Aalto University
School of Business

Value Relevance of R&D Reporting

Evidence from IT Companies listed on China Stock Market

Master's Thesis

Yudong Hu

Aalto University School of Business

Accounting

Spring 2017

**AI! Aalto University
School of Business**

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi
Abstract of master's thesis

Author   Yudong Hu

Title of thesis   Value Relevance of R&D Reporting: Evidence from IT firms listed in China Stock Market

Degree   Master of Science in Economics and Business Administration

Degree programme   Degree programme

Thesis advisor(s)   Henry Jarva, Yaping Mao

Year of approval   2017   **Number of pages**   74   **Language**   English

Abstract

As the result of the adoption of *Accounting Standards for Business Enterprise (2006)* in the beginning of 2007, the accounting treatment of Research and Development (R&D) expenditure changed dramatically. IT (Information Technology) industry, an R&D intensive industry, was expected to experience more significant change than average. Meanwhile, the financial market in China was increasing mature and investors were becoming more sophisticated. These conditions provide a meaningful ground to investigate the value relevance of R&D reporting based on data of listed IT firms. The work observed all IT firms listed on the Shanghai Stock Exchange and Shenzhen Stock Exchange over the period of 2009 to 2015. In this study, I find evidence supporting the implementation of accounting reforms on R&D increases the value relevance of financial reports. In addition, I also find positive (negative) association between the market value and R&D asset (expense). This study extends the existing studies regarding the effect of R&D reporting reform by using 'AS-IF' method. Besides, it collaborates with existing argument that valuation effect of capitalized R&D expenditure is distinct from that of expensed capitalized R&D expenditure. The existence of difference of valuation effect between GEM and Other Boards (Main Board and SME Board) is examined as well, while the study fails to find evidences supporting such difference.

Keywords   Value relevance, R&D reporting, IT, GEM, Main Board, SME

Table of Content

List of Tables and Figures

1. Introduction

1.1. Motivation

Research and development (R&D) is the exploratory activities that a business conducts with the wish of acquiring new knowledge and technique that can be used for the development of new products or procedures, or for improvement of existing products or procedures. Research and development is one of the approaches by which business can experience future growth by developing new products or processes to improve and expand their operations.

R&D is widely accepted as the main way to build core competence and achieve differentiation through continuous innovation. Drucker (1994) argues in the post-capitalist society knowledge is the basic resource and knowledge worker produces growth and wealth. As the whole world is entering knowledge economy era, intangible asset is becoming increasingly significant in many firms. R&D activities are a main way to generate intangible asset related to technology.

In country level, among OECD[1] countries, with gross domestic expenditure on R&D (GRED) amounting up to 433 billion US dollars, the United States is the main performer with 40% of the total OECD in 2013, followed by Japan (14%) and Germany (9%) (OECD, 2016). These three countries are also ranked as top four in the world in terms of nominal GDP.

In firm level, Strategy& [2] collected R&D investment information from the 1,000

---

[1] OECD is an international cooperation organization aiming at promoting policies that will improve the economic and social well-being of people around the world. Most developed countries are its member

[2] Strategy& is a leading global strategy consulting firm, founded in 1914 as Booz Allen Hamilton in the United States and is now part of PricewaterhouseCoopers. Strategy& was established on March 31, 2014, when Booz & Company combined with PwC to create a new kind of consulting business. Since its foundation, Strategy& (former Booz) has been credited with developing some of the important concepts in business. The firm also builds a reputation by publishing high quality business researches.

biggest-spending public companies in the world in 2014 and found these with highest R&D investment are often the top players in their respective industries (Strategy&, 2015). As the R&D expenditure accounts for a large proportion of high technology firm's cost, the accounting treatment of the R&D expenditure may have significant impact on a firm's financial performance, hence resulting in variation on the investor's perception of the firm and even its stock return.

In a report[3] released by the State Council of China[4] in 2006, it clearly states the yearly R&D spending of the whole society of China should account for more than 2.5% of GDP before 2020. The country level spending on R&D in 2011 is 868.7 billion RMB, indicating an annual increase rate of 23% that surpasses the economic growth rate (National Bureau of Statistics,2012). The bulletin also shows firm is the main player on R&D activities. In 2011, the spending on R&D invested by firms dominates China's R&D expenditure with a ratio of 75.7%, far more than that of government (15%) and higher education institution (7.9%).

As mentioned by UNESCO[5] in 2015, based on data of 2013 at purchase power parity, China stands at the second place globally in R&D investment, taking up 19.6% of global spending on R&D. In the respect of R&D human capital, China has replaced USA as the country with the second largest number of researchers, employing 1.4 million of 7.8 million researchers worldwide in 2013 (UNESCO, 2015).

Even though R&D is of great importance and R&D spending keeps increasing, R&D expenditure was required to be treated as expense when incurred before 2007 in China. Listed firms were not allowed to capitalize any of their R&D expenditures. Thus, investors were not able to receive information on the difference of all expensed R&D spending from annual report or other public information channels. Consequently, investors were not able to evaluate

---

[3] *National Medium and Long Term Science and Technology Development Plan Outline (2006-2020)*, compiled by the State Council.(http://www.gov.cn/jrzg/2006-02/09/content_183787.htm)
[4] State Council of China is the chief administrative authority of the People's Republic of China.
[5] United Nations Educational, Scientific and Cultural Organization(UNESCO) is a branch of United Nations. It works with the aim of ' create holistic policies that are capable of addressing the social, environmental and economic dimensions of sustainable development'.

the potential value of a firm's R&D projects and their impact on firm value. The situation changed since the enforcement of *Accounting Standard for Business Enterprises (2006)*[6] in 2007*, which is claimed by the authority as showing substantial convergence with IFRS.

The new accounting standards achieve significant improvements in theory. New ideas embodied in the standards are expressive of emphasis on value relevance of accounting information. The breakthroughs are mainly on three aspects. First, the standards are of convergence of international accounting standards. They expand the range of financial reports' applying scenarios and attempt to increase the accounting information's usefulness on investors' decisions. Second, the Asset-liability view applied in the standards further enhances the value relevance of financial information by assuming earnings is the change of net asset balance during an accounting period. The new view is dramatically different from the former Revenue-expense view. Third, the standards introduce the concept of fair value measurement with market price presence and directly connect the book value to market value, which further increases the value relevance of accounting numbers.

Along with the enforcement of the new standards in 2007, the information of R&D expenditure began to appear not only in administrative expense but also in the balance sheet. New accounting standards change the rules of R&D reporting, making the comparison of expensed and capitalized R&D spending possible. R&D is able to provide vital source for future growth and profit. In the industries where update of technology is frequent, increases in the R&D expenditure do not necessarily happen at the price of reduced current period earnings under the new rules, which is likely to be appreciated by investors that value parameters such as Price-Earnings Ratio and Market-to-Book Ration. With the wish of building competitive edge, firms will be more willing to invest in the R&D if R&D spending does not necessarily mean profit eating. Such virtuous cycle will enhance the competitiveness of whole industry in the long run.

---

[6] No. 33 Order of the Ministry of finance of the People's Republic of China, *Permission on the modifications on Business Enterprise Accounting Standard.*
http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/caizhengbuwengao2006/caizhengwengao20061/200805/t2008051 9_23593.html

In the case where all R&D expenditures are expensed, investors tend to lack information on the potential value of R&D project conducted by a firm in an asset's view as the expenditures are all included in administrative expense without differentiated treatments. The new prescription makes the capitalization of R&D expenditure discretionary, providing additional information on the process of a firm's R&D projects. Therefore, the market value is comprised of more asset-related information, such as the proportion of successful R&D investment. Exploring how R&D reporting affect market value and return is of interest to both external investors and internal managers since it provides an approach to estimate firm value and guide R&D investment decision.

Accounting standards and stock exchange rules in western countries normally require listed firm to disclose information on R&D expenditure as detailed as possible. Because of the availability of adequate relevant data and the controversy on the accounting treatment of R&D, various empirical researches that based on data from western countries have been conducted on the topic of R&D since 1990. In contrast, due to the limitation of financial information providers, few researches have been conducted to reveal the value relevance of Chinese companies' R&D expenditure before the introduction of new accounting standards. As the R&D expenditure data becomes more accessible and China's academic environment keeps developing, relevant empirical researches began to emerge. The average R&D expenditure is going to increase with China's economic transition from fixed asset investing to innovation orientated. R&D investment is the key to accelerate the process and is likely to bring more value to the economy in the future. For example, in Pharmaceutical and Chemical Industries, the effect of an investment in R&D on the firm's market value is about twice as much the effect of an investment in fixed assets (Hsieh, Mishra and Gobeli,2003). The appropriateness of the accounting treatment of R&D and its consequence on valuation are worth paying attention to. This undergoing change provides a chance to assess the association between share price and R&D accounting information, explanatory power of R&D expenditure in different market boards and whether the accounting reform held in 2007 improves the value relevance of financial reports.

Information technology (IT) industry, although only having a relatively short history, is gradually moving to the center of people's life and found in almost all other industries and business. The function of IT industry products and service ranges from providing convenience to ordinary people's daily life to improving firms' performance. Bharadwaj (2000) finds that firms with high IT capability tend to outperform firms without strong IT capability on a variety of profit and cost-based performance measures. IT firms have a tradition of competing on R&D. IT industry is an industry where technical advance has been much more cumulative than discrete, cultivating an environment in which a high degree of spillovers may not only spur technical advance but also encourage R&D investment (Levin, 1988). Usually IT firms' business is scalable as it is capable of supplying or serving additional customers at a very low cost. Firms with strong R&D capacity usually have the ability to generate endogenous growth, thus having less incentive to achieve growth through taking over. Blonigen and Taylor (2003) document a substantial negative correlation between R&D-intensity and a firm's propensity to acquire external targets by using a panel of over 200 US electronic and electrical equipment firms from 1985 to 1993.

The IT industry in China starts from nowhere 30 years ago, while becoming a significant player nowadays in the global supply chain of IT industry. China has turned into the world's factory since the late 1990s, and has also since 2002 become the second largest information technology (IT) producer in the world (People's Daily, 2005). Given the huge market of mainland China, access to advance technology was mainly achieved by the strategy of trading market for technology before joining WTO. The establishment of a variety of joint ventures between Chinese firms and foreign firms also diffuses knowledge to Chinese firms and helps Chinese firms set up efficient product development system. In the recent years, the government starts to build a sustainable developing environment by increasing the protection of intellectual property. This change will act as another stimulus to the R&D investment of IT firms in China. According to a rank made by The Wall Street Journal, Chinese Internet companies account for four of world's top 10 Internet companies by market capitalization (Dou, Osawa & Ma, 2004). IT industry is also one of the few where Chinese

firms are better positioned when competing with foreign companies in domestic market. The extraordinary success of Chinese IT companies has drawn wide academic attentions. Researchers found the successes of Chinese IT firms are mainly from three ways. The first is adopting the catch-up strategy of "trading market for technology" as a new entrant (Mu and Lee, 2005). Another way is to utilize local entrepreneurs' knowledge of China's culture, society, economy and political environment (Wang, 2012). The third way is to catch up through continuous efforts on R&D. After analyzing innovation capability development of four Chinese firms in telecom-equipment industry (a sub-industry of IT industry): Huawei, ZTE, DTT, and GDT, Fan (2006) points out that Chinese firms should make building innovation capability as a priority from the very beginning to build up their competitiveness and to survive in the competition with the multinational companies as well as other domestic companies. The research also suggests that Chinese firms should take in-house R&D development as the main approach to building their innovation capability. External alliances should only be treated as a supplement.

Whether a firm's market value is associated with its R&D capital is worth investigating as the importance of R&D is rising in recent years. My research is developed following the trend. While research on the valuation relevance of R&D expenditure of listed firms in China is gradually evident, little attention has been given to a single industry where the importance of R&D is extremely high. Knowledge concerning the different value effects of among various market boards is also limited.

IT industry, depending heavily on human resource and R&D, along with its relatively high proportion of intangible asset compared to other industries, provides a meaningful background to test the value relevance of R&D expenditure. In addition, positive research result based on a typical research-intensive industry, if any, may give more confidence to manager on investing in R&D activities, accelerating economic restructuring and industrial upgrading urgently-needed by China's society.

The growing of China's financial market has incubated several market boards with distinct

features. Growth Enterprises Market (GEM), established with less demanding listing rules, exhibits different features compared to the rest. An investigation on the difference of value relevance of the R&D among trading board could deepen people's understanding of these boards. China has joined WTO for more than 10 years and more industries are open to the outside world, the increasing opening Chinese stock market is becoming a greater concern of the global investors, and will play a more important role in the world economy. Meanwhile, China's stock market is gradually open to foreign investor. Measures like the establishment of Shanghai-Hong Kong Stock Connect and Shenzhen-Hong Kong Stock Connect are taken to provide foreign capital less cumbersome investment channels. This research may provide some guidelines for foreign investors regarding the effect of R&D expenditures on share price and improve their understanding of China's stock market. Moreover, IT industry in China is one of few industries that have competitiveness in terms of global standard. Outstanding firms like Huawei and Alibaba[7] keep emerging. The research may provide some sources for further comparison of similarity and difference on market appreciation and R&D behaviors between China and western countries.

1.2. Research question

The main aim of my research is to examine, in the context of China's IT industry, whether the accounting standard reform enforced in 2007 regarding R&D increases the value relevance of accounting numbers and how the market prices R&D expenditures. The research also attempts to find out whether there are any different valuation effects regarding R&D spending between firms on GEM and firms on Main Board and Small and Medium Enterprise Board (hereafter, the latter two collectively called other boards). R&D activities are risky, while they give a company future competitive advantages. These advantages will later be transformed into extra profit and growth. If the investors are rational enough, R&D accounting information should be an influential factor of a firm's value. The divide of R&D expenditure into capitalized part and expensed part brings more information for investors to predict future cash flow. Thus, value relevance will be increased.

---

[7] Huawei and Alibaba are successful Chinese IT companies with global competitiveness.

Based on data of listed IT firm in China, this thesis tries to addresses following three research questions:

1. *Does the R&D reporting reform following the enforcement of New Accounting Standards in 2007 increase the value relevance of financial reports of an IT firm?*

2. *Does the capitalized R&D expenditure have more significant explanatory ability on the market value of an IT firm than expensed portion?*

3. *Is there any difference of valuation effects regarding R&D spending between IT firm on GEM and IT firms on other boards (Main Board and SME Board)?*

1.3. Contribution to existing research

The findings of the research increase the understanding how accounting standard reform held in 2007 affects IT firms' valuation, from the overall effect on value relevance of financial statements to value relevance of different R&D expenditures components.

Previous value relevance studies on R&D expenditure are seldom based on one industry. Many of them investigate the value relevance of R&D information by observing all firms in a certain stock market (Chan and Sougiannis, 2001; Han and Manry, 2004). However, firms' dependencies on R&D are varied. Accordingly, investors may treat spending on R&D with distinct attitudes. My research narrows the scope down to IT industry; an industry typically relies heavily on R&D and has unique features. This attempt adds new empirical evidences with special angle and knowledge regarding IT industry's value relevance to existing literature.

In previous studies, the evaluation on the effect of newly implemented accounting standards, in terms of value relevance, are typically based on a comparison of level of fitness on two samples from before-reform period and after- reform period. This method is straight forward. However, the number of listed IT firm before the 2007 reform is limited, resulting a challenge to collect a sizeable before-reform sample. Instead, this study adopts an 'As If 'method by

adjusting the post-reform numbers into before-reform ones. It contributes to existing researches on the effect of new accounting standard by using a different method.

Similar to previous studies based on IFRS (Cazavan-Jeny and Jeanjean, (2006), Tsoligkas and Tsalavoutas. (2011)), value reverence of R&D expenditures has been found, and suggesting China's R&D reporting is not only similar to that of IFRS on rule definitions but also on effect. Previous researches based on IFRS arrive at contrary conclusions on different portions of R&D spending. Some argue R&D spending is negatively associated with firm value (Cazavan-Jeny and Jeanjean, 2006). Others claim capitalized R&D expenditure is positively associated with firm value while expensed expenditure negatively (Tsoligkas and Tsalavoutas, 2011). This study supports the latter with evidences from China's IT industry. China stock market's investors recognize the value of R&D spending. Capitalized expenditure, with the ability of generating economic benefit, is positively associated with firm value. In contrast, value relevance of expensed R&D expenditure is negative.

The research fails to find evidences supporting the existence of different valuation effects on R&D expenditures between GEM firms and firms from other boards. As the regulation authority emphasizes the regulation on GEM is as tight as other boards', the failure reflects that investors agree with authority's claim. It could also be help to explain away some market participants' doubt about GEM.

1.4. Structure of the study

The research consists of the following sections. Section 1 is the introduction of the thesis, including the motivation to do the research, basic background of the research, its purpose and a summary of its findings. Section 2 is about the introduction of key concepts in this research，various accounting approaches on R&D and previous relevant academic literatures concerning value relevance of R&D expenditures. This section introduces previous researches both in China and foreign countries. It also contains short summaries, evaluations and comparison of earlier researches. In addition, this section compares four possible R&D

reporting approaches and discusses the trade-off behind these prescriptions. Moreover, this section discusses the potential consequences of applying new R&D reporting rules and how this factor will influence value relevance of R&D numbers. Section 3 describes the development of China's capital market and financial reporting system, including the history of China's capital market and features of existing trading boards. In addition to a detailed introduction of current R&D reporting rules, it summarizes accounting practices of R&D expenditures during different periods in China. Research hypothesis, corresponding models, variables construction and data selection process constitute the Section 4. This section forms the basis for empirical test. Section 5 describes the statistical result of collected data. It includes a summary of data, correlations of variables and regression analysis. Section 6 is the summary of above analysis and conclusion and implications of this research. It points out the shortages of this research as well. This section also proposes certain directions for further researches.

2. Definition, Accounting and Value Relevance of R&D

2.1. Definitions of key concepts in the research

R&D: UNESCO defines R&D activities as any creative systematic activity undertaken to increase the accumulation of knowledge, including knowledge of man, culture and society, and the use of this knowledge to devise new applications. R&D includes fundamental research, applied research in such fields as agriculture, medicine, industrial chemistry, and experimental development work leading to the creations of new devices, products or processes (UNESCO, 2001). According to No.119 document of Finance and Taxation [2015][8],an official document that defines R&D in the Chinese government's point of view,

---

[8] *Notice on improving the policy of tax deduction for research and development expenditure,* jointly published by China Finance Ministry, China State Administration of Taxation and China Technology Ministry
http://www.chinatax.gov.cn/n810341/n810755/c1878881/content.html

R&D activities refer to continuous and systematic enterprise behaviors with clear targets, aiming at acquiring new knowledge in science and technology, creatively applying new knowledge and improving techniques, products (services), and skill substantially.

R&D Expenditure: current and capital expenditures spent on creative work systematically conducted to increase knowledge. The content of R&D expenditure covers but are not limited to the labor cost of researchers and engineers, the material consumptions and depreciation costs of property, plant, and equipment(PPE) used for R&D activities.

Capitalized R&D: Expenditure of R&D capitalized as intangible asset, implying new non-monetary resource that lack of physical presence but offer the entity controlling them with a benefit arise. It normally refers to the cost of R&D activities incurred in the development stage of R&D after several requirements are met.

Expensed R&D: R&D costs debited as expense in the period they are incurred. Generally, all the cost of R&D activities fails to meet the criteria of capitalization should be expensed. In some cases, firms may record costs fulfilling the criteria of capitalization as expense since capitalization usually is not compulsory.

Value Relevance: The explanatory ability of accounting variables on market value, including earnings and book value of equity (Ali and Hwang,1999), cash flows (Bartov, Goldberg and Kim, 2001), or other relevant accounting variables chose by other authors (Göttsche and Schauer, 2011).

Information Technology Industry: Information technology (IT) industry focuses on the production, trading and sales of information and equipment that used to transmit and present information. It also covers business of providing service by utilizing information. The industry's products or services are often offered in intangible form.

New Accounting Standards: In this study, the notion refers to the accounting standards reform

implemented in 2007 in the mainland of China. It is applicable to all business enterprises in in the mainland of China. This reform is often considered as deep convergence with international standards.

GEM and Other Boards: GEM is the second-board market of Shenzhen Stock Exchange, targeting at firms that not qualified to list on other boards but with high potential to growth. Other boards consist of main board and SME board. Listing on GEM is basically easier than on other boards as the former has lower admittance standards.

2.2. Various R&D accounting approaches

As R&D spending is essentially a consumption of resource, it theoretically can be treated at least by four distinct ways, including fully expensed, selective capitalization, fully capitalized and accumulated in a special account and adjusted later.

Since several accounting treatments of R&D costs are available, R&D reporting differs in different areas. The debate of accounting treatment of R&D expenditure is essentially a debate on the trade-off between reliability and relevance. Both are the cornerstones of financial reporting framework. One of financial reporting's main function is to provide investors with reliable and relevant information on reported firm's financial position and operation. Enterprise is discretionary on the divide of research and development stages and the condition of capitalization. Furthermore, capitalization is not compulsory and the condition is almost impossible to be fairly judged by outsiders, including auditor. These features leave room for managers to manipulate profit. Supporters of the expensing method argue it is more appropriate than capitalization because it rules out any opportunity that may be abused by management to capitalize costs of unsuccessful projects. Proponents of capitalization believe expensing the cost of successful projects is a failure of reflecting business essence, which will undermine the relevance of financial reporting. In a word, expensing all cost renders accounting numbers objective and verifiable; capitalization is more useful at conveying information while suffering the problem of reliability. Based on the need

of financial information users and legitimate environment, standard-setters prescribe different treatments on R&D costs involved in projects that have a probability of success. The mainstream accounting approaches of R&D costs are selective capitalization and fully expensing. Currently the most widely used and influential accounting standard supporting selective capitalization of R&D expenditure is International Financial Reporting Standard (IFRS). IFRS are applied in many places of the world, including the South Korea, European Union, India, Hong Kong, Australia, but not in the United States. United States, as a key player of the global economy, adopts its own GAAP (US GAAP), which differs considerably from IFRS in terms of R&D accounting. US GAAP is a proponent of expensing all R&D spending.

2.2.1. International Financial Reporting Standard

The relevant prescription on the accounting treatment of R&D expenditure is mentioned in IAS 38[9].

This Standard requires an entity to recognize an intangible asset if, and only if, specified criteria are met.

"Charge all research cost to expense." [IAS 38.54]

"Development costs are capitalized only after technical and commercial feasibility of the asset for sale or use has been established. This means that the entity must intend and be able to complete the intangible asset and either uses it or sells it and be able to demonstrate how the asset will generate future economic benefits." [IAS 38.57]

IFRS also clearly prescribes the situation when development expenditure can be capitalized. IAS 38 defines an intangible asset arising from development (or from the development phase of an internal project) shall be recognized if, and only if, an entity can demonstrate all of the following:

  (a) "the technical feasibility of completing the intangible asset so that it will be available for

---

[9] IAS 38 — Intangible Assets. http://www.iasplus.com/en/standards/ias/ias38

use or sale".

(b) "its intention to complete the intangible asset and use or sell it".

(c) "its ability to use or sell the intangible asset".

(d) "how the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset".

(e) "the availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset".

(f) "its ability to measure reliably the expenditure attributable to the intangible asset during its development".

IASB attempts to make the R&D accounting numbers not only relevant but also verifiable and objective by prescribing tough rules on capitalization. With the strict requirements on capitalization, more reliability is achieved. However, room still exists for management to capitalize costs associated with potentially unsuccessful projects. In the trade-off between reliability and relevance, international accounting standard-setter explicitly favors relevance over reliability.

2.2.2. US GAAP

According to SFAS 2, Research is "planned search or crucial investigation aimed at discovery of new knowledge". Firms or organizations wish the knowledge to be applied in the creation a new product or service. The definition of research also covers inventing a new process or technique that could solve existing matters thoroughly or partially. As for the later, only important refine on existing process or technique is supposed to be described as research. The improvement could happen in forms of cost reduction or performance. "Development is the translation of research findings or other knowledge into a plan or design for a new product or process or for a significant improvement to an existing product or process whether intended

for sale or use. It includes the conceptual formulation, design, and testing of product alternatives, construction of prototypes, and operation of pilot plants." Maintenance should not be classified as development activities, even in some cases the maintenance work could dramatically boost a machine's efficiency and productivity, for example, the repair of a broken car. (FASB No.2, 1974).

Consistent with US GAPP'S tradition on conservatism, SFAS 2 requires all research and development costs are immediately recognized as expense when incurred because future economic benefits are highly uncertain. Meanwhile, FAS 86[10] grants more flexibility to accounting for the costs of computer software, as a result of the booming of the IT industry. Under FAS 86, all R&D cost should be recognized as expense until evidence shows technological feasibility has been established. A project cannot be considered as technology feasible until an explicit program design is available or a working model is ready. When such a statue is arrived, all afterward costs shall be recognized as an asset. At the year end, as an intangible asset, it should be shown in the balance sheet in the same way as other asset. The appropriate amount is the lower of unamortized cost or net realizable value. The exception given to computer software further confirms the value of exploring the value relevance of R&D reporting concerning IT firm.

As capitalization eliminates huge tax benefit enjoyed by software firms, the exception receives strong resistance, in form of petition, from U.S.A Software Publisher Association (SPA) in 1996. SPA claims capitalization should be abolished as capitalization of the development cost of software does not bring benefit to investors after industry change since 1986. In a research that examines the relevance to investors of public information on software capitalization, Aboody and Lev (1998) analyze the relations between accounting numbers and capital market observables and the association between reported numbers and accuracy net income forecast. They fail to find evidence supporting the view that judgments made in the software capitalization decision reduce the amount of information the reported

---

[10] *Statement of Financial Accounting Standards No. 86: Accounting for the Costs of Computer Software to Be Sold, Leased, or Otherwise Marketed*
http://www.fasb.org/jsp/FASB/Document_C/DocumentPage?cid=1218220127961&acceptedDisclaimer=true

earnings numbers contain. In the trade-off between reliability and relevance, US GAAP standard-setter chooses the side of reliability and compromises relevance in this special case.

2.2.3. Evaluations of different R&D Accounting treatments

Fully Expensed

All the cost incurred by R&D activities will be recorded as expense into the period when it is incurred. Such treatment is a reflection of prudence principle of accounting. High uncertainty normally exists upon the benefit of a R&D project may bring in. In many case it is very difficult to find direct connection between the expenditure and the benefit. However, such treatment ignores the intangible asset R&D could create, making the book value of asset underestimated. Therefore, fully expensing theoretically is more suitable for the industry where market position is changing quickly and the product cycle is short. In the industries where next generation technology platform is under development and firms are scattered on different directions, fully expensing is also necessary as in many cases only one platform could survive.

Fully Capitalized

The logic behind this method is that R&D activities are conducted with the hope of bringing in future benefit. It is reasonable to have the view that the accounting treatment for research and development expenditures should be decided by considering combined effect of a research and development project. When there is a high probability that an enterprise's certain research and development program will bring in return, all expenditures related to the project should be capitalized without consideration of whether the expenditures are happened in research phase or development phase. Supporters argue the research phase is unavoidable and firms should find a reason way to attribute research phase expenditures to further step. Such treatment is often criticized for being too board and less conservative. Asset recognition should be conducted at individual item level when the asset has measurable positive

economic value. A firm's R&D projects stand at different stages of completion and with varying degrees of uncertainty as to their ultimate success.

Selective Capitalization

Capitalized the expenditures incurred development phase when certain conditions are met. Expense all other expenditures. The supporters of selective capitalization take the position because these development expenditures that meet the conditions of capitalization are in conformity with asset recognition principles. However, because of the uncertainty and the difficulty of assessing the business or technique feasibility, selective capitalization will be likely to be used as a tool of earning manipulation. The flexibility gives management more room to make subjective judgment, such as the choice capitalization and expense, the time of recognition as intangible asset. Overall, selective capitalization is widely applied in many different countries.

Accumulation of Costs in a Special Account

It is a method that accumulates all research and development costs into a special account, which is distinct from assets and expenses until a decision can be made about whether future benefits exist. Depending on the existence of future benefit, the accumulated costs would either be transferred to assets or written off. This method is complained by financial statement users as it contains high uncertainty, which increases the difficulty of assessing the earning power of a firm. Furthermore, the use of a special account would alter the nature of the widely accepted financial statements and would complicate the computation of financial ratios and other financial data. As the process of a R&D project tends to exceed one accounting period, accumulating costs in a special account raises a challenge regarding the year-end R&D reporting.

2.3. Factors influencing value relevance of R&D expenditure information

Theoretically, a company's equity value represents the value of the company's all net assets, no matter the asset is measurable or not in accounting. In the case where most of the assets are tangible assets, it is reasonable to argue the share price has significantly positive relation with value of net asset value per share, for example the relation between the equity value of a mining company whose main assets are proven coal deposits and its net book value. Since intellectual property rights and intangible assets are increasingly important in modern competition and account their proportion of a firm's asset is growing on average, the accounting treatment of R&D costs and its effect on accounting information quality have attracted strong attention from academic researchers and standard makers during recent years. Meeting the needs of capital market is the primary purpose of all accounting standards (FASB, 1974; and IASC, 1994). Capital market is the place that decides the value of a firm at arm's length. One debatable topic regarding R&D accounting is whether the treatment of certain R&D costs as a capital expenditure would make the book value more informative, namely, the value relevance of R&D accounting.

The most direct and prominent differences on distinct treatments are reflected on the earnings and net asset of the period when the R&D expenditure is incurred. Information in financial statement, such as earnings, is created to help a wide range of users in making economic decisions. A premise of testing the value relevance of specified account is that the market is efficient enough to react to public available information. Accounting information failing to be reflected in share price could be caused by the inefficiency of market to react to the information or simply because investors believe the information is not relevant to the future prosperousness of the firm.

As early as 1970, the efficient-market hypothesis was developed by Professor Eugene Fama at the University of Chicago as a notion of academic study through his published Ph.D. thesis.

He argues that all the information that is available should be fully reflected in the security prices in the case of efficient market (Fama, 1970). If the market is efficient to utilize the accounting information system, the price in the security market should display all the information in the information system (Beaver and Landsman, 1981). Many other researchers raise similar opinion but with small modification. Jensen (1978) brought up a comprehensive and clear definition of efficient market. An efficient market in strong-form has the features described below:

1. Market price is decided mutually by many factors. If the market is efficient, the price will fully and correctly reflect all relevant information

2. The market price encompasses all the information when the market is efficient. The price will keep constant even when certain information is provided to some market participants.

3. When the market is efficient, it is impossible to grab abnormal profit by possessing certain information since the market already absorbs all the relevant information

Efficient market may also exist in other two forms. One is semi-strong-form efficiency, which implies share price reacts to new public available information very quickly and one can achieve excess return by utilizing inside information. Another efficient market presents weak-form efficiency. It implies excess return cannot be earned by analyzing historical security information such as past share price and trading volume.

Ideally, value relevance of R&D expenditure is significant in a market with strong-form efficiency, no matter how R&D expenditure is classified in accounting. However, strong form of efficiency may not exist in real life as insider traders could still gain abnormal return.

So far, the academic has not reached an agreement on whether the China's stock market is efficient and which form it belongs to if it is efficient. A research conducted in the 1990 implies that the Shanghai and Shenzhen stock markets are collectively inefficient. However, the research also showed the Shanghai and Shenzhen indexes can be best characterized as random walk processes and therefore the markets are efficient if observed separated (Liu,Song and Romilly 1997). On the other side, Chen and Su (2001) noted financial data is

value-relevant to investors in the Chinese market despite the market only has a short history and the perception of only inadequate accounting information being available in China. Similar to earlier studies on the Chinese stock market, Seddighi and Nian (2004) find Chinese stock prices show a different pattern from a random-walk process. However, as Summers (1986) proposes, the violation of the random walk hypothesis in a given market may only indicate that the results obtained are not consistent with a random walk's special martingale process.

As estimating the value relevance of R&D expenditures on the macro level is not applicable, micro level analysis may be more beneficial. Capitalized R&D, part of a firm's future competitive edge's source, is theoretically associated with a firm's future cash flow. In this way, capitalized R&D is supposed to be value relevance. Expensed R&D account accumulates the costs that are not related with future performance, suggesting it should either be irrelevant or adversely relevant with firm value.

However, the inaccuracy of R&D expenditures may reduce its value relevance. R&D expenditures usually refer to the depreciation of equipment, the consumption of raw material, the personnel cost of employees involved in the R&D project directly and rent and interest expense incurred during the R&D project. The cost allocation process involved in allocating R&D costs can be very rough. Even though these prescriptions seem very specific, firms in China still are still flexible to some extent in deciding what belong to as an R&D cost. The flexibility may create distorted numbers even if the management has no intention of earnings management.

The nature of R&D activities complicates the realization of value relevance of R&D expenditure. In general, R&D can be considered as a kind of investment activity. Contrast to other investments, R&D contains more uncertainty and risk on benefit, resulting in difficulty in recognition and measuring of accounting information. Research activities are essentially a trial process of acquiring new knowledge or technique. High uncertainty exists upon whether it could bring economic benefit to the firm ultimately, as technology update is more

frequently in nowadays competition and previous efforts may turn out to be in vain. Thus, capitalized R&D spending may not achieve expected benefit and investors surely are aware of the uncertainty.

The separation of R&D activities into two phases has certain drawbacks, which may also reduce the value relevance of R&D expenditures, especially capitalized R&D expenditures. Even though research phase expenditure is basically not able to meet the requirement of asset recognition, it is still a necessary step to the development activities and unavoidable cost to acquire intangible asset that the capitalized development expenditure turns into. In practice, R&D activities are often conducted with clear goals even in research phase. Thus, it is reasonable to assert that the intangible asset from development activities is underestimated in some cases. Investors tend to value a firm by using earnings and book value of asset. Distortion created by the separation may lead to investors' unwillingness to make decisions based on R&D numbers.

As the capitalization of R&D costs provides another method for earnings management, it may further reduce investors' confidence in R&D numbers, which in turns reduces the value relevance of R&D expenditure. The capitalization R&D costs is always a controversial accounting issue since the general belief that such capitalization is likely to be motivated by incentives of manipulating earnings. As management's compensation is often connected with corporate performance, there are strong incentives for management to avoid reporting earnings decline, which always is the last thing management wish to see. Increases in earnings in the beginning are often mentioned in the management discussion section of the annual report, managers tend to magnify the importance of these rise (Burgstahler and Dichev, 1997). Despite the share price driven pay accounts for a large proportion in management's compensation, the pressure and severe consequence of delisting from stock exchange after 3 consecutive years of loss is likely to act as another blasting fuse for the earning manipulation behavior of Chinese managers. In addition, whether a listed firm is allowed to raise capital from issuing new security depends on its financial performance. Poor financial performance also result in a listed firm losing the right of financing from capital market, such as issuing

new convertible bond because of the strict approval procedures required by CSRC[11](i.e., ROE on weight average basis of the past three years is no less than 6%). Generally speaking, managers of listed firms in China have greater incentive to manipulate earnings compared to their peers in other stock market, given other factors the same. Due the high uncertainty and professional judgment involved in the assessing the technology and business feasibility of capitalized R&D project by external auditor and investors, the flexibility of R&D accounting might be abused as a tool for earnings management. Earnings management distorts the picture depicted by financial reporting. Markarian, Pozza and Prencipe (2007) gather evidences that companies tend to use cost capitalization as an earnings-smoothing method by observing samples from Italy. The accounting trick are more likely to be played than others as inappropriately capitalizing R&D cost is less challenging and harder to be spotted. The reported earnings' information quality will be damaged by the trick, consequently only weak stock return /reported earning correlation can be expected (Lev, 1989).

On the one hand, allowing capitalization reduces management's incentive to conduct real activities adjustments, which is usually more jeopardizing. In this perspective, investors may attach greater importance to the change in R&D numbers, thus enhancing their value relevance. Changing the underlying R&D activities of a firm is costly. Firms have the incentive to do so in cash flow distress or when struggling to make an even. However, discretionary accounting choice allowed by new accounting standard puts a mask on true economic performance, creating the problem of accrual earning management. For the two types of earning management, investors usually give different reactions to the managements based on the basis of the manipulated firm' condition (Gunny, 2010). In the context of China's stock market, earnings management is less likely to be realized by investors as the market is chaos because of the participation of individual investors that lack professional skill and judgment. Therefore, the market will be more likely to respond directly to current year's R&D information, rather than a combined consideration of several years' information. The following table is a summary of the theoretical relations between R&D expenditure's value

---

relevance and discretion over the capitalization of R&D, assuming successful R&D could bring in economic benefits.

Table 1. Value relevance of R&D expenditures under various situations

Scenario	Constituent of A/B		Value Relevance of A	Value Relevance of B
	A.Capitalized R&D	B.Expensed R&D		
Situation 1	③	①②	Positive	Unknown
Situation 2	③	①②③	Positive	Unknown
Situation 3	②③	①②	Unknown	Unknown
Situation 4	①②③	①②	Unknown	Unknown

① Research phase cost
② Development costs incurred capitalization conditions are met
③ Development costs incurred after capitalization conditions are met

2.4. Prior studies on value relevance of R&D, accounting reform and comparison between trading boards

2.4.1. Value relevance and accounting variables

An accounting number will be considered as value relevant if it has a predicted association with a firm's market value (Bath, Beaver & Landsman, 2001). Accounting standards are applicable on every business enterprise, no matter it is public or not. Capital market offers a platform to straightly gain information regarding firm value. Consequently, current value relevance studies are mainly around the relation between market value observed form capital market value and accounting information. As the main users of financial reports in capital market are equity investors, the top task of financial reporting for them is to provide information useful to share pricing. Value relevance of accounting information is one of fundamental features of accounting quality (Francis, Lafong and Schipper, 2004).

Empirically testing the statistical association between market values and accounting variables is a widely-accepted value relevance testing methodology. However, there is no consensus on the interpretation of the statistical association. Francis and Schipper(1999) summarize four distinct interpretations that have been used in previous empirical studies. The first one is that

financial information guides the movement of share prices by reflecting the intrinsic value of the shares. Share prices drift around intrinsic value. Profits earned from applying 'accounting-based trading rules' could be used a measurement of value relevance. The second interpretation is that value relevance indicates financial accounting information is useful in employing a valuation model. To be considered useful, financial information should consists of variables included in a valuation model or helping predicting such variables. The third interpretation is based on the idea that the association between market value and accounting information reflects whether investors use the information to make investment decision. Investors' decisions are based on all the information available in the market place. Value relevance could be measure by the extent of change financial reporting information bring to the whole. Applying this interpretation involves the prerequisites of 'timeliness and expectations formation', which seriously complicate the test of value relevance. The fourth interpretation suggests the statistical relation between financial accounting information and market value only means tested accounting information has correlation with certain information used in investment decisions. The last interpretation has no requirement on whether financial reports are the earliest source of information. In this case, value relevance is known as the explanatory power of accounting information to capture or summaries information that affects share values.

To my knowledge, value relevance is first mentioned and used by Amir (1993) to describe the association. Studies aiming at revealing the association are often conducted to extend people's understanding of the relevance and reliability of accounting amounts as reflected in equity values. Earnings and book values of equity are intuitively to be value relevant. By investigating the variation of the two factors' value-relevance over the past forty years, Collins, Maydew and Weiss (1997) notice the two's value-relevance change in different directions. The former one has descended while the latter becomes increasingly significant in predicting value. Since in the context of US, current accounting rules only allow recognizing intangible assets in extremely limited circumstances (i.e., intangibles purchased from third party), book value information may not be helpful in valuing companies with large amounts of unrecorded intangibles. On the other hand, Brown, Lo and Lys (1999) document a

long-term decline in the relevance of accounting information on value by observing the value relevance of financial statement information during the post-World War II period

Different from finding evidences of value relevance of accounting variables separately or together over a long term, Amir and Lev (1996) report that earnings, book values, and cash flows are largely value irrelevant when they are used individually, by exploring the value of companies in the cellular telephone industry. Generalizing this finding to other R&D intensive industries (i.e., IT industry), then one would expect a growing failing in the value-relevance of earnings, book values, or both as the significance of R&D of these firms increases over time. In contrast, in the environment where the recording of intangible asset is less strict, these accounting variables should be more relevant in valuing firms.

Financial statement information used to act as a key important determinant of the market value of the firm. Since R^2 is dependent on the size of samples, they challenge the validity of the practice of using the R^2 deprived from regressions of share price on some indicators (namely, accounting variables divided by number of share) to test whether the value relevance of accounting variables has changed over time or whether there is discrepancy among selected subjects in terms of value relevance.

Firms issuing both A share and B share in China form suitable samples to investigate the difference in the value relevance between the accounting information prepared and audited under the China GAAP for A-share investors and under the international accounting standards (IAS) for B-share investors in the Chinese stock market. Through conducting cross-sectional analysis on the difference between the A-share market and the B-share market, and annual cross-sectional analysis on the variation of value relevance of basic accounting information over time, Sami and Zhou (2004) arrive at three conclusions concerning the difference of value relevance of A-share and B-Share. These conclusions can be expressed as following:

· Accounting information is able to influence both of the pricing process of the A-share market and the B-share market

· Value relevance of accounting information is more significant in the B-share market than

in the A-share market

· Value relevance of accounting information in the A-share market goes through a para-curve during 1990s. It is less significant in earlier years, grew and peaked in 1996, and then decreased due to changes in the disclosure environment.

·

The first one reassures previous positive findings on the value relevance of accounting variables. The second one demonstrates in terms of value relevance IAS is superior to China's accounting standard then. It also offers basis to predict the improved value relevance of financial numbers under new accounting standards implemented in 2007 as the new CAS No.6 is showing convergence with IAS 38. The superiority of IFRS is further confirmed by Chalmers, Clinch & Godfrey (2011), using a vertical study based on a period during which IFRS was adopted. The period 1990–2008 is divided into pre-IFRS and post-IFRS. The adoption of IFRS grants earnings numbers strong power in explaining market value. However, the same trend has not been found on book value. The third conclusion indicates change in value relevance accompanying is possible to be caused by changes in the disclosure environment.

In contrast to findings mentioned above, Liu and Liu (2007) show the value relevance of financial information does not differ between companies issuing both AB-share and AH-shares and firms issuing only A-shares within the China's stock market. Firms offering multiple kinds of share targeting investors with distinct stock market experience are often considered as better reported as they are required to prepare annual reports based on different accounting standards. Investors are supposed to have more insight if the reports are used collectively.

Through testing the value relevance of financial accounting data of manufacturing firms from 16 countries during 1986-1995, Ali and Hwang (1999) notice that the value relevance of accounting information is less significant in countries where the financial systems are bank-oriented rather than market-oriented. According to the research, the same phenomenon also happens in countries where private sector force does not influence standard setting

process. Accounting numbers under the Continental rules are also less relevant than these from British-American rules. In the context where rules of tax have a greater effect on financial accounting measurements and where spending on auditing services is relatively insufficient, accounting information is less significant.

2.4.2. Market value and R&D information

The debate regarding the accounting for R&D expenditures focus on the trade-off between the expected benefits of the capitalizing certain expenditures as an asset and the uncertainty beard in these benefits, which challenges the actions of asset recognition. Confronted with increasing competition, firms are pushed to rely on R&D investment to improve performance through entering new market earlier than competitors or achieving lower cost or premium with technology advancement achieved from R&D. The R&D investment decision made by the management of a firm today can affect the viability, growth and competitiveness of the organization in the future periods (Morbey, 1988), hence influencing investors' expectation on the firm. R&D is not only heavily applied in high-tech firm but also in traditional manufacturing firms.

Numerous researchers have found the positive correlation between R&D investment and productivity in different geographical areas. Hall and Mairesse (1995) reveal the productivity of R&D capital for French manufacturing firms in the 1980s is positive. New Information is reckoned by economists as the output of R&D. In addition to new information generated from R&D activities, extra value is created from a firm's enhanced ability of assimilating and exploiting existing information (a form of productivity) developed through conducting R&D activities (Cohen and Levinthal, 1989). Theoretically, increased productivity will result in better future earnings and be incorporated into share price.

Firms operating in good condition normally do not sell in progress R&D projects. One of few situations where unfinished R&D projects are on sales is the transferring of all asset

accompany in a taking over. M&A events offer a platform to observe the market value of R&D projects in a bundled deal. Based on this idea, Deng and Lev (2006) explore distinct treatments of in-process R&D and attempted to find the most suitable one. The question can be detailed as whether it should be recognized as an asset or an expense. More specialized, the question becomes how well the estimate match the reliable principle in the case where R&D spending is worthy of capitalization. They find a significant association between the values of purchased in-process R&D and the buyers' cash flows after the taking over. The finding further backs the FASB's prescription[12] on the practice of in-process R&D. The organization believes it should be recognized as an asset. Even though Deng and Lev (2006)'s research is focusing on the value of in-process R&D, its finding can be considered as an indirect proof of value of expensed R&D expenditure. Expensed R&D expenditures, also called as off-balance sheet R&D assets, could offer investors with reliable and relevant information. FASB's prescriptions of immediately expensing all R&D expenditure are proposed with good wish that regulators have the responsibility to keep public confidence in the financial markets as a fair battling ground. In fact, maintenance of a financial market's health is realized from reducing information asymmetry and inequity. Expensing all R&D expenditure may not be helpful in reducing information asymmetry.

Previous studies have documented that a firm's investment on R&D influences its market value consistently and positively. Such appreciation may be caused by investor's positive expectation on payback of firms' R&D investment. R&D is a source of a company's intellectual capital. Chen, Cheng and Hwang (2005) examine their hypothesis that a company' intellectual capital is able to influence its market value and accounting result positively. It can also work as an indicator for it subsequent financial performance. Evidence supporting positive relations is found. Besides, the authors reveal investors may place distinct weight on the three components of value creating efficiency, including physical capital, human capital, and structural capital. Evidence supporting R&D expenditure capable of capturing additional information on structural capital and has a positive effect on firm value and profitability is presented as well.

---

[12] SFAS No.141(Revised 2007)   http://www.fasb.org/pdf/fas141r.pdf

Because of the uncertainty of the benefit R&D expenditure and advertising expenditure could bring in, these expenditures are often expensed. However, these expenses are likely to form intangible assets, such as patents and brand. With the consideration of conservative principle of accounting, these items are required not to be recorded as asset.

The similarity between the accounting treatment and potential influence of R&D and advertising expenditure offers opportunity to explore the value relevance of the sum of R&D and advertising expenditure. Many researchers pay attention to these issues. Chauvin and Hirschey (1993) provide evidences that advertising and R&D expenditure affect sample firms' market value. The impact is best described as significant, positive and robust. Various studies reveal the significant market value effect of advertising and R&D expenditure based on the data from COMPUSTAT, a global financial information provider that started operation in 1962. Besides, some other studies that based on the firms from non- COMPUSTAT data also find similar result (Peterson and Jeong, 2010). One exception is a research conducted by Han and Manry (2004), whose results indicate that advertising expenditures are negatively associated with stock price. The article argues it can be explained by the Korean investors' specialized understanding on advertising expenditure. They believe the possible economic benefits of advertising spending are expected to vanish in a short period, even prior than the end of the current fiscal period.

Following the adoption trend of IFRS worldwide, in more and more states R&D expenditures are allowed to be capitalized when some conditions are met, which makes it possible to distinguish value relevance effects of capitalized and expensed R&D expenditures. Lev and Sougiannis(1994)'s study estimates the off balance R&D asset of a large sample of public companies from R&D expense and found these estimates to be statistically reliable and be consistent with real life experience.

R&D expenditure is not allowed to be capitalized under US GAAP. The only exception is the development cost of software. Aboody and Lev (1998) argue there is a significant relation

between the capitalized software development expenditure and capital market variables (e.g. market value) and future earnings.

The level of relevance can also be influenced by the nature of industry that the reporting entity belongs to. Chan, Martin and Kensinger (1990) test stock price responses to announcement of R&D expenditure increase. They find high-technology firms with announcement of rises in R & D spending were associated with positive abnormal returns on average. In contrast, announcements by normal firms were accompanied with negative abnormal returns. Hirschey & Richardson (2001) document the robustness of relation between R&D expenditures and equity values depend on the success of observed R&D firms. In their work the extent of success is defined as the quality of patent. Successful firms tend to benefit more from the R&D.

A study based on samples from continent European countries show presence of a single large shareholder may affect the valuation of R& D (Hall and Oriani, 2006). The R&D of French and Italian firms enjoy high valuations in the cases no single shareholder control more than 33% of the ownership. The reporting of all R&D costs together provides additional information to net income and balance sheet number in Germany and the USA, where R&D spending are required to report R&D as expense. By contrast, when R&D costs are partly capitalized and partly expensed, increases in the value relevance of R&D number were found significant in France and the UK, where R&D spending are acceptable to be reported as assets (Zhao, 2002). Based on data from the Czech Republic, a transition economy that provides a financial reporting environment where the results of value relevance tests might be predicted unambiguously, Hellström (2006) discovers significantly positive evidence regarding existing value relevance methods' usefulness.

In the context of Japan, Sartorius (2006) measures the effectiveness of R&D investment on supporting market value. He also tests the effectiveness of tangible asset on the market value. Both effectiveness rises in the 1990. The former one experienced more significant increase. Japanese managers tend to make short-sighted decision when facing performance pressure.

Their behaviors were the same as their counterpart's in US. With the pressure of the recession started from1991, Japanese firms for the first time reduced their outlay on R&D. The public were wondering whether managers in Japan lost the ability of making effective decisions on the allocations of monetary resource to R&D activities. Mande, File and Kwak (2000) examine whether Japanese managers' decision on adjustment R&D spending based on performance target expected in short-term. Their results show that Japanese firms in several industries are involved in making adjustment to their R&D budgets so that profit smooth could be realized. Interestingly, larger adjustments to R&D were made when companies were growing fast.

Under the set of Taiwan, an area that is geographically more close to the mainland of China and where mangers share similar society characters with the counterparty in China, firms have the potential to realize better stock returns and net sales through the boost of R&D capability. However, firms with high level of capability do not have an advantage in terms of raising operating income (Hsu, Chen, Chen, & Wang ,2013)

Even though value relevance of R&D reporting has been witnessed in many researches, its generaization has a long way to go. Sougiannis (1994) points out the result of previous relevant studies might be resulted from the econometric techniques used, the insufficient sample size and poor quality of R&D information. Osawa and Yamasaki (2005) summariz three factors that reduce the explanatory power of the connection between R&D expenditure and firm value, including lack of definitive means to measure R&D results, time lag between initial R&D expenditures and progress that emerges later and lack of appropriate index resulting the absence of well-established concepts regarding future project techniques. These factors together undermine the explanatory ability of any measurement of R&D performance. Consequently, accurately quantifying the total effects of cumulative spending on R&D is becoming increasingly challenging with the time lag lengthening.

2.4.3. Change in accounting quality after 2007 new accounting standards implementation

The implementation of new accounting standards in 2007 brings substantial changes to the accounting society. Limited academic researches investigating changes caused by the implementation emerge. Liu, Yao, Hu and Liu (2011) examine the change of accounting quality. In their research, accounting quality is tested from two aspect, earnings management and value relevance of accounting variables. Regression results suggest accounting quality has been improved in terms of value relevance since 2007, and the improvement is caused by the implementation of new accounting standards, rather than by changes in economics environment.

However, the consensus whether the improvement is achieved by adopting new accounting standards has not been reached yet. Fair value accounting (FVA) is one of most significant new notions brought forward by the standards. Peng and Bewley (2010) argue benefits of adopting FVA, expected by standard setters from China, may fail to come true as some minor differences between China standards and IFRS are of significance on the overall success of implementation of FVA. Following Peng and Bewley (2010), He, Wong and Young (2012) investigate effects of mandatory FVA adoption in China. Applying FVA for trading securities is designed to offer investor more value relevant information regarding these investments. They found the desired benefits are lessen by earnings management and smoothing actions.

Based on data from Chinese companies, Lam, Sami and Zhou (2013) investigate the changes of value relevance of accounting information during the past two decades. Period between 2000 and 2008 is defined as stage three in the research. They find the value relevance of different variables move in distinct directions.

Aiming at examining the influence of new accounting standards' adoption on equilibrium pricing in the audit market, Zhu and Sun (2012) find the audit market has not changed

significantly. In their research, audit market condition is reflected by the concentration of the market share among major auditors and the probability of issuing modified audit opinions. The research reveals the new standards have increased public firm's market risk. Therefore, auditors charge higher fees as a respond to increased audit risk. It also finds positive relation between the increase in audit fees and the extent of difference in net income based on old and new accounting standards.

Since the 2007 standards are IFRS-based and the prior 2007 one is not, the comparison of the value relevance of accounting measures before and after 2007's implantation is likely to have similar result as the comparison of value relevance of different financial reports prepared Chinese firms listed on multiple stock exchange. As discussed in the last chapter, existing researches on this topic have not reach an agreement (Sami and Zhou, 2004; Liu and Liu, 2007)

2.4.4. Comparisons between firms in GEM and Other boards

The differences between trading boards in the same country are typically minor. The knowledge concerning the difference of certain accounting variable' value relevance between distinct markets in the same country is limited. Gao, An and Lu (2014) investigate the value-relevance of different R&D capitalization components, normal capitalized part and discretionary capitalized part. By employing Ohlson (1995) price model on samples from China's GEM, they find investors are able to differentiate various components. Accordingly, they find that normal capitalized part is positively associated to market value, while the discretionary capitalized part and the firm value is negatively and significantly related.

Wilbon (2002) find high technology firms tend to have a higher rate of survival rate if they are more conservative on R&D spending. He tracks 95 high-technology firms that did IPO in the US in 1992. In contrast to people's common sense, firms that survived for at least five years are these with lower level of spending on R&D, which is measured by R&D spending/ revenue in the research.

Compared to firms on other boards, GEM firms are usually characterized as smaller in size and higher growth opportunity. However, these two features may not be positively related as they are supposed to be. Hart and Oulton (1996) argue growth is not related with firm size, by investigating samples from UK.

Fast growth of GEM firms is found to be supported mainly by three factors, including benefits from intangible assets marketisation, smart use of government supportive policies and technological and managerial capabilities (Haisu and Zhongxiu, 2010).

The effect of size on valuation may partially explain the difference regarding value relevance of accounting variables between Gem firms and firms from other board, if any. Chauvin and Hirschey (1993) argue, in terms of valuation, the impact of R&D on large firms is more significant than on small firms.

3. IT industry, capital market development, accounting and tax policies of R&D in China

3.1. IT industry in China

Information technology industry is a capital-intensive, technology-intensive and knowledge-intensive business. Based on the definitions of Industry Classification Guideline of Listed published by Chinese Securities Regulatory Commission (CSCR)[13] in 2001, IT industry includes four subsectors, communication technology and related equipment manufacturing sectors, computer and related equipment manufacturing sector, communications services sector and service regarding application of computer sector. It is

---

[13] Chinese Securities Regulatory Commission (CSRC), a government agency responsible for regulation of China security business.

one of earliest areas that start market-oriented reforms. In the latest revised version of the guideline, former IT industry is renamed as industry of information transmission, software and information technology service, reflecting a shift to focus to intangible forms of products or services. In general, IT firms enjoy high valuation because of their potential for growth, as shown in Figure 1 and Figure 2.
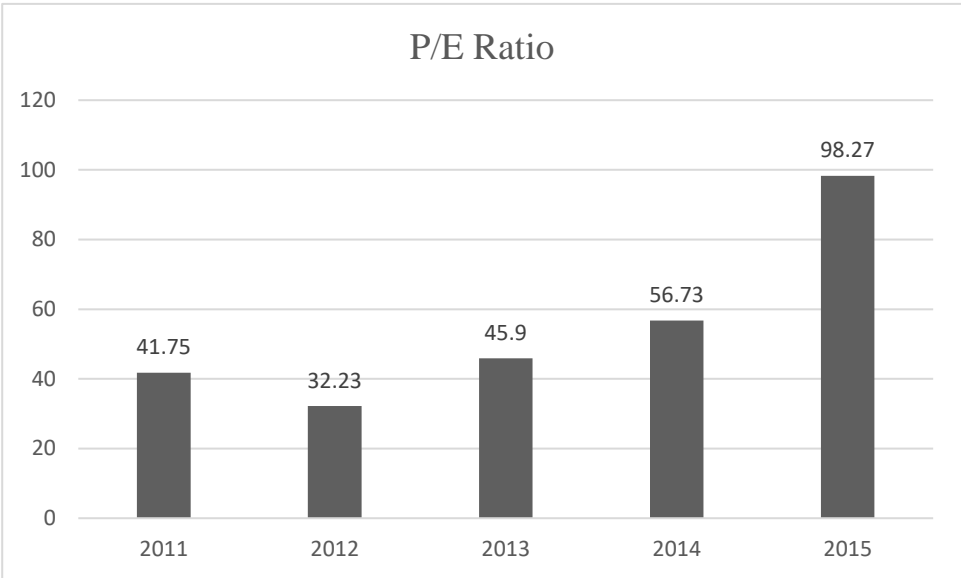

Figure 1. Average P/E Ratio of IT firms listed in China
Source: Wind

Figure 2. Average Market-to-Book Ratio of IT firms listed in China
Source: Wind

China's reform begins from over three decades ago. IT industry is one of earliest areas that start market-oriented reforms. In 1983, China's government planned to triple the output of

electronic industry (a branch of IT Industry) by 2000. In the beginning of 1990, the importance of IT Industry was further raised and IT industry has become a pillar industry. As certain areas of the industry are considered as strategically important to national security, some fields in the industry, such as telecommunication service, are still not open to private and foreign capital. With the rapid progress of society and huge domestic market, the IT industry is prosperous overall. Free competition sectors emerge several world class enterprises such as Lenovo, Huawei and Alibaba. In addition to the success of free competition sectors, highly regulated sectors such as carrier service also achieve rapid growth that comparable to the overall improvement on life quality of Chinese, as can be seen in the following figure that illustrates the penetration of carrier service during 2009 to 2015.
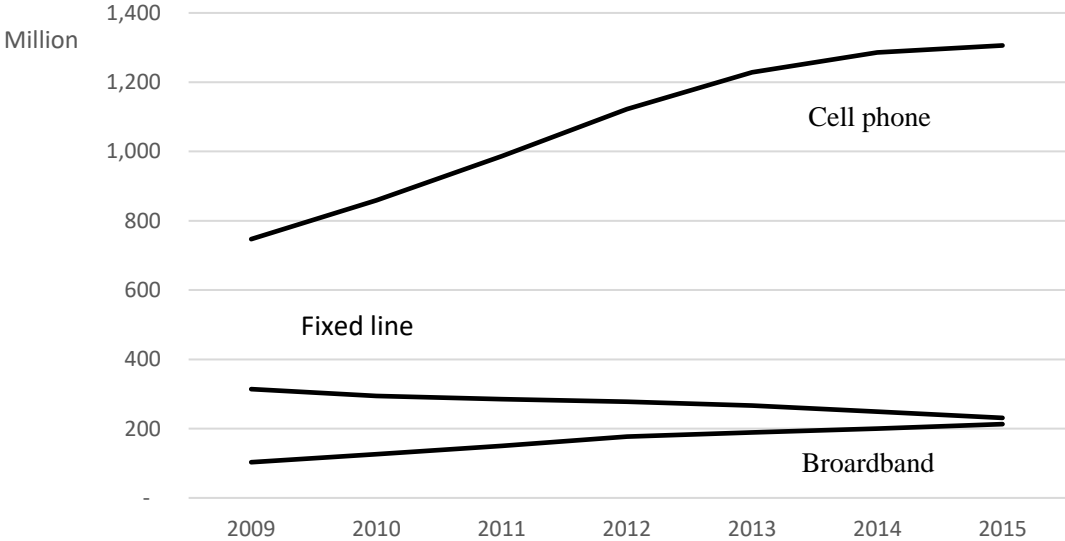
Figure 3. Number of users Fixed line, Cell phone and Broadband in China from 2009 to 2015
Source: Ministry of Industry and Information Technology of the People's Republic of China

China's capital market development and accompanied accounting reforms

The understanding of China's financial market is crucial to assess the value relevance of R&D information since market participants are the main users of financial report information. Security trading appears in China more than a century ago along with the booming

commodity exchange between China and western countries. The contemporary financial market is a byproduct of the national wide economic reform started from the end of 1970s.The opening of Shanghai Stock Exchange (SSE) in the early 1990s, at a time when private sector trading was still considered as a crime at many places in China, witnessed a significant move of financial reform. In less than one year, the second stock exchange, Shenzhen Stock Exchange (SZSE), was put into operation. Both exchanges were established with main board at first. The latter has ceased to accept new firms on main board since 1999. The opening of these two stock exchanges marked China's financial reform was moving into a new stage. As a result of adopting planned economy for more than 30 years before 1980, many large-scale corporations were still fully state-owned and were poorly managed. Even nowadays, state owned enterprises (SOEs) still play an important role in every Chinese's daily life. The performance of these SOEs is tied together with the wellbeing of the whole society. For the purpose of efficiently using these party-controlled assets, the government has undertaken a series of reforms to boost the efficiency of SOEs and their competitiveness. These steps include raising capital from stock market, hiring professional manager from the labor market and decentralization of decision making from party committee to the management. Whereas various measures have been taken to reform SOEs, many of them are still operating under a bureaucratic way. Since managers of SOEs are not plagued with pressure from investors, they tend to have less incentive to conduct earnings management or engage in fraudulent practices.

At the beginning of the operation of the stock market, few private enterprises were qualified to go public as market economy reform just began and private economy started form zero then. SOEs were the primary players in capital market at that time. One of the main steps to reform SOEs is to spread shares to the public so that bureaucracy can be contained with the help of modern governance practices and supervision of external investors. Meanwhile, it reduces the pressure of government on funding SOEs. In many cases, selling share to private sector in an opaque way was related with severe corruptions and loss of state assets. Going public was a relative transparent way of disposing state asset. The process of going public was undertaken in a way that balances the benefit of different involved parties. Therefore,

many kinds of shares that have not been heard in West were created to meet the balancing need. Large quantities of non-tradable shares used to exist in the security market of China. Two kinds of these stocks are relevant to this study. One is ordinary share, which is traded mainly by Chinese. In recent year, qualified foreign investors are eligible to trade this kind of share as well. Firms issuing ordinary share are required to report their performance on the basis of China's accounting standards. Another relevant type of share is the one that has been developed with the intention of raising capital from overseas. It includes H share, B share and N share. Firms are required to release annual report and announcement in accordance with the regulation in respective listing destinations.

The rest groups of shares normally were not allowed to be traded directly on the stock exchange in the past. The inequality is a violation of Chinese law. China's corporate law expressively stipulates each share from the same company should be granted the same voting and income sharing rights[14]. Related reforms aiming at solving the problem have been carried out since 2005. As the reforms on these non-tradable have undergone for many years, the number of non-tradable share has been gradually reduced. As of the end of 2012, the capitalization of SOEs accounts for 51% of the whole stock market value. The number of listed SOEs amounts to 953[15].

Currently there are three different kinds of boards with distinct listing requirements in China's stock market. Main board is set up at the founding period of the two stock exchanges and has a relatively high requirement on IPO. Main board is not accessible for firms currently without solid financial performance. Aiming at meeting the small and media size firms' need of raising capital through equity, a Small and Medium Enterprise (SME) board is established in Shenzhen Stock Exchange in 2004. Besides, Growth Enterprises Market (GEM) is created in 2009 in SZSE as another supplement to the main board. The firms listed on the GEM normally are high technology firms with high growth potential. Similar to NASDAQ, GEM is

---

[14] *Corporate Law for People's Republic of China (2005)   http://www.fdi.gov.cn/1800000121_23_64555_0_7.html*

[15]   National Conference on State Owned Assets Supervision and Administration (2012).
http://www.sasac.gov.cn/n1180/n1566/n259730/n264168/14200309.html

aimed at attracting innovative and fast–growing firms. So far IPO is closely regulated by CSCR and firms with IPO intention without exception have to meet various requirements of respective board. These requirements cover corporate governance practices and key financial figures. In general, SOEs tend to go public on the main board. GEM is crowded with private enterprises. SME board and main board are similar in terms of admittance standards, which are much higher than GEM. The table below summarizes the difference of listing requirements and regulations between GEM and other boards.

Table 2. Summary of the IPO and delisting rules between GEM board and other boards

Market	GEM	Other Boards
Type of firm	High-tech businesses with high growth potential	No restriction
Financial requirements before IPO	①operating with growing net profit in the recent two years and the total net income of the recent two years exceeds 10 million RMB.	①operating with positive yearly net profit in the recent three years and the total net income of the recent three years exceeds 30 million RMB
	② operating with net profit no less than 5 million RMB and revenue over 50 million RMB in the recent year. The annual growth rate of recent two year should exceed 30%	②total cash flow from operation in the recent three years exceed 50 million RMB, or the total revenue of the recent three years exceeds 300 million RMB
	③the net asset at the end of last fiscal year should be no less than 20 million	③net asset should be no less than 30 million. Intangible asset (net of land use right, water surface farming right and mineral right) should account for no more than 20% of net asset
	Fulfill③ and one of ①②	Fulfill ①②③simultaneously
Number of shares outstanding	Exceed 30 million after IPO	No less than 30 million before IPO. Exceed 50 million after IPO
Delisting rules	Similar to other boards, but the time for correction is shorter.	A series of rules including audit opinion and trading volume
Average amount raised per IPO	Around 300 million RMB	500 to 800 million RMB
Refinancing through stock market	Seasoned equity offering is not allowed	Seasoned equity offering is widely used as a source of financing

Source: Documents from websites of CSCR, Shenzhen Stock Exchange, Shanghai Stock Exchange as of the end of 2013

However, the differences between firms traded on GEM and firms on other board are not necessarily as huge as the IPO requirements suggest. First, all of them are public firms and are closely watched by various regulators and media. They share most regulatory policies. In some cases, GEM firms are even more closely monitored. For example, CSCR asks principal underwriter to extend their consistent supervision session after IPO for GEM firm to three fiscal years, compared to two years for firms from other board[16]. Second, there is no difference concerning the qualification of investors for all three boards. In other words, investors are attracted to trade by the characters of individual firm rather than the features of trading board. A firm should have same valuation no matter which board it is listed on. Third, the reliability of a firm's financial statement is supposed to be decided by its auditor, rather than the board it belongs to. All listed firms are required to hire an eligible auditor to do annual report audit. The list of eligible auditors for GEM firm is the same one as list for firms from other boards. For any engagement with listed firms, auditors face same level of punishment for their neglect in duty. Auditors are unlikely to lower audit quality just because the clients are firm listed on GEM.

China's financial market is becoming increasingly mature and well-regulated with all these years' reforms. The improvements relevant to this research can be summarized as following:

1. The market is more standardized and orderly. Information disclosure procedures are designed comprehensively and listed firms are closely supervised by authority on information disclosures. This feature makes the research become possible, as investors having access to R&D expenditure information is the prerequisite of testing value relevance.

2. Institutional investors become prominent market participants. China's stock market used to be notorious of speculation because many investors are individual investor without long term plan and strategy on investing (Wang, Shi and Fan, 2006). As more institutional investors are involved in the markets, stock price is supposed to be more closely associated with fundamentals and public information, including public

---

[16] Rules for Growth Enterprise Market Stock (2004), published by Shenzhen Stock Exchange.
http://www.szse.cn/main/disclosure/bsgg_front/39753081.shtml

information on R&D expenditures. Under the Qualified Foreign Institutional Investor (QFII) program, global institutional investors, though selected, are eligible to invest in China's RMB denominated capital market. With the cross-boundary investment channel Shanghai-Hong Kong Stock Connect launched in 2014, investors from one side are allowed to purchase stocks listed on the other side since then. These efforts aiming at attracting investors from mature market could further reduce unprofessional behaviors in the market and enhance the value relevance of accounting information. Meanwhile, the value relevance of certain accounting information become more predicable

3. Financial information providers that focus on China's stock market appear and provide comprehensive and timely information service. With the booming of the financial market, some firms start to gather financial information and provide reliable information service to professional firms or researchers. These information providers give enormous convenience to conduct researches based on China financial market.

Accompanying the development of economic reform, accounting infrastructure also goes through rapid changes. Establishing an effective accounting infrastructure is often considered as a prerequisite of developing a healthy capital market. China's financial accounting reforms happened in the second half of 1980s is believed as a respond to the development of capital markets. Before these reforms, business activities were reported in Soviet-Union way. Consequently, the reporting used to be more like a counting measure and generated statistic summaries.

Aiming at developing an integrated accounting infrastructure that suitable for the evolving socialist market economy with Chinese characteristics, various policies have been produced. As the old style of accounting could not meet the need of expanding market economy, China began to adopt the accounting system commonly used in western countries. In the beginning of 1990s, Chinese government decided to follow the Hong Kong way of financial reporting regulation, which is traceable to those developed in UK and USA. Reforms polices have been gradually released since then. Among these reforms, improvements made in 1998 were significant, indicating the accounting practices of domestic listed firms were becoming in line

with international practices. Following the theme of integration with the western world, an ambitious project to develop China's own accounting standards was initialized.

The release of Accounting Standard for Business Enterprises (1992)[17] is often considered as a milestone in China's accounting history. It is PRC's the first edition of modern accounting standard and was promulgated by Finance Ministry. All companies in China were required to make adjustments in less than one year and apply these standards from the second half of 1993. The Standard is designed to make accounting information become useful to more stakeholders and states clearly that financial accounting information is supposed to meet the demand of information users in understanding a company's financial position and past performance.

The 1992 standards were replaced by 2001 version, and later it was replaced by Accounting Standard for Business Enterprises (2006), which is implemented in 2007. The 2006 version shows extensive convergence of international accounting standards. The standards introduce the concept of fair value measurement with market price presence and directly connect the book value to market value. A big breakthrough of standards (2006) is on R&D reporting. Following international practice, capitalization of certain R&D expenditures is accepted. More detailed description of R&D reporting change will be presented in the following chapters.

Listed firms' disclosure of accounting information is also regulated by CSRC. Several rules concerning accounting information disclosure have been worked out by the CSRC since 1993, stipulating the content and format of disclosure documents. The requirement on reporting R&D in annual report since 2007 is one of them. Listed firms are also required to conform to rules set by respective stock exchanges.

Under the rules set by Finance Ministry, all listed firms' fiscal year stars from January1st and ends on December 31st. It is mandatory for a public firm to release its annual report within

---

[17] *Accounting Standard for Business Enterprises (1992), http://www.fdcew.com/fgwk/fgbw/52522.html*

120 days after December 31st. The content of the annual report should comply with relevant accounting regulations and standards. As the same in many other countries, the annual reports of listed firms should be audited by certified public accountants with qualification for the business of security.

3.2. R&D accounting in China

China neither follows the trend of adopting IFRS. Accounting practice in China is guided by its self-developed China Accounting Standard (CAS). Among these standards implemented in 2007, CAS No.6 clearly stipulates the treatment of R&D expenditures.

The accounting for R&D experienced dramatic change since 2007 along with the adoption of new accounting standard. The previous relevant accounting standard required all the R&D expenditure to be expensed in to the period when it is incurred. The only exception is the registration fee and legal fee of self-developed intangible asset that has been applied by legal steps. R&D expenditure that recorded as expense is not required to disclose in the note of financial statement. Such prescription renders accounting number less pervasive in reflecting a firm's value as R&D is keeping increasing.

China Accounting Standard No. 6 (CAS NO.6) prescribes the accounting treatment of R&D expenditure. There is still no clear definition of R&D expenditure made by the standard makers in China. The new accounting standard, implemented in 2007, mentions the scope of what kinds of R&D activities need to be recorded separately. Similar to IAS 38 of IFRS, the CAS No.6 divides a R&D project into research phase and development phase. Development phase is after research phase, implying new product or a new technique based on the R&D project is very likely to emerge. When the management is not sure about which phase the activity belongs to, it should be recorded as expensed in period in which they are incurred. Development cost can be capitalized when certain conditions are met and should be listed Development Expenditure during the project and will be moved to intangible asset after the

project is finished. All the expenditure that does not meet the requirement of capitalization should be recorded as expense in period in which they are incurred, under the account General Expense.

The development expenditure can be capitalized when several conditions are met:

1. the intangible asset that will be used or sold is technological feasible

2. the firm has the intention to use or sell the intangible asset

3. the way the intangible asset brings in benefit, including proving the presence of the market of the product produced by using the intangible asset, the intangible asset has potential market. If the intangible asset will only be used internally, the management should prove its usefulness

4. the firm has sufficient technological capacity, financial resource and other resource to support the completion of the intangible asset

5. the development cost can be reliably measured (Ministry of Finance, 2007).

The drastic change made in 2006 is considered by the accounting community in China as being in line with international practice, following the trend of convergence of China Accounting Standard and IFRS. In this way, the standard setter in China also picks up the side of relevance. The previous prescription on R&D severely violates some key accounting principle of accounting, such as matching and historical cost principle. The change is made based on the assumption that the competence of accountants has increased significantly during past few years and investors are more sophisticated than before. Since the accounting treatment of R&D expenditure in China is similar to that under IFRS, it is reasonable to argue the value relevance of R&D expenditure should be alike, given other factors the same.

Table 3 below illustrates main differences regarding R&D reporting between various jurisdictions

Table 3. Summary of R&D reporting in various jurisdictions

Jurisdictions	China	US	Countries adopting IFRS
Standard applicable	CAS NO.6	SFAS NO.2/NO.86	IAS 36/38
Expense R&D expenditure as incurred	Yes, as a subaccount of administrative expense	Yes, presented separately	Yes, presented separately
Capitalize R&D expenditure	Yes, subject to conditions	Yes, but only for software industry	Yes, subject to conditions
Further treatment of capitalized expenditures	Transferred to Intangible Asset account when finished and then amortized and impaired as an intangible asset	Amortized over economic life. Impaired if necessary.	Amortized over useful life. Impaired if necessary.

3.3. Tax policies encouraging IT firms conducting R&D

The capitalization of development cost influences net income and intangible asset directly. Its impact is further amplified by tax preference related with R&D. Tax preference policies on R&D expenditure established by tax authority also play a role in influencing the decision of a R&D-intensive company, aiming at encouraging firms building competitiveness by investing in R&D. According to Regulations for the Implementation of the PRC Enterprise Income Tax Law promulgated by the State Council on December 6, 2007, enterprises can claim additional deduction equal to 50% of the actual expensed R&D expenditures incurred. Meanwhile, capitalized R&D expenditures, which are constituent part of intangible asset in financial statements, are permitted be amortized by 1.5 times of the normal amount. In addition to the tax incentive policies mentioned above, companies recognized as National High -Tech Enterprises (NHE, hereafter) are entitled to a special corporate income tax rate of 15%, which is 10% lower of the normal 25%. To be recognized as a NHE, a firm needs to develop certain number of patents and employs enough numbers of technicians. Meanwhile, the total R&D expenditure of the past three years should reach certain percentage of its sales. A firm also needs to maintain the R&D intensity at a certain level before and after the recognition. The majority of listed IT firms are accredited as NHE. These tax incentives offer firm extra

motivation to spend on R&D. Table 4 below illustrates the percentage requirements on NHE certification.

Table 4. Requirements on R&D investment for different size of certified High-Tech firms to get tax incentive

Revenue	R&D expenditure / Revenue
Less than 50 million RMB	5%
50 million to 200 million RMB	4%
Over 200 million RMB	3%

4. Hypothesis and Methodology

4.1. Development of hypothesis

R&D in nature is plagued by high uncertainty. With the excuse of maintaining confidentiality, information asymmetry on R&D expands to a more severe level than that of other expenditures. Financial statement's main function is to deliver information to information user. Thus, whether the accounting treatment of R&D is appropriately reflecting the fact draws a great deal of attention. As accounting standards are designed to help firms preparing financials that comprehensively depict pictures of firms' operation and future, checking the association between R&D expenditure and firm value, the decision investors made based on accounting and other information, could address the problem of assessing the fairness of adjusted accounting treatment of R&D from the usefulness angle.

Before the adoption of New Accounting Standard, all the R&D expenditures are recognized as expenses, resulting in underestimated earning and net asset. In fact, R&D spending is more like an investment. Just like a normal investment, it could bring in economics benefit into a firm if the R&D project turns out to be successful. Based on data from China, R&D is found to create value by generating cash flow (Wang, Chuang and Chun-Ling, 2005). Successful

R&D project shares the characters of asset. Thus, capitalizing development expenditures incurred after certain requirements are met enhances the financial report's ability of depicting a firm's actual running condition than expensing them directly. Lev and Sougiannis, (1996) argue capitalization of successful R&D spending conforms to the business essence and increases the value relevance of financial reports. Accordingly, my first hypothesis is stated as follows:

H1. New R&D reporting rules under New Accounting Standard increase the value relevance of IT firms' accounting information

The split of R&D expenditures into capitalized part and expensed provides extra information for investors to estimate potential return on successful R&D projects. The capitalization of certain R&D expenditures reduces the uncertainty beard in the R&D investment, indicating a research project is becoming technology feasible or business feasible. Therefore, it may deliver as a good signal to management and investors as the R&D investment are going to be paid off and the firm will move to more advantageous position in competition. Although the amount of economics benefit that newly recognized R&D projects will turn into is still uncertain, it is reasonable to argue the benefits associated with the capitalized R&D expenditure are likely to flow into the enterprise. Selective capitalization depicts a more relevant picture while maintains reliability. Hence, recognition of R&D asset at cost is expected to be appreciated by investors and related asset is supposed to be positively associated with the firm's market value. As the new China accounting standard on R&D gives management the flexibility to choose whether expense or capitalize certain R&D expenditure, expensed R&D expenditure may consist of not only spending unsuccessful projects but also successful ones, However, in consideration of the tax benefit and beautifying earnings numbers, when it is allowed, management is inclined to recognized a R&D expenditure as an asset, namely, capitalized R&D expenditure. Thus, the portion of expensed R&D expenditure incurred on successful projects is limited. The unsuccessful portion still accounts for a dominant part. As these expenses are mostly spent on unsuccessful project, investors may reckon these expenditures have no chance of bringing in positive impact and represents useless consumption of firm resource. Given all that, I test the following

hypothesis:

H2. As for IT firms, both of capitalized and expensed R&D expenditure are value relevant. A positive association between capitalized R&D expenditure and market value is expected. For expensed portion, a negative association is expected.

Growth Enterprises Market is a unique existence on China's stock market. In 2015, the board gained a nick name of "Board created by God" among individual investors because of its sky-high average PE ratio of 100X. As going public in China still relies on bureaucratic approval and firms looking to going public are faced with various unavoidable requirements, the relative low requirements of entering GEM attract pre-public firms that are distinct from these listing on main board and SME board. Companies in GEM are generally smaller in size than companies in other boards. Based on historical data, a majority part of technological advancements is contributed by firms with large size (Cohen and Klepper, 1992). Large companies are more efficient in acquiring market share by launching leading products with price premium because of their more outstanding competency of innovation compared to small companies. Tsoligkas and Tsalavoutas (2011) claim that company size is significantly associated with valuation effect on R&D with data from UK.

Meanwhile, the differences between GEM firms and other boards are not always on firm size. Some IT firms (i.e. Le. Com) in GEM are larger in size than main board IT firms. Because of more severe instability, firms on GEM are faced with more strict regulation and having more limitation on refinancing through issuing new shares. Normally firms go public on GEM as they are not eligible to be listed on other board. Gem firms are usually riskier than their peers in other board. As mentioned above, firms in GEM faces stricter delisting requirements than firms in other boards, including the warning period after adverse audit opinion being issued or reporting negative equity value. GEM firms are also under heavier pressure of maintaining growth because their high P/E ratio. These factors combined suggest managers are more likely to increase earnings through R&D capitalization than their peers in other boards. Earnings management by R&D capitalization has already been spotted in other markets (Markarian, Pozza and Prencipe, 2008; Triki-Damak and Halioui, 2013). Thus, the capitalized portion of R&D costs among GEM firms may include more costs from some unsuccessful

project, while expensed portion of R&D costs among other board firms may include development costs from some successful project. These issues are likely to change investors' perception on comparison between GME firms' and other board firms' R&D.

Firms in GEM and other boards are subject to same accounting rules and same level of audit. The economics meanings of R&D figures in GEM and other boards are supposed to the same, as they compete in the same industry and are mostly based on Chinese market. Even though creative accounting and small firm size are more about features of individual firm rather than market board, a tendency of bearing these two features by GEM firms may lead the investors to evaluate these firms' R&D efforts differently from firms of other boards. With the consideration of potential "water injection" of capitalized amount of R&D cost by GEM firm and size effect, I assume, for every RMB of capitalized R&D, more future economic benefit will be brought to IT firms listed on other boards than their counterparts on GEM. On the other hand, expensed R&D costs of firms from other boards contain costs incurred on successful projects. These costs are likely to bring in economic benefit to firms. Therefore, I put forward my third and fourth hypothesis:

H3. The valuation effect of capitalized R&D cost is larger for listed IT firms on Main board and SME Board than firms from GEM.
H4. The valuation effect of expensed R&D cost is less negative for listed IT firms on Main board and SME Board than firms from GEM.

4.2. Methodology

This article examines the value relevance of R&D expenditure by using public financial information. Value relevance is reflected in the significant association between a piece of accounting information and a firm's market value. As the same as many previous articles, this study adopts and extends Ohlson (1995) model to test the association between accounting information and market value. The model is based on rigorous mathematical derivation and

builds a framework to learn knowledge concerning relations between share prices and accounting numbers (Easton, 1999). The model attempts to explain firm value by book value and earnings. Both are fundamental accounting numbers and their quality is closely associated with the overall quality of financial reports.

Pooled regression is employed to exam the associations. The preliminary form of Ohlson (1995) model is as below:

$$P = a_0 + a_1 BVPS + a_2 EPS + \varepsilon$$

Where: P is the share price of a firm at the year end. $BVPS$ is the book value per share of a firm year end. ε accounts for disturbance term with mean value of zero.

From 2009 to 2015, the China's stock fluctuates dramatically. During the period, Shanghai Composite Index[18] ranges from 1850 in 2012 to more than 5000 in 2015. It can be concluded that the testing year may has a significant impact on a firm's market value. Variable YEAR(YR) is created as the dummy variable to estimate the market-wide factors that change in time but are equal for all firms in each of the periods considered. The adding of year dummy enables intercept to change from year to year over the observation period. The Ohlson model with year dummy is presented as following:

$$P_{it} = a_0 + a_1 BVPS_{it} + a_2 EPS_{it} + \sum YR_{it} + \varepsilon_{it} \tag{1}$$

Where
- P_{it} is the share price of firm i at the end of April 30th of year $t+1$
- $BVPS_{it}$ is the book value per share of firm i at the end of year t
- EPS_{it} accounts for earning per share of firm i during year t
- YR_{it} is the year dummy (it equals one if the observation is from year t. In any other case, zero)
- ε_{it} is the disturbance term

---

[18] Shanghai Securities composite index is the official index reflecting the price movement of shares in Shanghai Stock Exchange. It has been published since 1991

A straight forward way to evaluate whether an accounting policy enhances a financial number's explanatory power on value is to compare the power before and after the policy is enforced. However, since disclosure on R&D was not compulsory before the implementation, firms rarely reported their R&D numbers. The absence of R&D data before reform forms a challenge to check the improvement on normal ways as the improvement may also be caused by higher quality of accounting information disclosure, rather than the adoption of selective capitalization of costs. Moreover, the number of listed IT firms is limited before 2009, resulting problems of inadequate sample. In the light of Smith, Percy and Richardson (2001), whether an accounting practice is better than another in terms of value relevance can be tested by using "As-If" method. The idea of the method is to adjust the actual accounting numbers under certain practice to theoretically estimated numbers by assuming another practice is working and then compare the explanatory power of adjusted number with existing number in the same model. In order to exam whether the prescriptions of R&D reporting under New Accounting standards (2006) are superior than previous ones in terms of value relevance, variables *Adj_BVPS* and *Est_EPS* are brought forward to represent the book value per share and earning per share as if the previous R&D reporting rules are still valid and firms prepare accounts under previous rules. Since the adjustments only need few calculation, two set of data are effectively available for equity investors. With the considerations above, Model 2 is established to test Hypothesis 1 by comparing with Model 1.

$$P_{it}=b_0+b_1Adj\_BVPS_{it}+b_2Est\_EPS_{it}+\Sigma YR_{it}+\varepsilon_{it} \tag{2}$$

Where

- P_{it}, YR_{it} and ε_{it} are the same as above
- *Adj_BVPS*$_{it}$ is the estimated book value per share of firm *i* at the end of year *t* under previous R&D reporting rules, equivalent to the difference of BVPS and capitalized R&D expenditure per share
- *Est_EPS*$_{it}$ is the estimated book value per share of firm *i* in year *t* under R&D reporting rules before 2007. It equals EPS less capitalized R&D expenditure per share.

In order to exam the value relevance of capitalized and expensed R&D expenditure separately, previous researches often decomposed a firm's book value into capitalized R&D parts and remainder (Aboody and Lev,1998；Han and Manry, 2004; Anne Cazavan-Jeny and Jeanjean, 2006). In their researches, EPS is also adjusted by adding the expensed R&D per share. Similar to previous studies, the adjusted model for Hypothesis 2 is following:

$$P_{it} = c_0 + c_1 Cap\_RDPS_{it} + c_2 Exp\_RDPS_{it} + c_3 Adj\_BVPS_{it} + c_4 Adj\_EPS_{it} + \Sigma YR_{it} + \varepsilon it$$

(3)

Where

- $P_{it,}$ YR_{it}, Adj_BVPS_{it} and ε_{it} are defined as above
- Cap_RDPS_{it} is firm i's annual capitalized amount of R&D expenditure during year t
- Exp_RDPS_{it} is firm i's annual expensed amount of R&D expenditure during year t
- Adj_EPS_{it} is firm i's earnings per share add annual expensed capitalized R&D expenditure per share of firm i during year t

As Hypothesis 3 and 4 are to examine the difference of valuation effect of R&D expenditure between firms on GEM and on other boards, the sample is divided into two groups. Other boards group includes firms from main board and SME board. Model 3 is run separately. Since separately running Model 3 is incapable of examining the significance of difference between sub samples without decreasing the sample size, a dummy variable Dum is introduced to capture the significance of the difference (Tsoligkas and Tsalavoutas, 2011). Model 4 for Hypothesis 3 and 4 is as follows:

$$P_{it} = d_0 + d_1 Cap\_RDPS_{it} + d_2 Cap\_RDPS_{it}*Dum + d_3 Exp\_RDPS_{it} + d_4 Exp\_RDPS_{it}*Dum$$
$$d_5 Adj\_BVPS_{it} + d_6 Adj\_BVPS_{it}*Dum + d_7 Adj\_EPS_{it} + d_8 Adj\_EPS_{it}*Dum + d_9*Dum + \Sigma$$
$$YR_{it} +$$
$$\Sigma Dum*YR_{it} + \varepsilon it$$

(4)

Where

- $P_{it,}$ YR_{it}, Adj_BVPS_{it}, Adj_EPS_{it}, $Cap\_RDPS_{it,}$ Exp_RDPS_{it} and ε_{it} are defined as above

– *Dum* is a dummy variable that equals 1 if the observation is from GEM. Otherwise, it is zero

Table 5 below summarizes the predicted empirical results under the assumption that all four hypotheses are valid.

Table 5. Summary of predictions

Hypothesis	Related models	Expected empirical result if the hypothesis is valid
1	(1), (2)	Model 1 has higher goodness of fit than Model 2. The variance of the fitness is significant
2	(3)	Both of coefficients of Cap_RDPS and Exp_RDPS are significanat. The former is positive but the latter is negative
3	(3), (4)	Coefficient of Cap_RDPS of Other boards group in Model 3 is more positive than that of GEM group. Coefficient of Cap_RDPS*Dum in Model 4 is significantly negative.
4	(3), (4)	Coefficient of Exp_RDPS of Other boards group is less negative than that of GEM group. Coefficient of Exp_RDPS*Dum in Model 4 is significantly negative.

4.3. Data source

The sample of this study consists of IT firm listed on Shanghai Stock Exchange and Shenzhen Stock Exchange from 2009 to 2015, a post financial crisis period during which firms are allowed to capitalize R&D expenditure in development phase when all the five conditions mentioned above are met.

All the samples tested in this research are selected based on the classification[19] of CSRC on industry. According to the classification, firms with main business in information

---

[19] *Guide to the classification of listed firms (2001). http://www.cs.com.cn/csnews/20010403/46658.htm*

transmission, software, and information technology service and the manufacturing of relevant equipment will be classified into IT industry. Samples comprise IT firms listed on the main board of China stock market, SME board and GEM. Since the implementation of new accounting standard in 2007, listed firms in China are allowed to present capitalized R&D expenditures in balance sheet, either in the name of Development Expenditure or Intangible Asset. Development Expenditure is defined as a sub account of intangible asset, representing capitalized development expenditures on projects that have not been completed. Expensed R&D expenditure should be classified under Administrative Expense and disclosed in the notes of annual report.

The data are retrieved from a series of datasets provided by several databases. Different databases are used because of their respective limited availability on R&D information. The expensed R&D expenditure data are from Wind database, the market leader in China's financial information services industry. The capitalized R&D expenditures data, other accounting data and stock market data come from the CSMAR database, another widely-used financial information provider in China. Some data are collected manually from annual reports published by CNINF, which is the official public firm information disclosure platform designated by CSRC. Raw data are processed in accordance with the definition of the variables by using Excel, and then processed by employing SPSS 19 and STATA 14.

Point of time of stock price data is set at the end of April. Price data is collected on backward answer authority basis if any seasoned equity offerings occurs between year-end and the end of April. The date is prescribed by CSRC as the official deadline for public firms releasing their last year's annual report. In most cases, listed firms have already published their annual reports by that day. The date is selected to ensure R&D information is publicly available to everyone in the market and the market price contains R&D spending information (Tsoligkas and Tsalavoutas, 2011). Firms that had halted trading for more than 4 months before April 30th of certain year are excluded as an observing target of that year.

Table 6. Sample observation

Year	Observation in Other boards	Observation in GEM	Sum
2009	24	5	29
2010	39	17	56
2011	47	28	75
2012	66	34	100
2013	71	43	114
2014	80	50	130
2015	85	62	147
Total	412	239	651

Table 6 shows observations distribution between two groups. Annual firm-year number increases from 29 to 147 in a five years' period, indicating IT industry has cultivated a growing number of firms with considerable size. The total number of observations in other boards is about 1.7 times as large as that of GEM. The table above demonstrates rapid growth of the number of IT firms on GEM (10 times in 5 five years), which is consistent with GEM's goal of supporting innovative firms through equity financing. The upward trend of the number of observations witnessed in both group over 2009 to 2015 indicates IT firm of different sizes are increasingly interested in finance through going public.

Table 7. Average annual capitalized and expensed R&D amount in different listing boards

Listing Board	Capitalized / Expensed*	RDI
Shanghai Main Board	27.38%	8.13%
Shenzhen Main Board	10.43%	8.59%
Shenzhen SME Board	25.28%	13.98%
Shenzhen GEM	39.53%	19.46%

* Capitalized / Expensed=average capitalized R&D expenditure/average expensed R&D expenditure.

RDI refers to R&D intensity. RDI=R&D spending/ Revenue. All numbers in the table are calculated on arithmetic mean

Table 7 reports average annual capitalized and expensed R&D amount in various listing boards. Overall the numbers are consistent with the features of different boards. Shenzhen main board has the lowest ratio of capitalized amount to expensed amount, indicating firms on the Shenzhen main board may focus on conducting more advanced researches that normally a have lower successful rate. Shanghai main board comes as the third. While their

R&D intensities are close, suggesting IT firms on the two boards may have similar R&D spending habit. Firms in main boards are generally larger in terms of revenue than firms in GEM and SME. Thus, the growth opportunities of firms in main boards are less prominent than their counterparties in GEM and SME. The fact that the highest RDI belongs to GEM suggests firms publicly traded on GEM rely more heavily on R&D. The Capitalization/Expense ratio of GEM in is around 40%, the highest of the four boards again, suggesting GEM firm might be more aggressive at capitalizing R&D cost or they are more efficient at conducting R&D activities. These ratios are generally in line with existing theory and expectations, which to some extent reflects the data collection is largely right

5. Empirical Result

5.1. Descriptive statistics

Descriptive statistics of the variables used in the study are presented as below in Table 8. The full sample of firm-year is 651. Both minimum amount of Cap_RDPS and Exp_RDPS are zero, suggesting there are firm(s) fully expensing all R&D spending or aggressively full capitalizing all R&D spending in a certain year. The variance of Price is relatively huge. The range of share price is from 4.18 and 217.49. As the highest EPS is 1.74, share price of 217.49 does need a lot of imagination on the ceiling that the firm will be constrained with. The lowest value of EPS is below zero, which implies not all the firms are well-run. Covering both well-run firm and poorly-run firm reduces the survivorship bias. The average BVPS/ average EPS is about 16 times, implying the IT industry in China may not be that efficient in utilizing asset as deemed. The lowest BVPS is below 1, which is the par value of every listed firm's ordinary share. BVPS less than 1 proves there is at least one firm in heavy debt burden in a certain year. If scaled by mean value, Adj_ BVPS has the lowest standard deviation. BVPS comes as the second.

Table 8. Descriptive statistics: Observation from all boards

Variables	N	Minimum	Maximum	Mean	SD
Price	651	4.18	217.49	26.99	22.34
Cap_RDPS	651	0	0.93	0.1	0.13
Exp_RDPS	651	0	3.66	0.35	0.4
BVPS	651	0.98	31.54	4.99	2.93
EPS	651	-2.32	1.74	0.32	0.36
Adj_BVPS	651	0.75	31.54	4.89	2.91
Est_EPS	651	-2.46	1.74	0.22	0.37
Adj_EPS	651	-1.64	4.56	0.67	0.6

5.2. Correlation analysis

Table 9 below illustrates the correlations between variables tested in the research. The correlation coefficient between Adj_BVPS and BVPS is close to one, while it does not necessarily imply severe multicollinearity problem exists as they are never included in the same model. The same works to high coefficients between Adj_EPS and EPS/Est_EPS. As expected, Price has a positive and significant correlation with EPS (Adj_EPS) and BVPS (Adj_BVPS). Correlation between Price and Cap_RDPS is found to be insignificant at 0.05 level. While correlation between Price and Exp_RDPS is significant while the coefficient is positive, this is contrary to prediction of the Hypothesis 2. The correlation coefficient between Adj_EPS and Exp_R&DPS is significant and over 0.8. Multicollinearity may exist between Adj_EPS and Exp_R&DPS. Thus, multicollinearity indicators such as variance inflation factor (VIF) should be taken notice of when Hypothesis 2 is tested. Pearson correlation coefficient is tested based on two variables. The association between Adj_EPS and Price in models with several other variables may change as price is decided by multiple factors.

Table 9. Pearson correlation matrix for all variables

Variables	Price	CapRD	ExpRD	BVPS	EPS	Adj_BVPS	Adj_EPS	Est_EPS
Price	1							
CapRD	0.072	1						
ExpRD	0.139**	0.358**	1					
BVPS	0.279**	0.208**	0.309**	1				
EPS	0.338**	0.130**	0.219**	0.462**	1			
Adj_BVPS	0.279**	0.165**	0.296**	0.992**	0.460**	1		
Adj_EPS	0.299**	0.320**	0.806**	0.488**	0.755**	0.478**	1	
Est_EPS	0.308**	-0.222**	0.090*	0.381**	0.938**	0.394**	0.630**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5.3. Results of regression analysis

Table 10. Empirical result of Hypothesis 1

Variable	Model PRE	1 Coefficient T-value	2 Coefficient T-value
BVPS	+	1.56*** 4.8	
EPS	+	21.16*** -4.45	
ADJ_BVPS	+		1.92*** 5.77
Est_EPS	+		16.00*** 3.84
Year Effect	?	Tested and significant	
Constant	?	20.44*** 12.21	20.57*** 11.48
Sample Size		651	651
Adjusted R-square		0.42	0.39
F -value		32.15	29.66
Vuong's Z Value		2.73***	

*** coefficient is significant at 1%,**significant at 5%

Table 10 shows the regression result of models testing Hypothesis 1. Model 1 is the price model under the New Accounting Standards. Model 2 is derived from Model 1, by eliminating the annual capitalized portion of R&D expenditure from BVPS and EPS. As expected, all of BVPS, EPS, Adj_BVPS, Est_EPS have positive coefficients and the associations are significant. Year effect is controlled and found to be significant as projected. Adjusted R-square here works as a measurement of investors' dependence on accounting information. If investors reckon the new R&D reporting rules do not give extra value, they may recover BVPS and EPS to old ones before making decisions on these numbers. In this way, the new R&D reporting rule won't influence investors' decision and the variables in the two models should have same explanatory power. The adjusted R-square in Model 1 is 42%. In Model 2, it is 39%, 3% lower than the former one. The increased adjusted R-square suggests financials under R&D reporting rules at present have higher explanatory power on

market than the estimated ("As If") financials based on previous R&D reporting rules. F-value of Model 1 is slightly bigger than that of Model 2, which further proves the explanatory power of Model1 is better. Table 10 also reports the result of Vuong Test, following what Smith, Percy and Richardson (2001) did. Vuong test provides evidence concerning the superiority of two comparable models. Vuong'Z value is 2.73, which is significant at 0.01 level. The test result is in line with prediction. The significance of Vuong'Z value indicates the difference between the two models' R-square is significant, implying Model 1 is truly capable of explaining a larger part of a firm's share price. In other words, Model 1 is superior to Model 2. The information showed in Table 10 is consistent with expectations. On this ground, Hypothesis 1 is confirmed. The reforms on R&D reporting accompanying the implementation of New Accounting Standards in 2007 enhance the value relevance of earnings and book value. The conclusion is in line with Liu, Yao, Hu and Liu (2011).

The following Table 11 presents empirical result regarding Hypothesis 2. All the variables are significant in Model 3. The variables of interest in this table are Cap_RDPS and Exp_RDPS. According to the table, the coefficient of Cap_RDPS in Model 3 is around 14, which means a firm's share price will increase by 14 RMB if the firm manage to do successful R&D and recognizes1 RMB capitalized development cost per share. The coefficient is significant at 95% confidence interval. The result on Cap_RDPS collaborates with the belief that capitalized R&D cost will bring economic benefit to firms. In other words, capitalized R&D expenditure is positively associated with market value. The figure is in line with previous researches based on IFRS figures (Tsoligkas and Tsalavoutas, 2011), US GAAP figures (Aboody and Lev, 1998) and Korean GAAP figure (Han and Manry, 2004)

The coefficient of Exp_RDPS is -22.50 and significant at 1%, which is consistent with the prediction as well. Exp_RDPS typically consists of three parts, research phase cost, development costs incurred on unsuccessful projects and development costs incurred on successful projects. The first cost is not able to generate future cash flow and it pools all source wasted on R&D during current period, so it is supposed to be negatively related with

share price. The last one could bring value to a firm, while the firm chooses to record it as an expense. This part should be positively related with price. The coefficient of Exp_RDPS reflects an overall effect of these components. A negative coefficient of -22.50 suggests the unsuccessful part outweighs the successful part. It can be concluded, unlike capitalized R&D expenditures, expensed R&D is perceived by investors as not able to generating future economic benefits, collaborating with the prior articles (Cazavan-Jeny and Jeanjean, 2006)

As mentioned above, multicollinearity may weaken persuasiveness of these coefficients and the model. Thus, VIF value is also reported in Table 11. No VIF value is large than 5. The highest VIF, 4.28, falls on Adj_EPS. As a rule of thumb, severe multicollinearity problem usually does not exist if no VIF value is larger than 10 (Gujarati, 2006). So the model is not plagued with severe multicollinearity problem. These results lead to the conclusion that Hypothesis 2 is confirmed.

Table 11. Empirical result of Hypothesis 2

Variable	Model	3	
	PRE	Coefficient	
		T-value	VIF
Cap_RDPS	+	14.41**	1.19
		2.4	
Exp_RDPS	+	-22.50***	3.59
		-3.97	
ADJ_BVPS	-	1.52***	1.42
		4.6	
Adj_EPS	+	21.26***	4.28
		4.37	
Year Effect	?	Tested and significant	
Constant	?	20.02***	
		12.09	
Sample Size		651	
Adjusted R-square		0.42	
F -value		27.78	

*** coefficient is significant at 1%,**significant at 5%

Moving to Table 12, it can be noticed that test results for Hypothesis 3 and 4 are presented. The table includes the results of two mutually exclusive samples. The GEM column reports the OLS result run on GEM sample. The sample size is greatly reduced to 237, a nearly 60% reduction. Cap_RDPS is showed with a positive coefficient (1.08). Even though not significant, it still implies capitalized R&D is positively associated with firm value. A positive coefficient closing to one suggests investors might be conservative about the amount of economic benefits that will flow into the firm. The coefficient of Exp_RDPS is about -30, which is more negative than the coefficient of same variable from samples of other boards (-12.48). The difference alone partly supports Hypothesis 4. If looking at the Adj_BVPS, even though it is not a variable of interest, it is interesting to notice it is less than 1, suggesting one RMB per share increase on book value for an IT firm from GEM could not achieve one RMB share price increase. The coefficient of Adj_EPS is bigger than 40, which is in collaboration with the belief that IT stocks in GEM are not cheap.

If we move our attention to the column next to GEM, we can find a very different picture. The coefficient of Cap_RDPS based on other boards' samples is significant and much bigger than the number on its left side. The raise suggests investors expect more economic benefit will flow into a firm publicly traded on other boards than a firm on GEM (8 times), in the case both invest certain amount of resources that will cause their capitalized R&D per share increases by 1 RMB. Variable Adj_BVPS is significant in other board sample as well. A coefficient over 2 (2.24) implies an existing shareholder's fortune will increase by 2 RMB if he or she injects one more RMB to the firm, which seems to be a very good deal. Compared to the Adj_EPS on the left, Adj_EPS from other boards' column is much lower. Both coefficients are significant. The difference could be a reflection of distinct view concerning growing opportunities of firms from different sub samples. From the difference a conclusion can be draw that GEM firms are believed by investor to be more capable of sustaining growth. The adjusted R square in this column is slight higher than the left one (0.48/0.46). As the group of other boards has 417 observations, the difference is probably caused by the sample size.

The rightest column of the table is derived from Model 4. As expected, the coefficients of Dum*Variables equal the differences of the left two columns. This column tells whether the differences of coefficients between the two sub samples are significant. According to the table, the coefficient of Dum*Cap_RDPS is insignificant. The result is contrary to the prediction. Valuation effect on capitalized R&D for firms publicly traded on other boards is not statically different from that for GEM firms. Thus, Hypothesis 3 is rejected.

The coefficient of Dum*Exp_RDPS is significant at 0.1 level, suggesting there are different valuation effect on expensed R&D costs between firms from GEM and firms from other boards. The coefficient of Exp_RDPS based on other boards' samples is less negative than counterpart of GEM samples. The numbers in Exp_RDPS row confirm each other, which strengthens the explanatory power of these numbers. The coefficients are consistent with the prediction. Thus, Hypothesis 4 is confirmed.

Table 12. Empirical result of Hypothesis 3 and 4

Model		3		4
Variable		GEM Coefficient (T-value)	Other boards Coefficient (T-value)	Dum*Variable (T-value)
	PRE			
Cap_RDPS	+	1.08	9.20*	-8.12
		0.08	1.69	-0.63
Exp_RDPS	+	-30.03**	-12.48***	-17.55*
		-2.37	(-4.75)	-1.7
ADJ_BVPS	+	0.71	2.24***	-1.53**
		1.41	7.76	-2.88
Adj_EPS	+	40.20***	10.98***	29.22***
		7.38	5.31	5.9
Year Effect	?	Controlled	Controlled	Controlled
Constant	?	22.93***	16.15***	6.78**
		6.61	8.77	1.91
Sample Size		237	414	651
Adjusted R-square		0.46	0.48	0.48
F -value		21.86	38.65	30.34

*** coefficient is significant at 1%,**significant at 5%

The following robustness checks have been conducted to test the reliability of the findings. First, I winsorize all the variables except Cap_RDPS and Exp_RDPS by 5% at two tailors, aiming at excluding the effect of outliers. Meanwhile, Cap_RDPS and Exp_RDPS are processed with 5% upper tailor as the lowest value of these two variables is zero, which has specified economic interpretation. A change from nil to positive could be nothing but imprudence. Second, I redid all the tests based on robust standard errors that clustering at firm level, in order to control the impact of heteroscedasticity on firm level. For H1, H2 and H3, results are very similar. For H4, the retest shows a distinct result. With the consideration of heteroscedasticity, the standard deviation increases and the coefficient representing the valuation difference of capitalized R&D between GEM and other boards is no longer significant, which suggests the market does not differentiate the effect of the expensed portion of R&D between these firms. The change can be argued as reasonable since firm features other than these considered in models are also critical to a firm's valuation. Stochastic error term is constant for an individual firm over the tested period while it varies among different firms. Some firms in GEM boards may share a different pattern of valuation effects on R&D and it results in the false significance. However, such pattern is not prevalent in GEM board. Most firms, either in GEM or other boards, share other valuation effects on R&D. H3 and H4 are developed based on the assumption that IT firms in GEM board are distinct from their counterparts in other boards. The insignificance of coefficient suggests the assumption is not valid. Thus, it can be concluded no significant evidence has been found supporting H3 and H4. Both are rejected.

6. Conclusion and Discussion

6.1. Conclusion

Accounting reform accompanied by the release of new accounting standards in 2006 brought dramatic changes to the R&D information reporting. CAS No.6's stipulation on R&D is close to that of IFRS, suggesting convergence with international practices. IT industry, as a R&D

intensive industry, is of high probability to be influenced by the change in financial reporting. New accounting standards are generally designed to bring more comprehensive financial information to investors and give them more insight to a firm's operation. In this way, investors will gain better understanding of accounting numbers.

This study intends to examine the increase of value relevance brought by new R&D reporting rules and the relationship between company value and R&D accounting information, with evidence from IT public firms listed in China. The study investigates not only the association between firm value and R&D spending numbers but also the difference of the associations between GEM firm and firms from other boards. Four hypothesizes are developed and tested one by one in the research. The methodology used in the research is based on pooled OLS models that have been employed by previous studies (Ben-zion, 1984;; Cazavan-Jeny, 2006; Ehie and Olibe, 2010). The study is based on a sample of around 650 firm-years during a period of 2009-2015, when the new accounting standards have been well implemented and the number of listed IT firms is growing fast.

First, reforms on R&D accounting by the adoption of new accounting standards in 2007 have increased the value relevance of accounting numbers of IT firms. New R&D reporting rules divide R&D expenditures into capitalized portion and expensed portion. Investors could easily adjust the financials under current R&D reporting rules to financials under previous rules. I find that accounting numbers (EPS and Book Value) under new rules is more significantly associated with firm value than these under old rules. As EPS and book value per share are key items in financial reports, the statistical result suggests R&D reporting related reforms have increased the value relevance of IT firms' financial statements. In terms of value relevance, the reform is successful in IT industry.

Second, capitalized R&D expenditure is found to be positively associated with market value of firms in IT industry, which is consistent with the intention of allowing capitalizing certain amount of R&D spending. Under the strict rules of R&D spending capitalization, these costs are very likely to bring in future benefit. Expected economic benefit inflow suggests

capitalized R&D expenditure is a form of asset. Investors agree with the logic. Thus, share price, the decision of investors, is positively associated with capitalized R&D expenditure. In contrast, expensed R&D expenditure is found to be negatively associated with firm value. In theory, expensed R&D expenditures are unlikely to bring in future economic benefits and investors consider these costs as disruptions of firm's profit. However, as discretions exist, expensed R&D expenditures may include some spending that can be capitalized. The negative association found suggests useless portion of expensed R&D expenditures outweighs the economic benefits that might be brought by useful portion of expensed R&D expenditures.

Third, the research attempts to find valuation effect difference between IT firms in Gem boards and other boards. However, no evidence has been found supporting that investors treat the R&D spending of GEM firms differently from their counterparts in other boards. The absence of difference occurs not only in capitalized R&D expenditures but also in expensed R&D expenditures. The lack of difference implies the assumption that the financial reports of GEM firms are not as reliable as these from other boards is not valid. It also suggests regulation authority's efforts are fruitful in maintaining consistency of information quality of multi-level capital market.

6.2. Limitation of present research and implication for further studies

Despite contributing several meaningful findings mentioned above, the study is weak in certain aspects. First, the study focuses on IT industry, which is distinct from other industries. The findings are insufficient to generalize to all industries. Second, in order to test whether the reforms on R&D reporting increases the value relevance of financial statements, the study adopts a 'AS-IF' method. Under such method, the share price in estimated 'fully expensing' condition is assumed to be the same as in 'discretionary capitalization 'condition. However, the market may react differently if it was truly in 'fully expensing' condition. Third, the

sample of the study is based on a period when a large number of IT firms went public. Because of the bureaucracy of IPO admission, IPO underpricing is rather common. The share prices of these newly listed firms are well under its intrinsic value. Very often the share prices will move upward rapidly after floating. The research does not separate the effect of IPO. Share price may not be able to reflect the true value of these new floated firms.

Further researches could be devoted to solving these limitations. As R&D in IT industry is intensive, future research on the comparison of valuation effect of R&D between IT industry and an industry where R&D plays a negligible role, such as traditional retailing industry. Additionally, aiming at looking into the improvement of value relevance from the adoption of new accounting standards, it could be more convincing if a research based on data from the period when previous accounting standards were still valid shows the similar results. Moreover, researches controlling the effect of IPO underpricing could present more reliable results. Future studies focusing on firms that have being floated for more than one year are likely to generate fruitful result. Finally, studies concerning comparing the reliability of financial statements prepared by firms from different boards are still limited. Researches covering this topic may provide useful suggestions to regulation policy makers. Also, the tax effect of R&D is neglected in this study. Investigating R&D related tax effect on firm valuation could be another interesting topic.

Reference

Aboody, D., & Lev, B. (1998). The value relevance of intangibles: The case of software capitalization. *Journal of Accounting research*, 36, 161-191.

Ali, A., & Hwang, L. S. (1999). Country-specific factors related to financial reporting and the value relevance of accounting data. *Journal of Accounting Research*, 38(1), 1-21.

Amir, E. (1993). The market valuation of accounting information: the case of postretirement benefits other than pensions. *Accounting Review*, 68(4), 703-724.

Amir, E.& Lev, B. (1996). Value-relevance of nonfinancial information: The wireless communications industry. *Journal of Accounting and Economics*, 22(1), 3-30.

Barth, M., Beaver, W., Landsman, W., (2001). Comments on the relevance of the value-relevance literature for financial accounting standard setting. *Journal of Accounting and Economics*, v. 31, 77-104.

Bartov, E., Goldberg, S.R. and Kim, M.S. (2001). The Valuation-Relevance of Earnings and Cash Flows: An International Perspective, *Journal of International Financial Management and Accounting*, 12 (2), 103-176.

Beaver, W. H., & Landsman, W. R. (1981). Note on the behavior of residual security returns for winner and loser portfolios. *Journal of Accounting & Economics*, 3(3), 233-241.

Ben-Zion, U. (1984). The R&D and investment decision and its relationship to the firm's market value: Some preliminary results. R&D, Patents, and Productivity (pp. 299-314). University of Chicago Press.

Bharadwaj, A. (2000). A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation. *MIS Quarterly*, 24(1), 169-196.

Blonigen, B., & Taylor, C. (2000). R&D Intensity and Acquisitions in High-Technology Industries: Evidence from the US Electronic and Electrical Equipment Industries. *The Journal of Industrial Economics*, 48(1), 47-70.

Brown, S., Lo, K., & Lys, T. (1999). Use of R^2 in accounting research: measuring changes in value relevance over the last four decades. *Journal of Accounting & Economics,* 28(2), 83-115.

Burgstahler, D., & Dichev, I. (1997). Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics*, 24(1), 99-126.

Cazavan-Jeny, A., & Jeanjean, T. (2006). The negative impact of R&D capitalization: A value relevance approach. *European Accounting Review*, 15(1), 37-61.

Chalmers, K., Clinch, G., & Godfrey, J. M. (2011). Changes in value relevance of financial information upon IFRS adoption: Evidence from Australia. *Australian Journal of Management*, 36(2), 151-173.

Chan, L. K. C., & Sougiannis, T. (2001). The stock market valuation of research and development expenditures. *The Journal of Finance*, 56(6), 2431–2456.

Chan, S. H., Martin, J. D., & Kensinger, J. W. (1990). Corporate research and development expenditures and share value. *Journal of Financial Economics*, 26(2), 255-276.

Chauvin, K. W., & Hirschey, M. (1993). Advertising, R&D expenditures and the market value of the firm. Financial Management: *The Journal of the Financial Management Association*, 22(4), 128-140.

Chen, C. J. P., Chen, S., & Su, X. (2001). Is accounting information value-relevant in the emerging Chinese stock market? J*ournal of International Accounting Auditing & Taxation*, 10(1), 1-22.

Chen, M., Cheng, S., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of Intellectual Capital*, 6(2), 4006-8.

Cohen, W. M., & Klepper, S. (1992). The tradeoff between firm size and diversity in the pursuit of technological progress. *Small Business Economics*, 4(1), 1-14.

Cohen, W. M., & Levinthal, D. A. (1989). Innovation and learning: the two faces of R&D. *Economic Journal*, 99(397), 569-96.

Collins, D. W., Maydew, E. L., & Weiss, I. S. (1997). Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting & Economics*, 24(1), 39-67.

Deng, Z., & Lev, B. (2006). In-process R&D: to capitalize or expense? *Journal of Engineering & Technology Management*, 23(1-2), 18-32.

Dou, E., Osawa, J. and Ma, W. (2014, Sep 16th). Internet Power Balance Tilts Toward Asia. Retrieved from http://www.wsj.com/articles/internet-power-balance-tilts-toward-asia-1410887497

Drucker, P. F. (1994). Post-Capitalist Society. HarperCollins Publishers.

Ehie, I. C., & Olibe, K. (2010). The effect of R&D investment on firm value: An examination of US manufacturing and service industries. *International Journal of Production Economics*, 128(1), 127-135.

F. Tsoligkas, & I. Tsalavoutas. (2011). Value relevance of R&D in the UK after IFRS mandatory implementation. *Applied Financial Economics*, 21(13), 957-967.

Fama, E. (1970). Efficient Capital Markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383-417

Fan, P. (2006). Catching up through developing innovation capability: Evidence from China's telecom-equipment industry. *Technovation,* 26(3), 359-368.

Financial Accounting Standards Board (1974). Accounting for Research and Development Costs. Statement of Financial Accounting Standards No. 2, 7-16

Francis, J., & Schipper, K. (1999). Have financial statements lost their relevance? *Journal of Accounting Research*, 37(2), 319.

Francis, J., Lafond, R., Olsson, P. M., & Schipper, K. (2004). Costs of equity and earnings attributes. *Accounting Review*, 79(4), 967-1010.

Gao, J., An, H., & Lu, Q. (2014). The value-relevance of R&D capitalization: evidence from the GEM board in China. International Conference on Management Science and Engineering (pp.1339-1346).

Göttsche, M. and Schauer, M. (2011). The value relevance of accounting figures in the European market reconsidered, European Accounting Association (EAA), 34th Annual Congress, Roma.

Gujarati, D. N. (2014). Basic econometrics 4th edition.2006, (3):110-113.

Gunny, K. A. (2010). The relation between earnings management using real activities manipulation and future performance: Evidence from meeting earnings benchmarks. *Contemporary Accounting Research*, 27(3), 855-888.

Haisu, W., & Zhongxiu, F. (2010). Empirical study on commonness of fast growing private enterprises in China: Study on listed companies on GEM in Shenzhen Stock Exchange. *Journal of Chinese Entrepreneurship*, 2(3), 282-291.

Hall, B. H., & Mairesse, J. (1995). Exploring the relationship between R&D and productivity in French manufacturing firms. *Journal of Econometrics*, 65(1), 263-293.

Hall, B. H., & Oriani, R. (2006). Does the market value R&D investment by European firms? Evidence from a panel of manufacturing firms in France, Germany, and Italy. *International Journal of Industrial Organization,* 24(5), 971-993.

Han, B. H., & Manry, D. (2004). The value-relevance of R&D and advertising expenditures: Evidence from Korea. *International Journal of Accounting*, 39(2), 155-173.

Hart, P. E., & Oulton, N. (1996). Growth and size of firms. T*he Economic Journal,* 1242-1252.

He, X., Wong, T. J., & Young, D. (2012). Challenges for implementation of fair value accounting in emerging markets: Evidence from China. *Contemporary Accounting Research*, 29(2), 538-562.

Hellström, K. (2006). The value relevance of financial accounting information in a transition economy:

The case of the Czech Republic. *European accounting review*, 15(3), 325-349.

Hirschey, M., & Richardson, V. J. (2001). Valuation effects of patent quality: A comparison for Japanese and U.S. firms. *Pacific-Basin Finance Journal*, 9(1), 65-82.

Hsieh, P. H., Mishra, C. S., & Gobeli, D. H. (2003). The return on R&D versus capital expenditures in pharmaceutical and chemical industries. IEEE Transactions on Engineering Management, 50(2), 141-150.

Hsu, F. J., Chen, M. Y., Chen, Y. C., & Wang, W. C. (2013). An empirical study on the relationship between R&D and financial performance. *Journal of Applied Finance & Banking*, 3.

IASC. 1994. International Accounting Standards. (Basingstoke, Hants: Burgess Science Press).

Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics*, 6(2-3), 95-101.

Lam, K. C. K., Sami, H., & Zhou, H. (2013). Changes in the value relevance of accounting information over time: Evidence from the emerging market of China. *Journal of Contemporary Accounting & Economics*, 9(2), 123-135.

Lev, B. (1989). On the usefulness of earnings and earnings research: Lessons and directions from two decades of empirical research. *Journal of Accounting Research*, 27, 153-192.

Lev, B., & Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. Journal of Accounting & Economics, 21(1), 107-138.

Levin, R. (1988). Appropriability, R&D Spending, and Technological Performance. *The American Economic Review*, 78(2), 424-428

Liu, C., Yao, L. J., Hu, N., & Liu, L. (2011). The impact of IFRS on accounting quality in a regulated market: An empirical study of China. *Journal of Accounting, Auditing & Finance*,

Liu, J., & Liu, C. (2007). Value relevance of accounting information in different stock market segments: the case of Chinese A‐, B‐, and H‐shares. *Journal of International Accounting Research*, 6(2), 55-81.

Liu, X., Song, H., & Romilly, P. (1997). Are Chinese stock markets efficient? A cointegration and causality analysis. *Applied Economics Letters*, 4(8), 511-515.

Mande, V., File, R. G., & Kwak, W. (2000). Income smoothing and discretionary R&D expenditures of Japanese firms. *Contemporary Accounting Research*, 17(2), 263–302.

Markarian, G., Pozza, L., & Prencipe, A. (2008). Capitalization of R&D costs and earnings management: Evidence from Italian listed companies. *The International Journal of Accounting*, 43(3), 246-267.

Ministry of Finance, P. C. (2007). No.6 Intangible Asset. Beijing: People's Publishing House

Morbey, G. K. (1988). R&D: its relationship to company performance. *Journal of Product Innovation Management*, 5(3), 191–200.

Mu, Q., & Lee, K. (2005). Knowledge diffusion, market segmentation and technological catch-up: The case of the telecommunication industry in China. *Research policy*, 34(6), 759-78

National Bureau of Statistics (2012). Statistics Bulletin of the National Economic and Social Development of the People's Republic of China in 20113.

OECD (2016), OECD Science, Technology and Innovation Outlook 2016, OECD Publishing, Paris

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

Osawa, Y., & Yamasaki, Y. (2005). Proposal of industrial research and development performance indices. *R&D Management*, 35(4), 455-461.

Peng, S., & Bewley, K. (2010). Adaptability to fair value accounting in an emerging economy: A case study of China's IFRS convergence. *Accounting, Auditing & Accountability Journal,* 23(8), 982-1011.

People's Daily. The size of China's Information Industry ranked as No.2 in the world. (2005, January 1st). Retrieved from http://www.people.com.cn/GB/paper39/13874/1238908.html

Peterson, R. A., & Jeong, J. (2010). Exploring the impact of advertising and R&D expenditures on corporate brand value and firm-level financial performance. *Journal of the Academy of Marketing Science*, 38(6), 677-690.

Sami, H., & Zhou, H. (2004). A comparison of value relevance of accounting information in different segments of the Chinese stock market. *International Journal of Accounting*, 39(4), 403-427.

Sartorius, N. (2006). R&D and market value of Japanese firms in the 1990s. *Journal of the Japanese & International Economies*, 20(2), 155-176.

Seddighi*, H. R., & Nian, W. (2004). The Chinese stock exchange market: operations and efficiency. *Applied Financial Economics,* 14(11), 785-797.

Smith, D. T., Percy, M., & Richardson, G. D. (2001). Discretionary capitalization of R&D: Evidence on the usefulness in an Australian and Canadian context. *Advances in International Accounting*, 14, 15-46.

Sougiannis, T. (1994). The accounting based valuation of corporate R&D. *Accounting Review*, 69(1), 44-68.

Strategy&. (2015). The top innovators and spenders. New York: PwC.

Summers, L. H. (1986). Does the stock market rationally reflect fundamental values? *The Journal of*

Finance, 41(3), 591-601.

Triki-Damak, S., & Halioui, K. (2013). Accounting treatment of R&D expenditures and earnings management: An empirical study on French listed companies. *Global Business and Economics Research Journal*, 2(1), 50-71

UNESCO. (2001). UNESCO Statistical Yearbook. Paris.

UNESCO. (2015). UNESCO science report, towards 2030: Executive summary. Paris

Wang, H. C., Chuang, L. U., & Chun-Ling, L. I. (2005). On the correlation between intangible assets and future firm performance: Empirical evidences from China's stock market. *China Soft Science*, 120-124.

Wang, X. (2012). Foreign direct investment and innovation in China's e-commerce sector. *Journal of Asian Economics*, 23(3), 288-301.

Wang, X. L., Shi, K., & Fan, H. X. (2006). Psychological mechanisms of investors in Chinese stock markets. *Journal of Economic Psychology*,27(6), 762-780.

Wilbon, A. D. (2002). Predicting survival of high-technology initial public offering firms. *The Journal of High Technology Management Research*, 13(1), 127-141.

Zhao, R. (2002). Relative value relevance of R&D reporting: An international comparison. *Journal of International Financial Management & Accounting*, 13(2), 153-174.

Zhu, K., & Sun, H. (2012). The reform of accounting standards and audit pricing. *China Journal of Accounting Research*, 5(2), 187-198.

e