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所得稅不確定性認列對公司決策的影響—
以美國公司風險偏好及投資效率為例
The Impact of FIN 48 on Corporate Decision-Making—
Evidence from Risk-taking and Investment Efficiency of
Firms in United States

黃中誠
Chung-Cheng Huang

指導教授：高偉娟 博士
林世銘 博士
Advisor: Wei-Chuan Kao, Ph.D.
Su-Ming Lin, Ph.D.

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在研究所的兩年學習過程裡，我要感謝家人作為我最大的支柱，讓我能夠在臺大心無旁騖的學習，另外也很慶幸自己能遇到許多熱心且有能力的同學們，一起在報告跟撰寫論文的過程中相互鼓勵跟學習。

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摘要

　　本研究旨在瞭解美國第四十八號解釋公報對美國公司決策的影響。第四十八號解釋公報從 2007 始適用，要求公司評估其稅務申報事項之不確定性，並以「未認列租稅利益」之名詞進行揭露。既有文獻指出稅務風險會降低公司的風險偏好程度。另外，較高的財務報表品質可以增加公司投資效率。本研究假設在第四十八號解釋公報實施後，公司將會降低其風險承受的程度，同時投資效率將有所提升。

　　實證結果顯示，從多個風險評估的變數觀察，公司確實在四十八號解釋公報實施後降低了風險承擔的程度。足以證實四十八號解釋公報是公司無法迴避的稅務風險。

　　再者，在第四十八號解釋公報實施後，趨向投資不足(過度)的公司增加(降低)了投資的程度。而在較高資訊不對稱的環境下，投資效率增加的假設也獲得某些面向的證據。
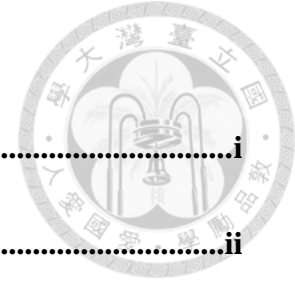

關鍵字: 四十八號解釋公報、未認列租稅利益、稅務風險、投資效率

ABSTRACT

This study is designed to test whether FIN 48 affects U.S. firms' decision making.

FIN 48 effectively in 2007 requires companies to evaluate their uncertain tax

positions and disclose the tax reserves as unrecognized tax benefits (UTBs). Then

investors or stakeholders would know such tax risks. Additionally, prior literature

indicates that tax risks make firms to reduce their risk-taking and that better financial

reporting quality improves investment efficiency. If FIN 48, a required disclosure of

tax risks, increase the exposure of tax risks and enhance financial reporting quality,

firms would reduce their risk-taking and investment efficiency is improved in the FIN

48 regime. I examine such hypothesis by using a quasi-experiment method. The

results show that firms reduces their operational risk-taking in the FIN 48 regime.

This suggests that FIN 48 expose firms with more tax risks and change firms'

decisions in risk-taking. Further results show that firms with propensity to

underinvestment (overinvestment) make more (less) investment in the FIN 48 regime,

implying that FIN 48 reduces certain information asymmetry and thus improves firms'
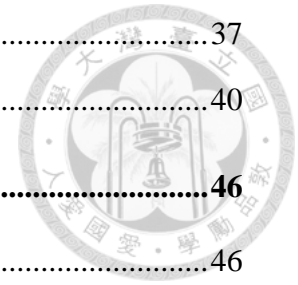
investment efficiency.

Keywords: FIN 48; unrecognized tax benefits (UTBs); Tax risks; Investment efficiency

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1. Introduction

An interpretation of Financial Accounting Standards 109- Accounting for Income

Taxes, FIN 48, is validated in 2007 demanding firms to provide information about

uncertain tax positions in their financial reporting. It is natural that firms use tax

strategies such as research tax credits and transfer pricing to decrease their income tax

liabilities. However, those tax positions filed in tax returns will be audited and

challenged by tax authorities, some of which may not be sustained eventually. Before

FIN 48 was adopted, tax uncertainty position is recorded in numerous ways. Financial

Accounting Standards Board (FASB) considers it necessary to build a consistent

guidance of income tax accounting, and thus introduce FIN 48. FASB believes that

FIN 48 implementation improve financial reporting quality of income tax accounting.

Prior literature finds that FIN 48 affects firms' financial reporting of tax reserves

and income tax benefits since 2007. Researchers discuss FIN 48 from the perspective

of relevance, management discretion, and market reactions (e.g., Ciconte et al. 2016;

Hanlon et al. 2017; Robinson et al. 2016; Gupta et al. 2016; Koester et al. 2015).

From a broader point of view, I would like to investigate how FIN 48 can affect firms'

decision making. Inspired by prior literature, I observe the impact of FIN 48 in terms

of corporate risk-taking and investment efficiency.
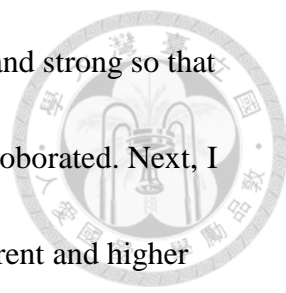
First, previous literature suggests that tax risks have significant negative effects

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on corporate risk-taking (e.g., Ljungqvist et al. 2016; Langenmayr and Lester 2015;

Guenther et al. 2017). Specifically, tax risks are widely documented as negative

effects on reducing firms' risk-taking in operations. The adjustments of risk-aversion

toward tax risks for companies are expectable and reasonable. Considering FIN 48 as

a stricter guidance for income tax accounting, I posit that FIN 48 exposes firms' tax

risk to their stakeholders, so firms will reduce their risk-taking in the FIN 48 regime.

On the other hand, some literature provides evidence that better financial reporting

quality leads to investment efficiency (e.g., Biddle et al. 2009; Lara et al. 2015). In

spite of the mixed findings for whether FIN 48 can improve financial reporting quality,

I am supportive of FASB's positive opinion on FIN 48. Therefore, I hypothesize that

investment efficiency is enhanced in the FIN 48 regime.

To test the corporate risk-taking, I mainly follow the work of Ljungqvist et al.

(2016) and then use four different proxies to understand how the implementation of

FIN48 affects firms' risk-taking. As for the method of analyzing investment efficiency,

I refer to Lara et al. (2015). The measure for underinvestment (overinvestment) is

generated from deciled industry-year residuals of the regression of aggregate

investments on sales growth.

Using U.S. firms from 1990 to 2015, the empirical results mainly support my

hypotheses. To begin with, all four proxies for the risk-taking of firms with UTB

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inherent decrease in the FIN 48 regime. The evidence is consistent and strong so that

the inference of FIN 48 representing a tax risk for companies is corroborated. Next, I

observe higher (lower) level of investment for firms with UTB inherent and higher

propensity toward underinvestment (overinvestment). The outcome is mostly

consistent in that three out of four (all four) measures of investment are significantly

increased (decreased). Additionally, the setting of information asymmetry contributes

some evidence. With higher information asymmetry, the level of investment for

companies with UTB and tendency towards underinvestment (overinvestment) has

risen (dropped). These findings confirm that FIN 48 is effective in improving

financial reporting quality in the sense that investment efficiency becomes better.

This study is the first to integrate FIN 48 with tax risk and investment efficiency

expanding the existing literature on FIN 48. Little literature of FIN 48 is focused on

specific corporate decision-making. Finally, it is worth noticing for policy makers that

FIN 48 has some economic consequences.

2.Relevant Literature and Hypothesis Development

2.1 Background

Prior to the enactment of FIN 48, firms report taxes in the financial statements following Financial Accounting Standard No.109 (SFAS 109), Accounting for Income Tax. However, SFAS 109 contains no specific guidance for tax uncertainty. Hence, firms usually address uncertain tax positions by using Financial Accounting Standard No.5 (SFAS 5), Accounting for Contingencies. No explicit instruction regarding accounting for tax uncertainty leads to diverse accounting practices. FASB therefore issues FIN48 to improve the relevance and comparability in financial reporting of income taxes hoping that the principles would provide consistent recognition and measurement.

FASB states that FIN 48 improves financial reporting for uncertain tax positions, namely tax reserves (FASB 2006). FIN 48 requires firms to report tax reserves following two steps. First, FIN 48 asks companies to evaluate the position pursuant to the more-likely-than-not recognition threshold. Second, a tax position that meets the more-likely-than-not recognition threshold shall be measured as the largest amount of tax benefit that is greater than 50 percent likely of being realized upon settlement with a taxing authority that has full knowledge of all relevant information. At the same time, firms are required to disclose more information about firms' tax uncertainty.
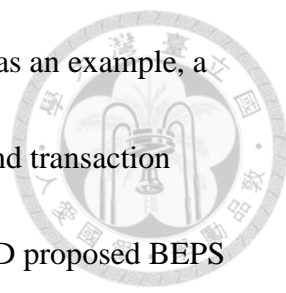
These two steps provide uniform guidance for firms to follow. Meanwhile, FIN 48 defines the difference between the recognized income tax benefit and the amount filed in the tax returns as unrecognized tax benefits (UTBs).
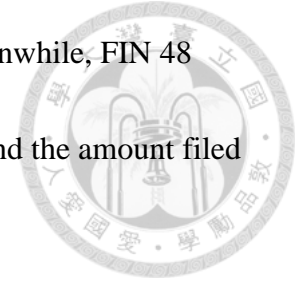
According to the exposure draft of FIN 48 (FASB 2005), there are two board members with an alternative view. They were concerned that FIN 48 would be needlessly complex and difficult to apply in practice. Specifically, companies might systematically overstate tax reserves at first and then reverse these recorded liabilities when the tax authority finishes auditing their tax position. This debate triggers more tension about whether FIN 48 reduces information asymmetry, improves financial reporting quality, and further improves investment efficiency. Additionally, how FIN 48 affect corporate risk-taking is unclear, and therefore how FIN48 affects investment efficiency is still an empirical question.

2.2 Tax Risks Affecting Corporate Decisions and Unrecognized Tax Benefit

Firms are faced with various risks such as operational risks, financial risks, et cetera. Among these risks, tax is one of those that should be taken into consideration in the process of firms' every critical decision making. The survey undertaken by Ernst & Young (2014) points out four sources of tax risks that tax and financial executives are concerned about. They are reputation risk, the base erosion and profit shifting (BEPS)

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risk, enforcement risk, and operational risk. Taking transfer pricing as an example, a

multinational company takes advantage of its global supply chain and transaction

arrangements to reduce its overall tax burden. However, since OECD proposed BEPS

actions, aggressive tax avoidance has become an issue. Thus, multinational companies

have been under the pressure from different jurisdictions. These companies would have

more compliance costs when planning transfer pricing, and have higher possibilities of

double taxation that required their attention to adjust their operations. According to

PwC's global CEO survey (2015), over half of the CEOs say: "governments on a global

basis are increasingly implementing more competitive tax policies, which influence

organizations' decisions on where to operate."

Prior literature echoes the practitioners' findings and demonstrates how tax risk

affect overall firm risk (e.g. Ljungqvist et al. 2016; Langenmayr and Lester 2015;

Guenther et al. 2017; Hutchens and Rego 2015). First, Ljungqvist et al. (2016) find that

firms respond to tax risks by reducing the risk-taking when their home state tax

increases. To be precise, the signal of risk reduction is the decrease in earnings volatility,

and the change of operating cycle. Consistent with lower earnings volatility, the days of

operating cycle are shorter. Besides, Langenmayr and Lester (2015) use both a

theoretical and an empirical model to ascertain the effect of tax rules on corporate

risk-taking. The tax rules in this literature refer to tax loss offset and statutory tax rates.

The level of corporate risk-taking increases if the available loss offset period is longer. The effects of tax rates on risk-taking are opposite for firms with high or limited possibilities of using their loss offset. Higher rates lead to greater risk-taking for firms expecting to use the loss offset, but the relation is negative for firms unlikely to the loss offset.

Moreover, Guenther et al. (2017) test whether corporate tax avoidance strategies are related to higher risks in the future and find mixed results. They do not find association between historical tax avoidance behaviors and future firm risks measured by cash tax rate volatility or stock return volatility. However, the results show a significant relationship between tax rate volatility and stock return volatility, a measure of overall firm risk. A similar finding can be referred to in Hutchens and Rego (2015). Hutchens and Rego (2015) use several proxies for tax risk and firm risk to test the relation between the two kinds of risk. The results suggest that discretionary book-tax differences and cash effective tax rate volatilities are positively associated with all of their proxies for firm risk. Last, just as Donohoe et al. (2014) describe, tax departments act as risk centers after the validation of FIN 48 and the use of schedule UTP.

The change in overall firm risk can stand for a signal of firms changing their operations or the process of decision-making. In order to further understand what tax risk can have any effect specifically, I explore the following literature (Chow et al.

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2016; Alexander and Jacob 2016; Graham et al. 2016; Jacob et al. 2016)
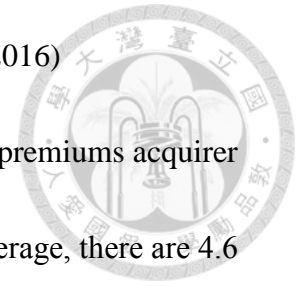
Chow et al. (2016) examine the relation between the takeover premiums acquirer willing to pay and target companies' tax sheltering behavior. On average, there are 4.6 percent higher premiums for target companies when they disclose they do not engage in tax sheltering. The result shows that acquirers prefer less tax risks when undergoing mergers and acquisitions. Alexander and Jacob (2016) interpret how tax risks interact with managers' inside debt (i.e. pension plans and deferred compensation of high executives). They find the high executives tend to be more risk-averse toward companies' uncertain tax position if inside debt level is greater. Graham et al. (2016) conduct a survey to ask tax executives which tax rate their companies use as an input when making corporate decisions. According to the corporate finance theory, marginal tax rate is preferable, which is defined as the present value of additional taxes paid on an additional dollar of income earned today (Scholes et al. 2014). The survey shows that fewer than 13% of their sample firms use the marginal tax rate in any decision-making. Graham et al. (2016) then test whether the theoretically incorrect choice of tax rate leads to suboptimal decision-making. For capital structure, they find that firms with marginal tax rate (MTR) greater than GAAP effective tax rate (ETR) use more conservative debt policies. As for investments, firms with larger gap between MTR and GAAP ETR are less responsive or efficiency in investment

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arrangements. Jacob et al. (2016) also document how tax uncertainty affects corporate

investment decisions. Their measures for tax uncertainty contain GAAP ETR

volatility, ending balance of UTB scaled by total assets, and estimated cash buffer due

to increases in ETR volatility. The results suggest that tax uncertainty leads to the

delay of large investments and lower levels of investments.
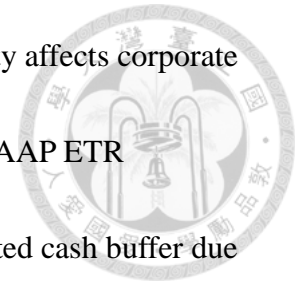
As for the studies for unrecognized tax benefits, some literature discusses

whether FIN 48 change managements' discretion over tax uncertainty (e.g. Gupta et al.

2016; Robinson et al. 2016). Prior to the adoption of FIN 48, there was great

complexity inherent in tax expense itself, and managers had quite large discretion

about reporting tax contingency. According to the anecdotal information provided in

Blouin et al. (2010), KPMG's policy was to require clients to record a contingency

unless they had more than 70 percent chance surviving IRS's challenges. Other

companies used an expected value approach to record tax contingency to minimize the

average impact on earnings when they settled with tax authorities. To sum up, there is

divergence in the practice prior to the enactment of FIN 48.

The factors mentioned above give opportunities for earnings management.

Dhaliwal et al. (2004) observe that firms tend to decrease their annual GAAP effective

tax rate if they fall short of analysts' forecasts. However, Gupta et al. (2016) find that,

compared to the period prior to FIN 48, firms reduce earnings management through

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tax reserve in the period following the adoption of FIN 48. Moreover, Robinson et al. (2016) interpret that the restrictions of FIN 48 prevent the management from bringing more private information.
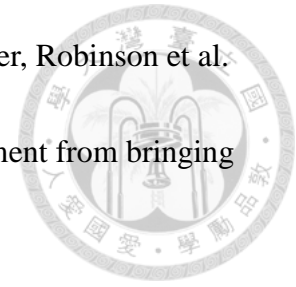
Previously researchers observe the positive market reactions to the adoption of FIN 48 (e.g. Koester et al. 2015). Dyreng et al. (2016) further suggest tax avoidance increase UTBs. Meanwhile, the market affirmatively value tax avoidance because tax avoidance means that managers could pay less cash tax to the government. Nesbitt et al. (2016) takes advantage of the Luxembourg tax leaks event and test the market reaction using three-day window abnormal return model. On average, the market reacted positively toward the Luxembourg tax leaks event, which released information of firms engaging in tax avoidance. Specifically, Koester et al. (2015) find a positive relation between stock price and the disclosure of UTB. Although the positive effect is attenuated if tax-related material weakness in internal controls is in presence. The rational possible interpretation for the positive market reaction is that the balance of UTB serves as a signal of tax avoidance. On the other hand, FIN 48 has a large impact on firms' behaviors of compliance (e.g. Gupta et al. 2014; Blouin et al. 2007). Gupta et al. (2014) documents that both firm-level tax expense and state-level tax collections increase under the FIN 48 regime which shows the change of financial reporting standards can affect firms' behaviors pertaining to tax. That is, tax avoidance is

attenuated to certain degree. Considering tax avoidance as the reason of UTB receiving

positive market reaction, perhaps the findings of Koester et al. (2015) are short-term

phenomena. As tax avoidance decreases in the FIN 48 regime, the positive market

reactions may also decline. Last, Blouin et al. (2007) hand-collected 100 largest non–

financial and non–regulated firms' disclosures of tax reserve. All of them report the

balance of UTB on January 1, 2007.

Overall, there still hasn't any literature to argue whether FIN 48 represents a tax

risk for companies and will affect their risk-taking.

2.3 Investment Efficiency and Unrecognized Tax Benefit

Prior research finds that FIN 48 provides predictability of future cash flows for

financial reporting users (e.g., Ciconte et al. 2016; Hanlon et al. 2017). Specifically,

Ciconte et al. (2016) find a positive relation between UTB and future income tax cash

outflows after the adoption of FIN 48, suggesting that the recognition improves the

predictability of income tax cash flows. Hanlon et al. (2017) find that firms with higher

tax uncertainty hold larger levels of cash using the balance of UTB scaled by total

assets as the measure of tax uncertainty. This result suggests that UTB can be used to

predict a companies' future cash positions. Nevertheless, Robinson et al. (2016) argue

that the fixed rules of FIN 48 fail to improve the relevance of income tax accounting.

They find no evidence that the predictive ability of tax expense for future tax outflows

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improves. This result is clearly contradictory to that of Ciconte et al. (2016). This inconsistency could result from different proxies for predictability. Still, mixed evidence exists about whether FIN 48 improve the quality of accounting for income taxes. Hence, I would like to investigate the association between FIN 48 and financial reporting quality through investment efficiency.
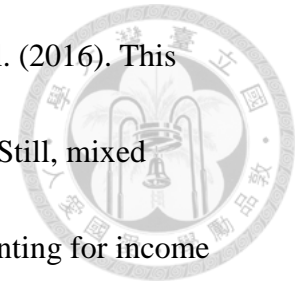
Based on prior discussion, there is profound evidence supporting that financial reporting quality influences firms' investment decisions. Furthermore, investment efficiency improves by virtue of less information asymmetry (e.g. Biddle et al. 2009; Lara et al. 2015). It means that the core concept linking financial reporting quality and investment efficiency is information asymmetry. First, the information asymmetry between firms and investors can be described as a source of adverse selection. The adverse selection problem may increase the cost of raising capital and hence lead to under-investments. For example, Myers and Majluf (1984) prove that there are some situations in which firms would probably forgo projects with positive NPV if the management acts in favor of existing shareholders. It means management giving up positive investments when the capital comes from issuing stock at a discounted price.

Secondly, the agency problem (Jensen and Meckling 1976) may cause greater cost of raising capital or poor project selection and therefore result in under- or over-investments. Companies' managers sometimes do not make the most beneficial

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decisions in those situations where they have opportunities of seeking personal

interests. There are several likely scenarios. For instance, managers over-invest to

meet certain benchmarks required in their contracts so that they can gain the

compensation (Jensen 1986). On the other hand, Bertrand and Mullainathan (2003)

using plant-level data find that average managers tend not to build new plants if their

firms are protected from hostile takeovers by the law. Lambert et al. (2007) give us an

insight that better information reduces a firm's cost of capital which they define as the

expected return on a firm's stock. Putting it in another way, the information

asymmetry may leave shareholders cautious beforehand which gives rise to

under-investment *ex-post*.

However, better financial reporting quality can alleviate information asymmetry

and reduce the costs of adverse selection and agency problems. Leuz and Verrecchia

(2000) study German firms which change their financial reporting from German to an

international regime (i.e. IAS or U.S. GAAP). They document lower bid-ask spread

and higher share turnover for firms adopting international IAS or U.S. GAAP.

Following the logic, accounting conservatism aids in mitigating agency costs. Early or

timely loss recognition discipline managers to invest more prudently. If managers tend

to over-invest beyond the optimal level, they are more likely to suffer from those

inadequate investments due to the early loss recognition. Francis and Martin (2010)

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discover that the positive relation between timely loss recognition and acquisition

profitability is stronger for firms with larger *ex-ante* agency costs.

Providing more direct evidence about financial reporting quality and investment

efficiency, Biddle et al. (2009) observe that, with higher financial reporting quality,

investment efficiency improves. To be precise, the investment level of firms with

better likelihood of over-investment (under-investment) decreases (increases) if

financial reporting quality gets higher. Lara et al. (2015) further test investment

efficiency by incorporating the effect of conservatism and settings of information

asymmetry. Their findings are consistent with those of Biddle et al. (2009) and even

more robust. More conservative firms invest more if inclined toward underinvestment.

The positive effect of conservatism remains in each scenario for which Lara et al.

(2015) use different proxies for information asymmetry. Also, Cheng et al. (2013)

examines firms that have poor financial reporting quality prior to the first disclosure

of an material internal control weakness (ICW). They find that ICW firms over-invest

(under-invest), relative to non-ICW firms, if they are more prone to over-investment

(under-investment).

2.4 Research Hypothesis

The primary objective of this study is to interpret how FIN 48 can affect firms'

processes of decision-making among which risk-taking and investment efficiency

draw my attention most.

To begin with, prior literature indicates positive or mixed evidence that tax risk influences corporate risk-taking. Ljungqvist et al. (2016) find negative association between state tax increases in the U.S. and firms' risk-taking. Langenmayr and Lester (2015) indicate that more generous tax loss provision induces firms' risk-taking, especially when the firms are in the country with higher statutory tax rates. Guenther et al. (2017) further observe a significant link between tax rate volatility and stock return volatility while they do not capture their expected positive relation between tax avoidance and future firm risk.

Although there is no precise definition for tax risk, I regard it as the uncertainty that will change firms' operations. As regulations grow rapidly these days, it's inevitable that firms need to carefully manage their risks in taxation. It occurs to me that FIN 48 is the most significant financial reporting rule for tax accounting recently. Not to mention the core concept of FIN 48 is disclosing uncertain tax positions, the update of this rule itself can be a risk. Hence, I anticipate FIN 48 to have a positive impact on corporate risk-taking. Gupta et al. (2014) already observes less tax avoidance in FIN 48 regime. Their finding is a sign of firms lowering their risks pertaining to tax. It's reasonable to infer that other aspects of risk are reduced in the meantime. Hence, I state my first hypothesis in alternative form as follows:

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H1: Firms reduce their risk-taking in the FIN 48 regime.
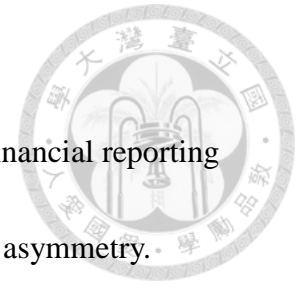
Biddle et al. (2009) and Lara et al. (2015) suggest that better financial reporting quality improves investment efficiency because of less information asymmetry. Balakrishnan et al. (2012) explains that the complexity and uncertainty inherent in tax planning generate opacity between firms and their stakeholders, leading to information asymmetry problems. Then, the question of interest is whether FIN 48 can enhance financial reporting quality, lessen information asymmetry, and therefore improve investment efficiency. Ciconte et al. (2016) and Hanlon et al (2017) indicate that FIN 48 provides financial reporting users with predictability of tax cash flows. On the other hand, Robinson et al. (2016) argue that FIN 48 is not able to improve the relevance of income tax expense.

Despite the fact that conflicting opinions exist for whether FIN 48 enhance financial reporting quality, I posit that more information regarding tax reserve is provided. Especially, IRS statistics from 2010 to 2014 show that the top two uncertain tax positions reported by filers are R&D tax credit, and transfer pricing. Capitalization ranks as either the third or the fourth[1]. In this sense, the disclosure of UTBs can reflect the eventual tax effects on corporate investment decisions to a certain degree since R&D and capitalization are regarded as sources of investments. With the incremental

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[1] Statistics for uncertain tax positions are available on the IRS website:
https://www.irs.gov/businesses/corporations/utp-filing-statistics

information provided by the disclosure of UTB and lower level of tax avoidance in the

FIN 48 regime, I expect the information asymmetry problems to be alleviated. The cost

of a tradeoff between the financial reporting quality and corporate investment decisions

becomes smaller. Hence, I expect FIN 48 to enhance firms' financial reporting quality

and improve their investment efficiency. The above discussion leads to my second

hypothesis in alternative form:

H2: Among firms prone to underinvestment (overinvestment), the firms with UTB

inherent invest more(less) in the FIN 48 regime.

3. Research Design
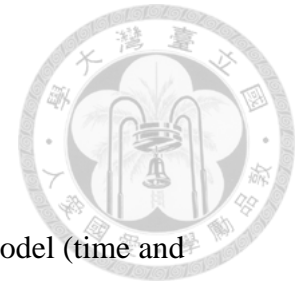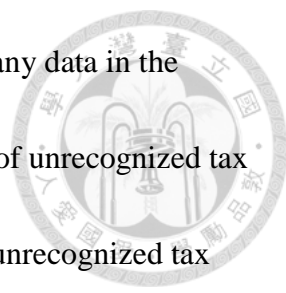
3.1 FIN 48 and Risk-taking

To test the first hypothesis, I set up the following regression model (time and

firm subscripts suppressed for brevity):

$$Risks = \beta_0 + \beta_1 UTB + \beta_2 POST07 + \beta_3\ UTB * POST07 + \textbf{X}'\zeta + i + t + \varepsilon \quad (1)$$
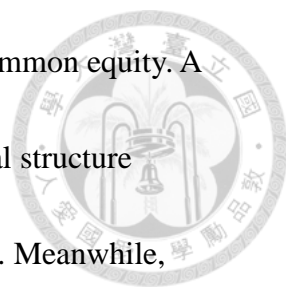
$\textbf{X}$ stands for control variables. I also control for industry (i) and year (t) fixed effects.
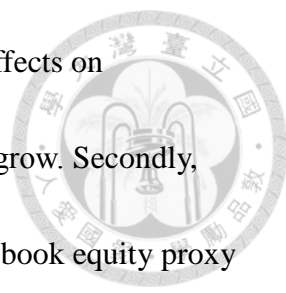
I use the 48 industry classifications in Fama and French (1997) for the industry fixed

effect. To evaluate the risk-taking of firms, I follow the work of Ljungqvist et al. (2016).

They offer several measures to proxy for the dependent variable *Risks*. Those measures

include *ROA volatility*, *ROIC volatility*, *Operating Cycle Change Ratio*, and *Capex*. *ROA*

volatility is the standard deviation of quarterly pretax returns on assets and *ROIC*

volatility is the standard deviation of quarterly pretax returns on invested capital. Both are

calculated over the period from *t* to *t+2*. They both are suitable proxies to reflect firms'

aggregate risk taking. *Operating Cycle Change Ratio* is the ratio of the difference

between current and one-year ahead operating cycle to current operating cycle. This ratio

is expected to detect whether firms reduce their risk-taking by shortening their operations.

If operating cycles are shorten, the operating capital put in risk becomes less. *Capex* in

my definition is one-year ahead net capital expenditure (capital expenditure less sale of

property) over the book value of lagged total assets.

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UTB is an indicator variable equal to one if an observation has any data in the following items that are provided in *Compustat*: beginning balance of unrecognized tax benefits, ending balance of unrecognized tax benefits, decreases to unrecognized tax benefits relating to settlements with taxing authorities, interest and penalties related to uncertain tax positions, and increases to unrecognized tax benefits arising from uncertain tax positions taken in a prior year. *POST07* is equal to one if an observation is in 2007 or afterwards, and zero otherwise. 2007 is the year when FIN 48 is validated. My main independent variable is *UTB*POST07*, the interaction effect of *UTB* and *POST07*. As my first hypothesis states, I expect *β3* to be negative because I argue that firms reduce their risk-taking in the FIN 48 regime.

Following prior literature, I include the firm characteristics that may affect firms' investment and financing activities as control variables (e.g. Fama and French 1993 1995 2002; Harris and Raviv 1991; Coles et al. 2006; Jackson et al. 2009; Dechow and Dichev 2002; Liu and Wysocki 2016; Kothari et al. 2005). Specifically, I control for leverage (*LEV),* the accounting method choice of depreciation (*DEP_PUREAC),* the log of firm age (*LOGAGE)*, market-to-book value (*MTB)*, the log of market value of equity (*LOGMVE)*, the volatility of sales *(STDSALES)*, the volatility of investments *(STDINVEST)*, the log of operating cycle (*LOGOPCYCLE)*, and performance-matched modified-Jones model discretionary accrual (*PERFDAROA)*.

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(1) *LEV* stands for leverage, equal to long-term debt divided by common equity. A

large stream of finance literature illustrates the corporate capital structure

decisions (e.g. Fama and French 2002; Harris and Raviv 1991). Meanwhile,

Coles et al. (2006) find positive relation between leverage and CEO

compensation schemes with higher sensitivity to stock volatility. In light of the

literature, I believe the choices of capital structure are made to optimize the firm

value. Hence, leverage is a cumulative outcome of corporate decisions and will

positively affect firms' risk-taking.

(2) *DEP_PUREAC* is an indicator showing whether the firm adopts the accounting

method choice of accelerated depreciation or the units of production method.

Jackson et al. (2009) find that the external financial reporting choice of

depreciation method affects managerial decisions on capital investments. Firms

using accelerated depreciation make larger investments than firms that use

straight-line depreciation. Thus, I argue that the aggressive choice of

depreciation method has an positive impact on firms' risks *ex ante*.

(3) *LOGAGE* is the log of firm age. *MTB* is market-to-book value. *LOGMVE* is log

of market value of equity which proxies for firm size. These variables are

common variables to control for firm-level characteristics. First, the nature of

firms' operations changes as they grow so firms' age can capture their

developments over time. I expect *LOGAGE* to have negative effects on

risk-taking for firms' development may become stable as they grow. Secondly,

Fama and French (1993) find evidence that size and market-to-book equity proxy

for sensitivity to risk factors in stock returns. Furthermore, market-to-book value

can be an indicator of the growth opportunities since firms with higher

market-to-book value are typical of higher average returns (growth stocks) and

strong earnings (Fama and French 1995). Therefore, I suppose that *MTB* and

LOGMVE are positively associated with my proxies for corporate risks.

(4) *STDSALES* and *STDINVEST* represent the volatility of sales and investments.

These two variables proxy for firms' historic operating volatilities.

LOGOPCYCLE is the log of operating cycle. Prior literature (e.g. Dechow and

Dichev 2002; Liu and Wysocki 2016) provides evidence that these operating

features affect accruals quality. In light of their work, a portion of operating

decisions come along spontaneously and are without managerial discretions such

as accounting principle choices. Hence, I expect these variables to capture some

variation of firms' risk-taking and the effects are positive. Higher operating

volatilities and longer operating cycles are indicators of higher risk-taking.

(5) *PERFDAROA* is the performance-matched modified-Jones model discretionary
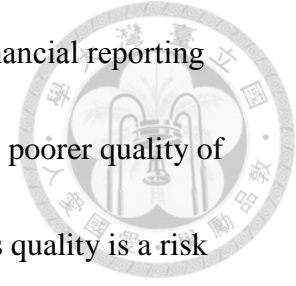
accrual developed by Kothari et al. (2005)[2]. It's a proxy for financial reporting

quality in the sense that larger value of *PERFDAROA* refers to poorer quality of

financial reporting. Francis et al. (2005) conclude that accruals quality is a risk

factor priced by investors. Given this idea, I suppose it's necessary to control for

the reporting quality. The relation may be positive because firms need to react to

capital providers' higher required rate of return for higher information risk

brought out by poor accrual quality.

The detailed definitions of variables can be referred to in appendix A.

3.2 FIN 48 and Investment efficiency

To test my second hypothesis, I extend equation (1) to the following equation:

$$INVESTMENT = \beta_0 + \beta_1 UTB + \beta_2 POST07 + \beta_3 UNDERINVEST$$

$$+\beta_4 OVERINVEST + \beta_5 UTB * POST07 + \beta_6 UTB * POST07$$

$$* UNDERINVEST + \beta_7 UTB * POST07 * OVERINVEST$$

$$+X'\zeta + i + t + \varepsilon, \qquad (2)$$

where **X** stands for the same control variables as equation (1) plus O*VERINVEST**
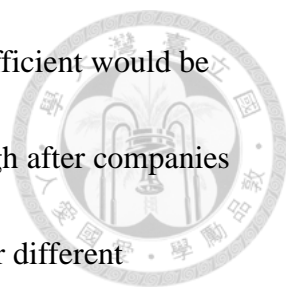
PERFDAROA and *UNDERINVEST* PERFDAROA*. The expected effects of the

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[2] First, discretionary accruals are generated from estimating modified-Jones model as follows:

$$Acc_t = \alpha + \beta_1 (\triangle Rev_t - \triangle Rec_t) + \beta_2 PPE_t + \varepsilon_t$$

Then, the performance-matched discretionary accrual is calculated as the difference between the discretionary accruals of matched firms. That is:

$$DisAcc_t - Matched\ firm's\ DisAcc_t$$

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control variables are also the same except *LOGMVE*. I think its coefficient would be

negative since the proportion of investment is unlikely to stay as high after companies

grow larger. Industry and year fixed effects are controlled. I use four different

measures to evaluate firms' investment as the dependent variable. The first kind is the

one used in Biddle et al. (2009) which is the one-year ahead sum of research and

development expenditure, capital expenditure, and acquisition expenditure, less cash

receipts from the sale of property, plant, and equipment and scaled by lagged total

assets (*Investment_latf1*). Secondly, I modify the first measure to a simpler one which

is the one-year ahead sum of research and development expenditure and capital

expenditure and then scaled by lagged total assets. (*Investment2_f1*). Last, I also test

the ratio of one-year ahead capital expenditure to lagged total assets (*Capex*) and the

ratio of one-year ahead research and development expenditure to lagged total assets

(*R&D spending*). The development of *UNDERINVEST* and *OVERERINVEST* is based

on the work of Lara et al. (2015). The first step is to estimate the regression model of

aggregate investments on sales growth on industry-year levels. The second step is to

rank the residuals of the equation into deciles and multiply them by -1. Then, I rescale

them to range from 0.1 to 1. The larger value in this range, the more likely a firm is to

underinvest. Finally, I define the group with the value of 1 as *UNDERINVEST* and the

group with the value of 0.1 as *OVERINVEST*. In this test, the main independent

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variable of interest is *UTB*POST07*UNDERINVEST* and

UTB*POST07*OVERINVEST. Anticipating firms prone to underinvestment

(overinvestment) and with UTB inherent invest more (less) in the FIN 48 regime, I

posit that β_6 (β_7) is to be positive (negative).

3.3 Sample Selection

The sample is the publicly-traded U.S. firms from *Compustat* database. My

sample includes firms between fiscal year 1990 and 2015. I drop firms in the electric,

gas and sanitary services sector (SIC 4900 to 4999) and finance, insurance and real

estate (SIC 6000 to 6799), because these firm have different firm characteristics. I

also delete the observations with missing data. Last, I winsorized the variables in my

tests lying beyond the 1% or 99% range of the sample distribution.

4. Empirical Results

4.1 Descriptive Statistics

Table 1 provides descriptive statistics for my main and control variables. To start

with the main variables, the average (median) *ROA volatility* is 7.1% (1.5%), and the

average (median) *ROIC volatility* is 16.1% (2.2%). The average (median) *Operating*

Cycle Change Ratio is 1.9% (-2.1%). The absolute difference between the average

and absolute value isn't huge but the direction is opposite. Besides, the standard

deviation is enormous. *Operating Cycle Change Ratio* reflects volatile and random

business environments. The average (median) *Investment_latf1* is 16.1% (8.9%) and

the average (median) *Investment2_f1* is 12.9% (7.1%). They both seem able to capture

firms' relative investment levels to the total assets. The mean *UTB* is 11.8% which

stands for the portion of the treatment group. Table 2 provides descriptive statistics for

firms with UTB as the treatment group and firms without UTB as the control group.

First, firms in the treatment group are more risk-averse than those in the control group.

This observation can be made by comparing the treatment and control groups in the

same period. To be precise, the comparison is between firms with and without UTB

before (after) 2007.The mean value and the standard deviation of *ROA volatility*,

ROIC volatility, *Operating Cycle Change Ratio*, *Capex*, *STDSALES*, *STDINVEST*,

and *LOGOPCYCLE* are mostly smaller in the treatment group no matter they are

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before or after 2007. Secondly, the mean value of *Operating Cycle Change Ratio* and

Capex become less after 2007 for firms with UTB. These results represent primitive

evidence on firms reducing their risks and make changes to simplify their operations.

However, some variables do not bring about the same outcome (e.g. *ROA volatility*,

and *ROIC volatility*). Therefore, more evidence is needed to support my expectations.
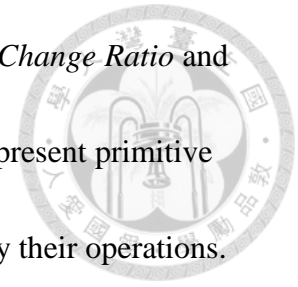
Table 1 Descriptive Statistics

	N	Mean	Std Dev	Min	P25	P50	P75	Max
ROA volatility	122988	0.071	0.268	0.001	0.007	0.015	0.036	2.296
ROIC volatility	123059	0.161	0.597	0.002	0.010	0.022	0.055	4.634
Operating Cycle Change Ratio	107774	0.019	1.908	-9.293	-0.206	-0.021	0.140	11.884
Capex	108546	0.058	0.082	-0.041	0.013	0.033	0.071	0.530
Investment_latf1	110490	0.161	0.233	-0.037	0.035	0.089	0.189	1.543
Investment2_f1	110215	0.129	0.187	-0.029	0.028	0.071	0.151	1.230
R&D spending	109187	0.068	0.156	0.000	0.000	0.000	0.068	1.034
UTB	123263	0.118	0.323	0.000	0.000	0.000	0.000	1.000
POST07	123263	0.308	0.462	0.000	0.000	0.000	1.000	1.000
OVERINVEST	108895	0.100	0.300	0.000	0.000	0.000	0.000	1.000
UNDERINVEST	108895	0.084	0.278	0.000	0.000	0.000	0.000	1.000
LEV	123263	0.206	0.292	0.000	0.000	0.105	0.298	1.738
DEP_PUREAC	123263	0.019	0.137	0.000	0.000	0.000	0.000	1.000
LOGAGE	123263	2.607	0.706	1.386	2.079	2.565	3.135	4.190
MTB	123263	2.575	6.666	-27.826	0.884	1.758	3.327	39.443
LOGMVE	123263	4.945	2.621	-1.143	3.071	4.912	6.783	11.043
STDSALES	123263	0.462	0.876	0.000	0.102	0.213	0.449	6.807
STDINVEST	123263	0.219	0.568	0.000	0.028	0.067	0.166	4.524
LOGOPCYCLE	102463	4.127	1.330	-6.798	3.677	4.350	4.891	7.196
PERFDAROA	114194	0.043	2.204	-10.963	-0.132	-0.001	0.134	12.663
IA_Spread	103392	0.409	0.215	0.100	0.200	0.400	0.600	1.000
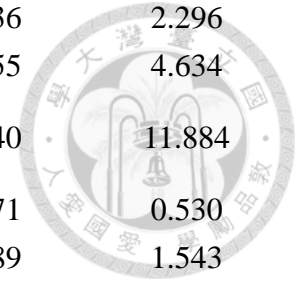
Table 2　Descriptive Statistics by Groups and T-test between treatment and control groups

| | UTB=1 n_1=10,688 | | | | UTB=0 n_2=61,689 | | | | T-test between treatment and control groups n=72,377 | |
| | Before 2007 n_{1b}=5,368 | | Post 2007 n_{1p}=5,320 | | Before 2007 n_{2b}=47,233 | | Post 2007 n_{2p}=14,456 | | | |
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Difference	t-statistic
ROA volatility	0.019	0.030	0.020	0.069	0.026	0.064	0.022	0.066	-0.00578***	(-8.78)
ROIC volatility	0.039	0.169	0.056	0.283	0.058	0.264	0.057	0.278	-0.0107***	(-3.88)
Operating Cycle Change Ratio	0.037	1.143	0.029	1.163	0.032	1.532	0.078	1.570	-0.00976	(-0.63)
Capex	0.058	0.065	0.039	0.044	0.057	0.069	0.047	0.059	-0.00618***	(-9.01)
Investment_latf1	0.162	0.190	0.147	0.179	0.147	0.187	0.132	0.170	0.0115***	(5.98)
Investment2_f1	0.117	0.129	0.106	0.125	0.114	0.138	0.101	0.127	0.000451	(0.32)
R&D spending	0.058	0.107	0.067	0.120	0.056	0.114	0.054	0.116	0.00713***	(5.95)
OVERINVEST	0.078	0.269	0.073	0.261	0.068	0.252	0.065	0.247	0.00835**	(3.15)
UNDERINVEST	0.041	0.199	0.053	0.224	0.079	0.270	0.080	0.271	-0.0325***	(-11.81)
LEV	0.192	0.245	0.195	0.260	0.192	0.246	0.181	0.234	0.00392	(1.53)
DEP_PUREAC	0.013	0.112	0.002	0.041	0.017	0.129	0.007	0.082	-0.00727***	(-6.04)
LOGAGE	2.476	0.713	2.643	0.636	2.605	0.724	2.944	0.699	-0.125***	(-16.51)
MTB	3.305	4.619	3.044	5.671	2.817	5.214	2.588	5.137	0.412***	(7.57)
LOGMVE	6.181	1.879	6.571	1.793	5.090	2.245	6.284	2.249	1.005***	(42.81)
STDSALES	0.384	0.511	0.303	0.499	0.457	0.762	0.304	0.569	-0.0773***	(-10.59)
STDINVEST	0.157	0.321	0.143	0.379	0.165	0.402	0.132	0.354	-0.00746	(-1.84)
LOGOPCYCLE	4.235	0.957	4.110	1.050	4.304	1.039	4.162	1.129	-0.0975***	(-8.82)
PERFDAROA	-0.013	1.303	0.057	2.655	0.003	1.127	0.095	2.709	-0.00251	(-0.14)
IA_Spread	0.334	0.196	0.347	0.186	0.421	0.218	0.390	0.211	-0.0727***	(-32.57)

4.2 Univariate Statistics

4.2.1 T-test Between Treatment and Control groups

Table 2 shows the results of mean comparison t-tests where I subtract the control group from the treatment group. My opinion is similar with that in section 4.1. The differences between control and treatment group for *ROA volatility*, *ROIC volatility*, *Capex*, and *STDSALES* are negative in significant levels which indicate that firms with UTB inherent are averagely less prone to riskiness. Nevertheless, the difference is insignificant for *Operating Cycle Change Ratio* and *STDINVEST*.

4.2.2 Pearson Correlation Coefficient

I have three observations. First, I suppose there is little concern for collinearity. Except the negative correlation between *LOGMVE* and the information asymmetry proxy *IA_Spread* (-0.631), the absolute value of coefficients between all the other independent variables are less than 0.5 and most of them are less than 0.2. Besides, to rationalize my inclusion of control variables, the coefficients between the dependent and control variables mainly reach significant levels other than those for *Operating Cycle Change Ratio* and *Investment2_f1*. Last, *UNDERINVEST* (*OVERINVEST*) is negatively (positively) correlated with *Capex*, *Investment_latf1*, *Investment2_f1*, and *R&D spending* significantly which indicates that *UNDERINVEST* (*OVERINVEST*) successfully identifies the firms that are prone to underinvestment (overinvestment).

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Table 3 Pearson Correlation Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) ROA volatility	1																				
(2) ROIC volatility	0.484***	1																			
(3) Operating Cycle Change Ratio	0.014***	0.008*	1																		
(4) Capex	-0.006	-0.01**	-0.024***	1																	
(5) Investment_latf1	0.154***	0.132***	0.019***	0.389***	1																
(6) Investment2_f1	0.223***	0.186***	0.012**	0.494***	0.752***	1															
(7) R&D spending	0.255***	0.221***	0.032***	-0.032***	0.619***	0.841***	1														
(8) UTB	-0.033***	-0.014***	-0.002	-0.034***	0.022***	0.001	0.022***	1													
(9) POST07	-0.029***	0.0014	0.001*	-0.087***	-0.03	-0.04***	0.004	0.210***	1												
(10) OVERINVEST	0.06***	0.046***	0.0043	0.289***	0.591***	0.342***	0.211***	0.018**	-0.0033	1											
(11) UNDERINVEST	0.017***	0.00499	0.0108**	-0.197***	-0.201***	-0.199***	-0.118***	-0.044***	-0.0052	-0.077***	1										
(12) LEV	-0.04***	-0.01**	-0.012***	0.052***	-0.058***	-0.114***	-0.164***	0.0057	-0.014***	0.0005	0.032***	1									
(13) DEP_PUREAC	0.0083*	0.0075*	0.00231	0.015	-0.0073*	0.00564	-0.0046	-0.022***	-0.042***	-0.0046	0.00164	-0.031***	1								
(14) LOGAGE	-0.171***	-0.098***	-0.01**	-0.073***	-0.147***	-0.182***	-0.167***	-0.061***	0.166***	-0.066***	-0.013***	0.0113**	0.0111**	1							
(15) MTB	0.075***	0.029***	0.0116**	0.081***	0.148***	0.173***	0.156***	0.028***	-0.013***	0.054***	-0.043***	-0.030***	-0.0055	-0.051***	1						
(16) LOGMVE	-0.155***	-0.077***	-0.0036	0.115***	0.024***	-0.019***	-0.085***	0.157***	0.228***	-0.011**	-0.174***	0.116***	0.019***	0.281***	0.150***	1					
(17) STDSALES	0.167***	0.093***	0.0102**	-0.018***	0.00612	-0.0052	0.00328	-0.039***	-0.093***	0.024***	0.044***	-0.047***	-0.013***	-0.237***	0.015***	-0.178***	1				
(18) STDINVEST	0.235***	0.148***	0.0084*	0.00323	0.124***	0.145***	0.163***	-0.0069	-0.034***	0.046***	0.00240	0.047***	-0.010**	-0.211***	0.042***	-0.08***	0.451***	1			
(19) LOGOPCYCLE	0.025***	-0.008*	-0.048***	-0.171***	-0.014***	-0.0016	0.098***	-0.033***	-0.063***	-0.032***	0.027***	-0.118***	0.025***	0.037***	-0.021***	-0.128***	-0.091***	-0.041***	1		
(20) PERFDAROA	-0.012**	0.00166	-0.0025	0.0113**	-0.013***	-0.0052	-0.014***	-0.0005	0.022***	-0.0006	-0.0005	-0.0019	-0.004	0.016***	-0.012**	-0.014***	-0.0082*	-0.012**	0.002	1	
(21) IA_Spread	0.093***	0.049***	-0.0037	-0.109***	-0.07***	-0.037***	0.018***	-0.12***	-0.07***	-0.023***	0.148***	-0.056***	0.00427	-0.128***	-0.128***	-0.631***	0.084***	0.028***	0.089***	0.0112**	1

* p<0.05 ** p<0.01 *** p<0.001

4.3 FIN 48 and Risk-taking

Table 4 reports the results of estimating equation (1). Column (1) and (2) show

similar outcomes. The significantly positive coefficient of *POST07* indicates that

overall economic conditions get more dynamic after 2007 given the global financial

crisis in 2008 and European debt crisis. To specifically capture the effect of how FIN

48 affects firms' risking-taking, the significantly negative coefficients on

UTB*POST07 confirm it. In the regression with *ROA volatility* as the dependent

variable (column 1), the coefficient on *UTB*POST07* is -0.0207 (t-stat = -4.75, p

<0.01), suggesting that firms with UTB inherent reduce their risk-taking in the FIN 48

regime relative to other firms in the same industry. The economic significance is such

that the reduction is 29% of the mean value of *ROA volatility*. In column (2), where I

use *ROIC volatility* as the dependent variable, the estimate is less strong but still

significant compared to that in column (1). The coefficient is -0.0176 (t-stat = -1.86,

p <0.1), meaning 11% reduction of the mean value of *ROIC volatility*.

Column (3) and (4) show how firms respond to FIN 48 by changing operational

arrangements. They both have significantly negative coefficients on *UTB*POST07*.

Firms with UTB inherent accelerate their operating cycles by 6.3% and scales down

their net capital expenditure over total assets by 0.73% in the FIN 48 regime. The

coefficients on *UTB*POST07* in Column (1) to (4) all reflect significant negative

relations. These consistent results corroborate my first hypothesis: *Firms reduce their*

risk-taking in the FIN 48 regime.

When it comes to the control variables, *LEV*, *DEP_PUREAC*, and *STDINVEST*

are significantly positively for column (1) and (2). It shows that higher levels of

leverage, more aggressive choices of accounting methods, and historic operating

volatilities will bring about greater firms' future overall risk-taking. These effects are

not obvious for column (3) and (4). I reckon that *Operating Cycle Change Ratio* and

Capex are more specific aspects of firms' risk-taking unlike the aggregate level

represented by *ROA volatility* and *ROIC volatility*. From *LOGAGE*, I find that firms

reduce their risk-taking as they mature. Last, the negative effect of *LOGOPCYCLE*

contradicts my expectation but I suppose it will not harm the regression results

because of the little economic impacts.

Table 4
FIN 48 and Risk-taking

$$Risks = \beta_0 + \beta_1\ UTB + \beta_2\ POST07 + \beta_3\ UTB*POST07 + X'\zeta + i + t + \varepsilon\ (1)$$

	Predicted Sign	(1) ROA volatility	(2) ROIC volatility	(3) Operating Cycle Change Ratio	(4) Capex
UTB	+/-	-0.0119***	-0.0376***	0.0050	0.0004
		(-4.51)	(-6.32)	(0.26)	(0.24)
POST07	+/-	0.0555***	0.1099***	-0.0583	-0.0234***
		(10.68)	(10.79)	(-0.44)	(-14.70)
UTB*POST07	-	-0.0207***	-0.0176*	-0.0633**	-0.0073***
		(-4.75)	(-1.86)	(-2.17)	(-4.03)
LEV	+	0.0165**	0.0730***	-0.0108	0.0002
		(2.43)	(4.77)	(-0.37)	(0.12)
DEP_PUREAC	+	0.0548***	0.1045***	0.0737	0.0026
		(4.40)	(4.22)	(1.32)	(0.73)
LOGAGE	-	-0.0079***	-0.0232***	-0.0080	-0.0080***
		(-4.13)	(-5.81)	(-0.91)	(-13.06)
MTB	+	-0.0019***	-0.0039***	-0.0016	0.0005***
		(-6.37)	(-4.99)	(-1.04)	(6.84)
LOGMVE	+	-0.0161***	-0.0324***	-0.0023	0.0035***
		(-21.59)	(-23.54)	(-0.77)	(19.56)
STDSALES	+	0.0009	0.0055	0.0079	-0.0007
		(0.24)	(0.91)	(0.62)	(-1.22)
STDINVEST	+	0.1000***	0.1480***	0.0113	0.0013
		(11.93)	(11.25)	(0.53)	(1.31)
LOGOPCYCLE	+	-0.0343***	-0.0454***		-0.0037***
		(-13.99)	(-11.58)		(-9.55)
PERFDAROA	+	-0.0043***	-0.0045**	-0.0021	0.0006***
		(-3.27)	(-2.17)	(-0.50)	(3.36)
_cons		0.2532***	0.4022***	0.1498	0.0764***
		(15.11)	(11.88)	(1.22)	(12.48)
Year Fixed-Effect		Yes	Yes	Yes	Yes
Industry Fixed-Effect		Yes	Yes	Yes	Yes
Std. Error Clustered by Firm		Yes	Yes	Yes	Yes
n		94443	94497	99678	84031
adj. R^2		0.199	0.119	0.001	0.137

t statistics in brackets * p<0.1 ** p<0.05 *** p<0.01

[a] See Appendix A for variable definitions

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4.4 FIN 48 and Investment Efficiency

In my second analysis, I study the relation between FIN 48 and investment efficiency. Table 5 reports the results of regressing equation (2) which is designed to test my second hypothesis. Consistent with my expectations, column (1) to (4) provide evidence that firms with UTB inherent and a greater likelihood of underinvestment (overinvestment) invest more (less) in the FIN 48 regime. The estimated coefficient on *UTB*POST07*UNDERINVEST* is statistically positive in column (1) to (3). They are 0.0152 for *Investment_latf1* (t-stat = 2.31, p <0.05), 0.0236 for *Investment2_f1* (t-stat = 3.57, p <0.01), and 0.016 for *Capex* (t-stat = 7.56, p <0.01). But the coefficient for *R&D spending* is 0.0061 (t-stat = 0.92) and not significant in statistical levels. The coefficient on *UTB*POST07*OVERINVEST* is statistically negative in column (1) to (4). They are -0.0911 for *Investment_latf1* (t-stat = -4.53, p <0.01), -0.1122 for *Investment2_f1* (t-stat = -6.66, p <0.01), -0.0516 for *Capex* (t-stat = -9.14, p <0.01), and -0.0416 for *R&D spending* (t-stat = -2.61, p <0.01).

Regarding economic significance, firms with UTB inherently increase *INVESTMENT* by 9.44%, 18.3%, 27.6%, and 8.97% of the mean value of *INVESTMENT* respectively in column (1) to (4) if they are the firms in the group of *UNDERINVEST*. Regarding economic significance, firms with UTB inherently

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decrease *INVESTMENT* by 56.6%, 87%, 89%, and 61.2% of the mean value of

INVESTMENT respectively in column (1) to (4) if they are the firms in the group of

OVERINVEST.
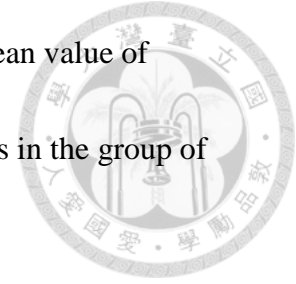
About the coefficients of the control variables, I have a few observations. Being

significant negative, the coefficients of *LOGAGE* indicate that firms invest less as

they develop more maturely. The results of *LOGMVE* seem to reflect similar

tendencies that companies' investment proportions decline when their sizes become

larger. *MTB*, proxy for investment opportunities, are positively related with all four

investment variables.

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Table 5
FIN 48 and Investment Efficiency

$INVESTMENT = \beta0 + \beta1\ UTB + \beta2\ POST07 + \beta3\ UNDERINVEST + \beta4\ OVERINVEST + \beta5\ UTB*POST07 + \beta6\ UTB*POST07*UNDERINVEST + \beta7\ UTB*POST07*OVERINVEST + X'\zeta + i + t + \varepsilon$ (2)

	Predicted Sign	(1) Investment_latf1	(2) Investment2_f1	(3) Capex	(4) R&D spending
UTB	+/-	0.0017	-0.0054*	-0.0003	-0.0044
		(0.59)	(-1.70)	(-0.15)	(-1.48)
POST07	+/-	0.0102***	0.0052	-0.0177***	0.0211***
		(2.82)	(1.64)	(-12.38)	(7.49)
UNDERINVEST	-	-0.1133***	-0.1003***	-0.0393***	-0.0583***
		(-62.33)	(-55.04)	(-53.57)	(-32.08)
OVERINVEST	+	0.4941***	0.2579***	0.0800***	0.1544***
		(74.75)	(41.14)	(35.16)	(26.97)
UTB*POST07	+/-	-0.0000	0.0012	-0.0048***	0.0044
		(-0.01)	(0.36)	(-2.83)	(1.45)
UTB*POST07*UNDERINVEST	+	0.0152**	0.0236***	0.0160***	0.0061
		(2.31)	(3.57)	(7.56)	(0.92)
UTB*POST07*OVERINVEST	-	-0.0911***	-0.1122***	-0.0516***	-0.0416***
		(-4.53)	(-6.66)	(-9.14)	(-2.61)
LEV	+	-0.0111***	-0.0205***	0.0008	-0.0219***
		(-3.63)	(-6.60)	(0.54)	(-7.59)
DEP_PUREAC	+	0.0031	0.0159***	0.0039	0.0070
		(0.51)	(2.63)	(1.21)	(1.31)
LOGAGE	-	-0.0137***	-0.0156***	-0.0055***	-0.0101***
		(-12.65)	(-13.65)	(-9.76)	(-9.29)
MTB	+	0.0008***	0.0011***	0.0003***	0.0008***
		(4.57)	(6.08)	(5.26)	(5.22)
LOGMVE	-	0.0002	-0.0032***	0.0025***	-0.0051***
		(0.70)	(-8.64)	(14.69)	(-14.22)
STDSALES	+	-0.0129***	-0.0147***	0.0007	-0.0144***
		(-9.99)	(-11.26)	(1.35)	(-11.72)
STDINVEST	+	0.0394***	0.0414***	-0.0029***	0.0413***
		(12.44)	(12.64)	(-3.11)	(13.10)
LOGOPCYCLE	+	-0.0122***	-0.0135***	-0.0027***	-0.0098***
		(-13.17)	(-14.14)	(-7.49)	(-10.47)
PERFDAROA	+	0.0002	0.0006*	0.0006***	-0.0001
		(0.69)	(1.82)	(5.27)	(-0.28)
OVERINVEST* PERFDAROA	+/-	-0.0008	-0.0017***	-0.0005**	-0.0012**
		(-1.34)	(-2.76)	(-2.11)	(-2.14)
UNDERINVEST* PERFDAROA	+/-	-0.0068**	-0.0050*	0.0012	-0.0048*
		(-2.25)	(-1.75)	(1.17)	(-1.95)
_cons		0.1572***	0.1821***	0.0645***	0.1112***
		(12.92)	(15.17)	(10.75)	(11.62)
Year Fixed-Effect		Yes	Yes	Yes	Yes
Industry Fixed-Effect		Yes	Yes	Yes	Yes
Std. Error Clustered by Firm		Yes	Yes	Yes	Yes
n		84520	84299	83272	83639
adj. R-sq		0.548	0.430	0.257	0.420

t statistics in brackets * p<0.1 ** p<0.05 *** p<0.01
[a] See Appendix A for variable definitions

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4.5 Additional Tests

4.5.1 Effect of Information Asymmetry

Following Lara et al. (2015), I also want to know the effect of including

information asymmetry. According to Lara et al. (2015), they find that the effect of

conservatism mitigating investment efficiency is greater when information asymmetry

is high. They construct the proxy for information asymmetry by averaging bid-ask

spread, daily stock return volatility, and idiosyncratic risk. Inspired by Lara et

al.(2015), I expect to augment my main results in section 4.4 by adding the impact of

information asymmetry to equation (2). I choose bid-ask spread (*IA_Spread*) as my

proxies and rank it in deciles. My hypothesis is that, among firms in UTB and

underinvestment (overinvestment) setting, firms invest more (less) when the level of

information asymmetry is high. However, I fail to confirm the hypotheses in

untabulated results when I add information asymmetry proxies to equation (2).

To fix possible evaluation issues, I modify my dependent variables to the form of

the change of ratio. That is, I calculate the ratio as one-year ahead measurement of

investment less investment this year over one-year before total assets (*t+1-t/t-1*). By

making use of this adjustment, I find some evidence to support the idea that UTB can

better alleviate investment inefficiency when information asymmetry is greater. The

coefficients of *UTB*POST07*UNDERINVEST*IA_Spread* and

UTB*POST07*OVERINVEST*IA_Spread for *Investment_latf1_change* are with the

expected signs and statistically significant. However, the results for

Investment2_f1_change and *Capex_change* aren't as compelling. Meanwhile, in the

group with propensity to underinvestment, investment efficiency improves for *R&D*

spending_change. My inference is that the information for capital expenditure is

relatively clear than that for research and development expenditure. Therefore, the

effect of including information asymmetry is less obvious for *Investment2_f1_change*

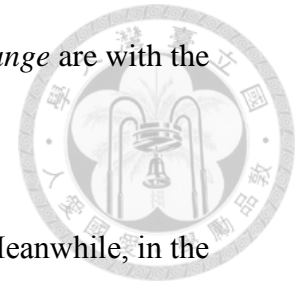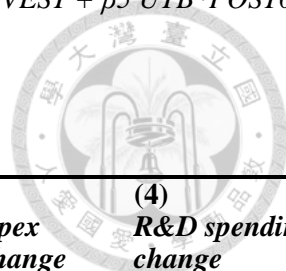and *Capex_change* for which capital expenditure accounts more.

Table 6
Effect of Information Asymmtry

$INVESTMENT = \beta 0 + \beta 1 \ UTB + \beta 2 \ POST07 + \beta 3 \ UNDERINVEST + \beta 4 \ OVERINVEST + \beta 5 \ UTB*POST07 +$
$\beta 6 \ UTB*IA\_Spread + \beta 7 \ UTB*POST07*IA\_Spread +$
$\beta 8 \ UTB*POST07*UNDERINVEST + \beta 9 \ UTB*POST07*OVERINVEST +$
$\beta 10 \ UTB*POST07*UNDERINVEST*IA\_Spread +$
$\beta 11 \ UTB*POST07*OVERINVEST*IA\_Spread + \beta 12 \ IA\_Spread$
$X'\zeta + i + t + \varepsilon$ (3)

	Predicted Sign	(1) Investment_lat f1_change	(2) Investment2 _f1_change	(3) Capex _change	(4) R&D spending_ change
UTB	+/-	0.0073	0.0007	0.0023	0.0002
		(1.44)	(0.25)	(1.20)	(0.21)
POST07	+/-	-0.0130	-0.0113***	-0.0105***	-0.0024**
		(-1.07)	(-3.86)	(-6.07)	(-2.04)
UNDERINVEST	-	-0.0626***	-0.0356***	-0.0261***	-0.0048***
		(-25.11)	(-24.55)	(-25.26)	(-8.55)
OVERINVEST	+	0.3809***	0.1188***	0.0661***	0.0259***
		(51.82)	(31.70)	(29.46)	(17.44)
UTB*POST07	+/-	-0.0060	-0.0032	-0.0038*	0.0006
		(-0.91)	(-0.95)	(-1.84)	(0.42)
UTB*IA_Spread	+/-	-0.0127	-0.0047	-0.0065	0.0014
		(-1.09)	(-0.65)	(-1.50)	(0.45)
UTB*POST07* IA_Spread	+/-	0.0097	0.0121	0.0113**	-0.0029
		(0.65)	(1.49)	(2.38)	(-0.78)
UTB*POST07* UNDERINVEST	+	-0.0672**	0.0087	0.0192***	-0.0063
		(-2.30)	(0.95)	(4.08)	(-1.60)
UTB*POST07* OVERINVEST	-	0.0760	-0.0929***	-0.0472***	-0.0174***
		(1.56)	(-6.33)	(-4.91)	(-2.77)
UTB*POST07* UNDERINVEST* IA_Spread	+	0.1775*** (3.36)	0.0255 (1.40)	-0.0076 (-0.72)	0.0234*** (2.96)
UTB*POST07* OVERINVEST* IA_Spread	-	-0.3774*** (-3.32)	0.0560 (1.30)	0.0119 (0.51)	0.0228 (1.09)
IA_Spread	-	-0.0051	-0.0170***	-0.0059***	-0.0070***
Controls included					
Year Fixed-Effect		Yes	Yes	Yes	Yes
Industry Fixed-Effect		Yes	Yes	Yes	Yes
Std. Error Clustered by Firm		Yes	Yes	Yes	Yes
n		68538	73726	73726	73726
adj. R-sq		0.266	0.117	0.090	0.047

t statistics in brackets * p<0.1 ** p<0.05 *** p<0.01

[a] See Appendix A for variable definitions

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4.5.2 Robustness Tests

In this section, I would like to reinforce my main results by adding some restrictions on sample selection and interaction variables into the regression models. The rationale of having these robustness tests is to reduce potential measurement errors coming from the designation of treatment and control groups. I use the same definition of *UTB* and calculate the frequency of disclosures for unrecognized tax benefit in the period after 2007. Most of the firms with UTBs have UTBs across all the years since 2007 (the mean value of the frequency is 84%). Such constant disclosures of unrecognized tax benefits can first justify my main research design.

Further, I conduct two additional tests in subsamples. First, I delete the observations of a company with disclosed unrecognized tax benefits only once in all of its fiscal years. Table 7 shows the results of this test, the results are consistent with the main results. Statistics for *β3* of equation (1) are as follows: -0.0225 for *ROA volatility* (t-stat = -4.12, p <0.01), -0.0223 for *ROIC volatility* (t-stat = 2.35, p <0.05), -0.0597 for *Operating Cycle Change Ratio* (t-stat = -2.04, p <0.1), and -0.0077 for *Capex* (t-stat = -4.22, p <0.01). Statistics for *β6* of equation (2) are: 0.0146 for *Investment_latf1* (t-stat = 2.20, p <0.05), 0.0235 for *Investment2_f1* (t-stat = 3.55, p <0.01), 0.0163 for *Capex* (t-stat = 7.65, p <0.01), and 0.0057 for *R&D spending* (t-stat = 0.85); statistics for *β7* are: -0.0918 for *Investment_latf1* (t-stat = -4.56, p

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<0.01), -0.1140 for *Investment2_f1* (t-stat = -6.76, p <0.01), -0.0514 for *Capex* (t-stat = -9.03, p <0.01), and -0.0434 for *R&D spending* (t-stat = -2.61, p <0.01). For equation (3), the coefficients and their p-values also remain similar compared to those in the main tests.

In the second test, I add more restrictions on sample selection. Firms have to disclose unrecognized tax benefit once from 2007 to 2009 and at least five times after 2007. The results in table 8 still remain consistent with my hypotheses. In general, the coefficients and the statistical significance stays as strong as those in the main results. *ROIC volatility* even decreases more clearly. I also observe this trend in $\beta 10$ and $\beta 11$ of equation (3) for *Investment_latf1_change*. By conducting these robustness tests, the rationale of my research design is bolstered so that the empirical results are reasonable and convincing.

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Table 7
Robustness Tests 1

Panel A: FIN 48 and Risk-taking

Risks = β0 + β1 UTB + β2 POST07 + β3 UTB*POST07+X'ζ + i + t + ε (1)

	Predicted Sign	(1) ROA volatility	(2) ROIC volatility	(3) Operating Cycle Change Ratio	(4) Capex
UTB	+/-	-0.0117***	-0.0376***	0.0011	0.0005
		(-4.42)	(-6.26)	(0.06)	(0.25)
POST07	+/-	0.0702***	0.1571***	-0.0578	-0.0233***
		(12.42)	(12.09)	(-0.43)	(-14.51)
UTB*POST07	-	-0.0225***	-0.0223**	-0.0597**	-0.0077***
		(-5.12)	(-2.35)	(-2.04)	(-4.22)
Controls included					
n		93041	93095	98270	82863
adj. R-sq		0.197	0.118	0.001	0.137

Panel B: FIN 48 and Investment Efficiency

INVESTMENT = β0 + β1 UTB + β2 POST07 + β3 UNDERINVEST + β4 OVERINVEST + β5 UTB*POST07 + β6 UTB*POST07*UNDERINVEST + β7 UTB*POST07*OVERINVEST + X'ζ + i + t + ε   (2)

	Predicted Sign	(1) Investment_latf1	(2) Investment2_f1	(3) Capex	(4) R&D spending
UTB	+/-	0.0016	-0.0054*	-0.0003	-0.0044
		(0.55)	(-1.68)	(-0.17)	(-1.45)
POST07	+/-	-0.0216**	-0.0097***	-0.0208***	0.0238***
		(-2.31)	(-2.92)	(-13.84)	(8.46)
UNDERINVEST	-	-0.1132***	-0.1005***	-0.0397***	-0.0581***
		(-62.83)	(-55.55)	(-53.54)	(-32.35)
OVERINVEST	+	0.4936***	0.2580***	0.0799***	0.1545***
		(74.02)	(40.92)	(34.89)	(26.81)
UTB*POST07	+/-	0.0007	0.0012	-0.0052***	0.0049
		(0.19)	(0.36)	(-3.04)	(1.59)
UTB*POST07* UNDERINVEST	+	0.0146**	0.0235***	0.0163***	0.0057
		(2.20)	(3.55)	(7.65)	(0.85)
UTB*POST07* OVERINVEST	-	-0.0918***	-0.1140***	-0.0514***	-0.0434***
		(-4.56)	(-6.76)	(-9.03)	(-2.71)
Controls included					
n		83338	83124	82111	82474
adj. R-sq		0.547	0.430	0.258	0.421

Panel C: Effect of Information Asymmetry on FIN 48 and Investment Efficiency

$INVESTMENT = \beta_0 + \beta_1\ UTB + \beta_2\ POST07 + \beta_3\ UNDERINVEST + \beta_4\ OVERINVEST +$
$\quad \beta_5\ UTB*POST07 + \beta_6\ UTB*IA\_Spread + \beta_7\ UTB*POST07*IA\_Spread +$
$\quad \beta_8\ UTB*POST07*UNDERINVEST + \beta_9\ UTB*POST07*OVERINVEST +$
$\beta_{10}\ UTB*POST07*UNDERINVEST*IA\_Spread + \beta_{11}\ UTB*POST07*OVERINVEST*IA\_Spread +$
$\beta_{12}\ IA\_Spread + X'\zeta + i + t + \varepsilon \quad (3)$

	Predicted Sign	(1) Investment_latf1_change	(2) Investment2_f1_change	(3) Capex_change	(4) R&D spending_change
UTB	+/-	0.0073	0.0007	0.0023	0.0004
		(1.42)	(0.23)	(1.21)	(0.34)
POST07	+/-	-0.0110**	-0.0111***	-0.0103***	-0.0025**
		(-1.96)	(-3.76)	(-5.91)	(-2.16)
UNDERINVEST	-	-0.0633***	-0.0360***	-0.0264***	-0.0049***
		(-25.32)	(-24.42)	(-25.12)	(-8.58)
OVERINVEST	+	0.3811***	0.1193***	0.0666***	0.0257***
		(51.17)	(31.59)	(29.27)	(17.37)
UTB*POST07	+/-	-0.0049	-0.0026	-0.0039*	0.0009
		(-0.74)	(-0.76)	(-1.88)	(0.61)
UTB*IA_Spread	+/-	-0.0140	-0.0052	-0.0070	0.0008
		(-1.18)	(-0.72)	(-1.59)	(0.27)
UTB*POST07* IA_Spread	+/-	0.0071	0.0106	0.0116**	-0.0033
		(0.48)	(1.30)	(2.43)	(-0.86)
UTB*POST07* UNDERINVEST	+	-0.0677**	0.0077	0.0185***	-0.0064
		(-2.32)	(0.84)	(4.03)	(-1.61)
UTB*POST07* OVERINVEST	-	0.0791	-0.0935***	-0.0474***	-0.0174***
		(1.61)	(-6.31)	(-4.88)	(-2.74)
UTB*POST07* UNDERINVEST* IA_Spread	+	0.1831*** (3.44)	0.0305* (1.71)	-0.0041 (-0.42)	0.0239*** (3.00)
UTB*POST07* OVERINVEST* IA_Spread	-	-0.3823*** (-3.34)	0.0569 (1.31)	0.0115 (0.49)	0.0231 (1.10)
IA_Spread	-	-0.0047	-0.0171***	-0.0061***	-0.0069***
		(-1.09)	(-6.22)	(-3.71)	(-6.44)
Controls included					
n		68538	73726	73726	73726
adj. R-sq		0.266	0.117	0.090	0.047

t statistics in brackets * p<0.1 ** p<0.05 *** p<0.01

[a] See Appendix A for variable definitions.

[b] Year and industry fixed-effect are included in all regression results.

[c] Standard error is clustered by firm in all regression results.

Table 8
Robustness Tests 2

Panel A: FIN 48 and Risk-taking

$Risks = \beta0 + \beta1\ UTB + \beta2\ POST07 + \beta3\ UTB*POST07 + X'\zeta + i + t + \varepsilon$ (1)

	Predicted Sign	(1) ROA volatility	(2) ROIC volatility	(3) Operating Cycle Change Ratio	(4) Capex
UTB	+/-	-0.0083***	-0.0306***	0.0194	-0.0019
		(-2.92)	(-4.85)	(0.99)	(-0.99)
POST07	+/-	0.0679***	0.1545***	-0.0791	-0.0197***
		(12.14)	(11.73)	(-0.52)	(-11.64)
UTB*POST07	-	-0.0219***	-0.0258***	-0.0732**	-0.0064***
		(-5.08)	(-2.61)	(-2.42)	(-3.35)
Controls included					
n		91561	91615	96785	81571
adj. R-sq		0.201	0.12	0.001	0.137

Panel B: FIN 48 and Investment Efficiency

$INVESTMENT = \beta0 + \beta1\ UTB + \beta2\ POST07 + \beta3\ UNDERINVEST + \beta4\ OVERINVEST + \beta5\ UTB*POST07 + \beta6\ UTB*POST07*UNDERINVEST + \beta7\ UTB*POST07*OVERINVEST + X'\zeta + i + t + \varepsilon$ (2)

	Predicted Sign	(1) Investment_latf1	(2) Investment2_f1	(3) Capex	(4) R&D spending
UTB	+/-	0.0006	-0.0065*	-0.0026	-0.0031
		(0.18)	(-1.86)	(-1.37)	(-0.94)
POST07	+/-	-0.0192*	-0.0152***	-0.0166***	0.0253***
		(-1.88)	(-4.51)	(-10.66)	(8.72)
UNDERINVEST	-	-0.1132***	-0.1001***	-0.0393***	-0.0581***
		(-62.03)	(-54.73)	(-53.08)	(-31.87)
OVERINVEST	+	0.4942***	0.2590***	0.0802***	0.1552***
		(74.19)	(40.94)	(34.88)	(26.85)
UTB*POST07	+/-	-0.0006	0.0011	-0.0034*	0.0027
		(-0.15)	(0.32)	(-1.91)	(0.83)
UTB*POST07*UNDERINVEST	+	0.0145*	0.0229***	0.0174***	0.0043
		(1.92)	(3.15)	(7.79)	(0.59)
UTB*POST07*OVERINVEST	-	-0.0944***	-0.1352***	-0.0564***	-0.0577***
		(-4.19)	(-7.55)	(-8.76)	(-3.42)
Controls included					
n		82064	81874	80866	81227
adj. R-sq		0.549	0.431	0.258	0.42

(continued on next page)

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Panel C: Effect of Information Asymmetry on FIN 48 and Investment Efficiency

$INVESTMENT = \beta0 + \beta1\ UTB + \beta2\ POST07 + \beta3\ UNDERINVEST + \beta4\ OVERINVEST +$
$\beta5\ UTB*POST07 + \beta6\ UTB*IA\_Spread + \beta7\ UTB*POST07*IA\_Spread +$
$\beta8\ UTB*POST07*UNDERINVEST + \beta9\ UTB*POST07*OVERINVEST +$
$\beta10\ UTB*POST07*UNDERINVEST*IA\_Spread + \beta11\ UTB*POST07*OVERINVEST*IA\_Spread +$
$\beta12\ IA\_Spread + X'\zeta + i + t + \varepsilon$ (3)

	Predicted Sign	(1) Investment_latf1_change	(2) Investment2_f1_change	(3) Capex_change	(4) R&D spending_change
UTB	+/-	0.0056	-0.0022	0.000047	-0.0007
		(1.02)	(-0.74)	(0.02)	(-0.56)
POST07	+/-	-0.0077	-0.0047	-0.0049***	-0.0027**
		(-1.51)	(-1.60)	(-2.82)	(-2.38)
UNDERINVEST	-	-0.0621***	-0.0356***	-0.0262***	-0.0048***
		(-24.87)	(-24.40)	(-25.09)	(-8.50)
OVERINVEST	+	0.3802***	0.1188***	0.0659***	0.0260***
		(51.3)	(31.38)	(29.11)	(17.33)
UTB*POST07	+/-	-0.0077	-0.0035	-0.0024	-0.0001
		(-1.09)	(-1.01)	(-1.16)	(-0.08)
UTB*IA_Spread	+/-	-0.0077	0.0029	-0.002	0.0038
		(-0.60)	(0.38)	(-0.44)	(1.2)
UTB*POST07* IA_Spread	+/-	0.0099	0.0104	0.0094*	-0.0029
		(0.62)	(1.21)	(1.85)	(-0.73)
UTB*POST07* UNDERINVEST	+	-0.0770**	0.0108	0.0225***	-0.0065
		(-2.29)	(1.05)	(4.84)	(-1.41)
UTB*POST07* OVERINVEST	-	0.1122**	-0.0840***	-0.0415***	-0.0167**
		(2.1)	(-5.37)	(-4.28)	(-2.28)
UTB*POST07* UNDERINVEST* IA_Spread	+	0.1936***	0.0217	-0.013	0.0227**
		(3.11)	(1.04)	(-1.14)	(2.44)
UTB*POST07* OVERINVEST* IA_Spread	-	-0.4405***	0.0089	-0.0159	0.0159
		(-3.32)	(0.2)	(-0.80)	(0.64)
IA_Spread	-	-0.0055	-0.0173***	-0.0061***	-0.0071***
		(-1.27)	(-6.35)	(-3.77)	(-6.71)
Controls included					
n		66487	71417	71417	71417
adj. R-sq		0.267	0.117	0.09	0.047

t statistics in brackets * p<0.1 ** p<0.05 *** p<0.01

[a] See Appendix A for variable definitions.

[b] Year and industry fixed-effect and standard error clustered are included in all regression results.

[c] Standard error is clustered by firm in all regression results.

5. Conclusions, Constraints, and Recommendation

5.1 Conclusions

This study aims to identify the impact of the adoption of FIN 48 on firms'

decision-making which includes risk-taking and investment efficiency. In the first

place, I argue that FIN 48 is such a stringent change of rule that it may force

companies to adapt their operating practices. I hypothesize those adaptions lead to the

reduction in firms' risk-taking. Using six variables to proxy for risk-taking, I provide

evidence that firms reduce their risk-taking in the FIN 48 regime. Secondly, FASB

expected FIN 48 to improve financial reporting quality. According to prior literature,

better financial reporting quality attenuates investment inefficiency. Therefore, I argue

that FIN 48 aids in investment efficiency in the FIN 48 regime. In the setting of

underinvestment (overinvestment), I observe that firms invest more (less) in the FIN

48 regime when using four measures of investment level. Finally, I extend the model

of underinvestment (overinvestment) by adding bid-ask spread to proxy for

information asymmetry. The results provides some evidence that are supportive of my

expectation that firms with UTB and prone to underinvestment (overinvestment)

invest more (less) in the FIN 48 regime when information asymmetry is high.

5.2 Constraints and Recommendation

This study is subject to the constraint that the data for UTB in only available

after 2007. To construct the difference-in-difference model, I need to partition the

observations into two groups where I designate a company into the treatment group if

one has any relevant data of UTB. This is an assumption that firms disclosing UTB

after 2007 had similar operating activities regarding tax uncertainty before 2007.
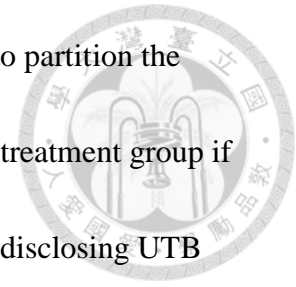
Last but not least, this study provides an implication for accounting policy

makers that the change of rules has economic consequences. As stated in my research,

firms respond to FIN 48 by reducing their risk-taking and altering investment

decisions. Although the rationale of adopting FIN 48 is to improve financial reporting

quality, which is the top priority of FASB, other governmental administrations may

also need to consider what economic impact the new accounting rule will bring. For

instance, there still has not been any signal that IASB or Taiwan is going to include

the rule for tax uncertainty. If they intend to do so, then the economic consequences

documented in this study are worth their noticing.

APPENDIX   A

Variable Definitions

A.1 DEPENDENT VARIABLES

ROA volatility is defined as the standard deviation of the difference between quarterly

ROA and that of the same quarter from the previous year, computed from the period t

to t+2. ROA is calculated as operating income after depreciation over the book value

of assets.

ROIC volatility is defined as the standard deviation of the difference between

quarterly ROIC and that of the same quarter from the previous year, computed from

the period t to t+2. ROIC is calculated as operating income after depreciation over the

sum of debt, minority interests, preferred stock, and common stock.

Operating Cycle Change Ratio is the ratio of the difference between current and

one-year ahead operating cycle to current operating cycle. Operating cycle is defined

in section A.2

Capex is one-year ahead net capital expenditure (capital expenditure less sale of

property) over the book value of lagged total assets.

Investment_latf1 is the one-year ahead sum of research and development expenditure,

capital expenditure, and acquisition expenditure, less cash receipts from the sale of

property, plant, and equipment and scaled by lagged total assets.

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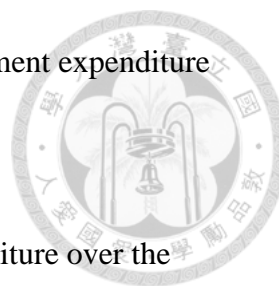
Investment2_f1 is the one-year ahead sum of research and development expenditure

and capital expenditure and scaled by lagged total assets.

R&D spending is one-year ahead research and development expenditure over the

book value of lagged total assets.

A.2 INDEPENDENT VARIABLES

UTB is an indicator variable equal to one if an observation has any data in the

following items that are provided in Compustat: beginning balance of unrecognized

tax benefits (Compustat item txtubbegin), ending balance of unrecognized tax benefits

(Compustat item txtubend), decreases to unrecognized tax benefits relating to

settlements with taxing authorities (Compustat item txtubsettle), interest and penalties

related to uncertain tax positions (Compustat item txtubxintbs and txtubxintis), and

increases to unrecognized tax benefits arising from uncertain tax positions taken in a

prior year (Compustat item txtubposinc).

POST07 is an indicator variable that is equal to one if an observation is in year 2007

or afterwards.

UNDERINVEST (OVERINVEST) is a variable that is ranked to identify the level of

underinvestment (overinvestment).

To generate these two variables, the first step is to estimate the following regression:

$$\text{Investment}_{i,t} = \beta_0 + \beta_1 \text{SalesGrowth}_{i,t-1} + \varepsilon$$

where Investment and SalesGrowth are calculated at industry level. Each industry

group is required to have a minimum of 20 firms. The second step is to rank the

residuals of the above equation into deciles and multiply them by -1. After being

rescaled, these rankings range from 0.1 to 1. The higher the value of this range, the

more likely firms underinvest at the industry-year level. Finally, I designate the group

with the value of 1 (0.1) as *UNDERINVEST (OVERINVEST)*.

IA_Spread is the annual average of daily bid-ask spread scaled by midpoint between

bid and ask in decile form.

LEV   stands for long-term debt over the book value of lagged total assets.

DEP_PUREAC equals to one if the firm chooses accelerated depreciation or the units

of production method.

LOGAGE is the log of firm age.

MTB is the ratio of the market value of equity to the book value of equity.

LOGMVE is the log of market value of equity.

STDSALES is defined as the firm's standard deviation of annual sales scaled by

lagged total assets calculated for the period from years t-5 to t-1.

STDINVEST is defined as the firm's standard deviation of annual investment scaled

by lagged total assets calculated for the period from years t-5 to t-1

LOGOPCYCLE is the log of operating cycles. An operating cycle is defined as the

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sum of the average inventory holding period and the average number of days to

collect receivables minus the average number of days to pay payables.
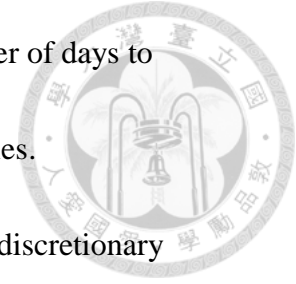
PERFDAROA is the performance-matched modified-Jones model discretionary

accrual developed by Kothari et al. (2005). Based on original modified-Jones model,

they match each firm-year observation with another from the same industry and year

with the closest return on assets. The difference of the discretionary accrual between

the match is the performance-matched modified-Jones model discretionary accrual.

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References

Alexander A., and M. Jacob. 2016. Executive inside debt and corporate tax avoidance. Working paper, Otto Beisheim School of Management.

Balakrishnan, K., J. Blouin, and W. Guay. 2012. Does tax aggressiveness reduce corporate transparency?. Working paper, University of Pennsylvania.

Bertrand, M., and S. Mullainathan, 2003. Enjoying the quiet life? Corporate governance and managerial preferences. *Journal of Political Economy* 111 (5): 1043–1075.

Biddle, G.C., G. Hilary, and R.S. Verdi. 2009. How does financial reporting quality relate to investment efficiency? *Journal of Accounting and Economics* 48 (2/3): 112–131.

Blouin, J. L., C. A. Gleason, L. F. Mills, and S. A. Sikes. 2007. What can we learn about uncertain tax benefits from FIN 48? *National Tax Journal* 60 (3): 521-535.

Blouin, J. L., C. A. Gleason, L. F. Mills, and S. A. Sikes. 2010. Pre-empting disclosure? Firms' decisions prior to FIN No. 48. *The Accounting Review* 85 (3):791-815.

Cheng, M., D. Dhaliwal, and Y. Zhang. 2013. Does investment efficiency improve after the disclosure of material weakness in internal control over financial

reporting? *Journal of Financial Economics* 56 (1): 1–18.

Chow, T., K.J. Klassen, and Y. Liu. 2016. Targets' tax shelter participation and takeover

premiums. *Contemporary Accounting Research* 33 (4): 1440-1472.

Ciconte, W., M. Donahoe, P. Lisowsky, and M. Mayberry. 2014. Predictable

Uncertainty: The Relation between Unrecognized Tax Benefits and Future

Income Tax Cash Outflows. Working paper, University of Illinois at Urbana–

Champaign and University of Florida.

Coles, J., N. Daniel, and L. Naveen. 2006. Managerial incentives and risk-taking.

Journal of Accounting and Economics 79 (2): 431–468.

Dechow, P. and I. Dichev. 2002. The quality of accruals and earnings: The role of

accrual estimation errors. *The Accounting Review* 77 (s-1): 35–59.

Dhaliwal, D., Gleason, C., and Mills.L. 2004. Last-chance earnings management:

Using the tax expense to meet analysts' forecasts. *Contemporary Accounting*

Research 21 (2): 431-459.

Donohoe, M., G. McGill, and E. Outslay. 2014. Risky business: The prosopography

of corporate tax planning. *National Tax Journal* 67 (4): 851–874.

Dyreng, S., Hanlon, M., and Maydew. E. 2016. When does tax avoidance result in tax

uncertainty? Working paper, Duke University.

Ernst & Young. 2014. Tax risk and controversy survey. Available at

http://www.ey.com/gl/en/services/tax/tax-policy-and-controversy/ey-2014-tax-

risk-controversy-survey-01-summary.
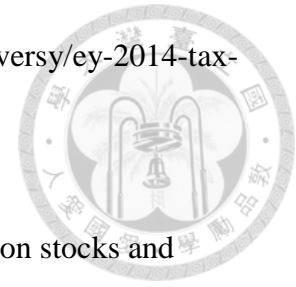
Fama, E., and K. French. 1993. Common risk factors in the returns on stocks and

bonds. *Journal of Financial Economics* 33 (1): 3–56.

Fama, E., and K. French. 1995. Size and book-to-market factors in earnings and

returns. *The Journal of Finance* 50 (1): 131–155.

Fama, E., and K. French. 1997. Industry costs of equity. *Journal of Financial*

Economics 43 (2): 153–193.

Fama, E., and K. French. 2002.Testing trade-off and pecking order predictions about

dividends and debt. Review of Financial Studies 15 (1): 1–33.

Financial Accounting Series NO. 1215-001, FASB EXPOSURE DRAFT, Proposed

Interpretation: Accounting for Uncertain Tax Positions. July 2005. Available at

http://www.fasb.org/cs/ContentServer?site=FASB&c=Document_C&pagenam

e=FASB%2FDocument_C%2FDocumentPage&cid=1176157305569.

Financial Accounting Series NO. 281-B, FASB Interpretation No. 48: Accounting for

Uncertainty in Income Taxes. June 2006. Available at

http://www.fasb.org/cs/BlobServer?blobcol=urldata&blobtable=MungoBlobs

&blobkey=id&blobwhere=1175820931560&blobheader=application/pdf.

Francis, J., and X. Martin. 2010. Acquisition profitability and timely loss recognition.

Journal of Financial Economics 49 (1/2): 161–178.

Francis, J., R. Lafond, P. Olsson, and K. Schipper. 2005. The market pricing of

accruals quality. *Journal of Financial Economics* 39 (2): 295–327.

Graham, J., M. Hanlon, T. Shevlin, and N.Shroff. 2016. Tax rates and corporate

decision making. Working paper, Duke University.

Guenther, D., S. Matsunaga, B. Williams. 2017. Is tax avoidance related to firm risk?

The Accounting Review 92 (1): 115–136.

Gupta, S., L. Mills, and E. Towery. 2014. The effect of mandatory financial statement

disclosures of tax uncertainty on tax reporting and collections: The case of FIN

48 and multistate tax avoidance. *The Journal of the American Taxation*

Association 36 (2): 203–229.

Gupta, S., R. Laux, and D. Lynch. 2016. Do firms use tax reserves to meet analysts'

forecasts? Evidence from the pre- and post-FIN 48 periods. *Contemporary*

Accounting Research 33 (3): 1044–1074.

Hanlon, M., E. Maydew, and D. Saavedra. 2017. The taxman cometh: Does tax

uncertainty affect corporate cash holdings? *Review and Accounting Studies,*

Forthcoming.

Harris, M., and A. Raviv. 1991. The theory of capital structure. Journal of Finance

(46): 297–355.

How taxes affect corporate risk taking. *Journal of Accounting Research*

Hutchens, M., and S. O. Rego. 2015. Does greater tax risk lead to increased firm risk.

Working paper, Indiana University.

Jackson, S., X. Liu, and M. Cecchini. 2009. Economic consequences of firms'

depreciation method choice: Evidence from capital investments. *Journal of*

Accounting and Economics 48 (1): 54–68.

Jacob, M., Wentland, K., and Wentland, S. 2016. Real effects of tax uncertainty:

Evidence from firm capital investments. Working paper, Otto Beisheim School

of Management.

Jensen, M. 1986. Agency costs of free cash flow, corporate finance, and takeovers.

American Economic Review 76 (2): 323–329.

Jensen, M., and W. Meckling. 1976. Theory of the firm: managerial behavior, agency

costs and ownership structure. *Journal of Financial Economics* 3 (4): 305–
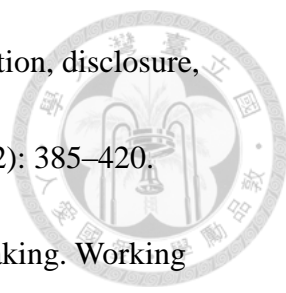
360.

Koester, A., S. Lim, and R. Vigeland. 2015. The effect of tax-related material weakness

in internal controls on the market valuation of unrecognized tax benefits. *The*

Journal of the American Taxation Association 37 (1): 129–155.

Kothari, S.P., A. Leone, and C. Wasley. 2005. Performance matched discretionary

accrual measures. *Journal of Accounting and Economics* 39 (1): 163–197.

Lambert, R., C. Leuz, and R. Verrecchia. 2007. Accounting information, disclosure, and the cost of capital. *Journal of Accounting Research* 45 (2): 385–420.

Langenmayr, D., and R. Lester. 2015. Taxation and corporate risk-taking. Working paper, University of Munich and Massachusetts Institute of Technology.

Lara, J.M., B. Osma, and F. Penalva. 2015. Accounting conservatism and firm investment efficiency. *Journal of Accounting and Economics* 61 (1): 221–238.

Leuz, C., and R. Verrecchia. 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 38 (1): 91–124.

Ljungqvist, A., L. Zhang, and L. Zuo. 2016. Sharing risk with the government: How taxes affect corporate risk taking. *Journal of Accounting Research* 55 (3): 669–707.

Liu, M., and P. Wysocki. 2016. Cross-sectional determinants of information quality proxies and cost of capital measures. *Quarterly Journal of Finance* 7 (2): 1–33 .

Myers, S., and N. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13 (2): 187–221.

Nesbitt, W., E. Outslay, and A. Persson. 2016. The relationship between tax risk and firm value: Evidence from the Luxembourg tax leaks. Working paper, Michigan

State University.

Peters, R., and L. Taylor. 2017. Intangible capital and the investment-q relation. *Journal of Financial Economics* 123 (2): 251–272.

PWC. 2015. 18th Annual Global CEO Survey. Available at http://www.pwc.com/gx/en/ceo-survey/2015/assets/pwc-18th-annual-global-ce o-survey-jan-2015.pdf

Robinson, L., B. Stomberg, and E. Towery. 2016. One size does not fit all: How the uniform rules of FIN 48 affect the relevance of income tax accounting. *The Accounting Review* 91 (4): 1195–1217.

Scholes, M., Wolfson, M., Erickson, M., Hanlon, M., Maydew, E., and Shevlin, T., 2014. Taxes and Business Strategy: A Planning Approach. 5th edition, Prentice-Hall, Upper Saddle River, NJ.