Economic Analysis and Policy 70 (2021) 123–147

Contents lists available at ScienceDirect

Economic Analysis and Policy

journal homepage: www.elsevier.com/locate/eap

Analyses of topical policy issues

Monetary policy tightening, accounting information comparability, and underinvestment: Evidence from China ☆

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ARTICLE INFO

Article history:
Received 25 September 2020
Received in revised form 4 February 2021
Accepted 5 February 2021
Available online 12 February 2021

JEL classification:
G14
G32
M41

Keywords:
Accounting information comparability
Investment efficiency
Monetary policy

ABSTRACT

Based on a macro and micro cross view, we empirically test the interactions among monetary policy, accounting information comparability, and investment efficiency with a sample of A-share listed firms in China from 2005 to 2019. We find that tightening monetary policy will aggravate underinvestment behavior, such as inefficient investment, while improvement in accounting information comparability can effectively mitigate the negative impact of tightening monetary policy on underinvestment, so as to improve firm investment efficiency. Further study shows that, in a period of monetary policy tightening, firms with high agency costs and high financing constraints can significantly reduce underinvestment by improving the comparability of accounting information, thus improving the investment efficiency of firms. After distinguishing the type of firm ownership (state-owned enterprises vs. private enterprises), we find that firms can reduce the effect of insufficient investment during a period of monetary tightening by improving the comparability of accounting information, which is more significant in the sample of private enterprises (PEs).

1. Introduction

Using a series of strict assumptions, such as complete information, no transaction cost, and zero-risk debt financing, some scholars have confirmed that a company's internal financing and external financing are equivalent, the choice of financing mode does not affect the company's investment behavior, and purely technical factors – such as future profitability and the capital cost of an investment project – are the only influencing factors that determine the value of a company and can maximize its value when it reaches an optimal investment level. However, this series of assumptions is

☆ We thank Associate Professor Fang Wang at the Zhongnan University of Economics and Law for valuable comments at the 2017 Academic Seminar of the Professional Committee on Basic Accounting Theory of the Chinese Accounting held by University of Jinan on May 21st, 2017. We thank Dr. Han Sun at the Nanjing University of Finance and Economics for helpful comments and suggestions at the 2018 International Academic Conference of Accounting and Finance in the Emerging Markets held by Nanjing University of Finance & Economics on October 13–14, 2018. We also thank Dr. Mohsin Ali at Taylor's University for constructive comments at the 14th Bulletin of Monetary Economics and Banking (BMEB) International Call for Papers & Webinar Sessions on August 27, 2020. Zhonghai Yang is grateful for financial support from Major Program of National Fund of Philosophy and Social Science of China (Grant No. 15BGL068) and Fundamental Research Funds for the Central Universities of China (Grant No. 3072019CFJ905). Wenhao Tan thanks the National Natural Science Foundation of China (Grant No. 71802105) and Humanities and Social Science Fund of Ministry of Education of the People's Republic of China (Grant No. 18YJC630159) for its support.

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https://doi.org/10.1016/j.eap.2021.02.005
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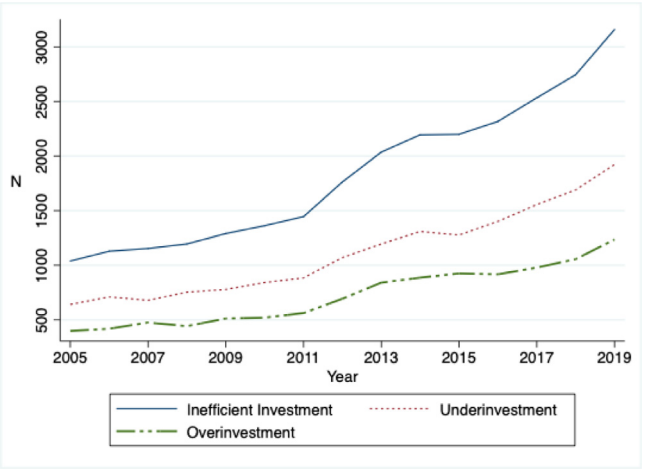

Fig. 1. The pattern of inefficient investment in China. *Note*: *N* is the sample number of nonfinancial listed firms in China from 2005 to 2019. *Source:* Wind database.

difficult to achieve perfectly in reality. Trade friction caused by information asymmetry tends to cause a company's actual value to deviate from the theoretical value in varying degrees in the capital market, which leads to inefficient investment. The inefficient investment includes underinvestment (projects with a positive net present value [NPV] are rejected) and overinvestment (projects with a negative NPV are carried out). This inefficient investment not only reduces the value of a firm at the micro level and hinders the development of the firm but also affects the efficiency of resource allocation in the entire economy at the macro level (Bian and Li, 2009), thus curbing sustainable and healthy development of the macro economy. Fig. 1 illustrates changes in the pattern of inefficient investment in China, in which the sample of listed firms with inefficient investment increased from 1,038 in 2005 to 3,159 in 2019, a rate of 204.335%, and the sample of listed firms with underinvestment was larger than that with overinvestment during the sample period, which indicates that underinvestment is more common than overinvestment. Therefore, it is of great theoretical research value to explore the reasons for low investment efficiency at firms and to reveal which factors can reverse underinvestment by firms and raise investment efficiency at listed firms.

From the macro perspective, monetary policy has a significant impact on the investment behavior of firms (He et al., 2019; Lyandres, 2007; Tan and Ma, 2016). As part of its supply-side reforms, the Chinese government continues to improve the implementation of monetary policy, which is an important means of macro-control over economic operations. On the one hand, monetary policy mainly affects the development of the macro economy and micro firms through the balance-sheet channel and credit channels, and the effect of their influence depends on the transmission mechanism of the policy (Choi and Kim, 2001).[1] On the other hand, the response to monetary policy and behavioral choices of firms, the main locus of economic activities, also affect the effect of the monetary transmission mechanism (Ashcraft and Campello, 2007). As investment activities are the basis for driving the development of the real economy and the creation of firm value, the transmission effect of monetary policy is reflected to a great extent through the behavior and efficiency of investment.

As the largest emerging market in the world and a developing country undergoing great economic transformation, China has some particularities in its investment efficiency and monetary policy. On the one hand, China is in transition from a planned to a market economy, its government still exerts tight control over valuable resources, such as land, energy, and lendable funds. However, some scholars argue that because the government imposed various political, economic, and social goals on Chinese firms, the resource utilization efficiency of firms has been weakened. On the other hand, in the past 10-plus years, the Chinese government has frequently adjusted monetary policy to cope with macroeconomic challenges such as economic decline, real estate bubbles, and high inflation. In addition, as the bond market in China is underdeveloped, most companies rely on bank loans to finance their projects and thus are more susceptible to changes in the money supply. So, we focus on China to study the relationship between monetary policy and investment efficiency.

Since 2006, China's central bank has frequently adjusted monetary policy to motivate change in economic behavior (Xiong, 2012). However, the country's monetary policy is still changing to take a completely market-oriented role, and

[1] The balance-sheet channel was proposed by Bernanke and Gertler (1989). They believe that the monetary tightening policy, which causes the interest rate to rise and the real economy to decline due to the incompleteness of the market and information asymmetry, will lead to deterioration in the balance sheet of the firm, cause an increase in the financing cost including the agency cost, and reduce firm investment. Bernanke and Blinder (1988) first proposed the credit channel of monetary transmission. The bank credit channel model that they proposed is an extension of the traditional IS-LM (Investment–Saving and Liquidity preference-Money Supply) model. The credit transmission channel of monetary policy means that the increase and decrease in the money supply affects asset changes at banks, which increase or decrease the loan supply of banks, thus affecting the actual economic level.

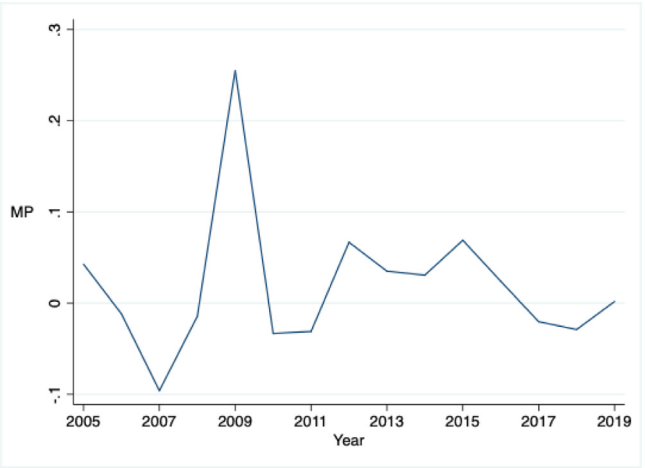

Fig. 2. The pattern in monetary policy in China.
Source: Wind database.

its effectiveness has been the focus of academic discussion. Some studies show that there is delay in the transmission process of monetary policy, which reduces its effectiveness (Fu and Liu, 2015). When the central bank loosens or tightens monetary policy, funds do not always flow into or out of industries or firms that the central bank intends to control. Because local governments focus on promoting economic growth, thereby optimizing local and regional development and investment, the monetary policy of the central bank may encounter local failures in its transmission mechanism (Song and Zhong, 2006). In particular when monetary policy changes from loose to tight, the supply of bank credit decreases, and the external financing environment faced by firms is more severe. It is easy to make the actual investment of the company deviate from its optimal investment level (Cheng et al., 2012), resulting in low investment efficiency.

Fig. 2 shows the changes in the pattern of monetary policy.[2] The growth rate of the money supply from 2007 to 2009 showed an upward trend and reached a maximum in 2009, largely due to China's increased money supply in response to the global financial crisis. Because of excessively rapid growth rate of the money supply in 2009, China began to reduce its money supply in 2010. The growth rate of the money supply in 2010 and 2011 was less than 0, evidence of monetary policy tightening. In 2012, the money supply began to increase again. In 2013 and 2014, the growth rate of the money supply showed a downward trend, but it was still greater than 0, demonstrating a loose monetary policy. There was a short rise in 2015 before it began to decline. In 2017 and 2018, the growth rate of the money supply was less than 0, showing another period of monetary tightening. In 2019, the growth rate of the money supply was greater than 0, indicating loosening in China's monetary policy. Overall, the growth rate of the money supply is significantly less than 0 in 2006, 2007, 2008, 2010, 2011, 2017 and 2018—all periods of monetary tightening. So, does monetary tightening aggravate overinvestment or underinvestment and then affect the investment efficiency of firms?

From the micro perspective, the quality of accounting information has an impact on investment efficiency at the firm level. According to agency theory (Gomariz et al., 2014; Martinez et al., 2015), there are various control mechanisms to attenuate information asymmetry and information risk and to enable better supervision of managerial activity to mitigate opportunistic behavior by managers, such as accounting information quality. A great proportion of the relevant literature associates accounting information quality with investment efficiency. Because higher-quality accounting information makes managers more accountable by allowing better monitoring, and it may reduce adverse selection and moral hazard and thereafter decreases information asymmetry, it could thereby greatly reduce overinvestment and underinvestment problems (Chen et al., 2011).[3] In addition, accounting information quality could improve investment efficiency by enabling managers to make better investment decisions through a better identification of projects and more truthful accounting numbers for internal decision makers (McNichols and Stubben, 2008; Gomariz et al., 2014).

In sum, inefficient investment by Chinese listed firms is widespread. Both macroeconomic policy and high-quality accounting information can affect investment efficiency. Therefore, our motivation is to study the impact of accounting information comparability (one of the characteristics of accounting information quality) on inefficient investment,

[2] We use the MP index proposed by Lu and Yang (2011) to measure monetary policy (MP = M2 growth rate − growth rate in the gross domestic product [GDP] − growth rate in the consumer price index [CPI]).

[3] Wimmer and Chezum (2006) characterize adverse selection as a sample selection problem in a setting in which sellers possess an informational advantage over buyers and characteristics correlated with seller adverse incentives in selecting goods and the quality of goods produced. With regard to moral hazard, a discrepancy in interests between shareholders and a lack of monitoring of managers can lead management to try to maximize its personal interests by making investment that may not be suitable for shareholders, which result in managerial empire building and overinvestment (Hope and Thomas, 2008).

especially whether comparability plays a role in whether tightening monetary policy can affect inefficient investment, which is of great significance for comparability and the factors that improve investment efficiency.

The research problems examined in this paper are as follows. First, we explore whether accounting information comparability, as one of the characteristics of accounting information that enhance quality, plays a role in the transmission from macromonetary policy to microeconomic behavior.[4] In particular, we study whether improving the comparability of accounting information can mitigate inefficient investment caused by monetary tightening. Second, we study whether accounting information comparability can improve investment efficiency in a period of monetary tightening by restraining overinvestment or mitigating underinvestment.

Based on a sample of A-share listed companies in China from 2005 to 2019, this paper tests whether accounting information comparability can play a role in the impact of monetary policy on investment efficiency using the ordinary least squares (OLS) method[5]. We found that a tight monetary policy significantly aggravates underinvestment by firms, and comparable accounting information can effectively alleviate underinvestment caused by a tight monetary policy, thus affecting the investment efficiency of firms. Further research shows that in a period with monetary policy tightening, firms with high agency costs and high financing constraints have a more significant negative impact on underinvestment by improving accounting information comparability. At private enterprises, improving the comparability of accounting information also helps to alleviate underinvestment caused by monetary policy tightening. In a robustness test, we first replace the measurement of inefficient investment with dummy variables. Second, we change the model and use the Vogt model (1994) to measure underinvestment. Then, we replace accounting information comparability with Compmed and Compa.[6] Finally, we use the three-stage least squares (3SLS) method to control for endogeneity problems between investment efficiency and accounting information comparability.[7] The results of the robustness test prove the robustness of our results.

The main contributions of this paper are as follows. First, to obtain a comprehensive macro and micro perspective, we include monetary policy, accounting information comparability, and investment efficiency in our research framework and investigate the role of accounting information quality in macroeconomic policies that affect micro-firm behavior. Many empirical papers explore the relationship between monetary policy and the investment level, investment opportunity, investment cost, and investment cash-flow sensitivity (Duchin et al., 2010; Kim and Kung, 2017; Moyen and Platikanov, 2013), but relatively few of the studies are on monetary policy and investment efficiency. Some of the empirical literature concerns the relationship between accounting information quality and investment efficiency, mainly the influence of accounting information transparency (Bhattacharya et al., 2003) and accounting conservatism (Easley and O'Hara, 2004; García Lara et al., 2016) on underinvestment and overinvestment, but the results are not consistent.[8] At present, the empirical literature on the transmission mechanism from monetary policy to investment behavior is mainly from the perspective of financing constraints (Han and Zhang, 2016), bank loans (Huang and Zeng, 2016), trade credit (Huang et al., 2016), financial flexibility (Yuan and Huang, 2016), and government control (Zhao et al., 2018). To date, no research has determined whether accounting information comparability plays a role in the transmission of monetary policy to investment efficiency. Therefore, we examine the effect of accounting information comparability on investment efficiency under the macroenvironment of monetary tightening.

Second, taking a cross view of macro and micro, we explore whether agency costs and financing constraints play a moderating role in accounting information comparability that affects underinvestment in a period with monetary policy tightening, which improves the transmission mechanism of accounting information comparability in the impact of monetary tightening on underinvestment. Tight monetary policy aggravates underinvestment. Companies with a high agency cost, high financing costs, and private enterprises can improve their situation by enhancing accounting information comparability and then improve their investment efficiency. The insights offered by this study present lessons for different listed companies. This study not only helps to deepen understanding of the transmission chain between government behavior and micro firm decision making, but, at the same time, it also helps to develop understanding on firm investment and financing, which has important theoretical and practical significance.

Third, this paper supplements the existing literature. It enriches the empirical literature not only on monetary policy and investment efficiency, especially monetary policy tightening and underinvestment, but also on the economic consequences of accounting information comparability. Our research highlights the importance of studying accounting information comparability. It is of great practical significance to improve internal and external firm governance, optimize the allocation of resources, improve the effect of macroeconomic policies, and ensure healthy economic development. In addition, the impact of fiscal policy on investment efficiency may differ in an emerging market economic system from

4 FASB, Concepts Statements No. 8, 2010; IASB, Conceptual Framework, 2010.

5 Ordinary least squares (OLS) is a mathematical optimization method. Using the OLS method, unknown data can be easily obtained, and the square of the sum of the errors between the obtained data and the actual data is minimized. OLS includes simple linear regression, polynomial regression, and multiple linear regression.

6 Compmed is the median of accounting information comparability, which is equal to the median of accounting information comparability between firm i and all other firms in the industry; Compa is the mean of accounting information comparability, which is equal to the mean of accounting information comparability between firm i and all other firms in the industry.

7 The three-stage least squares method is a complete information method proposed by Theil and Zellner in 1962. It is a logical extension of the 2SLS method. Under certain conditions, this method has higher asymptotic efficiency than the 2SLS estimation.

8 Accounting conservatism is one of the most important properties of financial reporting. Similar references are made in Ball et al. (2000).

the United States and other developed countries. And the role of accounting information comparability in its transmission may be different. It also provides reference for other developing countries.

The remainder of this paper is structured as follows. Section 2 conducts our theoretical analysis and outlines our hypotheses. Section 3 describes our research design. Section 4 presents our empirical results and analysis. Section 5 conducts further analysis, and Section 6 presents our conclusions.

2. Theoretical analysis and hypotheses

2.1. Monetary policy tightening and underinvestment

Monetary policy is very important for promoting stable economic development, and different monetary policies have different effects on the investment efficiency of firms. Many studies have been conducted on monetary policy and the investment level, investment opportunity, investment cost, and investment cash-flow sensitivity (Duchin et al., 2010; Kim and Kung, 2017; Moyen and Platikanov, 2013) but relatively few studies on monetary policy and investment efficiency. Loose monetary policy tends to raise the economic expectation of firms, increase investment opportunities, and enhance investment motivations, which can distort the investment behavior of firms (Chen et al., 2011), and thus affect the investment efficiency of firms (Jin et al., 2012; Tan et al., 2018). When a monetary policy changes from loose to tight, bank liquidity becomes tighter, the supply of bank credit drops, the financial and operating environment deteriorates, firms face greater uncertainty in the operating environment and greater financing constraints, and operating risk and financing cost increase. Company decision makers are more pessimistic in their expectation of the future market, and firm finances are more likely to fall into crisis (De Graeve et al., 2008). Some firms reduce their investment scale because they lack funds, limiting their expenditures, which results in greater underinvestment and inefficient investment. In addition, the debt overhang caused by overfinancing in periods with a loose monetary policy will also restrict a firm's financing ability in a tight environment and affect the firm's investment level.[9] Riccetti et al. (2013) find that overfinancing increases the potential for overinvestment when the monetary environment is looser. When macroeconomic policy becomes tighter, a negative feedback mechanism in which "net value declines–financing ability decreases–cash-flow tension grows–net value further declines" is created between firms and affiliated firms, which magnifies the impact of a tightening policy, and leads to a sharp decline in business performance, internal cash-flow tension, and external financing difficulties. In the end, it leads firms to defer or abandon investment projects with a positive NPV, which aggravates underinvestment and reduces the investment efficiency of firms. Based on this analysis, we propose our first research hypothesis:

H1: *Holding other conditions constant, underinvestment behavior is more likely to occur at the firm level during a period of tightening in monetary policy.*

2.2. Monetary policy, accounting information comparability, and underinvestment

The existing literature on the impact of accounting information quality on investment efficiency mainly focuses on the impact of the characteristics of accounting information quality, such as accounting information transparency and the impact of accounting information conservatism on investment efficiency. Biddle et al. (2009) find that accounting information with high transparency can mitigate the accounting information asymmetry of firms, which helps firm owners to supervise managers, reduce underinvestment and overinvestment behavior, and improve the investment efficiency of listed firms. But Bhattacharya et al. (2003) reach the opposite conclusion—that is, financial informational transparency is negatively related to investment efficiency. Easley and O'Hara, 2004 study the relationship between accounting conservatism and investment efficiency. They find that accounting conservatism not only reduces external financing costs, effectively alleviating financing constraints, but also reduces the degree of information asymmetry, which is conducive to solving the principal–agent problem, so as to inhibit inefficient investment in a more timely way (Pinnuck and Lillis, 2007).[10] García Lara et al. (2016) find that accounting conservatism not only effectively restrains underinvestment but also reduces overinvestment. However, some empirical studies have found that accounting conservatism has different effects on underinvestment and overinvestment. Wang (2015) finds that, on the one hand, accounting conservatism inhibits overinvestment and improves investment efficiency, but, on the other hand, it exacerbates underinvestment and lowers investment efficiency. Researchers have reached different conclusions about the impact of the same characteristics of accounting information quality on investment efficiency.

Compared to measures of accounting information quality characteristics, such as accounting information transparency and accounting conservatism, using only a company's own information, accounting information comparability measures the quality of accounting information based on information across companies in the industry. Through horizontal comparability among companies and vertical comparability across different periods within a company, this method is more beneficial for revealing similarities and differences among firms.[11] Therefore, it can provide external information

9 Debt overhang theory was first introduced by Myers (1977).

10 Stiglitz (1987) pointed out that the principal–agent problem arises from the imperfect ability of the principal to supervise the agent's behavior.

11 The comparability of accounting indicators at different firms is horizontal comparability; the comparability of accounting indicators at the same firm in different periods is vertical comparability.

users with higher-quality accounting information, improve the accuracy of their profit forecast, improve the information environment of the company, and alleviate uncertainty in managers' perception of market conditions, which is helpful for distinguishing good investment projects from poor ones and raising efficiency in decision making, investment, and resource allocation (De Franco et al., 2011; Chen et al., 2013).

In general, accounting information comparability can provide more useful information for decision making than accounting information quality characteristics, such as transparency and conservatism, and can help firms make accurate investment decisions, so as to raise the investment efficiency. Therefore, in a period of monetary policy tightening, improvement in accounting information comparability can increase the information content and reference value for information users, help to reduce information asymmetry between external investors and firms, improve equity financing and debt financing of firms, alleviate underinvestment caused by financing constraints, and enhance the usefulness of decision making. In addition, accounting information with high comparability can increase the sensitivity of firms to investment opportunities (Yuan and Rao, 2018), help investors and other stakeholders to identify and seize good investment opportunities, reduce potential investment uncertainty faced by managers (Gao and Sidhu, 2018), and reduce the level of underinvestment. In addition, comparable accounting information uses the financial information of peer firms as a benchmark for effectively monitoring managers and mitigating the agency problem between investors and managers (Gao and Sidhu, 2018), reducing behavior by managers that is harmful to the growth of firm value for personal interests, increasing internal investment such as purchasing and constructing fixed assets and research and development for new products, and mitigating underinvestment. Based on this analysis, we propose our second research hypothesis:

H2*: Holding other conditions constant, improving the comparability of accounting information can mitigate underinvestment during a period of monetary policy tightening.*

3. Data and model

3.1. Data

This paper uses a sample consisting of annual data on A-share listed firms in Shanghai and Shenzhen in China from 2005 to 2019.[12] To ensure the validity of the research data, the samples are filtered as follows: we exclude ST and *ST firms, listed financial firms, samples with net assets of less than 0, and samples with missing data.[13] Thus, we obtain a final sample of 14,666 firm-year observations.

Table 1 reports the industry distribution of the sample. The industrial distribution of the sample shows that manufacturing comprises the largest share, 58.141%, and real estate and wholesale and retail account for 7.132% and 7.425%, respectively. See Table 1.

The main financial data come from the China Stock Market and Accounting Research (CSMAR) database, and data on monetary policy, investment efficiency, the type of ownership, other receivables, and the management expense rate are from the Wind database. To eliminate the influence of extreme values on the regression results, we winsorize all the continuous variables at 1% and 99%.

3.2. Definition of variables

3.2.1. Monetary policy

Monetary policy has various proxy variables, mainly including the broad money supply (M2), the narrow money supply (M1), base money (M0), and the market interest rate (R). In China, the central bank (the People's Bank of China) mainly implements relevant monetary policies by controlling the issuance of currency, controlling the deposit reserve ratio, and adjusting the benchmark interest rate and the rediscount rate. In fact, it is difficult to judge whether monetary policy is tight or loose by looking at only one indicator. Lu and Yang (2011) proposed using MP (MP = M2 growth rate − growth rate of the gross domestic product [GDP] − growth rate in the consumer price index [CPI]) to measure monetary policy. If the MP is low, it means that monetary policy tends to tighten; otherwise, it means that monetary policy tends to loosen. So, we use the MP index proposed by Lu and Yang (2011) to measure monetary policy and obtain the calculation results of MP from 2005 to 2019.[14] The MP values for these 15 years are 0.043, −0.012, −0.096, −0.015, 0.255, −0.033,

[12] Based on the different listing places and investors, the stocks of Chinese listed companies are divided into A-shares, B-shares, and H-shares. The official name of A-share is common stock in RMB, which is issued by a company registered in China, listed in China, and marked with the par value in RMB, which is used by individuals and institutions in China (excluding Hong Kong, Macao, and Taiwan) to trade and subscribe in RMB. In addition, B and H shares follow the accounting standards that may be different from A-shares, whose accounting standards are entirely those of mainland China, and the sample size is relatively large. Therefore, the selection of A-shares better reflects China's institutional background and relevant conditions. For each firm-year, we need to use the 16 previous quarters of data to calculate accounting information comparability, and China has published this information quarterly since 2002, so we use data beginning in 2005.

[13] The China Securities Regulatory Commission defines ST and *ST as follows: ST refers to other special treatment, and *ST is a warning of delisting risk. Seven cases are marked as ST and *ST, respectively, by the exchange. For details, see http://www.csrc.gov.cn/pub/shanxi/xxfw/tzzsyd/jczs/200706/t20070608_69261.htm.

[14] The MP values calculated by Lu and Yang (2011) from 1997 to 2008 were 5.7, 8.3, 9, 5.6, 6.4, 9.6, 8.4, 0.9, 4.1, 3.0, −1.1, and 2.9. The monetary policy data in this paper come from the Wind database. Although the results are inconsistent with those of Lu and Yang (2011), the final results are consistent with them—that is, 2006, 2007, and 2008 are periods of monetary policy tightening and have no impact.

Table 1
Industry distribution of the sample.

Industry	N	Percent (%)
Agriculture, forestry, animal husbandry, and fishery	215	1.466
Mining	468	3.191
Manufacturing	8527	58.141
Electricity, thermal, gas, and aquatic and supply industries	817	5.571
Construction	400	2.727
Wholesale and retail trade	1089	7.425
Transport, warehousing, and postal services	613	4.180
Accommodations and catering	78	0.532
Communications, software, and information technology services	551	3.757
Real estate	1046	7.132
Leasing and business services	195	1.330
Scientific research and technical services	74	0.505
Water conservation, environment, and public facilities management	194	1.323
Education	14	0.095
Health and social work	45	0.307
Culture, sports, and entertainment	141	0.961
Other	199	1.357
Total	14666	100

Note: This table is based on the industry classification standard of the China Securities Regulatory Commission (CSRC) in 2012.

−0.031, 0.067, 0.035, 0.031, 0.069, 0.024, −0.020, −0.029, and 0.002, respectively; in 2006, 2007, 2008, 2010, 2011, 2017, and 2018, MP is less than 0, showing a period of monetary policy tightening; in the other six years, MP is more than 0, showing a period of monetary policy loosening. We set monetary policy as a dummy variable for MC. When MP is less than 0, it takes a value of 1, which means monetary policy is tight; otherwise, it takes a value of 0, which means monetary policy is loose.

3.2.2. Accounting information comparability

Since De Franco et al. (2011) creatively constructed the comparability index of accounting information at the firm level, a series of studies on accounting information comparability at the firm level have emerged. So, we mainly use the firm-level comparability measurement model constructed by De Franco et al. (2011). The revised models are, respectively, models (1) and (2):

$$\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{iit}}\right) = \hat{\alpha}_{\mathrm{i}} + \hat{\beta}_{1\mathrm{i}} * \mathrm{DR}_{\mathrm{it}} + \hat{\beta}_{2\mathrm{i}} * \mathrm{Return}_{\mathrm{it}} + \hat{\beta}_{3\mathrm{i}} * \mathrm{DR}_{\mathrm{it}} * \mathrm{Return}_{\mathrm{it}} \tag{1}$$

$$\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{ijt}}\right) = \widehat{\alpha_{\mathrm{j}}} + \hat{\beta}_{1\mathrm{j}} * \mathrm{DR}_{\mathrm{it}} + \hat{\beta}_{2\mathrm{j}} * \mathrm{Return}_{\mathrm{it}} + \hat{\beta}_{3\mathrm{j}} * \mathrm{DR}_{\mathrm{it}} * \mathrm{Return}_{\mathrm{it}} \tag{2}$$

in which $\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{iit}}\right)$ is the expected operating profit of company *i*; $\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{iit}}\right)$ is the expected operating profit of company *j*; $\mathrm{DR}_{\mathrm{it}}$ is the dummy variable, in which when the quarterly return is less than 0, the value is 1, and otherwise it is 0; $\mathrm{Return}_{\mathrm{it}}$ is the stock return of company *i;* $\hat{\alpha}_{\mathrm{i}}$, $\hat{\beta}_{1\mathrm{i}}$, $\hat{\beta}_{2\mathrm{i}}$, and $\hat{\beta}_{3\mathrm{i}}$ and $\widehat{\alpha_{\mathrm{j}}}$, $\hat{\beta}_{1\mathrm{j}}$, $\hat{\beta}_{2\mathrm{j}}$, and $\hat{\beta}_{3\mathrm{j}}$ are the estimated value of company *i,* which uses model (3) to estimate the OLS regression of the sixteen consecutive quarters of data before year *t.*[15]

$$\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{t}}\right) = \alpha + \beta_1 * \mathrm{DR}_{\mathrm{t}} + \beta_2 * \mathrm{Return}_{\mathrm{t}} + \beta_3 * \mathrm{DR}_{\mathrm{t}} * \mathrm{Return}_{\mathrm{t}} + \varepsilon \tag{3}$$

Finally, we use model (4) to measure the comparability of accounting information:

$$\mathrm{Comp}_{\mathrm{it}} = -\frac{1}{16} * \sum_{\mathrm{t-15}}^{\mathrm{t}} \left|\mathrm{E}\left(\mathrm{Earnings}_{\mathrm{iit}}\right) - \mathrm{E}\left(\mathrm{Earnings}_{\mathrm{ijt}}\right)\right| \tag{4}$$

in which $\mathrm{Comp}_{\mathrm{it}}$ is the comparability of accounting information. The larger the value of $\mathrm{Comp}_{\mathrm{it}}$, the greater is the comparability of accounting information between company *i* and company *j,* and vice versa. Because investors generally choose only four to six companies (not all) in the industry to compare their investment opportunities (Cooper and Cordeiro, 2008), we choose the average value (Comp_4) of the four largest values of a company paired with other companies in the industry to measure the accounting information comparability of company *i* (Liu et al., 2015; Yang et al., 2015).

3.2.3. Investment efficiency

Many different models can be used to measure investment efficiency, but few models can distinguish underinvestment from overinvestment. Among them, the most classic is the residual model of Richardson (2006). Based on Richardson's (2006) model, we calculate the expected investment level of the company. The absolute value of the residual is estimated

15 Following similar studies, OLS is used. The following are OLS regressions.

Table 2
Variable definitions.

Variable Type	Label	Definition
Dependent variables	Inefficient investment (Invef)	Absolute value of the residual of equation (5)
	Underinvestment (Underinv)	Absolute value of the negative residual of equation (5)
	Overinvestment (Overinv)	Positive residual of equation (5)
Independent variables	Monetary policy tightening (MC)	If MP is less than 0, the value is 1; otherwise, it is 0
	Accounting information comparability (Comp4)	Average value of the four largest values of a company paired with other companies in the industry
	Operating income growth rate (Grow)	The ratio of the difference between the current year's income and the previous year's income to the current year's income
	Cash-flow level (Cashflow)	The ratio of net cash flow from operating activities to total assets
	First large shareholder capital occupation (First)	The ratio of the number of shareholders holding the most shares of the listed firm to the total number of shares of the listed firm
Control variables	CEO and board chair duality (Dual)	When the chairman concurrently serves as the general manager, the value is 1, otherwise, it is 0
	Board size (Dsize)	Natural logarithm of the number of the board of directors
	Large shareholder tunneling (CNFO)	The ratio of other receivables to total assets
	Executive compensation (Paythree)	The ratio of total compensation of top three executives to total assets
	Asset–liability ratio (Lev)	The ratio of total liabilities to total assets
	Company size (Size)	Natural logarithm of assets
	Years of listing (Age)	Natural logarithm of years of listing
	Firm ownership (State)	When the firm is a state-owned enterprise, the value is 1; otherwise, it is 0
	Year (Year)	Dummy variable for the year
	Industry (Ind)	Dummy variable for the industry

by this model, which is the level of inefficient investment by the company. Following Wan (2013) and Zhai et al. (2014), we use a positive residual to represent overinvestment (Overinv), the absolute value of a negative residual to represent underinvestment (Underinv), and the absolute value of a residual to represent inefficient investment (Invef). A smaller absolute value of regression residuals indicates that the investment efficiency of listed companies is higher; otherwise, it is lower. Following Richardson (2006), we construct model (5) as follows:

$$\begin{aligned} \mathrm{Inv}_{i,t} = {} & \beta_0 + \beta_1 \mathrm{Inv}_{i,t-1} + \beta_2 \mathrm{Cash}_{i,i-1} + \beta_3 \mathrm{Age}_{i,t-1} + \beta_4 \mathrm{Return}_{i,t-1} + \beta_5 \mathrm{Grow}_{i,t-1} \\ & + \beta_6 \mathrm{Lev}_{i,t-1} + \beta_7 \mathrm{Size}_{i,t-1} + \sum \mathrm{Ind} + \sum \mathrm{Year} + \varepsilon \end{aligned} \tag{5}$$

in which i and t denote the company and the year, respectively; $\mathrm{Inv}_{i,t}$ denotes the level of investment, expressed by standardizing the cash paid for the purchase of total fixed assets, intangible assets, and other long-term assets minus the cash recovered from the disposal of total fixed assets, intangible assets, and other long-term assets, and total current assets; $\mathrm{Inv}_{i,t-1}$ denotes the investment level in the previous year; $\mathrm{Cash}_{i,i-1}$ represents cash holdings, calculated by dividing monetary assets by total assets at the beginning of the year; $\mathrm{Age}_{i,t-1}$ represents the years of establishment, which is calculated by subtracting the natural logarithm of the number of years from the year of the initial public offering to the end of the previous year; $\mathrm{Return}_{i,t-1}$ represents the annual return on individual stocks considering the reinvestment of cash dividends; and $\mathrm{Grow}_{i,t-1}$ represents investment opportunities, which is the growth rate of operating income in the previous year. Because the market value and replacement cost data on listed firms in China are difficult to obtain and Tobin's Q is ineffective in the Chinese stock market, we use the growth rate of operating income as a proxy for investment opportunities (Zhang et al., 2015); $\mathrm{Lev}_{i,t-1}$ represents solvency, which equals the asset–liability ratio of the previous year; and $\mathrm{Size}_{i,t-1}$ represents the size of the company, which equals the natural logarithm of the book value of total assets in the previous year. At the same time, we also control for the impact of the industry (Ind) and the year (Year).

3.2.4. Control variables

Following existing research, we select the following control variables: operating income growth rate (Grow), cash-flow level (Cashflow), the largest shareholder's capital holding (First), CEO and board chair duality (Dual), board size (Dsize), large shareholder tunneling (CNFO), executive compensation (Paythree), the asset–liability ratio (Lev), company size (Size), years of listing (Age), and firm ownership (State). In addition, to avoid the impact of fixed effects, such as the macroeconomic environment and institutional changes, we also control for the industry and year. Definition of the variables are in Table 2.

Considering the large number of manufacturing firms, based on the 2012 CSRC industry classification standard, manufacturing is subdivided into subcategories and other industries into categories.

Table 3
Descriptive statistics for the full sample and the period of monetary policy tightening.

	Full sample				Subsample of monetary policy tightening			
	N	Mean	Median	Std.	N	Mean	Median	Std.
Invef	14666	0.029	0.020	0.030	6877	0.029	0.020	0.029
Overinv	5751	0.037	0.023	0.040	2696	0.037	0.024	0.039
Underinv	8915	0.023	0.018	0.019	4181	0.023	0.018	0.020
LMC	14666	0.469	0.000	0.499	6877	1.000	1.000	0.000
Comp4	14666	−0.002	−0.001	0.005	6877	−0.002	−0.001	0.005
Grow	14666	0.165	0.100	0.410	6877	0.155	0.095	0.408
Cashflow	14666	0.051	0.049	0.073	6877	0.054	0.051	0.074
First	14666	0.356	0.338	0.151	6877	0.353	0.335	0.150
Dual	14666	0.176	0.000	0.381	6877	0.171	0.000	0.376
Dsize	14666	8.988	9.000	1.817	6877	9.008	9.000	1.839
CNFO	14666	0.019	0.009	0.020	6877	0.019	0.009	0.029
Paythree	14666	0.000	0.000	0.001	6877	0.001	0.000	0.001
Lev	14666	0.486	0.494	0.195	6877	0.492	0.500	0.192
Size	14666	22.306	22.151	1.288	6877	22.275	22.122	1.307
Age	14666	2.482	2.565	0.465	6877	2.498	2.565	0.449
State	14666	0.552	1.000	0.497	6877	0.567	1.000	0.496

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; LMC means monetary policy with a one-period lag; Comp4 means accounting information comparability; Grow means operating income growth rate; Cashflow means cash-flow level; First means first large shareholder capital occupation; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means firm ownership. Invef, Overinv and Underinv are the dependent variables. LMC and Comp4 are the independent variables. Grow, Cashflow, First, Dual, Dsize, CNFO, Paythree, Lev, Size, Age and State are the control variables. We mainly focus on the dependent variables and independent variables in the table.

3.3. Empirical model

To test H1 and alleviate the endogeneity problem, we use monetary policy with a one-period lag (defined as LMC) for multiple linear regression.[16] The model is as follows:

$$\text{Invef}_{i,t}\left(\text{or Overinv}_{i,t}\text{ or Underinv}_{i,t}\right) = \beta_0 + \beta_1\text{LMC}_{i,t} + \beta_2\text{ControlVariables}_{i,t} + \sum\text{Ind} + \sum\text{Year} + \varepsilon \quad (6)$$

To test H2, we add variables for accounting information comparability, and model (7) is a multiple linear regression after grouping based on LMC:

$$\text{Invef}_{i,t}\left(\text{or Overinv}_{i,t}\text{ or Underinv}_{i,t}\right) = \beta_0 + \beta_1\text{Comp4}_{i,t} + \beta_2\text{ControlVariables}_{i,t} + \sum\text{Ind} + \sum\text{Year} + \varepsilon \quad (7)$$

4. Empirical results and analysis

4.1. Descriptive statistics and correlation analysis

4.1.1. Descriptive statistics

Table 3 reports the descriptive statistics for the full sample ($N = 14{,}666$), with a subsample of the period with monetary policy tightening. The full sample has 5,751 observations of overinvestment (Overinv), accounting for 39.213%, and 8,915 observations of underinvestment (Underinv), accounting for 60.787%. The proportion of underinvestment by listed firms is relatively large, and underinvestment is more common than overinvestment, which is consistent with Fig. 1. The mean value of monetary policy (LMC) is 0.469, indicating that 46.9% of the sample observations are in the period with tightening. The maximum value of Comp4 is −0.0000439, which is nearly 0, and the standard deviation is small (0.005), which shows that the accounting information between sample companies is highly comparable.[17] The subsample for the period of monetary policy tightening comprises 2,696 overinvestment observations, accounting for 39.203% (2696/6877), and 4,181 underinvestment observations, accounting for 60.797% (4181/6877). During the period of monetary policy tightening, listed firms are more prone to underinvestment than overinvestment. The mean of accounting information comparability (−0.0024658) is lower than that of accounting information comparability (−0.0023984) in the full sample, which indicates that the level of accounting information comparability is lower in a period of monetary policy tightening.

[16] On the one hand, considering the impact of policy on economic behavior, it may not react in the current period, but will react in the next period. On the other hand, in order to control endogeneity problems, we follow Yang et al. (2017) in adopting the one-stage lag (LMC) return monetary policy.

[17] The mean, median, and standard deviation of the accounting information comparability in the full sample and subsample in the table are the same. For comparison, the accurate value of accounting information comparability is calculated as follows: the maximum value of Comp4 is −0.0000439 in full sample, and the mean of Comp4 in full sample and subsample is −0.0023984 and −0.0024658, respectively.

Table 4
Correlation analysis for the subsample of monetary policy tightening and loosening.

	Subsample of monetary policy tightening					Sub-sample of monetary policy loosening			
	Invef	Overinv	Underinv	Comp4		Invef	Overinv	Underinv	Comp4
Invef	1.000				*Invef*	1.000			
Overinv	1.000***	1.000			*Overinv*	1.000***	1.000		
	(0.000)					(0.000)			
Underinv	1.000***	.	1.000		*Underinv*	1.000***	.	1.000	
	(0.000)	.				(0.000)	.		
Comp4	−0.033***	−0.019	−0.061***	1.000	*Comp4*	−0.017	0.002	−0.050***	1.000
	(0.007)	(0.315)	(0.000)			(0.138)	(0.934)	(0.001)	

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability. ***, **, and * indicate a significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *p* values.

4.1.2. Correlation analysis

Table 4 reports the Pearson correlation coefficients of the dependent and independent variables in the periods of monetary policy tightening and loosening. In Table 4, when monetary policy is tightening, accounting information comparability is negatively correlated with underinvestment and inefficient investment at the <significance?> level of 1%, which indicates that in the period of monetary policy tightening, improving accounting information comparability is conducive to reducing underinvestment and inefficient investment. When the monetary policy is looser, the accounting information comparability is negatively correlated only with underinvestment at the level of 1%, which indicates that, in the period of monetary policy loosening, improving accounting information comparability is helpful in reducing underinvestment.

4.2. Regression results and analysis

4.2.1. Monetary policy and investment efficiency

Table 5 shows the regression results on the impact of monetary policy on investment efficiency.

In the full sample regression results in column (1), the coefficient of monetary policy is 0.006, which is significant at the level of 1%, indicating that, during the period of monetary policy tightening, firms are more likely to have inefficient investment. Compared to period with a looser monetary policy, inefficient investment increased by 0.6% in the period with monetary tightening. Columns (2) and (3) are grouped regression results for overinvestment and underinvestment. In the overinvestment group in column (2), the coefficient of monetary policy is 0.008, which is significant at the level of 5%, while in the underinvestment group in column (3), the coefficient of monetary policy is 0.005, which is significant at the level of 1%. Compared to the period of looser monetary policy, in the period with tightening, overinvestment increases by 0.8% and underinvestment increases by 0.5%. The results in columns (1) and (3) show that underinvestment is more likely to occur in the period of monetary policy tightening, thus reducing investment efficiency. The regression results confirm H1.

4.2.2. Monetary policy tightening, accounting information comparability, and investment efficiency

Table 6 shows the regression results for monetary policy tightening, accounting information comparability, and investment efficiency. In the period of monetary policy tightening, the coefficient of accounting information comparability in the full sample regression in column (1) is −0.142, which is not statistically significant, indicating no evidence that improving accounting information comparability in the period of tightening can significantly inhibit inefficient investment. It also indicates that, in the period of monetary policy tightening, accounting information comparability increases by one standard deviation and inefficient investment decreases by 14.2%. In column (2), the coefficient of accounting information comparability is 0.016, which is not statistically significant. When monetary policy is tightening, accounting information comparability increases by one standard deviation, and inefficient investment increases by 1.6%. In column (3), the coefficient of accounting information comparability is −0.293, which is significant at the level of 1%. This indicates that, in the period of monetary policy tightening, if comparability increases by one standard deviation, underinvestment will decrease by 29.3%; 0.293 is much higher than its mean (0.023) and median (0.018), indicating that improving accounting information comparability in a period of monetary tightening has important economic significance for underinvestment. The results in columns (2) and (3) show that, in the period of monetary policy tightening, improving the comparability of accounting information can significantly reduce underinvestment, but it may not have a significant impact on inefficient investment because of the positive impact on overinvestment.

In conclusion, H2 is confirmed. Table 5 shows that monetary policy tightening leads to underinvestment and increases inefficient investment but has no significant impact on overinvestment. Therefore, in a period with monetary policy tightening, improving the comparability of accounting information should reduce underinvestment. Therefore, Table 6 further validates Table 5.

Table 5
Regression results on monetary policy and investment efficiency.

	Invef (1)	Overinv (2)	Underinv (3)
LMC	0.006***	0.008**	0.005***
	(3.52)	(2.16)	(3.57)
Grow	0.006***	0.010***	0.001*
	(9.81)	(7.73)	(1.88)
Cashflow	0.014***	0.028***	−0.004
	(3.82)	(3.52)	(−1.24)
First	−0.004**	−0.006	0.001
	(−2.15)	(−1.64)	(0.54)
Dual	0.000	0.000	−0.000
	(0.44)	(0.20)	(−0.83)
Dsize	−0.000	−0.000	−0.000
	(−0.57)	(−0.30)	(−0.78)
CNFO	−0.033***	−0.065***	−0.008
	(−3.56)	(−3.12)	(−1.11)
Paythree	0.621	−1.457	1.449***
	(0.99)	(−1.07)	(2.80)
Lev	0.002	0.006*	−0.004***
	(1.20)	(1.72)	(−3.41)
Size	−0.001**	−0.001	−0.001***
	(−2.36)	(−1.62)	(−4.59)
Age	−0.005***	−0.007***	−0.004***
	(−8.06)	(−5.21)	(−7.47)
State	−0.002***	−0.004***	−0.001
	(−3.75)	(−2.78)	(−1.32)
Constant	0.059***	0.076***	0.061***
	(8.86)	(5.44)	(11.00)
Ind/Year	Yes	Yes	Yes
F_Value	21.810	9.189	20.837
Adj_R^2	0.059	0.059	0.089
N	14666	5751	8915

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; LMC means monetary policy with a one-period lag; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.
Following other scholars, the F-statistic used to test multiple hypotheses about the parameters in a multiple regression model. For details, see Wooldridge (2014). In our paper, all F-statistics are significant at the 1% level, which indicates that the model is effective. The following F-statistics have the same meaning and will not be repeated.

5. Further analysis

This analysis shows that a tight monetary policy aggravates underinvestment behavior, which leads to low investment efficiency at firms. But accounting information comparability can significantly alleviate underinvestment in a period of monetary policy tightening, to a certain extent, and it can improve investment efficiency at firms. High-quality accounting information not only reduces agency costs and financing costs caused by asymmetric information (Kim et al., 2013) but also helps managers make rational investment decisions (Chen et al., 2011). Chinese monetary policies have different effects on state-owned enterprises (SOEs) than on private enterprises (PEs) with or without political connections (Zhao et al., 2018). So, in a period of monetary policy tightening, agency costs and financing constraints might play a moderating role in accounting information comparability, reducing inefficient investment. PEs with "credit discrimination" might reduce inefficient investment when they improve accounting information comparability. This section attempts to analyze the impact of accounting information comparability on the transmission mechanism of investment deficiency in a period of monetary policy tightening from the perspective of agency costs, financing constraints, and the type of firm ownership.

5.1. Monetary policy tightening, accounting information comparability, and underinvestment from the perspective of agency costs

During a period of monetary policy tightening, the development of future economic conditions tends to be complex, and the uncertainty of future profits of firms increases, which raises the degree of information asymmetry. Thus information

Table 6
Regression results on monetary policy tightening, accounting information comparability, and investment efficiency.

	Invef	Overinv	Underinv
	(1)	(2)	(3)
Comp4	−0.142	0.016	−0.293***
	(−1.64)	(0.09)	(−3.90)
Grow	0.004***	0.005***	0.001
	(4.27)	(3.06)	(1.11)
Cashflow	0.016***	0.034***	−0.007
	(3.02)	(3.18)	(−1.55)
First	−0.006**	−0.011**	−0.001
	(−2.43)	(−1.97)	(−0.25)
Dual	0.001	0.001	0.001
	(1.16)	(0.66)	(0.76)
Dsize	0.000	0.000	−0.000
	(0.03)	(0.65)	(−1.09)
CNFO	−0.028**	−0.067**	0.004
	(−2.11)	(−2.30)	(0.36)
Paythree	−0.143	−2.788	0.809
	(−0.17)	(−1.56)	(1.08)
Lev	−0.000	0.001	−0.006***
	(−0.16)	(0.30)	(−3.03)
Size	−0.000	−0.000	−0.001***
	(−0.98)	(−0.39)	(−3.13)
Age	−0.006***	−0.008***	−0.004***
	(−6.65)	(−4.19)	(−5.37)
State	−0.000	−0.000	−0.000
	(−0.38)	(−0.14)	(−0.11)
Constant	0.056***	0.059***	0.063***
	(6.00)	(2.84)	(7.57)
Ind/Year	Yes	Yes	Yes
F_Value	14.500	6.015	13.410
Adj_R^2	0.068	0.064	0.099
N	6877	2696	4181

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at a significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

asymmetry provides opportunities for managers to engage in self-interested behavior, which increases agency costs. Accounting information plays an important role in reducing agency costs, which is an important way of alleviating the degree of information asymmetry in many forms of contracts (Shen and Wu, 2012; Hu and Lu, 2015). Compared to other characteristics of accounting information quality, accounting information comparability should be better able to alleviate information asymmetry, restrict the improper use of cash flows by managers, and reduce agency costs. Therefore, during a period of tightening monetary policy, firms with high agency costs improve the comparability of accounting information and not only reduce the agency costs caused by information asymmetry but also help managers to make rational investment decisions and better identify projects (McNichols and Stubben, 2008; Biddle et al., 2009; Chen et al., 2011). Moreover, it reduces managers' abandonment of investment projects with an NPV greater than 0 because of an awareness that when the cash flow is reduced by monetary policy tightening, it alleviates underinvestment and improves investment efficiency.

To confirm these expectations, following Jiang and Xu (2015), we use the rate of management expenses to measure agency costs (ADM) and examine whether agency costs play a moderating role in investment efficiency that is influenced by accounting information comparability in a period of monetary policy tightening, using interaction terms and group regressions. The empirical results are shown in Table 7.

Table 7 reports the regression results on accounting information comparability and the agency costs of inefficient investment and underinvestment during a period of monetary policy tightening. The results in columns (1) and (4) show the regression results for the effect of the interaction between accounting information comparability and agency costs on the investment efficiency and underinvestment in a period of monetary policy tightening. The results in columns (2), (3), (5), and (6) show the regression results of the effect of accounting information comparability on investment efficiency grouped by agency costs in a period of monetary policy tightening.

Table 7
Monetary policy tightening, accounting information comparability, and underinvestment: regression results from the perspective of agency costs.

	Invef			Underinv		
	Full sample	High agency cost	Low agency cost	Full sample	High agency cost	Low agency cost
	(1)	(2)	(3)	(4)	(5)	(6)
Comp4	0.021	−0.400***	0.056	−0.098	−0.579***	−0.079
	(0.19)	(−2.97)	(0.49)	(−1.01)	(−4.99)	(−0.79)
ADM	0.014**			−0.002		
	(2.21)			(−0.38)		
Comp4* ADM	−1.484**			−1.897***		
	(−2.02)			(−3.07)		
Grow	0.004***	0.005***	0.003***	0.001	0.003*	−0.000
	(4.72)	(3.70)	(2.85)	(1.39)	(1.96)	(−0.12)
Cashflow	0.017***	0.010	0.020***	−0.006	−0.014*	−0.003
	(3.30)	(1.28)	(2.93)	(−1.43)	(−1.90)	(−0.53)
First	−0.006**	−0.007*	−0.005	−0.001	−0.002	−0.000
	(−2.28)	(−1.70)	(−1.45)	(−0.27)	(−0.49)	(−0.11)
Dual	0.001	0.001	0.001	0.001	0.001	−0.000
	(1.02)	(0.93)	(0.47)	(0.74)	(1.03)	(−0.34)
Dsize	0.000	−0.000	0.000	−0.000	−0.001*	0.000
	(0.01)	(−1.08)	(0.88)	(−1.13)	(−1.82)	(0.09)
CNFO	−0.034**	−0.031	−0.029	0.002	0.002	0.006
	(−2.53)	(−1.60)	(−1.49)	(0.17)	(0.11)	(0.37)
Paythree	−0.431	0.060	−0.520	0.689	1.162	0.154
	(−0.50)	(0.05)	(−0.34)	(0.91)	(1.21)	(0.12)
Lev	0.000	0.004	−0.005	−0.006***	−0.005**	−0.008***
	(0.17)	(1.28)	(−1.38)	(−3.07)	(−1.98)	(−2.91)
Size	−0.000	−0.000	−0.000	−0.001***	−0.001	−0.001**
	(−0.36)	(−0.01)	(−0.20)	(−2.84)	(−1.45)	(−2.32)
Age	−0.006***	−0.006***	−0.006***	−0.004***	−0.006***	−0.004***
	(−6.94)	(−4.89)	(−4.83)	(−5.51)	(−5.05)	(−3.16)
State	−0.000	−0.001	0.001	0.000	−0.001	0.001
	(−0.19)	(−0.99)	(0.52)	(0.03)	(−0.90)	(0.92)
Constant	0.041***	0.050***	0.051***	0.057***	0.065***	0.060***
	(4.07)	(3.37)	(3.94)	(6.42)	(4.95)	(5.28)
Ind/Year	Yes	Yes	Yes	Yes	Yes	Yes
F_Value	14.230	6.976	9.066	13.036	8.083	6.880
Adj_R^2	0.070	0.062	0.075	0.101	0.114	0.090
N	6877	3318	3559	4181	2042	2139

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; ADM means agency cost; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

In column (1), the coefficient of the interaction between accounting information comparability and agency costs is −1.484, which is significant at the level of 5%. In the regression results on underinvestment in column (4), the coefficient of the interaction between accounting information comparability and agency costs is −1.897, which is significant at the level of 1%. The regression results show that in a period of monetary policy tightening, improving the comparability of accounting information of firms with a high agency cost can significantly reduce underinvestment and alleviate inefficient investment.

Further grouping by agency cost shows that in the group with high agency costs, the regression results for inefficient investment in column (2) show that the coefficient of accounting information comparability is −0.400, which is significant at the level of 1%. This shows that, in a period of monetary policy tightening, firms with high agency costs improve the comparability of accounting information by one standard deviation, and inefficient investment decreases by 40.0%. In the regression results for underinvestment in column (5), the coefficient of accounting information comparability is −0.579, which is also significant at the level of 1%. This shows that, in a period of monetary policy tightening, firms with high agency costs improve the comparability of accounting information by one standard deviation, and underinvestment decreases by 57.9%. The regression results show that, in a period of monetary policy tightening, improving the comparability of accounting information can significantly reduce underinvestment and inefficient investment. In the group with low agency costs, the coefficient of accounting information comparability is 0.056 for inefficient investment in column (3) and −0.099 for underinvestment in column (6), which are not statistically significant. The regression results show that, in a period of monetary policy tightening, there is no evidence that improving the comparability of accounting information can significantly reduce underinvestment and inefficient investment at firms with low agency costs. In sum, in a period of monetary policy tightening, improving the comparability of accounting information by firms with high agency costs is more conducive to reducing underinvestment and improving investment efficiency, which confirms our expectations.

5.2. Monetary policy tightening, accounting information comparability, and underinvestment from the perspective of financing constraints

During a period of monetary policy tightening, a decrease in the money supply leads to a decrease in market liquidity, and firms face higher financing constraints than in a period of monetary policy loosening (Yang and Li, 2016). At the same time, a tight monetary policy also makes future economic development conditions more complex, uncertainty of a firm's future profits increases, and information asymmetry increases accordingly. Investors do not understand the operational status of the firm using the accounting information provided by firms, which means the firm has fewer opportunities to obtain external financing, and the financial constraints faced by the firm also increase. In view of this, during a period of monetary policy tightening, if firms with high financing constraints improve the comparability of their accounting information and reduce the cost of collecting and collating information on investors, which help investors to identify benefit expropriation behavior by management, understand the real financial conditions and operating results of firms, reduce information asymmetry between investors and firms, strengthen the speculative motivations of investors, provide funds to firms, reduce financing costs (Kim et al., 2013), ease financing constraints faced by firms, and then effectively reduce underinvestment.

To confirm these expectations, following Zhang et al. (2017), we use the following procedure and logistic model (8) to calculate the financing constraints (FC).[18] First, we sort the observation values based on company size from large to small, dividing them into three groups: high, medium, and low financing constraints. We set FC as a dummy variable; when financing constraints are high, the value of FC is 1, and when financing constraints are low, the value is 0. Second, we use the financing constraints pre-group variable FC as the dependent variable and the asset–liability ratio (Lev), dividend payment rate (Div), market-to-book ratio (MB), ratio of net working capital to total assets (NWC/Asset), and ratio of EBIT to total assets (EBIT/Asset) as the independent variables. Third, based on the results of logistic regression, we construct a financial constraint index (FCI). When this index is larger, so are financial constraints.

$$\Pr(\mathrm{FC}=1 \text{ or } 0|\mathrm{FCI}_{i,t}) = \frac{1}{1+e^{-\mathrm{FCI}_{i,t}}},$$
$$\mathrm{FCI}_{i,t} = \beta_0 + \beta_1 \mathrm{Lev}_{i,t} + \beta_2 \mathrm{Div}_{i,t} + \beta_3 \mathrm{MB}_{i,t} + \beta_4 \left(\frac{\mathrm{NWC}}{\mathrm{Asset}}\right)_{i,t} + \beta_5 \left(\frac{\mathrm{EBIT}}{\mathrm{Asset}}\right)_{i,t} \quad (8)$$

Fourth, we examine whether financing constraints play a moderating role in the impact of accounting information comparability on investment efficiency in a period of monetary policy tightening through interaction term and group regression. The relevant empirical results are shown in Table 8.

Table 8 reports the regression results on accounting information comparability and financing constraints on inefficient investment and underinvestment in a period of monetary policy tightening. Columns (1) and (4) list the regression results of the interaction between accounting information comparability and financing constraints in a period of monetary policy tightening; columns (2), (3), (5), and (6) list the regression results of accounting information comparability affecting investment efficiency and underinvestment grouped by financing constraints in a period of monetary policy tightening. In the regression results on inefficient investment in column (1), the coefficient of the interaction term between accounting information comparability and financing constraints is −0.081, which is significant at the level of 10%. In the regression results on underinvestment in column (4), the coefficient of the interaction term between accounting information comparability and financing constraints is −0.118, which is significant at the level of 1%. The regression results show that, in a period of monetary policy tightening, improving the comparability of accounting information of firms with high financing constraints is more conducive to reducing underinvestment and alleviating inefficient investment. Further grouped by the level of financing constraints, in the group with high financing constraints, the results on inefficiency investment regression in column (2) show that the coefficient of accounting information comparability is −0.350, which is significant at the level of 5%. This indicates that, in a period of monetary policy tightening, firms with high financing costs improve the comparability of accounting information by one standard deviation, and inefficient investment decreases by 35.0%. In the regression results on underinvestment in column (5), the coefficient of accounting information comparability is −0.552, which is also significant at the level of 1%. This indicates that, in a period of monetary policy tightening, firms with high financing costs improve the comparability of accounting information by one standard deviation, and underinvestment decreases by 55.2%. The regression results show that, in a period of monetary policy tightening, improving the comparability of accounting information can significantly reduce underinvestment and reduce inefficient investment at firms with high financing constraints. In the group with low financing constraints, the coefficient of accounting information comparability is −0.013 and −0.118, respectively, in the inefficient investment regression results in column (3) and the underinvestment regression results in column (6), which are not statistically significant.

The regression results show that, in a period of monetary policy tightening, improving the comparability of accounting information does not significantly reduce underinvestment and inefficient investment at firms with low financing constraints. These results show that, in a period of monetary policy tightening, firms with high financing constraints can improve the comparability of accounting information, which is more helpful for reducing underinvestment and improving investment efficiency.

[18] Logistic regression analysis is performed with a generalized linear regression analysis model. The dependent variables of a logistic regression can be dichotomous (dummy variable) or multicategory, but the binomial is more commonly used and easier to explain. In fact, the most commonly used is a binary classification logistic regression.

Table 8
Monetary policy tightening, accounting information comparability, and underinvestment: regression results from the perspective of financing constraints.

	Invef			Underinv		
	Full sample	High financing constraints	Low financing constraints	Full sample	High financing constraints	Low financing constraints
	(1)	(2)	(3)	(4)	(5)	(6)
Comp4	−0.132	−0.350**	−0.013	−0.304***	−0.552***	−0.118
	(−1.42)	(−2.31)	(−0.11)	(−3.70)	(−4.01)	(−1.16)
FCI	0.000			0.000		
	(0.84)			(0.76)		
Comp4* FCI	−0.081*			−0.118***		
	(−1.82)			(−3.10)		
Grow	0.005***	0.005***	0.004***	0.002*	0.000	0.003**
	(4.52)	(3.08)	(2.79)	(1.90)	(0.01)	(2.30)
Cashflow	0.014**	0.004	0.023***	−0.007	−0.015*	−0.003
	(2.42)	(0.51)	(2.69)	(−1.25)	(−1.87)	(−0.40)
First	−0.004	−0.005	−0.004	0.002	0.002	0.003
	(−1.37)	(−0.97)	(−1.00)	(0.74)	(0.37)	(0.95)
Dual	0.002	0.002	0.001	0.000	0.001	−0.001
	(1.42)	(1.46)	(0.72)	(0.39)	(0.91)	(−0.45)
Dsize	0.000	−0.000	0.000	−0.000	−0.000	0.000
	(0.75)	(−0.29)	(0.47)	(−0.08)	(−1.26)	(0.79)
CNFO	−0.015	−0.010	−0.013	0.017	0.003	0.031*
	(−1.03)	(−0.50)	(−0.59)	(1.36)	(0.16)	(1.86)
Paythree	0.015	0.461	−0.685	0.555	0.742	2.074
	(0.02)	(0.43)	(−0.38)	(0.70)	(0.72)	(1.37)
Lev	−0.002	−0.009**	0.007	−0.007***	−0.009***	−0.004
	(−0.83)	(−2.47)	(1.44)	(−2.86)	(−2.85)	(−1.12)
Size	−0.000	0.000	−0.001	−0.001*	−0.000	−0.001**
	(−0.03)	(0.55)	(−0.96)	(−1.82)	(−0.19)	(−2.14)
Age	−0.006***	−0.006***	−0.006***	−0.005***	−0.005***	−0.004***
	(−5.95)	(−4.06)	(−4.25)	(−4.97)	(−3.45)	(−3.21)
State	−0.001	0.000	−0.002	−0.001	−0.001	−0.000
	(−0.82)	(0.01)	(−1.33)	(−0.72)	(−0.63)	(−0.16)
Constant	0.041***	0.040**	0.073***	0.050***	0.038**	0.075***
	(3.70)	(2.45)	(4.70)	(5.12)	(2.41)	(5.59)
Ind/Year	Yes	Yes	Yes	Yes	Yes	Yes
F_Value	10.489	3.705	9.057	9.623	3.714	6.413
Adj_R^2	0.074	0.043	0.108	0.107	0.065	0.126
N	4639	2237	2402	2812	1454	1358

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; FCI means financing constraints; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

5.3. Monetary policy tightening, accounting information comparability, and underinvestment: From the perspective of heterogeneity in the type of firm ownership

Many papers show that PEs in China might suffer from "credit discrimination" (Chen et al., 2019). The previous literature points out that because of the government's administrative intervention SOEs (Chen et al., 2011), they have more overinvestment, thus they have less investment efficiency than PEs (Yu et al., 2010). Yu et al. (2014) find that, at the beginning of the study, investment efficiency is indeed higher at PEs than SOEs. However, because of financing constraints, over time the investment efficiency of PEs declined rapidly, to the point that it was lower than that of SOEs. From the perspective of debt financing, Li and Liu (2009) found that PEs have higher debt financing costs than SOEs. In a period of monetary policy tightening, it is more difficult and costly for firms to obtain debt financing, which aggravates the firm financing constraints, and this adverse effect is more significant at PEs (Quan et al., 2016). Therefore, PEs have more severe financing constraints than SOEs. Monetary policy tightening has reduced the investment level of PEs (Yang and Yin, 2017), which exacerbates the insufficient investment of PEs. Based on this analysis, we believe that in a period of monetary policy tightening, improving the comparability of accounting information can significantly alleviate underinvestment by PEs caused by external financing constraints, moral hazard, and other factors and improve their investment efficiency.

To confirm these expectations, we use a group regression in model (7) based on the type of firm ownership (State) to examine whether PEs can enhance investment efficiency by improving the comparability of accounting information under a tight monetary policy. The results of this regression are in Table 9. Column (1) lists results of the regression on inefficient investment, in which the coefficient of accounting information comparability is −0.078, which is not

Table 9
Monetary policy tightening, accounting information comparability, and underinvestment: regression results from the perspective of firm ownership.

	Invef		Underinv	
	Private	State	Private	State
	(1)	(2)	(3)	(4)
Comp4	−0.078	−0.156	−0.438***	−0.205**
	(−0.47)	(−1.50)	(−3.08)	(−2.26)
Grow	0.007***	0.002	0.000	0.001
	(4.80)	(1.47)	(0.19)	(1.34)
Cashflow	0.004	0.025***	−0.009	−0.004
	(0.49)	(3.66)	(−1.25)	(−0.63)
First	−0.004	−0.009***	−0.002	−0.001
	(−0.90)	(−2.61)	(−0.43)	(−0.32)
Dual	0.001	0.001	0.001	−0.000
	(0.77)	(0.48)	(0.50)	(−0.01)
Dsize	0.000	−0.000	−0.000	−0.000
	(0.56)	(−0.63)	(−0.44)	(−1.27)
CNFO	−0.004	−0.054***	0.016	−0.016
	(−0.22)	(−2.87)	(0.96)	(−1.01)
Paythree	0.215	−0.900	2.364**	−2.801**
	(0.19)	(−0.64)	(2.42)	(−2.26)
Lev	0.002	−0.002	−0.000	−0.011***
	(0.62)	(−0.82)	(−0.09)	(−4.10)
Size	−0.001	0.000	−0.002***	−0.001**
	(−1.43)	(0.00)	(−2.67)	(−2.24)
Age	−0.005***	−0.007***	−0.004***	−0.005***
	(−4.18)	(−4.59)	(−3.84)	(−4.28)
Constant	0.058***	0.061***	0.063***	0.076***
	(3.81)	(4.79)	(4.72)	(6.87)
Ind/Year	Yes	Yes	Yes	Yes
F_Value	5.512	11.388	6.872	9.339
Adj_R^2	0.052	0.085	0.106	0.106
N	2977	3900	1787	2394

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

statistically significant. The results of the regression on underinvestment are in column (3), where the coefficient of accounting information comparability is −0.438, which is significant at the level of 1%. This indicates that, in a period of monetary policy tightening, PEs improve their accounting information comparability by one standard deviation, and underinvestment decreases by 43.8%. These results show that improving the comparability of accounting information of PEs in a period of monetary policy tightening can significantly reduce underinvestment and enhance investment efficiency to a certain extent.

In column (2), the results of the regression on inefficient investment, the coefficient of accounting information comparability is −0.156, which is not statistically significant. In the regression on underinvestment in column (4), the coefficient of accounting information comparability is −0.205, which is significant at the level of 5%. This indicates that, in a period of monetary policy tightening, PEs improve their accounting information comparability by one standard deviation, and underinvestment decreases by 20.5%. These results show that, during a period of monetary policy tightening, improving the comparability of accounting information at SOEs can also significantly reduce underinvestment.

In contrast, the absolute value of the coefficient of accounting information comparability in the regression on underinvestment by PEs is 0.438, which is slightly larger than the absolute value of the coefficient of accounting information comparability in the regression on underinvestment by SOEs (0.205), which might mean that, in a period of monetary policy tightening, PEs with greater financing constraints can improve the comparability of accounting information and may be more likely to ease financing constraints and thus reduce underinvestment.

5.4. Robustness check

5.4.1. Substitutions in the dependent variable

Following Zhang et al. (2014), we use the dependent variable for inefficient investment as a dummy variable. When the residual of model (5) is less than 0, the variable Invef1 is set at 1 to represent underinvestment; otherwise, it is set

Table 10
Robustness tests with substitution of dependent variables: monetary policy and investment efficiency.

	Invef1 (1)
LMC	0.242**
	(1.98)
Grow	−0.387***
	(−9.02)
Cashflow	−1.837***
	(−7.22)
First	0.754***
	(6.00)
Dual	−0.125***
	(−2.67)
Dsize	−0.003
	(−0.34)
CNFO	1.351**
	(2.06)
Paythree	−83.307*
	(−1.92)
Lev	−0.877***
	(−7.97)
Size	−0.122***
	(−5.89)
Age	−0.002
	(−0.05)
State	0.179***
	(4.37)
Constant	2.960***
	(6.52)
Ind/Year	Yes
N	14666

Note: Invef1 means inefficient investment; LMC means monetary policy with a one-period lag; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

at 0 to represent overinvestment. Tables 10 and 11 report the logistic regression results from substituting the dependent variables.

As shown in Table 10, in the full sample regression in column (1), the coefficient of monetary policy is 0.242, which is significant at the level of 5%. This indicates that underinvestment increases by 24.2%, in the period with tightening, compared to the period with a looser monetary policy. These results show that monetary policy tightening leads to underinvestment, which reduces the investment efficiency of firms. This confirms H1.

Table 11 shows the robustness results on monetary policy tightening, accounting information comparability, and investment efficiency.

In a period of monetary policy tightening, the coefficient of accounting information comparability in the full sample regression in column (1) is −13.676, which is significant at the level of 5%. This shows that, in a period of monetary policy tightening, accounting information comparability increases by one standard deviation, and underinvestment decreases by 1367.6%, indicating that improving the comparability of accounting information in a period of monetary policy tightening can significantly reduce underinvestment and inhibit inefficient investment. This confirms H2.

5.4.2. Change in the model on investment efficiency

Drawing on the research of Tang et al. (2007) and Liu et al. (2014), we use the Vogt model (1994) to reexamine investment efficiency and use models 9 and 10 for logistic regressions.

$$I_{i,t} = \alpha_0 + a_1 FCF_{i,t} + \alpha_2 TobinQ_{i,t} + \alpha_3 FCF_{i,t} \times TobinQ_{i,t} + \sum Control + \sum Ind + \sum Year + \varepsilon_{i,t} \quad (9)$$

$$I_{i,t} = \alpha_0 + a_1 FCF_{i,t} + \alpha_2 TobinQ_{i,t} + \alpha_3 FCF_{i,t} \times TobinQ_{i,t} + \alpha_4 Comp4_{i,t} \times TobinQ_{i,t} + \alpha_5 Comp4_{i,t} \times FCF_{i,t} \times TobinQ_{i,t} + \sum Control + \sum Ind + \sum Year + \varepsilon_{i,t} \quad (10)$$

where I is firm investment, which equals the annual change in the sum of long-term investment, fixed assets, and construction-in-progress, divided by the initial assets to eliminate the impact of scale. FCF is free cash flow, which equals

Table 11
Robustness tests with substitution of dependent variables: monetary policy tightening, accounting information comparability, and investment efficiency.

	Invef1 (1)
Comp4	−13.676**
	(−2.20)
Grow	−0.329***
	(−5.19)
Cashflow	−2.192***
	(−5.99)
First	0.719***
	(3.88)
Dual	−0.077
	(−1.11)
Dsize	0.002
	(0.13)
CNFO	1.471
	(1.51)
Paythree	−160.077***
	(−2.64)
Lev	−1.108***
	(−6.83)
Size	−0.144***
	(−4.77)
Age	0.072
	(1.10)
State	0.086
	(1.44)
Constant	3.694***
	(5.60)
Ind/Year	Yes
N	6877

Note: Invef1 means inefficient investment; Comp4 means accounting information comparability; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

net operating cash flow for the year, divided by the initial assets to alleviate the impact of scale. TobinQ is the ratio of market value to assets.[19] $\sum$Control includes First, Grow, ROE, and Lev. ROE is the return on equity, which equals the ratio of net profit to the balance of shareholder equity. The definition of First, Grow, and Lev are shown in Table 2.

When monetary policy is tight, as in model 9, if a_1 is significant, it means that there is a significant correlation between investment and cash flow; if a_3 is significantly positive, it indicates the existence of underinvestment at the sample firms. In model 10, the interaction of accounting information comparability, FCF, and TobinQ is added. If a_5 is significantly negative, it shows that improving the comparability of accounting information can reduce underinvestment behavior by sample firms.

Table 12 shows the regression result of monetary policy tightening and underinvestment after the investment efficiency model is changed.

In Table 12, the coefficient of free cash flow is significantly positive (0.072), which shows a correlation between the investment and cash flow of listed firms in the period of monetary policy tightening. The coefficient of the interaction terms between free cash flow and TobinQ is significantly positive at 1% (0.031), which indicates underinvestment by the sample firms during the period of monetary policy tightening. H1 is reconfirmed.

Table 13 shows the regression results of monetary policy tightening, accounting information comparability, and underinvestment after the investment efficiency model is changed.

In Table 13, considering the impact of accounting information comparability on investment efficiency during a period of monetary tightening, we find that the coefficient of the interaction of accounting information comparability, free cash flow, and TobinQ is significantly negative at the 1% level (2.202). This indicates that, in a period of monetary policy tightening, improving the comparability of accounting information can reduce the underinvestment behavior of the sample firms. H2 is reconfirmed.

[19] Market value = (total capital stock - foreign capital stock B-shares listed in China) * current value of current closing price A-shares + current value of foreign capital stock B-shares listed in China * current closing price B-shares (Shanghai Stock Market *CNY_USD, Shenzhen Stock Market/HKD_CNY, converted into RMB) + total liabilities at the end of this period.

Table 12
Robustness tests with changes in the model of investment efficiency: monetary policy tightening and underinvestment.

	I (1)
FCF	0.072***
	(3.39)
TobinQ	−0.009***
	(−7.18)
FCF*TobinQ	0.031***
	(4.46)
First	0.019**
	(2.56)
Grow	0.062***
	(22.68)
ROE	0.045***
	(4.80)
Lev	0.045***
	(7.26)
Constant	−0.014
	(−1.43)
Ind/Year	Yes
F_Value	58.585
Adj_R2	0.212
N	6847

Note: I means firm investment; FCF means free cash flow; TobinQ means the ratio of market value to assets; First means top large shareholder capital holdings; Grow means operating income growth rate; ROE means the return on equity; Lev means asset–liability ratio. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

Table 13
Robustness tests with changes in the model of investment efficiency: monetary policy tightening, accounting information comparability, and underinvestment.

	I (1)
FCF	0.079***
	(3.71)
TobinQ	−0.007***
	(−5.34)
Comp4*FCF* TobinQ	−2.202***
	(−2.74)
FCF*TobinQ	0.023***
	(3.12)
Comp4* TobinQ	0.558***
	(4.41)
First	0.019***
	(2.59)
Grow	0.062***
	(22.65)
ROE	0.039***
	(4.16)
Lev	0.049***
	(7.75)
Constant	−0.015
	(−1.48)
Ind/Year	Yes
F_Value	55.863
Adj_R^2	0.214
N	6847

Note: I means firm investment; FCF means free cash flow; Comp4 means accounting information comparability; TobinQ means the ratio of market value to assets; First means top large shareholder capital holdings; Grow means operating income growth rate; ROE means the return on equity; Lev means asset–liability ratio. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

Table 14
Robustness tests with substitution of independent variables.

	Invef		Overinv		Underinv	
	(1)	(2)	(3)	(4)	(5)	(6)
Compmed	−0.034		0.043		−0.099***	
	(−1.36)		(0.78)		(−4.63)	
Compa		−0.036		0.058		−0.110***
		(−1.28)		(0.96)		(−4.64)
Grow	0.003***	0.003***	0.005***	0.005***	0.001	0.001
	(3.81)	(3.81)	(2.73)	(2.72)	(1.20)	(1.19)
Cashflow	0.015***	0.015***	0.035***	0.035***	−0.007	−0.007
	(3.03)	(3.05)	(3.31)	(3.31)	(−1.62)	(−1.55)
First	−0.006**	−0.006**	−0.010*	−0.010*	−0.001	−0.000
	(−2.50)	(−2.50)	(−1.93)	(−1.92)	(−0.23)	(−0.22)
Dual	0.001	0.001	0.001	0.001	0.000	0.000
	(1.10)	(1.10)	(0.63)	(0.63)	(0.53)	(0.54)
Dsize	0.000	0.000	0.000	0.000	−0.000	−0.000
	(0.08)	(0.08)	(0.65)	(0.65)	(−0.95)	(−0.96)
CNFO	−0.026**	−0.026**	−0.065**	−0.065**	0.004	0.004
	(−1.99)	(−1.99)	(−2.27)	(−2.26)	(0.38)	(0.37)
Paythree	0.066	0.065	−2.512	−2.479	0.919	0.896
	(0.08)	(0.08)	(−1.42)	(−1.41)	(1.29)	(1.26)
Lev	−0.000	−0.000	0.001	0.001	−0.006***	−0.006***
	(−0.21)	(−0.21)	(0.29)	(0.30)	(−3.23)	(−3.24)
Size	−0.000	−0.000	−0.000	−0.000	−0.001***	−0.001***
	(−0.84)	(−0.81)	(−0.09)	(−0.06)	(−3.49)	(−3.45)
Age	−0.006***	−0.006***	−0.008***	−0.008***	−0.005***	−0.005***
	(−7.10)	(−7.09)	(−4.25)	(−4.24)	(−5.95)	(−5.94)
State	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(−0.24)	(−0.24)	(−0.05)	(−0.04)	(−0.31)	(−0.33)
Constant	0.055***	0.054***	0.062***	0.061***	0.064***	0.063***
	(6.01)	(5.98)	(3.12)	(3.12)	(8.13)	(8.06)
Ind/Year	Yes	Yes	Yes	Yes	Yes	Yes
F_Value	14.919	14.913	6.102	6.111	13.978	13.981
Adj_R^2	0.070	0.070	0.065	0.066	0.103	0.103
N	6877	6877	2696	2696	4181	4181

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Compmed and Compa mean accounting information comparability; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are *t* values, which are all two tailed.

5.4.3. Substitution of the independent variable

Following Chen et al. (2015), we substitute accounting information comparability in regression model (7) with the median (Compmed) and mean (Compa) of accounting information comparability and regress model (7) again. The results are in Table 14, which shows that, in a period of monetary policy tightening, the coefficients of accounting information comparability in the full sample regression in columns (1) and (2) are −0.034 and −0.036, respectively, which are not statistically significant. In the overinvestment group in columns (3) and (4), the coefficient of accounting information comparability is 0.043 and 0.058, respectively, which is not statistically significant. In the underinvestment group in columns (5) and (6), the coefficients of accounting information comparability are −0.099 and −0.110, respectively, which are significant at the level of 1%. This indicates that, in a period of monetary policy tightening, accounting information comparability increases by one standard deviation, and underinvestment decreases by 9.9% or 11.0%.

The regression results show that, in a period of monetary policy tightening, although improving the comparability of accounting information does not significantly inhibit inefficient investment overall, it can significantly reduce underinvestment, which again confirms H2.

5.4.4. Endogeneity test

In this paper, we use the three-stage least squares (3SLS) method to control for a potentially endogenous relationship between investment efficiency and accounting information comparability (see note 7). Based on the previous literature on the research design and the influencing factors of accounting information comparability, we construct the following simultaneous equation models (7) and (11):

$$\text{Comp4}_{i,t} = \beta_0 + \beta_1 \text{Invef}_{i,t} \left(\text{or Overinv}_{i,t} \text{ or Underinv}_{i,t}\right) + \beta_2 \text{Controls}_{i,t} + \sum \text{Ind} + \sum \text{Year} + \varepsilon \quad (11)$$

where the control variables are the influencing factors of accounting information comparability. Drawing on the existing literature, we mainly use as control variables the return on equity (ROE), the price-to-book ratio (Mb), the ratio of

Table 15
Endogeneity test of investment efficiency and accounting information comparability.

	Invef	Comp4	Overinv	Comp4	Underinv	Comp4
	(1)	(2)	(3)	(4)	(5)	(6)
Comp4	−2.169***		−0.187		−3.607***	
	(−4.50)		(−0.19)		(−7.41)	
Invef		−0.011				
		(−0.68)				
Overinv				−0.003		
				(−0.16)		
Underinv						−0.002
						(−0.04)
ROE		0.004***		0.004***		0.004***
		(10.96)		(6.78)		(4.97)
Mb		−0.000***		−0.000**		−0.000***
		(−6.76)		(−2.39)		(−5.05)
Independ		−0.002**		−0.004***		−0.001
		(−2.32)		(−3.50)		(−0.68)
absDA		−0.000		0.000		−0.000
		(−0.51)		(0.58)		(−0.39)
Grow	0.006***	0.000	0.009***	−0.000	0.003***	0.000*
	(9.48)	(1.14)	(7.54)	(−1.18)	(3.94)	(1.69)
Cashflow	0.029***		0.046***		0.008**	
	(7.26)		(5.04)		(1.98)	
First	−0.004**	−0.000*	−0.005	−0.001**	0.001	−0.000
	(−2.12)	(−1.71)	(−1.25)	(−2.26)	(0.59)	(−0.41)
Dual	−0.000	0.000**	−0.001	0.000	−0.000	0.000
	(−0.08)	(2.22)	(−0.45)	(1.54)	(−0.57)	(1.53)
Dsize	0.000	−0.000***	0.000	−0.000***	−0.000	−0.000***
	(1.00)	(−5.06)	(1.26)	(−4.50)	(−0.26)	(−2.98)
CNFO	−0.043***		−0.068**		−0.032***	
	(−3.53)		(−2.43)		(−2.85)	
Paythree	−1.375**		−3.987***		−0.450	
	(−2.23)		(−2.86)		(−0.85)	
Lev	−0.004**	−0.002***	0.003	−0.001**	−0.016***	−0.002***
	(−2.25)	(−8.00)	(0.90)	(−2.49)	(−7.45)	(−4.99)
Size	−0.003***	−0.000***	−0.003***	−0.000***	−0.003***	−0.000***
	(−8.56)	(−8.78)	(−3.81)	(−7.23)	(−9.84)	(−3.10)
Age	−0.006***	−0.000	−0.009***	−0.000	−0.005***	−0.000
	(−10.61)	(−1.47)	(−7.10)	(−0.32)	(−8.01)	(−0.96)
State	−0.001**	−0.001***	−0.000	−0.001***	−0.002***	−0.001***
	(−1.97)	(−8.72)	(−0.10)	(−5.26)	(−2.96)	(−6.58)
Constant	0.099***	0.010***	0.118***	0.012***	0.096***	0.007**
	(14.45)	(7.82)	(7.03)	(7.04)	(15.56)	(2.22)
Ind/Year	Yes	Yes	Yes	Yes	Yes	Yes
N	13741	13741	5415	5415	8326	8326

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; ROE means the return on equity; Mb means the price-to-book ratio; Independ means the ratio of independent directors; absDA means the absolute value of accrued earnings management; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are t values, which are all two tailed.

independent directors (Independ), the absolute value of accrued earnings management (absDA), the growth rate in operating income (Grow), the largest shareholder's capital holdings (First), CEO duality (Dual), board size (Dsize), the asset–liability ratio (Lev), company size (Size), years of listing (Age), and firm ownership (State).

Table 15 reports the regression results of the endogeneity test between investment efficiency and accounting information comparability using the 3SLS method.

Table 15 shows that the coefficient of accounting information comparability (Comp4) in the inefficient investment group in column (1) is −2.169, the coefficient of accounting information comparability (Comp4) in the overinvestment group in column (3) is −0.187, the coefficient of accounting information comparability (Comp4) in the underinvestment group in column (5) is −3.607, and the coefficient of accounting information comparability in columns (1) and (5) are significant at the level of 1%. This indicates that, in a period of monetary policy tightening, accounting information comparability increases by one standard deviation, inefficient investment decreases by 216.9%, overinvestment decreases by 18.7%, and underinvestment decreases by 360.7%. In the model of investment efficiency that affects accounting information comparability, the coefficients of inefficient investment group in column (2), the overinvestment group in column (4), and the underinvestment group in column (6) are not statistically significant. The results in Table 14 show that the impact

of inefficient investment, overinvestment, and underinvestment on accounting information comparability may be lower than the impact of accounting information comparability on inefficient investment, overinvestment, and underinvestment. Considering the endogenous relationship between investment efficiency and accounting information comparability, improving comparability of accounting information can restrain underinvestment and inefficient investment.

Table 16 reports the regression results of an endogeneity test between investment efficiency and accounting information comparability, using the 3SLS method during a period of monetary policy tightening. Table 16 shows that the coefficient of accounting information comparability (Comp4) in the inefficient investment group in column (1) is −1.243, which is significant at the level of 5%; the coefficient of accounting information comparability (Comp4) in the overinvestment group in column (3) is −0.705, which is not significant. The coefficient of accounting information comparability (Comp4) in the underinvestment group in column (5) is −2.453, which is significant at the level of 1%. This indicates that, in a period of monetary policy tightening, accounting information comparability increases by one standard deviation, inefficient investment decreases by 124.3%, overinvestment decreases by 70.5%, and underinvestment decreases by 245.3%. In the model of investment efficiency that affects accounting information comparability, the coefficients of inefficient investment group in column (2), the overinvestment group in column (4), and the underinvestment group in column (6) are not statistically significant.

The results of Table 16 show that the impact of inefficient investment, overinvestment, and underinvestment on accounting information comparability may be lower than the impact of accounting information comparability on inefficient investment, overinvestment, and underinvestment. In a period of monetary policy tightening, the endogenous relationship between investment efficiency and accounting information comparability is considered, improving accounting information comparability can restrain underinvestment and inefficient investment.

6. Conclusions

Based on a cross macro and micro perspective, we use nonfinancial listed firms in China from 2005 to 2019 as a sample in a theoretical analysis and empirical test on the interaction between monetary policy, accounting information comparability, and investment efficiency. We find that a tight monetary policy exacerbates underinvestment and leads to inefficient investment by firms. However, improvement in accounting information comparability can effectively reduce underinvestment in a period of monetary policy tightening and improve investment efficiency. Further research shows that during a period of monetary policy tightening, agency costs and financing constraints can play a significant moderating role in the transmission of accounting information comparability to investment efficiency by firms. Firms with high agency costs and high financing constraints can mitigate the impact of tight monetary policy by improving the comparability of accounting information, which significantly reduces underinvestment and improves the investment efficiency of firms. We find that PEs, which face credit discrimination, can also significantly reduce underinvestment and improve their investment by improving accounting information comparability.

The Chinese government has conducted a tight monetary policy to avoid economic overheating. However, decreasing the money supply and increasing interest rates creates more serious financing constraints for firms, which worsens underinvestment at some firms and is not conducive to sustainable and stable development by firms and the economy as a whole. Firms need to deal with changes in macroeconomic policies, and different microeconomic actors use different measures to address the adjustment and control of macroeconomic monetary policies. Based on our research results, we outline the following implications. Accounting information comparability can effectively alleviate the impact of macroeconomic policies on microeconomic behavior. Improving accounting information comparability can weaken the adverse effects of monetary policy tightening, reduce information asymmetry between management and external investors, relieve external financing pressure, reduce underinvestment by firms, and raise investment efficiency. This effect is more significant at firms with high agency costs and high financing constraints and at PEs. Therefore, accounting information comparability plays a mediating role in the transmission process from macro monetary policy to microeconomic behavior, which enhances the effectiveness of monetary policy; therefore, macroeconomic policy has a positive regulatory effect on microeconomic behavior and promotes healthy development of the macroeconomy.

These implications lead to two main recommendations. First, to determine the most suitable and effective monetary policy for China, the central bank needs to consider additional variables. Policies in developed countries might be not necessarily be adaptable or appropriate for developing countries. Countries should formulate policies based on their particular conditions and implement them accordingly. Second, we should pay attention to accounting information comparability, which is one of the characteristics for determining the quality of accounting information. Horizontal comparability can determine the relative financial status, operating performance, and changes in financial status of different firms, which is helpful for users of accounting information in making the correct decisions. Our study finds that, even in the context of monetary policy tightening, when external financing is more difficult, and underinvestment is more common, improving accounting information comparability can effectively alleviate the negative effect caused by the impact of external economic uncertainty and then improve investment efficiency, which shows the importance of accounting information comparability.

The paper has the following limitations. First, monetary policy is measured only with a dummy variable that equals 1 for tightening and 0 for loosening, and firm-year data are calculated quarterly. But using monthly data would make the results more accurate. Second, as for the measurement of underinvestment, we only use Richardson model and Vogt

Table 16
Endogeneity test of monetary policy tightening, investment efficiency, and accounting information comparability.

	Invef	Comp4	Overinv	Comp4	Underinv	Comp4
	(1)	(2)	(3)	(4)	(5)	(6)
Comp4	−1.243**		−0.705		−2.453***	
	(−2.29)		(−0.72)		(−4.28)	
Invef		0.003				
		(0.14)				
Overinv				−0.018		
				(−0.84)		
Underinv						0.108
						(0.78)
ROE		0.005***		0.007***		0.005***
		(9.09)		(7.13)		(2.61)
Mb		−0.000***		−0.000***		−0.000***
		(−7.96)		(−5.18)		(−4.90)
Independ		−0.001		−0.002		−0.000
		(−0.70)		(−0.79)		(−0.17)
absDA		0.001**		0.002		0.002
		(2.00)		(1.56)		(1.59)
Grow	0.004***	0.000	0.005***	−0.000	0.002**	−0.000
	(4.29)	(0.05)	(2.66)	(−0.72)	(2.55)	(−0.10)
Cashflow	0.026***		0.055***		−0.003	
	(4.77)		(4.62)		(−0.67)	
First	−0.005*	0.000	−0.010*	−0.001	0.002	0.000
	(−1.90)	(0.06)	(−1.82)	(−1.21)	(0.86)	(0.42)
Dual	0.000	0.000**	−0.000	0.000*	0.001	0.000*
	(0.37)	(2.44)	(−0.06)	(1.65)	(0.60)	(1.66)
Dsize	0.000**	−0.000***	0.001**	−0.000	−0.000	−0.000***
	(2.12)	(−3.42)	(2.20)	(−1.38)	(−0.28)	(−2.60)
CNFO	−0.046***		−0.050		−0.047***	
	(−2.64)		(−1.38)		(−2.86)	
Paythree	−2.606***		−5.027***		−1.576*	
	(−2.95)		(−2.76)		(−1.85)	
Lev	−0.003	−0.001***	0.001	0.000	−0.012***	−0.002
	(−0.95)	(−3.92)	(0.24)	(0.23)	(−4.32)	(−1.47)
Size	−0.003***	−0.000***	−0.003***	−0.001***	−0.003***	−0.000
	(−6.65)	(−5.66)	(−3.64)	(−5.39)	(−7.59)	(−0.48)
Age	−0.008***	−0.000	−0.011***	−0.000	−0.005***	0.000
	(−8.34)	(−0.73)	(−5.55)	(−0.72)	(−5.85)	(0.26)
State	0.002*	−0.001***	0.004*	−0.000*	−0.000	−0.001**
	(1.84)	(−3.46)	(1.90)	(−1.86)	(−0.44)	(−2.52)
Constant	0.102***	0.009***	0.123***	0.013***	0.102***	0.000
	(11.53)	(4.41)	(6.54)	(4.89)	(12.04)	(0.02)
Ind/Year	Yes	Yes	Yes	Yes	Yes	Yes
N	6117	6117	2423	2423	3694	3694

Note: Invef means inefficient investment; Overinv means overinvestment; Underinv means underinvestment; Comp4 means accounting information comparability; ROE means the return on equity; Mb means the price-to-book ratio; Independ means the ratio of independent directors; absDA means the absolute value of accrued earnings management; Grow means operating income growth rate; Cashflow means cash-flow level; First means top large shareholder capital holdings; Dual means CEO and board chair duality; Dsize means board size; CNFO means large shareholder tunneling; Paythree means executive compensation; Lev means asset–liability ratio; Size means company size; Age means years of listing; State means state ownership. ***, **, and * indicate that the variables pass the test at the significance level of 1%, 5%, and 10%, respectively. The numbers in parentheses are t values, which are all two tailed.

model to judge whether it exists or not, but we do not measure the extent of underinvestment, which may affect the explanation of economic conclusions in this paper. In future research, we should try to address these problems and study the relationship between monetary policy, accounting information comparability, and investment efficiency more thoroughly.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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