Randomly Assigned Control Firms with Required Data (Cont'd)

sic	year	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
3661	1997	95	3.46	1524	55.58
3663	1999	93	3.39	1617	58.97
3678	1995	13	0.47	1630	59.45
3679	1996	19	0.69	1649	60.14
3679	1999	25	0.91	1674	61.05
3690	1993	12	0.44	1686	61.49
3690	1998	19	0.69	1705	62.18
3714	1993	25	0.91	1730	63.09
3714	1994	9	0.33	1739	63.42
3714	1996	12	0.44	1751	63.86
3714	1998	8	0.29	1759	64.15
3743	1998	3	0.11	1762	64.26
3743	1999	1	0.04	1763	64.30
3751	1995	8	0.29	1771	64.59
3822	1996	2	0.07	1773	64.66
3823	1994	8	0.29	1781	64.95
3823	1996	13	0.47	1794	65.43
3823	2000	11	0.40	1805	65.83
3825	1996	22	0.80	1827	66.63
3825	1997	26	0.95	1853	67.58
3826	1994	11	0.40	1864	67.98
3826	1995	13	0.47	1877	68.45
3826	1996	8	0.29	1885	68.75
3841	1995	45	1.64	1930	70.39
3841	1997	37	1.35	1967	71.74
3861	1996	6	0.22	1973	71.95
3861	1997	11	0.40	1984	72.36
3861	1998	5	0.18	1989	72.54
4011	1993	21	0.77	2010	73.30
4213	1993	9	0.33	2019	73.63
4213	1995	12	0.44	2031	74.07
4213	1997	14	0.51	2045	74.58
4400	1994	20	0.73	2065	75.31
4812	1995	66	2.41	2131	77.72
4813	1993	44	1.60	2175	79.32
4813	1995	59	2.15	2234	81.47
4911	1996	53	1.93	2287	83.41
4911	1997	16	0.58	2303	83.99
4924	1999	36	1.31	2339	85.30
4931	1989	10	0.36	2349	85.67
4931	1995	10	0.36	2359	86.03
4931	1997	9	0.33	2368	86.36
4931	1998	21	0.77	2389	87.13
4950	1997	2	0.07	2391	87.20
4953	1997	27	0.98	2418	88.18

Appendix B Control Sample Distribution by SIC and Adoption Year (Cont'd)

Panel B: Randomly Assigned Control Firms with Required Data (Cont'd)

sic	year	# of Firms	Percent	Cumulative Frequency	Cumulative Percent
4955	1997	34	1.24	2452	89.42
5000	1993	2	0.07	2454	89.50
5031	1999	4	0.15	2458	89.64
5045	1995	50	1.82	2508	91.47
5072	1997	5	0.18	2513	91.65
5090	1997	11	0.40	2524	92.05
5110	1995	12	0.44	2536	92.49
5140	1998	25	0.91	2561	93.40
5141	1995	6	0.22	2567	93.62
5211	1998	12	0.44	2579	94.06
5311	1998	20	0.73	2599	94.78
5331	1995	37	1.35	2636	96.13
5411	2000	49	1.79	2685	97.92
5661	1999	9	0.33	2694	98.25
5731	2000	13	0.47	2707	98.72
5912	1994	25	0.91	2732	99.64
5945	1998	10	0.36	2742	100.00

Appendix C Samples of Descriptions in Proxy Statements on Prior Performance Measures

Panel A: Firms Switching from Earnings

Proxy Statement of Georgia-Pacific Group (Adopting RI in 1986)

...... 1985 Management Bonus Incentive Compensation Plan ("1985 Incentive Plan"). Under the 1985 Incentive Plan, officers and key employees were eligible for bonuses under a point system based on position evaluations. The bonus pool under the 1985 Incentive Plan was based on the Corporation's 1985 *"normal operating profit" (after tax and excluding unusual items) ("NOP"),* as determined by the Stock Option Plan and Management Compensation Committee, with the amount of bonus varying between $0 per bonus point until 1985 NOP reached $225 million to a maximum of $1 per bonus point when 1985 NOP reached $369 million. No bonuses were paid pursuant to the 1985 Incentive Plan.

Panel B: Firms Switching from Returns

Proxy Statement of Vigoro Corp (Adopting RI in 1992)

Management Incentive Plans:

...... Awards are based on corporate performance, business unit performance for certain participants and individual performance for other participants. The proportions of participant's awards based on corporate, business unit and individual performance will be designated annually and approved by the Vigoro Board....... The corporate performance measure is *return on capital employed, which is defined as the sum of pretax income and interest expense divided by the difference obtained by subtracting current liabilities from total assets.*

Appendix C Samples of Descriptions in Proxy Statements on Prior Performance Measures (Continued)

Panel C: Firms Using a Combination of Earnings and Returns

Proxy Statement of Ball Corp (Adopting RI in 1992)

...... Two target performance factors were established by the Executive Compensation Committee, consisting of nonparticipating directors: (1) *ratio of consolidated income before certain items, including federal income taxes and the provision for incentive compensation, to the net worth of the Corporation*, established at the beginning of the year; and (2) *earnings per share* escalating at 10 percent per year, with targets established at the beginning of 1990; the two factors each made up 50 percent of the combined performance factor.

Panel D: Firms Disclosing Only General Financial Terms

Proxy Statement of Duracell International (Adopting RI in 1993)

...... The Company's Management Incentive Compensation ("MIC") Plan includes the executive officers and managers who hold positions of key management responsibility and whose decisions have a significant impact on achievement of the Company's annual business goals. Annual incentive payments, calculated as a percentage of the employee's salary, are tied to the *Company's financial results and to individual performance.* Incentive payments are paid following the completion of the fiscal year and upon the approval of the Management Compensation and Employee Benefits Committee of the Board of Directors.

Appendix D Variables Definitions and Measurements

Panel A: Investment Sensitivity to IOS Regression

Variable Name		Variable Definitions and COMPUSTAT Data Items
NetInv		New investment net of asset disposition, scaled by total assets at the beginning of the period $[(Data128_t + Data129_t) - Data107_t] / Data6_{t-1}$
FACIOS		Confirmatory factor score of five investment opportunity set indicators
	MBTA	The ratio of market value of total assets to book value of total assets $[Data6_t - Data60_t + (Data199_t \times Data25_t)] / Data6_t$
	MBE	The ratio of market value of total equity to book value of total equity $(Data199_t \times Data25_t) / Data60_t$
	SG	The percentage change of total sales from previous year $(Data12_t - Data12_{t-1}) / Data12_{t-1}$
	MVATG	The percentage change of market value of total assets from previous year $\{[Data6_t - Data60_t + (Data199_t \times Data25_t)] - [Data6_{t-1} - Data60_{t-1} + (Data199_{t-1} \times Data25_{t-1})]\} / [Data6_{t-1} - Data60_{t-1} + (Data199_{t-1} \times Data25_{t-1})]$
	BVATG	The percentage change of book value of total assets from previous year $(Data6_t - Data6_{t-1}) / Data6_{t-1}$
AFTER		Takes the value of 1 if in the post-RI adoption period; 0 if in the pre-RI adoption period
RI		Take the value of 1 if RI adopting firms; 0 if non-RI adopting firms
DROP		Take the value of 1 for discontinuing sample; 0 for continuing sample

Appendix D Variables Definitions and Measurements (Continued)

Panel A: Investment Sensitivity to IOS Regression (Continued)

Variable Name	Variable Definitions and COMPUSTAT Data Items
CF	Operating cash flow (or net income before depreciation and amortization) scaled by total assets $(Data308_t) / Data6_t$ or $(Data172_t + Data14_t) / Data6_t$
DWC	The change of working capital from previous year scaled by total assets $(Data179_t - Data179_{t-1}) / Data6_t$
IndNetInv	Medium value of net investment in *j*th industry in which *i*th RI adopting firm is operating in

Panel B: Tests of RI Adoption Effectiveness

Variable Name	Variable Definitions and COMPUSTAT Data Items
Dependent Variables	
Sales of PPE	Asset disposition scaled by total assets at the beginning of the period $(Data107_t) / Data6_{t-1}$
New Investment	Capital expenditure plus acquisition scaled by total assets at the beginning of the period $(Data128_t + Data129_t) / Data6_{t-1}$
Net Investment	New investment net of asset disposition, scaled by total assets at the beginning of the period $[(Data128_t + Data129_t) - Data107_t] / Data6_{t-1}$
Asset Turnover	The ratio of total sales to average total assets $(Data12_t) / [(Data6_t + Data6_{t-1}) / 2]$

Appendix D Variables Definitions and Measurements (Continued)

Panel B: Tests of RI Adoption Effectiveness (Continued)

Variable Name	Variable Definitions and COMPUSTAT Data Items
Cash Conversion Cycle	Days in accounts receivable plus days in inventory minus days in accounts payable
Days in Accounts Receivable	$364/\{Data12_t / [(Data2_t + Data2_{t-1})/2]\}$
Days in Inventory	$364 / \{(Data41_t + Data240_t - Data240_{t-1}) / [(Data3_t + Data140_t + Data3_{t-1} + Data240_{t-1})/2]\}$
Days in Accounts Payable	$364 / \{Data41_t / [(Data70_t + Data70_{t-1})/2]\}$
OMBD per Employee	Operating margin before depreciation per employee $(Data13_t) / (Data29_t)$
Return on Investment	The ratio of net operating profit after tax to total capital employed $[Data18_t + (Data15_t \times 0.65)] / Data37_t$
Residual Income	Net operating profit after tax minus a capital charge $[Data18_t + (Data15_t \times 0.65)] - (Data37_t \times 0.12)$
Independent Variables	
PRIOREARN	Takes the value of 1 if RI adopting firm switches from earnings; 0 if switches from returns
RI	Take the value of 1 if RI adopting firms; 0 if non-RI adopting firms
DROP	Take the value of 1 for discontinuing sample; 0 for continuing sample
LOGTA	Natural log of total assets Log $(Data6_t)$

Appendix D Variables Definitions and Measurements (Continued)

Panel B: Tests of RI Adoption Effectiveness (Continued)

Variable Name	Variable Definitions and COMPUSTAT Data Items
LOGTS	Natural log of total sales Log ($Data12_t$)
LVRG	Long-term debt plus current portion of long-term debt scaled by total assets ($Data9_t + Data34_t$) / $Data6_t$
EMPL	Number of employees $Data29_t$
ADGPPE	The ratio of accumulated depreciation to gross value of property, plant & equipment ($Data196_t$) / ($Data7_t$)
MBTA	The ratio of market value of total assets to book value of total assets [$Data6_t - Data60_t + (Data199_t \times Data25_t)$] / $Data6_t$
SG	The percentage change of total sales from previous year ($Data12_t - Data12_{t-1}$) / $Data12_{t-1}$
CF	Operating cash flow (or net income before depreciation and amortization) scaled by total assets ($Data308_t$) / $Data6_t$ or ($Data172_t + Data14_t$) / $Data6_t$
DWC	The change of working capital from previous year scaled by total assets ($Data179_t - Data179_{t-1}$) / $Data6_t$
IndDDepVar	Medium value of the dependent variable in the model in *j*th industry in which *i*th RI adopting firm is operating in
MULTIYR	Takes the value of 1 if the RI adopting firm implements a "bonus bank" or uses RI in a long-term incentive plan; 0, otherwise.

Appendix D Variables Definitions and Measurements (Continued)

Panel C: Discontinuance Decision Model

Variable Name	Variable Definitions and COMPUSTAT Data Items
DC	Takes the value of 1 if firms are classified in the discontinuation sample; 0 if in the continuation sample
OWN	Percentage of shares ownership by the top management and the directors as a group Firm's proxy statement
LVRG	Long-term debt plus current portion of long-term debt scaled by total assets $(Data9_t + Data34_t) / Data6_t$
ADGPPE	The ratio of accumulated depreciation to gross value of property, plant & equipment $(Data196_t) / (Data7_t)$
MULTIYR	Takes the value of 1 if the RI adopting firm implements a "bonus bank" or uses RI in a long-term incentive plan; 0, otherwise. Firm's proxy statement
CapInts	The ratio of gross value of property, plant, and equipment to total assets $(Data7_t) / (Data6_t)$
CEO	Takes the value of 1 if there is a CEO turnover in the measurement period; 0 otherwise Firm's proxy statement
CLIENT	Takes the value of 1 if firms indicate hiring of a consulting firm to help the RI incentive system installation; 0 if no hiring of a consulting firm Firm's proxy statement

REFERENCES

Adam, T., and V. K. Goyal. 2002. The Investment Opportunity Set and Its Proxy Variables: Theory and Evidence, Working Paper, Hong Kong University of Science and Technology.

Anctil, R. M. 1996. Capital Budgeting Using Residual Income Maximization. *Review of Accounting Studies*, 1: 9-50.

Anctil, R. M., J. S. Jordan, and A. Mukherji. 1998. The Asymptotic Optimality of Residual Income Maximization, *Review of Accounting Studies*, 2: 207-229.

Baber, W. R., S. N. Janakiraman, and S. Kang. 1996. Investment Opportunities and the Structure of Executive Compensation, *Journal of Accounting and Economics*, 21: 297-318.

Balachandran, S. V. 2003. How Does Residual Income Affect Investment? The Role of Prior Performance Measures. Working Paper, Columbia University.

Baldenius, T. 2003. Delegated Investment Decisions and Private Benefits of Control. Working Paper, Columbia University.

Barber, B., and J. Lyon. 1996. Detecting Abnormal operating Performances: The Empirical Power and Specification of Test Statistics. *Journal of Financial Economics*, 41: 359-399.

Barber, B., and J. Lyon. 1997. Detecting Long-run Abnormal Stock Returns: The Empirical Power and Specification of Test Statistics. *Journal of Financial Economics*, 43: 341-372.

Barth, M. E., W. H. Beaver, and W. R. Landsman. 1998. Relative Valuation Roles of Equity Book Value and Net Income as a Function of Financial Health. *Journal of Accounting and Economics*, 25: 1-34.

Barth, M. E., and R. Kasznik. 1999. Share Repurchases and Intangible Assets, *Journal of Accounting and Economics*, 28: 211-241.

Biddle, G. C., R. M. Bowen, and J. S. Wallace. 1997. Does EVA® Beat Earnings? Evidence on Associations with Stock Returns and Firm Values, *Journal of Accounting and Economics*, 24: 301-336.

Bromwich, M., and M. Walker. 1998. Residual Income Past and Future, *Management Accounting Research*, 9: 391-419.

Chen, S., and J. L. Dodd. 1997. Economic Value Added (EVA™): An Empirical Examination of a New Corporate Performance Measure, *Journal of Managerial Issues*, 9: 318-333.

Claus, J., and J. Thomas. 2001. Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stock markets. *Journal of Finance*, 56(5): 1629-1666.

Core, J. E., R. W. Holthausen, and C. D. Ittner. 1999. Corporate Governance, Chief Executive Officer Compensation, and Firm Performance, *Journal of Financial Economics*, 51: 371-406.

Dittmar, A. K., and R. F. Dittmar. 2002. Stock Repurchase Waves: An Explanation of the Trends in Aggregate Corporate Payout Policy, Working Paper, Indiana University.

Feltham, G. A., and J. A. Ohlson. 1995. Valuation and clean surplus accountings for operating and financial activities. *Contemporary Accounting Research*, 11 (2): 689-731

Fama, E. F., and K. R. French. 1997. Industry costs of equity. *Journal of Financial Economics*, 43: 153-193.

Fazzari, S. M., R. G. Hubbard, and B. C. Petersen. 1988. Financing Constrains and Corporate Investment, *Brookings Papers on Economic Activity*, 1: 141-206.

Fazzari, S. M., and B. C. Petersen. 1993. Working Capital and Fixed Investment: New Evidence on Financing Constrains, *RAND Journal of Economics*, 24: 328-342.

Gaver, J. J., and K. M Gaver. 1993. Additional Evidence on the Association between the Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies, *Journal of Accounting and Economics*, 16: 125-160.

Garvey, G. T., and T. T. Milbourn. 2000. EVA versus Earnings: Does It Matter Which Is More Highly Correlated with Stock Returns? *Journal of Accounting Research*, 38 (Supplement): 209-245.

Garvey, G. T., and T. T. Milbourn. The Optimal and Actual Use of EVA versus Earnings in Executive Compensation. Working Paper, University of British Columbia.

Gertner, R., E. Powers, and D. Scharfstein. 2002. Learning about Internal Capital Markets from Corporate Spin-offs, *Journal of Finance*, 57: 2479-2506.

Goetzmann,W. N., and S. J. Garstka. The Development of Corporate Performance Measures: Benchmarks before EVA™. Working Paper, Yale University.

Gordon, L. A., and R. J. Iyengar. 1996. Return on investment and corporate capital expenditures: empirical evidence. *Journal of Accounting and Public Policy*, 15: 305-325.

Graham, J. R. 1996. Proxies for the corporate marginal tax rate. *Journal of Financial Economics*, 42: 187-221.

Ho, N., N. Hui, and L. Li. 2000. Does EVA® Beat Earnings? Round 2: Evidence from Internet Companies. Working Paper. University of New South Wales.

Hogan, C., and C. Lewis. 2000. The long-run performance of firms adopting compensation plans based on economic profits. Working paper, Southern Methodist University.

Ittner, C. D., and D. F. Larcker. 1998. Innovations in performance measurement: trends and research implications. *Journal of Management Accounting Research*, 10: 205-238.

Ittner, C. D., and D. F. Larcker. 2001. Assessing Empirical Research in Managerial Accounting: A Value-Based Management Perspective, *Journal of Accounting and Economics*, 32: 349-410.

Ittner, C. D., D. F. Larcker, and M. V. Rajan. 1997. The Choice of Performance Measures in Annual Bonus Contract. *The Accounting Review*, 72: 231-255.

Ittner, C. D., R. A. Lamber, and D. F. Larcker. 2003. The Structure and Performance Consequences of Equity Grants to Employees, *Journal of Accounting and Economics*, 34: 89-127.

Kallapur, S., and M. A. Trombley. 1999. The Association Between Investment Opportunity Set Proxies and Realized Growth, *Journal of Business Finance and Accounting*, 26: 505-519.

Kallapur, S., and M. A. Trombley. 2001. The Investment Opportunity Set: Determinants, consequences and Measurement, *Managerial Finance*, 27: 3-15.

Kleiman, R. 1999. Some new evidence on EVA companies. *Journal of Applied Corporate Finance*, 12 (2): 80-91.

Kleinbaum, D. G., L. L. Kupper, and K. E. Muller. 1988. Applied Regression Analysis and Other Multivariable Methods, Duxbury Press, Belmont, California.

Kothari, S. P., and J. B. Warner. 1997. Measuring Long-horizon Security Price Performance. *Journal of Financial Economics*, 43: 301-339.

Larcker, D. F. 1983. The association between performance plan adoption and corporate capital investment. *Journal of Accounting and Economics*, 5: 3-30.

Lev, B., and T. Sougiannis. 1996. The Capitalization, Amortization, and Value-Relevance of R&D. *Journal of Accounting and Economics*, 21: 107-138.

Lovata, L. M., and M. L. Costigan. 2002. Empirical analysis of adopters of economic value added. *Management Accounting Research*, 13: 215-228.

Lyon, J., B. Barber, and C. Tsai. 1999. Improved Methods for Tests of Long-run Abnormal Stock Returns. *Journal of Finance*, 54: 165-202.

Martin, J. 1996. Eli Lilly is making shareholders rich. How? By linking pay to EVA. *Fortune*, 134 (5): 173-174.

McLaren, J. 1999. A Strategic Perspective on Economic Value Added, *Management Accounting*, April: 30-32.

Mehran, H. 1995. Executive compensation structure, ownership, and firm performance. *Journal of Financial Economics*, 38: 163-184.

Mouritsen, J. 1998. Driving Growth: Economic Value Added versus Intellectual Capital. *Management Accounting Research*, 9: 461-482.

Myers, R. 1996. Metric wars. *CFO*, 12(10): 41-50.

Myers, R. 1997. Measure for measure. *CFO*. 13(11): 44-46, 48.

O'Hanlon, J., and K. Peasnell. 1998. Wall Street's Contribution to Management Accounting: the Stern Stewart EVA® Financial Management System, *Management Accounting Research*, 9: 421-444.

Ohlson, J. A. 1995. Earnings, book values, and dividends in equity valuation. *Contemporary Accounting Research*, 11 (2) 661-687

Plesko, G. A. 2003. An evaluation of alternative measures of corporate tax rates. *Journal of Accounting and Economics*, 35: 201-226.

Reichelstein, S. 1997. Investment Decisions and Managerial Performance Evaluation, *Review of Accounting Studies*, 2: 157-180.

Riceman, S. S., S. F. Cahan, and M. Lal. 2002. Do Managers Perform Better Under EVA Bonus Schemes? *The European Accounting Review*, 11: 537-572.

Rogerson, W. P. 1997. Intertemporal Cost Allocation and Managerial Investment Incentives: A Theory Explaining the Use of Economic Value Added as a Performance Measure, *Journal of Political Economy*, 105: 770-795.

Shin, H., and Y. H. Kim. 2002. Agency Cost and Efficiency of Business Capital Investment: Evidence from Quarterly Capital Expenditure, *Journal of Corporate Finance*, 8:139-158.

Smith, C. W., and R. L. Watts. 1992. The Investment Opportunity Set and Corporate Financing, Dividend, and Compensation Policies, *Journal of Financial Economics*, 32: 263-292.

Stark, A. W., and H. M. Thomas. 1998. On the Empirical Relationship between Market Value and Residual Income in the U.K. *Management Accounting Research*, 9:445-460.

Stewart, G. B. III. 1995. EVA works—but not if you make these common mistakes. *Fortune*, 131(8): 117-118.

Stewart, G. B. III. 1991. The quest for value. New York: Harper Collins,

Wallace, J. S. 1997. Adopting residual income-based compensation plans: do you get what you pay for? *Journal of Accounting and Economics*, 24: 275-300.

Wallace, J. S. 1998. EVA® Financial Systems: Management Perspectives, *Advances in Management Accounting*, 6: 1-15.

Young, S. D. 1999. Some Reflections on Accounting Adjustments and Economic Value Added, *Journal of Financial Statement Analysis*, Winter: 7-19.

Young, S. D., and S. F. O'Byrne. 2001. EVA and value-based management: a practical guide to implementation. New York: McGraw-Hill.

CURRICULUM VITAE

TING-TING LIN (林亭亭)

Year of Birth: 1969
Citizenship: Taiwan

EDUCATION

DBA in Accounting (January 2004)
Boston University, Boston, Massachusetts, USA

Research interests:

- Performance evaluation: residual income; executive compensation; Balanced Scorecard; non-financial performance measure
- Strategic cost analysis: trade-off between cost and flexibility
- Fundamental financial statement analysis: intangible assets benefit analysis

MBA in Finance (June 1994)
National Chengchi University, Taipei, Taiwan
Thesis: "Earning management before seasoned cash offerings"
Advisor: Dr. Mei-Hwa Lin, Professor, Accounting Department, National Chengchi University

BBA in Accounting (June 1991)
National Chengchi University, Taipei, Taiwan
Admitted into the MBA program with the regular entrance exam waived

EMPLOYMENT

Lecturer
Managerial Accounting (Spring 1997 — Fall 2001)
Accounting Department, School of Management, Boston University

- Students: sophomores with Management major or minor
- Course focus: introducing basic principles, methods, and challenges of modern managerial accounting, from a perspective of an accounting information user.
- Course pedagogy: equal emphasis on lecturing and case study.

Financial Reporting and Control (Spring 2000; Fall 2002)
Executive MS Program in Manufacturing, Department of Manufacturing Engineering, College of Engineering, Boston University

- Students: practicing design and manufacturing engineers
- Course focus: the basic elements and principles of preparing and interpreting the set of required financial statements for external reporting, and the accounting information for the purpose of internal decisions making and operation control.
- Course pedagogy: case study.

Teaching Assistant
International Management Program in Shanghai, China (Summer 2002)
School of Management, Boston University, in collaboration with Dong-Hua University, Shanghai, China

- Courses: Managing Individual and Organization; Financial Reporting and Control

International Management Program in Kobe, Japan (Summer 1996)
School of Management, Boston University, in collaboration with Sanyo Co, Kobe, Japan

- Course: Financial Reporting and Control

Assistant Research Fellow (January 1995 – June 1995)
Division of Taiwan Economic Research, Chung-Hua Institute for Economic Research
"The financial impacts of National Health Care on medium to small firms,"

Research Assistant
"The interactive effects between tax credit of equity stock investment and financial leverage on corporate investment," sponsored by National Science Council, Taiwan (August 1994 – June 1995)

"The effects of implementing the National Medical Information Network on the target groups," sponsored by Department of Health, Executive Yuan, Taiwan (April 1993 – November 1993)

"Agency costs and financing decisions," sponsored by National Science Council, Taiwan (September 1991 – August 1992)

AWARDS AND HONORS

- ***Doctoral Consortium Fellow*** at the American Accounting Association Doctoral Consortium, Tahoe City, California, USA (June 1999)

- ***DBA Fellowship*** awarded by the Doctoral Program Committee, School of Management, Boston University, Boston, Massachusetts, USA (September 1995 – May 1999)

- ***Fulbright Scholar /Fulbright-Hays Study Grant*** awarded by J. William Fulbright Foreign Scholarship Board, USA (October 1994)

- ***Outstanding Graduate Student Fellowship*** awarded by Ministry of Education, Taiwan (September 1993 – June 1994)