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THE EFFECTS OF FINANCIAL MARKET SHOCKS ON REVENUE–EXPENSE MATCHING: THE CASE OF CHINESE COMPANIES

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ABSTRACT

This study aims to analyze the trends of Chinese companies' revenue–expense matching level and identify the impacts of the 2008 global financial crisis and the 2015 plunge in the Shanghai index on this level of matching. Since these two events, China has implemented strong regulations in the form of structural changes in financial markets and the application of accounting standards. The analysis results can be summarized as follows: first, the analysis of samples for all firm years showed that the expenses of t-1, t, and t+1 had significant positive effects on current revenue. In particular, as concluded by prior studies, the current (t) expenses had the greatest impact on current revenue. Second, before and after the 2008 financial crisis, this matching level changed, but was not statistically significant. However, prior to the 2008 financial crisis and after the 2015 stock price crash, prior and current expenses showed statistically significant coefficients with regard to current revenues. This study provides accounting policy implications as an analysis of the impact of changes in accounting policies due to macroeconomic events in China on the level of revenue–expense matching.

Contribution/Originality: In general, raising the revenue–expense matching level of companies can eliminate information asymmetry between investors and managers. This study provides policy implications that the changes in accounting policies due to macroeconomic events, the 2008 global financial crisis, and the 2015 plunge in the Shanghai index in China affected the level of this matching. Therefore, this study provides empirical evidence that in order to increase the matching level of companies, regulations on the Chinese capital market must be relaxed and the accounting disclosure system of companies must be strictly regulated.

1. INTRODUCTION

Accrual accounting is based on the principle of recognizing expenses and revenues at the time of a transaction or event, not at the times of cash outflows and inflows (Kim & Hwang, 2013; Kim & Kang, 2020). Studies of the matching of revenues and expenses (hereinafter referred to as "matching") are theoretical and have practical implications for accounting policies because the matching level has a significant impact on the quality of earning and accounting information (Francis, Lafond, Olsson, & Schipper, 2004). Previous studies have argued that matching levels have been on the decline in recent years. In the United States, the relationship between current revenues and expenses has gradually weakened, while the relationship between current revenues and prior or subsequent expenses has continued to strengthen. As a result, the level of persistence of earnings has decreased and the volatility of earnings has shown an increasing trend (Dichev & Tang, 2008; Donelson, Jennings, & Mclnnis, 2011).

The Federal Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) reformulate accounting standards to measure an entity's balance sheet performance, in which recognizing an increase (decrease) in fair value as an expense can yield a reasonable earning.

The matching principle refers to the reporting of a profit or loss matched to expenses that are relevant to revenue. By reporting appropriate current earnings or losses while matching in this manner, companies can provide accounting information that is usefully related to investors' decisions. Moreover, for accounting information that is useful for making decisions, managers perform neutral accounting for appropriate matching to revenue–expense figures during the accounting period. On the other hand, if companies fail to properly match revenues and expenses, this lack of appropriate neutrality in their accounting reduces the quality of accounting earnings.

Meanwhile, the degree of revenue–expense matching is heavily influenced by the economic environment and/or by institutional changes (Wen & Shan, 2015). Recent events that have had a significant impact on China's financial market have been the global financial crisis of 2008 and the plunge in the Shanghai index in 2015. These two events increased the amount of regulation in the financial market (i.e., structural changes in the financial market) and strengthened the disclosure policy and accounting standards of companies. Therefore, these regulations are expected to have affected the matching level between revenues and expenses.

This study is differentiated from previous studies as follows. First, most of the previous studies analyzed the matching level targeting capitalist countries. However, this study targets Chinese companies of a socialist country with a strict environment for capital markets and corporate accounting practices. Second, unlike previous studies, this study empirically analyzes changes in matching levels based on macroeconomic events such as the 2008 global financial crisis and the 2015 Shanghai stock price crash.

This study analyzes time series trends in matching levels for listed Chinese companies from 2006 to 2019 based on the methodologies of Dichev and Tang (2008) and Donelson et al. (2011). In particular, the study investigates whether the 2008 global financial crisis and/or the 2015 stock price plunge affected the level of matching by Chinese companies.

The remainder of the study is organized as follows: Section 2 provides a review of economic events that affected the financial market and accounting policies in China and reviews the literature on the matching principle; Section 3 presents the research hypotheses, models and data as the empirical research design; and the last section discusses the empirical results and their implications, in particular policy implications.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1. Theoretical Background the Impact of the 2008 Global Financial Crisis on Changes in Accounting Policies in China

One aspect of the global financial crisis, the US housing credit crisis, started in August 2007. As investors sold assets in large quantities due to the plunge in the mortgage value of real estate, it caused a liquidity crisis in cash. This subprime mortgage crisis has had a serious negative impact on the global economy and has had a significant impact on accounting standards reform worldwide.

The global financial crisis had the greatest impact on the accounting policies of not only China, but also countries that did not introduce international financial reporting standards (hereinafter referred to as IFRS), related to the measurement of the fair value of assets. Because assets were evaluated based on historical cost, the current market value was not reflected in the asset price as of the reporting date (Arabi, 2019; Kyeong, Young, & Jeung, 2019; Wuh, Kim, & Hong, 2020).

Peng and Wang (2008) pointed out that fair value was the main factor that caused the subprime mortgage crisis. Large amounts of financial assets were overvalued, and information asymmetry left investors poorly aware of these risks, causing them to suffer the worst damage. He also argued that there was a flaw in the valuation method (fair value) of financial assets.

Li (2008) argued that if large Chinese financial institutions had used the fair value valuation method early, economic and market losses related to this crisis could have been significantly lower.

In October 2008, the FASB issued a revised proposal for SFAS No. 157. The main point is that fair value should be reflected in normal transactions. In other words, if data (e.g., transaction prices or market prices) can be observed in the relevant active market, but cannot be obtained, fair value can be estimated by adjusting future cash flows and the discount rate risk. This means that financial institutions can price some low-liquidity assets at a level higher than their current market value and lower their losses.

In 2009, the IASB revised the accounting treatment of market value as a valuation system for fair value in order to increase the applicability of fair value. This amendment lowered the risk associated with overvalued financial assets. As such, the financial crisis provided an opportunity to improve the fair value accounting valuation model, and the market price valuation method contributed to the correct reflection of expected investment returns.

In 2009, the Continuous Roadmap of the Chinese Corporate Accounting Standards and the International Financial Report Standards announced by the Chinese Ministry of Finance took the basic position that China's accounting rules are identical to international standards. In other words, by expressing it as 'directly adopted and used', it maintains a position identical to that of the IFRS.

In October 2012, the Ministry of Finance of China revised the accounting system for equity securities. Foreign-currency-redeemable financial instruments, introduced as a new type, meet the fixed value conditions and options assigned to redeemable rights and certain other conditions. In addition, regulations related to offsetting were revised and requirements related to fair value as it pertains to financial instruments were removed. In other words, due to the 2008 financial crisis, the essence of the revision of these fair value accounting rules is related to accounting recognition or processing rules linked to revenue.

On March 17, 2014, the Ministry of Finance of China announced the classification of financial liabilities and equity securities and related accounting rules. This amendment reflected the terms of the contract of financial instruments and clarified the concept of financial instruments and equity securities according to their economic nature, and this amendment largely classified financial instruments or components as financial assets, financial liabilities or equity securities. This amendment reflected the accompanying position of preferred stocks in China and meant that various financial instruments would emerge in the future.

2.2. The Impact of the 2015 Stock Price Crash Changes in Accounting Policies in China

The main cause of the stock price crash in 2015 was due to over-the-counter credit loan transactions causing supervisory authorities to add significant new regulations to fund management practices, whereas adjustments to accounting policies were insignificant. This has promoted a change in accounting policies, with the impact of the 2015 stock price crash on China's accounting policy having three layers:

First, after the stock price crash in 2015, the overall framework of China's accounting policy changed significantly. In other words, this entity was required to recognize current revenue and revenue arising from construction contracts on a unified basis. The accounting policy also required the replacement of the risk premium transition with the transfer of control as a basis for determining when income is identified.

Second, the incident prompted the China Securities Supervisory Commission to strengthen its oversight of the securities listed on the financial reports of companies. As the overseas stock market develops, investors can demand compensation through prosecution if false information is revealed about a company or if brokerage agencies are found to have violated laws. Additionally, illegal organizations will be severely punished by supervisory authorities. However, the Chinese stock market is still weak in terms of legal matters. If a company or institution is found to have violated the law, the majority will be subject to only some administrative disposition. All of these factors have caused the relevant supervisory authority to strictly control the governance structure and direction of the development of listed companies.

Finally, the stock price plunge provided an environment for the reliable financial reporting of accounting standards. External investors usually require listed companies to reflect their operations as truthfully as possible.

2.3. Literature Review

The match principle for revenue and expenses has been a major research topic since Paton and Littleton (1940). This principle means that revenue and associated expenses arising from various accounting transactions during the same accounting period should be recognized with appropriate matching. Consequently, accounting profit is less volatile than cash flow and can provide useful information, which can be a superior indicator for assessing an entity's operating performance (Dechow, 1994; Gibbins & Willett, 1997; Hyun & Cho, 2018; Su, 2005).

The matching principle has had a significant impact on the quality of earnings persistence. The lower this level of matching is, the lower the quality of earnings becomes. Su (2007) and Park (2017) argued that the lower the volatility of revenue is, the higher the quality of accounting information becomes and that users of information can better estimate the profitability of a company.

Dichev and Tang (2008) analyzed the time series trend of matching levels to validate the relationship between variability and the persistence of earning. The US has continued to decline in terms of appropriate matching levels over the past 40 years, claiming that the appropriateness of the matching was severely damaged particularly in the year when US stock prices plunged and the financial crisis occurred. This time series trend of matching levels is important because the matching level of revenue and expenses is systematically related to earning volatility, which is one of the important characteristics of accounting earnings stability (Dichev & Tang, 2008).

Paek (2011) and Paek (2018) analyzed the time series trends of matching levels of Korean companies, finding that matching levels fell during that period. Paek (2011) argued that the gradual decline in the degree of revenue–expense matching was due to increased losses, the amortization expenses of tangible and intangible assets, and discretionary accruals. Donelson et al. (2011) reached different conclusions from Dichev and Tang (2008). They argued that the change in the economic environment caused an increase in business operations, including sales of corporate assets and debt restructuring.

Kim (2013) analyzed the relationship between earnings management and the corresponding matching level for Korean companies, claiming that the matching levels of companies with large amounts of discretionary accrual were relatively low. Jin, Shan, and Taylor (2015) analyzed matching levels in a sample of Australian companies from 2001 to 2005, finding that matching weakened during that period. However, after Australia introduced IFRS, the matching level normalized. Kagaya (2014) also analyzed matching levels using a sample of companies from around the world, arguing that overall matching levels had declined, especially among companies in Europe.

Accounting policies for Chinese companies were reformed after the 2008 global financial crisis and the 2015 Shanghai stock price crash (He & Shan, 2016). Therefore, this study investigates how these two events affected the matching levels of Chinese companies. In particular, the study analyzes whether matching levels have improved or declined by analyzing individual costs as matched to revenues in detail, akin to Paek (2011) and Kim, Paek, and Lee (2017).

3. RESEARCH METHODOLOGIES AND DATA

3.1. Research Methodologies

The 2007–2008 global financial crisis caused investors to lose confidence in the value of mortgage-backed securities, selling their assets in large quantities at bargain prices and creating a liquidity crisis for households. The crisis had a serious negative impact on the global economy, and China's accounting standard reform led to new guidelines. The impact of this global financial crisis on accounting policies was an amendment to the requirements related to the fair value of assets, and the recognition criteria for revenues and expenses set out in each accounting standard were unified into IFRS.

The strongest driver of the 2015 stock crash in China was off-market capital allocation. This case had two main effects on accounting policy. First, the Chinese Securities Regulatory Commission strengthened the supervision of the public disclosure of financial reports by listed companies after the event of the stock crash in 2015. Second, reforms of Chinese accounting standards were strengthened, allowing the management decision-making process to include the consideration of risks in the capital market.

Dichev and Tang (2008) analyzed the appropriateness of matching, as measured in relation to current revenues and expenses, based on events such as the 1987 Black Monday stock price plunge, the 1991–1993 US financial crisis, the 1997 Asian financial crisis, and the 2001–2003 decline in stock prices. Accordingly, the present study aims to analyze trends in matching levels using 13-year samples from Chinese companies and to analyze the effects of the 2008 financial crisis and the 2015 stock price crash on matching levels. In particular, it can be assumed that there will be a change in the extent to which these matching principles are realized, as the two aforementioned events had a significant impact on China's accounting policies. Therefore, the following research hypotheses are developed.

Research hypothesis 1: The global financial crisis affected the matching level between the revenues and expenses of Chinese companies.

Research hypothesis 2: The 2015 stock price crash in China affected the matching level between the revenues and expenses of Chinese companies.

3.2. Research Model

This study utilizes the cross-sectional models introduced by Dichev and Tang (2008) and Donelson et al. (2011) to analyze trends in the matching levels of Chinese companies. REV_t is the total operating income of a company in the year t, which is the sum of its sales and non-operating revenue. EXP_t is the sum of expenses of the entity in year t, i.e., sales expenses, general administrative expenses, and non-operating expenses. EXP_{t+1} and EXP_{t-1} are subsequent and prior expenses, respectively.

REV_t denotes total revenue (i.e., the sum of revenue and non-operating revenue), and EXP is total expenses (i.e., the sum of the costs of goods sold, selling and administrative expenses, and non-operating expenses). EXP_{t+1} and EXP_{t-1} are expenses for the following and previous years, respectively.

As in Dichev and Tang (2008), the matching level is determined by the sign and size of the coefficients of current revenue and previous, current and subsequent expenses. If the coefficient is largest between current revenue and current expenses, and the coefficients for previous and subsequent expenses are relatively low, this indicates that the matching principles have been applied appropriately.

Therefore, in Equation 1, the larger the coefficient of $\alpha 2$ of the current expenses (EXP_t) for year t is, the more appropriate the matching level is. In addition, α_1 and α_3 are the coefficients of previous expenses (EXP_{t-1}) and subsequent expenses (EXP_{t+1}), respectively. If α_1 is the largest of the three expenses, α_1 represents the recognition of the current expense (acceleration recognition) in the previous year, and $\alpha 3$ represents the recognition of the current expense (delay recognition) in the following year.

$$REV_t = \alpha_0 + \alpha_1 \cdot EXP_{t-1} + \alpha_2 \cdot EXP_t + \alpha_3 \cdot EXP_{t+1} + \varepsilon_t \qquad (1)$$

Where, REV = total revenue ((sales + non-operating revenue)/total assets), and EXP = total expense ((sales - net income)/total assets).

In addition, this study establishes a model, expressed in Equation 2, to investigate the causes affecting matching levels by breaking total expenses down into the key components of the income statement, as in Donelson et al. (2011). This model analyzes which factors affect the application of matching principles by dividing total expenses into costs of goods sold, selling and general administrative expenses, non-operating expenses, and tax expenses.

$$REV_t = \alpha_0 + \alpha_1 EXP_{t-1} + (\alpha_{21} \cdot COGS_t + \alpha_{22} \cdot SGNA_t + \alpha_{23} \cdot NonOpEXP_t + \alpha_{24} \cdot TaxEXP_t)$$
$$+ \alpha_3 \cdot EXP_{t+1} + \varepsilon_t \qquad (2)$$

Where, *COGS* = costs of goods sold (= costs of goods sold/total assets); *SGNA* = selling and general administrative expenses (= selling and general administrative expenses/total assets); *NonOpEXP* = non-operating expenses (= non-operating expenses/total assets); *TaxEXP* = corporate income taxes (= corporate income taxes/total assets).

Using Equations 1 and 2, the time series trend of the expenses' coefficients is analyzed. In particular, this study divides the pooled sample into three periods based on the events of the global financial crisis and the 2015 stock price crash in China and analyzes whether there are significant differences in the average of the coefficients by period.

3.3. Sample Selection

Samples in this study are data from Chinese companies from 2006 to 2019 contained in the Osiris database. The total number of samples used for the final analysis is 23,268 firm years. Table 1 shows the distribution of samples according to global industry classification standards, showing industries at 39.11%, followed by materials at 26.53%, and information technology at 23.89%. In particular, winsorizing was done at the top and bottom 1% to remove outliers among the samples.

Table-1. Distribution of samples.

GICS code	Frequency (Observations)	Percent
Communication services	1,204	5.17
Energy	994	4.27
Financials	238	1.02
Industrials	9,100	39.11
Information technology	5,558	23.89
Materials	6,174	26.53
Total	23,268	100

4. EMPIRICAL RESULT

4.1. Descriptive Statistics and Correlation Analysis

Table 2 shows the descriptive statistics of the major variables. The average of total revenue for the year (*REV*) is 0.590, which ranges from 0 to 2.465, and the average of total expenses (*EXP*) is 0.532, which ranges from 0 to 2.484. In addition, the average of the costs of goods sold (*COGS*) for the total cost is 0.432, indicating a distribution of 0 to 2.276, which means that this *COGS* accounts for most of the total expenses. In addition, the averages of selling and general administrative expenses *(SGNA)*, non-operating expenses *(NonOpEXP)* and tax expenses (*TaxEXP*) are 0.087, 0.002, and 0.009, respectively.

Table-2. Descriptive statistics (N = 20,683).

Variables	Mean	STD	MIN	Max
REV	0.590	0.431	0	2.465
EXP	0.532	0.425	0	2.484
COGS	0.432	0.397	0	2.276
SGNA	0.087	0.071	0	0.421
NonOpEXP	0.002	0.002	0	0.014
TaxEXP	0.009	0.009	0	0.045

Note: The variables are defined as follows:
COGS = costs of goods sold (= costs of goods sold/total assets).
SGNA = selling and general administrative expenses (= selling and general administrative expenses/total assets).
NonOpEXP = non-operating expenses (= non-operating expenses/total assets).
TaxEXP = corporate income taxes (= corporate income taxes/total assets).

Table 3 shows the results of a correlation analysis of the variables used in Equations 1 and 2. With respect to total revenue (*REV*), total expense (*EXP*) shows a coefficient of 0.975 at a statistically significant level, indicating that the level of matching between revenue and expenses is high. In addition, *COGS* also shows a coefficient of 0.969 at a statistically significant level, which indicates that the level of correlation with revenue is high because the costs of goods sold account for most of the total expense.

Non-operating expense (*NonOpEXP*) also shows a significant coefficient of 0.057 at the 1% level, as does tax expense (*TaxEXP*), with a significant coefficient of 0.215 at the 1% level.

Table-3. Correlation analysis.

	REV	EXP	COGS	SGNA	NonOpEXP
EXP	0.975***	1			
COGS	0.969***	0.969***	1		
SGNA	0.337***	0.363**	0.172***	1	
NonOpEXP	0.057***	0.093***	0.061***	0.094***	1
TaxEXP	0.215***	0.137***	0.104***	0.124***	-0.014***

Notes:
1. *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively (two-tailed).
2. Refer to the note in Table 2 for the definitions of the variables.

4.2. Regression Analysis Results

Table 4 shows the results of the regression analysis for the revenue–expense responses, and Panel A shows the results of the regression analysis for the entire sample period. In the pooled sample, total expenses (EXP_t) and revenue (REV_t) show a statistically significant coefficient of 0.9835 (p < 0.001). Accordingly, the level of matching between revenue and expenses for Chinese companies is high. However, expenses for the prior year (EXP_{t-1}) show a statistically significant coefficient of -0.0142 (p < 0.001), which means that there is a negative relationship between expenses for the prior year and current revenue (*REV*).

This study divides the samples into three subsamples by period: the period before the global financial crisis (pre GFC), the period after the crisis but before the Shanghai stock crash (post GFC, pre SPC), and the period after the Shanghai stock price crash (post SPC). The coefficient signs of EXP_{t-1} and EXP_{t+1} for pre GFC and post GFC are reversed from negative (-) to positive (+) (after this crisis, EXP_{t-1} is a statistically insignificant coefficient), and EXP_t shows a significant decrease from 1.0611 (p < 0.001) to 0.9484 (p < 0.001) at the 1% level. Thus, this indicates that the level of matching between revenue and expenses of Chinese companies decreased after the global financial crisis.

In particular, since the IFRS was introduced and, subsequently, corporate tax laws were significantly revised, there is an incentive for companies to recognize expenses early or to delay them. Therefore, this result implies that the quality of accounting income may be lowered due to lower matching levels of companies. In addition, the result of the analysis of the matching level before (pre SMC) and after (post SMC) the Shanghai stock price crash in 2015, EXP_t indicates a statistically significant increase from 0.9484 (p < 0.001) to 0.9817 (p < 0.001). However, EXP_{t-1} and EXP_{t+1} are statistically insignificant, meaning that many factors, such as the disclosure system and asset valuation of accounting information through the 2015 stock price crash, have improved the matching level, in turn, meaning that the introduction of the IFRS has had a positive effect on the accounting environment of companies.

Panel B shows the analysis results after dividing it into detailed categories of total expenses that affect the matching level. In the pooled sample, non-operating expenses in all samples show statistically negative coefficients with current revenue, which, unlike operating expenses, shows the opposite relationship with regard to revenue. In addition, in all samples, tax expenses have a higher coefficient than the costs of goods sold or selling and general administrative expenses, which is more closely related than other expenses because taxable income is generated from revenue.

In the pre GFC and post GFC periods, the costs of goods sold (*COGS*) shows a statistically significant decrease

from 1.0204 (p < 0.001) to 1.0056 (p < 0.001), while selling and general administrative expenses (*SGNA*) statistically significantly increases from 0.9919 (p < 0.001) to 1.0795 (p < 0.001). This means that through the global financial crisis, *SGNA* increased the corresponding level of matching with revenue as opposed to *COGS*. In contrast, *COGS* increased to 1.0134 (p < 0.001), which is statistically significant, but decreased to 0.9693 (p < 0.001), which is statistically significant during the 2015 Shanghai stock price crash. This indicates that *COGS* contributed significantly to the level of matching with revenue after the stock price crash.

Table-4. Results of the analysis of the matching between revenue and expenses.

Panel A. Matching between revenue and expenses by period.

Variable	Pooled sample 2006–2019		Pre GFC 2006–2008		Post GFC, Pre SPC 2010–2014		Post SPC 2016–2019	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.0709***	57.38	0.0954***	25.54	0.0671***	43.17	0.0559***	23.00
Exp_{t-1}	–0.0142***	–5.10	–0.0601***	–2.43	0.0017	0.39	–0.0024	–0.33
Exp_t	0.9835***	244.67	1.0611***	74.49	0.9484***	164.30	0.9817***	107.83
Exp_{t+1}	0.0097***	2.81	–0.0466***	–3.76	0.0365***	7.83	0.0009	0.13
F-stat.	99999.00***		16517.23***		67956.04***		22214.39***	
Adj. R²	0.9496		0.99518		0.9608		0.9525	

Panel B. Matching between revenue and expenses by detailed expenses.

Variable	Pooled sample 2006–2019		Pre GFC 2006–2008		Post GFC, Pre SPC 2010–2014		Post SPC 2016–2019	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.0270***	31.35	0.0351***	19.73	0.0182***	13.17	0.0272***	16.11
COGS	1.0091***	89.16	1.0204***	39.19	1.0056***	61.46	1.0134***	45.45
SGNA	1.0158***	18.84	0.9919***	61.72	1.0795***	14.09	0.9693***	82.25
NonOpEXP	–3.4799***	–13.45	–4.6337***	–7.37	–3.0519***	–7.61	–3.2620***	–7.10
TaxEXP	4.7131***	95.73	4.1111***	40.47	5.0293***	68.10	4.5984***	41.41
F-stat.	99999***		51909.62***		99999***		57627.06***	
Adj. R²	0.9787		0.9808		0.9805		0.9788	

Notes:
1. *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively (two-tailed).
2. Pre GFC and post GFC are samples before and after the global financial crisis, respectively, and pre SPC and post SPC likewise are samples before and after the Shanghai stock price crash in 2015. The definitions of the variables are given in the note in Table 2.

Table 5 shows the degree of change in the matching levels before and after the global financial crisis and the Shanghai stock price crash. In Panel A, which shows the change before and after GFC, EXP_{t-1} and EXP_{t+1} increase significantly by 0.0766 (p < 0.05) and 0.0831 (p < 0.05) at the 5% level, respectively, whereas EXP_t increases significantly by 0.1127 (p < 0.001) at the 1% level. This indicates that the level of matching among Chinese companies has weakened since the global financial crisis. On the other hand, in Panel B, which shows the change in the matching level before and after the Shanghai stock price crash in 2015, there is a statistically insignificant change, but as the coefficients of EXP_{t-1} and EXP_{t+1} are decreased, EXP_t shows an increase after 2015. The result demonstrates that the effectiveness of the disclosure system is positive.

In particular, in Panel C, which shows the change in the matching level before the global financial crisis and after the Shanghai stock price crash, EXP_{t-1}, EXP_t, and EXP_{t+1} are all statistically significant, but only EXP_t is observed to be negative. This means that although there have been changes in accounting standards in China due to events in the global financial and capital markets, the overall matching level is now lower.

Table-5. Difference analysis of the effects of the global financial crisis and Shanghai stock price crash.

Panel A. Changes in matching levels before and after the global financial crisis.

	EXP_{t-1}	EXP_t	EXP_{t+1}
(A) Pre GFC (2006–2008)	–0.0601	1.0611	–0.0466
(B) Post GFC (2009–2015)	0.0165	0.9484	0.0365
Difference (= B-A)	0.0766	–0.1127	0.0831
Chi-Square (χ^2)	5.95**	10.27***	4.76**

Panel B. Changes in matching levels before and after the Shanghai stock price crash.

	EXP_{t-1}	EXP_t	EXP_{t+1}
(A) Pre SPC (2009–2015)	0.0165	0.9484	0.0365
(B) Post SPC (2016–2019)	–0.0023	0.9817	0.0009
Difference	–0.0188	0.0333	–0.0356
Chi-Square (χ^2)	0.51	0.02	1.45

Panel C. Changes in matching levels before the global financial crisis and after the Shanghai stock price crash.

	EXP_{t-1}	EXP_t	EXP_{t+1}
(A) Pre GFC (2006–2008)	–0.0601	1.0611	–0.0466
(B) Post SPC (2016–2019)	–0.0023	0.9817	0.0009
Difference	0.0578	–0.0794	0.0475
Chi-Square (χ^2)	4.85**	6.51***	2.75*

Notes:
1. *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively (two-tailed).
2. Pre GFC and post GFC are samples before and after the global financial crisis, respectively, and pre SPC and post SPC are samples before and after the Shanghai stock price crash in 2015. The definitions of the variables are given in the note in Table 2.

Table 6 shows the result after disaggregating the total cost for the current period and analyzing the matching level by component. In Panel A, *SGNA* and *TaxEXP* are increased by 0.0876 ($p < 0.1$) and 0.9182 ($p < 0.001$), respectively, both at a statistically significant level, but *COGS* is decreased by 0.0148 ($p < 0.001$) at a statistically significant level. This indicates that the matching level of the costs of goods sold has decreased since the global financial crisis. However, in Panel B, both *SGNA* and *TaxEXP* are decreased, and *COGS* is increased statistically significantly by 0.0079 ($p > 0.05$), indicating that the matching level of the costs of goods sold improved after the Shanghai stock price collapse.

Table-6. Relationship between revenue and disaggregated expenses.

Panel A. Changes in the matching level of disaggregated expenses before and after the global financial crisis

	EXP_{t-1}	EXP_t	EXP_{t+1}
(A) Pre GFC (2006–2008)	–0.0601	1.0611	–0.0466
(B) Post GFC (2009–2015)	0.0165	0.9484	0.0365
Difference (= B-A)	0.0766	–0.1127	0.0831
Chi-Square (χ^2)	5.95**	10.27***	4.76**

Panel B. Changes in the matching level of disaggregated expenses before and after the Shanghai stock price crash

	EXP_{t-1}	EXP_t	EXP_{t+1}
(A) Pre SPC (2009–2015)	–0.0601	1.0611	–0.0466
(B) Post SPC (2016–2019)	0.0165	0.9484	0.0365
Difference	0.0766	–0.1127	0.0831
χ^2	5.95**	10.27***	4.76**

Notes:
1. *, **, and *** indicate significance at 10%, 5% and 1% levels, respectively (two-tailed).
2. Pre GFC and post GFC are samples before and after the global financial crisis, respectively, and pre SPC and post SPC are samples before and after the Shanghai stock price crash in 2015. The definitions of the variables are given in the note in Table 2.

4.3. Additional Tests

Figure 1 shows the results of the analysis of the change in the matching level due to the 2008 financial crisis and the 2015 Shanghai stock market crash. The adjusted r-squared representing the overall model explanatory power exceeds 95%, which is similar to the findings of Dichev and Tang (2008) and Donelson et al. (2011), but the

coefficients of current revenue and expenses, which indicate the matching level, show fluctuations by year. In other words, after the global financial crisis of 2009/2010, these values decreased to 0.970 and 0.901, respectively, and in 2014 and 2015, just before the Shanghai stock price crash in 2015, there was a sharp decline. This shows that there was a change in the matching levels of Chinese companies triggered by these two incidents.

In particular, the matching level has improved to some extent as accounting standards and disclosure regulations were revised after these two incidents.
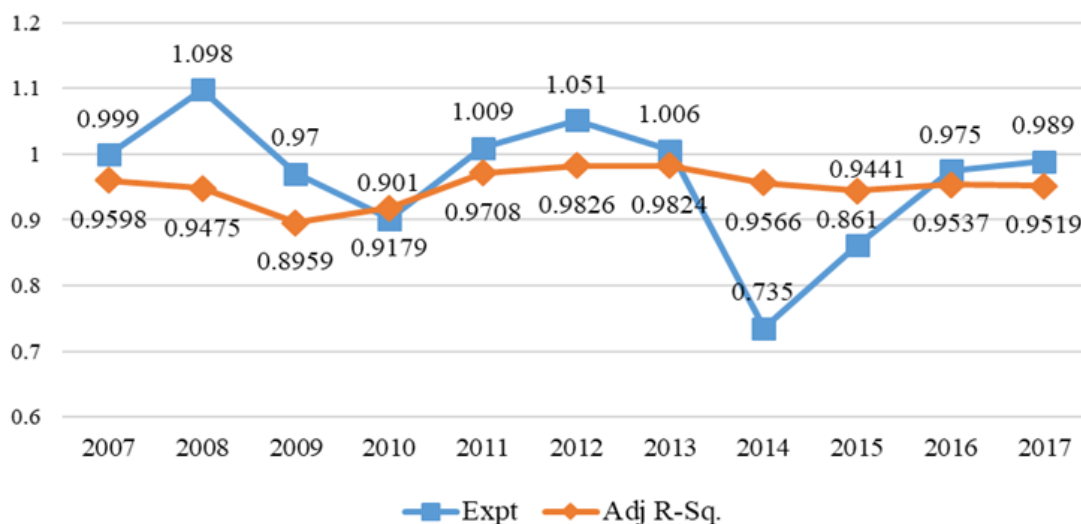
Figure 1. Analysis results of changes in the yearly matching levels.

5. CONCLUSIONS

The aim of this study is to analyze how the economic events (e.g., the global financial crisis and the 2015 Shanghai stock price crash) affected matching between revenue and expenses in China.

The financial and accounting policy authorities of China introduced IFRS, changed the method of valuation of assets, and revised the corporate disclosure system in response to these economic events. Therefore, this study hypothesized that such institutional changes have had a significant effect on the matching levels of companies. The analysis results are as follows.

First, after the global financial crisis, the level of matching between the revenue and expenses of Chinese companies declined. This occurred not only due to the accounting environment but was also an effect of the lowering of tax rates upon the enactment of the New Enterprise Income Tax Act affecting the management of the financial reporting income of companies. This phenomenon can be confirmed by the fact that between 2011 and 2013 the matching level of companies recovered to the previous year's level. Second, after the Shanghai stock price crash of 2015, this matching level improved as regulations on various capital markets and public disclosure systems of companies were revised. This stock price crash showed the lowest matching level in 2014, just before the plunge, but there is evidence that it recovered to the previous year's level immediately afterwards. Third, the level of matching among Chinese companies has fluctuated since 2007 due to these two economic events, but with a gradual improvement afterward as the Chinese accounting authorities introduced IFRS and effectively designed a new disclosure system for capital markets. The result of this study is an analysis of the matching levels of Chinese companies, focusing on the global financial crisis and the Shanghai stock price crash. The results here provide policy implications for authorities responsible for capital markets and accounting standards.

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