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Full Length Article

Product market competition and financial analysts' forecast quality: The mediating role of financial reporting quality

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Abstract

We reveal the reporting quality channel by investigating the mediating role of financial reporting quality (FRQ) in the relationship between product market competition (PMC) and analysts' forecast quality (AFQ). We analyze a sample of 1179 unique nonfinancial Chinese listed firms, resulting in 6074 firm-year observations, over the period 2007–2016. We employ the Herfindahl-Hirschman Index (HHI) to measure PMC, the modified Jones model to measure FRQ, and analysts' forecast dispersion and accuracy as measures of AFQ. We then apply a three-step mediation model following the Baron and Kenny approach to test our proposed hypotheses. The results of the mediation model support our hypotheses by revealing the mediating role of FRQ in the PMC-AFQ relationship. The results suggest that intense PMC enhances the FRQ of Chinese-listed firms, in turn enhancing AFQ. Our findings present important implications for both current and potential investors, financial analysts, and relevant government regulatory bodies.

JEL classification: G17; M41

Keywords: China; Product market competition; Financial reporting quality

1. Introduction

Financial analysts are an integral part of the capital market and provide information that is useful in decision-making, such as buy/sell recommendations for market participants, including but not limited to brokers, individual investors, and institutional investors (Brown et al., 2015; Lang & Lundholm, 1996). They develop their forecasts mainly from information disclosed by the firm in the form of interim reports, annual reports, interviews with firm executives, formal presentations by executives, and management forecasts (Knutson, 1992; Lang & Lundholm, 1996; Lees, 1981). Financial analysts are the most influential users of a firm's financial reports, as their forecasts represent market expectations of a firm's financial performance and therefore serve as a key information intermediaries (Yu, 2010). Accounting and finance researchers have long since shown great interest in learning about how the accounting numbers are used by financial analysts (Schipper, 1991). Furthermore, these researchers document that investors around the globe incorporate the earnings' forecasts provided by financial analysts into their firm valuation models (Capstaff et al., 2001). In other words, financial analysts' forecasts influence investors' decisions on the allocation of financial resources in the capital market (Almeida and Dalmácio, 2015) and, ultimately, market efficiency.

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Therefore, identifying the important factors that influence the quality of financial analysts' earnings' forecasts is of great interest.

The extant literature has established a significant nexus of product market competition (PMC) with analysts' forecast quality (AFQ), but, at the same time, it fails to provide the exact mechanism or channel through which PMC influences AFQ. For instance, prior research on the relationship between PMC and AFQ can be divided into two important but opposite viewpoints. The first illustrates that enterprises in concentrated industries are characterized by greater market power, abnormal profits, high information certainty, stable future income, and low idiosyncratic risk, resulting in a larger analyst following, lower dispersion in forecasts, and fewer errors in forecasts (see, e.g., Eaton & Lipsey, 1981; Haw et al., 2015; Hou & Robinson, 2006; Shepherd, 1972). The second suggests that intense PMC has favorable implications for AFQ. This stance offers two different explanations of the positive influence of high PMC on AFQ. First, in industries in which a firm's earnings are not stable and future firm performance is uncertain, financial analysts may have more incentives for putting greater effort into obtaining private information about these volatile firms, thus leading them to develop more precise earnings forecasts (Das et al., 1998; Kross et al., 1990; O'Brien & Bhushan, 1990). The second and perhaps more viable explanation is based on the significant impact of PMC on the quantity and the quality of financial information disclosure. The literature provides mixed evidence on the role of intense PMC for both the quantity and quality of financial disclosure (see, e.g., Ali et al., 2014; Hart, 1983; He, 2012; Holmstrom, 1982; Karuna, 2007; Li, 2010; Markarian & Santaló, 2014; Raith, 2003; Verrecchia, 1983).

In this study, we extend prior research on PMC and AFQ by introducing the reporting quality channel as an important potential mediating factor in the PMC-AFQ relationship. Specifically, we examine the mediating role of financial reporting quality (FRQ) in the relationship between PMC and AFQ. The underlying idea is that PMC influences a firm's FRQ (especially earnings quality), which in turn influences AFQ. However, prior research also provides mixed evidence on the influence of PMC on managerial behavior in the context of FRQ (for details, see, e.g., Iqbal et al., 2017).

The motivation for our research question is twofold: first, the significant disagreement in the extant research regarding the nature of the PMC-AFQ and PMC-FRQ relationships as to whether the bright-side or dark-side view is correct; second, the recent call for research to identify the channels that can better explain the PMC-AFQ relationship (see Haw et al., 2015). Our study adds to the literature on the relationship between PMC and AFQ by exploring the mediating role of FRQ in this relationship. This study is the first to build a theoretical model and empirically explore the underlying mechanism in the PMC-AFQ relationship.

Following this introduction, the paper is structured as follows: Section 2 presents the literature review, Section 3 the methods, Section 4 the results, Section 5 the sensitivity analysis, and Section 6 the conclusion.

2. Prior research and development of hypotheses

2.1. PMC and AFQ

The existing studies on the relationship between PMC and AFQ present two important but opposite viewpoints. The first viewpoint suggests that intense PMC deteriorates AFQ. This viewpoint is based on the assumption that enterprises in concentrated industries (low competition) have greater market power, abnormal profits, high information certainty, stable future income, and low idiosyncratic risk, which results in a greater analyst following, lower dispersion in forecasts, and fewer errors in forecasts. For instance, Eaton and Lipsey (1981) argue that firms with greater market power can easily maintain higher profits because of their greater pricing power. Shepherd (1972) and Strickland and Weiss (1976) argue that firms in concentrated industries can obtain monopolistic rents because of their ability to set prices above normal. Additionally, because they can transmit idiosyncratic shocks to consumers and deter competition, such firms have stable earnings and more predictable future financial performance (Gaspar & Massa, 2006; Irvine & Pontiff, 2009), which enables financial analysts to forecast their future earnings more accurately. Recent empirical studies, including Haw et al. (2015) and Almeida and Dalmácio (2015), present more direct empirical evidence on the deteriorating impact of PMC on AFQ.

In contrast, the second viewpoint suggests that intense PMC has favorable implications for AFQ. This viewpoint offers various explanations for the positive influence of intense PMC on AFQ. First, in industries in which a firm's earnings are not stable and future firm performance is uncertain, financial analysts may have more incentives for putting greater effort into obtaining private information about these volatile firms, thus leading them to develop more precise earnings forecasts (Das et al., 1998; Kross et al., 1990; O'Brien & Bhushan, 1990). The second and perhaps more viable explanation is based on the significant impact of PMC on the quantity and quality of financial information disclosure. The literature provides mixed evidence on the role of intense PMC in both the quantity and quality of financial disclosure (see, e.g., Ali et al., 2014; Hart, 1983; He, 2012; Holmstrom, 1982; Karuna, 2007; Li, 2010; Markarian & Santaló, 2014; Raith, 2003; Verrecchia, 1983).

Ali et al. (2014) conclude that enterprises in concentrated industries tend to have low-quality analyst forecasts, less frequent disclosure, and less information transparency, probably to decrease the cost of proprietary disclosure. Similarly, Iqbal et al. (2020) extend the literature by investigating the influence of PMC on AFQ using a sample of Chinese firms. Their study finds that intense PMC leads to less dispersed and more accurate forecasts about Chinese-listed firms. They further argue that the positive effect occurs because of the disciplinary role of intense PMC, which mitigates managerial slack and agency problems (Hart, 1983; Schmidt, 1997).

Although the prior literature on the relationship between PMC and AFQ is mixed, the results in Iqbal et al. (2020) lead us to expect that an increase in PMC will improve AFQ at

Chinese-listed firms, and therefore we posit our first hypothesis as follows:

Hypothesis 1. *An increase in PMC enhances AFQ.*

2.2. PMC and FRQ

Prior research offers two differing views regarding the influence of PMC on managerial behavior. The first view supports the bright side of PMC and presents it as an external disciplinary mechanism. This view holds that intense PMC disciplines managers, promotes economic efficiency, reduces managerial slack and principal-principal as well as principal-agent agency conflicts, overcomes managers' opportunistic behaviors, and leads to high FRQ (see, e.g., Hart, 1983; He, 2012; Raith, 2003; Shleifer & Vishny, 1997).

In contrast, the second view supports the dark side of PMC and argues that PMC exacerbates managerial slack and agency problems, reduces firm efficiency, increases managerial opportunism, leads to aggressive accounting, and deteriorates FRQ (see, e.g., Hermalin & Weisbach, 2007; Karuna, 2007; Markarian & Santaló, 2014; Rotemberg & Scharfstein, 1990; Shleifer, 2004; Verrecchia, 1983).

Iqbal et al. (2017) have a detailed discussion on the relationship between PMC and FRQ, examining the influence of PMC (measured by the Herfindahl-Hirschman Index and the Lerner index) on the reporting quality (measured by a composite measure computed on the basis of both discretionary accruals and accruals quality) at Chinese-listed nonfinancial firms. They conclude that intense PMC as an external disciplinary force overcomes managerial opportunistic behavior and leads to better financial reporting quality. Following Iqbal et al. (2017), we also expect PMC to enhance FRQ and posit our second hypothesis as follows:

Hypothesis 2. *An increase in PMC enhances FRQ.*

2.3. The mediating role of FRQ in the PMC-AFQ relationship

The prior literature identifies PMC as a significant predictor of a firm's financial and nonfinancial disclosure policy (see, e.g., Ali et al., 2014; Cheng et al., 2013; Holmstrom, 1982; Laksmana & Yang, 2014; Li, 2010; Stivers, 2004; Verrecchia, 1983). Similarly, previous research identifies financial and nonfinancial disclosures as significant determinants of AFQ, among other factors (see, e.g., Ali et al., 2014; Eng and Teo, 1999; Hope, 2003; Lang & Lundholm, 1996; Lang et al., 2003; Rajgopal et al., 2003; Vanstraelen et al., 2003; Yu, 2010). Lang and Lundholm (1996) examine the impact of information disclosure on the quality of analysts' earnings forecasts in the US and report that a higher level of information disclosure leads to less dispersed and more accurate forecasts. Ali et al. (2014) arrive at the same conclusion, using industry concentration as a measure of financial information disclosure. In addition, Eng and Teo (1999) explore the link between the level of annual report disclosures and the characteristics of analysts' earnings forecasts at a sample of Singaporean firms. Their empirical findings suggest a significant positive impact of the annual report disclosure level on forecast accuracy but a significant negative impact on forecast dispersion. Consistent with Eng and Teo (1999), Hope (2003) conducts a cross-country study and finds that accounting policy disclosure and the level of annual report disclosure both reduce forecast errors and forecast dispersion. Similarly, financial analysts following firms characterized by a greater information disclosure have less dispersed and more accurate forecasts (Vanstraelen et al., 2003; Yu, 2010).

These prior papers on the role of PMC for a firm's information environment lead us to several conclusions: first, PMC has important implications (both positive and negative) for FRQ; second, PMC has important implications (both positive and negative) for AFQ; and, finally, financial analysts are the major and most influential users of financial reports disclosed by a firm and use information from these reports, especially information regarding earnings, as input in making their forecasts. Given these findings, we argue that if the financial reports disclosed by firms contain more reliable and accurate information, the forecasts provided by the financial analysts based on these reports will have greater accuracy and less dispersion.

Using this analogy and considering the relevant empirical evidence in the Chinese context, as discussed above, we propose our third and main hypothesis as follows:

Hypothesis 3. *FRQ mediates the relationship between PMC and AFQ.*

3. Methods

3.1. Dataset and sample

To test our proposed hypotheses, we obtained data on all nonfinancial Chinese firms from China Stock Market and Accounting Research. We included A-share firms and excluded H- and B-shares (because they are open to international investors and have different reporting requirements). We also excluded firm-year observations with missing data. We obtained 6074 firm-year observations for a final sample of 1179 unique firms over the period 2007–2016. To ensure consistency in our analysis, we do not include observations before 2007 because of the major changes that China implemented in financial reporting standards that year.

3.2. Research design

To empirically test our hypotheses, we employ a three-step process following Muller et al., (2005). In step 1, we model the measurement of AFQ (i.e., FE and FD) as a function of PMC. In step 2, we model FRQ as a function of PMC. The first two steps help us make inferences about H1 and H2. In the final

step, we include both PMC and FRQ in our model as determinants of AFQ (i.e., FE and FD). Following the approach of Baron and Kenny (1986), we examine both the magnitude and statistical significance of the coefficients of PMC in all three steps. H3 states that FRQ has a mediating role in the relationship between PMC and AFQ, in which the independent variable PMC significantly explains the dependent variable AFQ (step 1) and the mediating variable FRQ (step 2). Furthermore, inclusion of the mediating variable FRQ (step 3) should reduce the magnitude and statistical significance of PMC in explaining AFQ. Finally, we observe the coefficient of PMC in step 3 and confirm full mediation if it becomes insignificant, partial mediation if a significant reduction is observed both in magnitude and significance, and no mediation if no significant reduction is observed. To assess the magnitude of the mediation effect, we conduct a Sobel test (1986) with the models.

In addition, assuming that endogeneity is a potential concern in the regression analysis, we follow Antonakis et al. (2014) and take numerous steps to address this issue. The ordinary least square (OLS) estimates are biased if we omit the unobserved characteristics that correlate with our independent variable PMC, and drawing causal inferences based on biased estimates is incongruous (Hasan et al., 2018). Therefore, we control for the unobservable, micro-level, and time-invariant heterogeneity across firms by including firm-fixed effects in our models, while controlling for time trends and economy-wide shocks by including year-fixed effects. The estimation is conducted with the following econometric models:

$$AFQ_{it} = \beta_0 + \beta_1 PMC_{it} + Controls_{it} + \gamma\_i + \delta\_t + \varepsilon_{it} \quad (1)$$

$$FRQ_{it} = \beta_0 + \beta_1 PMC_{it} + Controls_{it} + \gamma\_i + \delta\_t + \varepsilon_{it} \quad (2)$$

$$AFQ_{it} = \beta_0 + \beta_1 PMC_{it} + \beta_2 FRQ_{it} + Controls_{it} + \gamma.i + \delta.t + \varepsilon_{it} \quad (3)$$

where AFQ is analyst forecast quality measured by two forecast characteristics (i.e., FE and FD), PMC is product market competition, and FRQ is the reporting quality measure as an absolute level of discretionary accruals multiplied by −1. We also include γ_i as the firm fixed effect and δ_t as the year fixed effect. Equation (1) estimates the relation between PMC and the measurement of AFQ. Equation (2) estimates the relationship between PMC and FRQ. Similarly, Equation (3) estimates the mediating influence of FRQ on the relationship between PMC and AFQ.

3.3. Variable measurement

3.3.1. Product market competition (PMC)

Competition is the main explanatory variable in this research, and we measure it using the Herfindahl-Hirschman Index (HHI). In addition to its routine use by the market and regulators, HHI is a widely used measure of competition in economics and accounting research (see, e.g., Almeida & Dalmácio, 2015; Gaspar & Massa, 2006; Haw et al., 2015; Iqbal et al., 2020). HHI is commonly defined as the sum of the squared market shares of all firms operating in an industry, as follows:

$$HHI_j = \sum_{j=1}^{n} S_{ij}^2$$

where S_{ij} is the market share of firm i in industry j. As HHI basically measures the level of industry concentration, we multiply it by −1 to interpret it in terms of competition.

$$PMC = HHI^*(-1)$$

where PMC is product market competition. The higher the PMC value, the greater is the competition. Each firm is then assigned the H-index of its industry to indicate the degree of competition at the firm level. Following Hou and Robinson (2006), to avoid grouping unrelated firms together and to ensure a sufficient number of firms in each industry, we distinguish industries using the China Securities Regulatory Commission's (CSRC's) two-digit industry classification codes.

Table 1
Variable definitions.

Variable	Definition	Effect on AFQ (+/−/?)
AFQ	Analysts' forecast quality measured by the forecast accuracy (FA) and forecast dispersion (FD)	
FD	Annual standard deviation of a firm's forecasted EPS, deflated by the share price at the beginning of the period	
FE	Absolute value of the difference between forecasted earnings per share (FEPS) and actual earnings per share (AEPS) and scaled by the share price at the beginning of the period	
FRQ	Financial reporting quality measured by modified Jones model	−
PMC	Product market competition calculated by HHI	−/+
MB	Market-to-book ratio	+
SIZE	Log of total assets	−
ROA	Net income scaled by total assets	−
LEV	Total debt scaled by total assets	+
LOSS	Dummy variable set at 1 if the net income reported by a firm in the previous year is negative; otherwise, 0	+
VOLUME	Natural logarithm of the annual trading volume	+
RETVOL	Standard deviation of the daily stock returns during the year	+
SOE	Dummy variable set at 1 if a firm is state owned; otherwise, 0	−

3.3.2. Financial reporting quality (FRQ)

We use the absolute level of a firm's discretionary accruals as a proxy for our mediating variable FRQ. In the financial

Table 2
Descriptive statistics and correlations.

Panel A. Descriptive statistics

Variables	Obs.	Mean	Median	Std. Dev.	Min.	Max.
PMC	6074	−0.096	−0.083	0.068	−0.367	−0.031
FE	6074	0.013	0.010	0.025	0.000	0.223
FD	6074	0.010	0.009	0.018	0.000	0.085
FRQ	6074	−0.083	−0.057	0.091	−0.583	−0.001
SIZE	6074	21.341	21.203	2.544	16.871	23.240
MB	6074	4.257	3.699	2.672	−5.620	17.585
LEV	6074	0.535	0.179	0.538	0.117	0.830
ROA	6074	0.062	0.122	0.026	−0.061	0.512
RETVOL	6074	0.031	0.025	0.010	0.019	0.513
VOLUME	6074	25.869	25.221	1.571	21.335	28.731
LOSS	6074	0.119	0.101	0.311	0.000	1.000

Panel B. Correlations

Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
PMC	(1)	1										
FE	(2)	−0.044**	1									
FD	(3)	−0.024**	0.297**	1								
FRQ	(4)	0.343**	0.355**	0.281***	1							
SIZE	(5)	0.033*	−0.122**	0.113***	0.332	1						
MB	(6)	−0.031**	−0.013*	−0.043**	0.021*	0.227**	1					
LEV	(7)	0.009***	0.235***	0.241**	−0.033***	−0.137**	−0.133**	1				
ROA	(8)	−0.026**	−0.293**	−0.077**	0.213*	0.194***	−0.152***	−0.056***	1			
RETVOL	(9)	−0.053**	0.049**	0.048**	0.036**	0.047*	0.168**	0.019**	−0.034***	1		
VOLUME	(10)	−0.052	0.113***	0.291**	0.191*	0.473*	0.063*	0.089**	0.037**	0.316***	1	
LOSS	(11)	−0.054**	0.466**	0.257***	0.057**	−0.217**	0.021***	0.291***	−0.433*	0.066*	−0.018**	1

Note: See variable definitions in Table 1. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

reporting literature, the level of discretionary accruals is a widely used measure of a company's FRQ, as a lower level of discretionary accruals represents high earnings quality (see Francis et al., 2005; Jones, 1991). We first estimate nondiscretionary accruals using the modified Jones model developed by Dechow et al. (1995) as follows:

$$NDA_{i,t} = \alpha_1 \frac{1}{Assets_{i,t-1}} + \alpha_2 \frac{\Delta Rev_{i,t} - \Delta Rec_{i,t}}{Assets_{i,t-1}} + \alpha_3 \frac{PPE_{i,t}}{Assets_{i,t-1}} \quad (4)$$

where $NDA_{i,t}$ is a firm's nondiscretionary accruals; $\Delta Rev_{i,t}$ is a change in revenue; $\Delta Rec_{i,t}$ is a change in net receivables; $PPE_{i,t}$ is gross property, plant, and equipment; $Assets_{i,t\text{-}1}$ is total assets; and α_1, α_2, and α_3 are firm-specific parameters. We then use the original Jones (1991) model for each industry-year to generate estimates for parameters α_1, α_2, and α_3 using the CSRC's two-digit industry classification codes.

$$\frac{TA_{i,t}}{Assets_{i,t-1}} = a_1 \frac{1}{Assets_{i,t-1}} + a_2 \frac{\Delta Rev_{i,t} - \Delta Rec_{i,t}}{Assets_{i,t-1}} + a_3 \frac{PPE_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t} \quad (5)$$

where $TA_{i,t}$ is total accruals of a firm i in year t; and a_1, a_2, and a_3 are OLS estimates of α_1, α_2, and α_3.

Total accruals are the difference between net income and cash flows from operations. In addition, we do not include industry years with less than ten observations when estimating the original Jones model. Discretionary accruals are obtained by subtracting nondiscretionary accruals calculated using the modified Jones model from total accruals.

$$DA_{i,t} = TA_{i,t} - NDA_{i,t}$$

We use the absolute level of discretionary accruals, which represent a decrease in FRQ. Therefore, we multiply it by −1, and thus higher values represent a higher reporting quality.

3.3.3. Analysts' forecast quality (AFQ)

AFQ is the main dependent variable in this research. We employ the two widely used proxies to assess the quality of analysts' forecasting activity, namely, forecast error (FE) and forecast dispersion (FD) (see, e.g., Hab et al., 2014). We calculate FE as follows:

$$FE_{i,t} = \frac{\left| FEPS_{i,t}^{t-1} - AEPS_{i,t} \right|}{P_{i,t-1}}$$

where FE is the forecast error; FEPS is forecasted earnings per share; AEPS is actual earnings per share; and $P_{i,t-1}$ is the share

Table 3
The mediating role of FRQ in the relationship between PMC and AFQ.

Variables	FE (1)	FD (2)	FRQ (3)	FE (4)	FD (5)
PMC	−0.089***	−0.054**	0.117***	−0.065*	−0.038*
	(-5.77)	(-2.38)	(5.65)	(-1.87)	(-1.79)
FRQ				−0.031***	−0.102***
				(-3.96)	(-8.29)
SIZE	−0.004**	−0.003	0.008***	−0.001*	−0.001
	(-2.08)	(-0.49)	(6.14)	(-1.88)	(-0.81)
MB	0.007	0.001	−0.002	0.002	0.003
	(1.01)	(1.33)	(-0.61)	(0.61)	(0.65)
LEV	0.013**	0.056**	−0.006*	0.009**	0.024**
	(2.05)	(2.31)	(-1.58)	(2.18)	(2.38)
ROA	−0.044**	−0.008	0.065***	−0.030**	−0.003
	(-2.20)	(-0.75)	(7.71)	(-2.12)	(-1.62)
RETVOL	0.131*	0.073**	−0.013	0.068**	0.088**
	(1.90)	(2.22)	(-0.75)	(2.03)	(2.37)
VOLUME	0.009***	0.005***	−0.082	0.001***	0.001**
	(6.35)	(8.59)	(-0.93)	(6.81)	(2.47)
LOSS	0.009***	0.018***	−0.038***	0.003**	0.027**
	(13.78)	(7.49)	(-3.85)	(2.33)	(2.10)
SOE	−0.029***	−0.009**	0.003***	−0.018**	−0.008**
	(-4.19)	(-2.08)	(3.81)	(-2.07)	(-2.29)
Constant	−0.026**	−0.039**	1.528**	−0.008***	−0.018**
	(-2.16)	(-2.48)	(2.38)	(-4.11)	(-2.31)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes
Firm-fixed effects	Yes	Yes	Yes	Yes	Yes
F-test	41.51***	46.87***	125.70***	61.56***	88.76***
Adjusted R^2	0.202	0.184	0.143	0.253	0.227
Sobel test				P < 0.01	P < 0.01
Indirect effect				0.004	0.012
Direct effect				0.065	0.038
Total effect				0.069	0.050
Mediated total effect				5.8%	24.0%

Note: See variable definitions in Table 1. Figures in parenthesis are *t*-statistics. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

price. A higher value of FE indicates greater forecasting error and lower AFQ.

Similarly, we calculate FD with the following equation:

$$FD_{i,t} = \frac{\text{Std.Dev.}(FEPS_{i,t})}{P_{i,t-1}}$$

where FD is the forecast dispersion; Std. Dev. (FEPS) is the annual standard deviation of FEPS; and $P_{i,t-1}$ is the share price. We calculate these measures on an annual basis for each firm. A higher value of FD indicates greater forecast dispersion and lower AFQ.

3.3.4. Control variables

Following the extant literature, we also control for important predictors of AFQ, including the growth opportunities (*MB*), firm size (*SIZE*), profitability (*ROA*), financial leverage (*LEV*), stock return volatility (*RETVOL*), loss (*LOSS*), trading volume (*VOLUME*), and state ownership (*SOE*) (see, e.g., Hab et al., 2014; Iqbal et al., 2020; Lang & Lundholm, 1996). See Table 1 for variable definitions and their expected signs with AFQ in light of the literature.

4. Results

4.1. Summary statistics and correlations

Panel A of Table 2 reports the summary statistics. PMC has a mean value of −0.096, whereas the mean values for FE and FD are 0.013 and 0.010, respectively. The mean values of FRQ, SIZE, MB, and LEV are −0.083, 21.341, 4.257, and 0.535, respectively. Similarly, ROA, RETVOL, VOLUME, and LOSS have mean values of 0.062, 0.031, 25.869, and 0.119, respectively.

Panel B of Table 2 reports the correlation results. PMC is negatively related to both measures of AFQ (i.e., FE and FD), which suggests that an increase in PMC leads to a decrease in forecast error and forecast dispersion. Additionally, PMC and FRQ are positively associated with each other. The correlations provide preliminary support for our proposed hypotheses.

4.2. Mediation analyses: the role of FRQ in the relationship between PMC and AFQ

Table 3 reports the results of the regression analysis testing the mediating role of FRQ in the relationship between PMC and AFQ measured by FE and FD. We perform a stepwise regression analysis. Columns 1 and 2 report the results from regressing FE (the dependent variable) and FD (the dependent variable) on PMC (independent variable) along with a set of control variables. In column 1, the coefficient on PMC reveals a significantly negative effect of PMC on FE ($p < 0.01$), thus showing that an increase in competition reduces FE, hence enhancing analyst forecast accuracy. In column 2, the coefficient on PMC reveals a significantly negative effect of PMC on FD ($p < 0.01$), thus showing that an increase in competition reduces FD, hence enhancing the AFQ. These results show a positive influence of PMC on AFQ and support H1.

Similarly, column 3 presents the results of regressing FRQ (the mediating variable) on PMC. The coefficient on PMC reveals a significantly positive effect of PMC on FRQ ($p < 0.01$), thus showing that an increase in competition leads to an increase in a firm's financial reporting quality. This disciplining role of PMC on a firm's FRQ supports H2. According to Muller et al., (2005) and Hasan et al. (2018), the relationship of PMC (IV) with FE (DV), FD (DV), and FRQ (MV) must be significant to confirm the mediating role of FRQ in the relationship between PMC and forecast quality (i.e., FE and FD). Furthermore, controlling for PMC, FRQ must have a significant effect on FE and FD, and the main effect of PMC should decrease substantially in both magnitude and statistical significance.

In columns 4 and 5, after controlling for PMC, FRQ has a significantly negative coefficient ($p < 0.01$), and the significance level and the magnitude of PMC drop substantially. This significantly negative coefficient on FRQ shows that a

Table 4
Using accruals quality as an alternate proxy for FRQ.

Variables	FE (1)	FD (2)	ACC_QLTY (3)	FE (4)	FD (5)
PMC	−0.089***	−0.054**	0.118***	−0.059	−0.039*
	(-5.77)	(-2.38)	(6.47)	(-0.91)	(-1.79)
ACC_QLTY				−0.028***	−0.117***
				(-3.96)	(-8.29)
SIZE	−0.004**	−0.003	0.017**	−0.009*	−0.008
	(-2.08)	(-0.49)	(2.44)	(-1.87)	(-0.76)
MB	0.007	0.001	−0.002	0.002	0.003
	(1.01)	(1.33)	(-0.61)	(0.59)	(0.63)
LEV	0.013**	0.056**	−0.029***	0.009**	0.028**
	(2.05)	(2.31)	(-8.58)	(2.22)	(2.21)
ROA	−0.044**	−0.008	0.015***	−0.029**	−0.003
	(-2.20)	(-0.75)	(7.71)	(-2.33)	(-1.51)
RETVOL	0.131*	0.073**	−0.017	0.054**	0.067**
	(1.90)	(2.22)	(-0.88)	(2.28)	(2.41)
VOLUME	0.009***	0.005***	−0.019	0.004***	0.004**
	(6.35)	(8.59)	(-0.83)	(7.11)	(2.47)
LOSS	0.009***	0.018***	−0.068***	0.004**	0.018***
	(13.78)	(7.49)	(-11.21)	(2.09)	(6.23)
SOE	−0.029***	−0.009**	0.025**	−0.018**	−0.008**
	(-4.19)	(-2.08)	(2.31)	(-2.07)	(-2.29)
Constant	−0.026**	−0.039**	0.926***	−0.006***	−0.043**
	(-2.16)	(-2.48)	(6.71)	(-5.08)	(-2.32)
Year-fixed effects	Yes	Yes	Yes	Yes	Yes
Firm-fixed effects	Yes	Yes	Yes	Yes	Yes
F-test	41.51***	46.87***	98.35***	73.44***	57.43***
Adjusted R^2	0.202	0.184	0.23	0.284	0.267
Sobel test				P < 0.01	P < 0.01
Indirect effect				0.003	0.014
Direct effect				0.059	0.039
Total effect				0.062	0.053
Mediated total effect				4.8%	26.4%

Note: See variable definitions in Table 1. Figures in parenthesis are *t*-statistics. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

rise in the reporting quality leads to a reduction in forecast errors and dispersion, and vice versa. To assess the magnitude of the mediation effect, we conduct a Sobel (1986) test for both measures of analyst forecast quality (FE and FD), as shown in columns 4 and 5. The results reveal a significant ($p < 0.01$) decline of 5.8 percent and 24 percent in the case of FE and FD, respectively. Also, for FE, the direct, indirect, and total effects are 0.065, 0.004, and 0.069, respectively. Similarly, for FD, the direct, indirect, and total effects are 0.038, 0.012, and 0.050, respectively. Thus, the results support H3.

Our findings on the relationship between PMC and AFQ are in line with those of Ali et al. (2014) and Iqbal et al. (2020), who suggest that an increase in PMC enhances AFQ. However, our results are in sharp contrast to those of Hab et al. (2014), who suggest a negative impact of PMC on AFQ. Similarly, our findings on the PMC-FRQ relationship support the bright-side view of competition, which holds that PMC improves FRQ (see, e.g., Hart, 1983; Laksmana & Yang, 2014; Schmidt, 1997). More broadly, our results confirm previous research that identifies PMC as a significant predictor of a firm's financial and nonfinancial disclosure policy (see, e.g., Ali et al., 2014; Holmstrom, 1982; Laksmana & Yang, 2014; Li, 2010; Stivers, 2004; Verrecchia, 1983). Further, our mediation analysis supports previous research that identifies both financial and nonfinancial disclosure, among other factors, as significant determinants of AFQ. Overall, the results of this study provide further theoretical and empirical evidence on the disciplinary role of PMC (see, e.g., Hart, 1983; He, 2012). Finally, the results for the control variables corroborate prior literature.

5. Robustness analysis

We carry out a robustness analysis to further confirm our main findings. The results in Table 4 are similar to those in Table 3 using an alternative proxy (i.e., Accruals Quality, denoted ACC_QLTY for the mediating variable FRQ). To calculate our variable ACC_QLTY, we employ the model by Francis et al. (2005). Using the CSRC's two-digit industry classification codes, we estimate the following equation for each industry year:

$$TCA_{i,t} = \phi_{o,i} + \phi_{1,i}CFO_{i,t-1} + \phi_{2,i}CFO_{i,t} + \phi_{3,i}CFO_{i,t+1} + \phi_{4,i}\Delta \mathrm{Re}v_{i,t} + \phi_{5,i}PPE_{i,t} + v_{i,t} \quad (6)$$

where $TCA_{i,t}$ represents total current accruals of firm i in year t and is calculated as the Δ in current assets less the Δ in current liabilities less the Δ in cash plus the Δ in the short-term debt of

firm i in year t. *CFO* represents cash flows from operations, ΔRev is the change in revenue, and PPE is the gross property, plant, and equipment. We deflate all the variables with average total assets and drop industry years with less than ten observations. ACC_QLTY for a given firm-year is then calculated as the standard deviations of firm-specific residuals obtained from this equation from year t-4 to t. As a higher standard deviation indicates poor accruals quality, we multiply it by -1 to simplify the interpretation. Thus, a higher value denotes higher accruals quality and ultimately higher reporting quality.

In columns 1 and 2 of Table 4, we re-report the regression analysis of PMC with FE and FD. Column 3 shows the results from regressing ACC_QLTY (MV) on PMC (IV). The coefficient on PMC reveals a significantly positive effect of PMC on ACC_QLTY ($p < 0.01$), thus showing that an increase in competition enhances accruals quality, hence enhancing a firm's FRQ. Then, in columns 4 and 5, after controlling for PMC, ACC_QLTY has a significantly negative coefficient ($p < 0.01$), and the significance level and the magnitude of PMC drop substantially. This significantly negative coefficient on ACC_QLTY shows that a rise in accrual quality leads to a reduction in both errors and dispersion in forecasts. We again conduct Sobel test to assess the mediation effect of ACC_QLTY for both measures of AFQ (FE and FD), as shown in columns 4 and 5. The results reveal a significant ($p < 0.01$) decline of 4.8 percent and 26.4 percent for FE and FD, respectively. Also, for FE, the direct, indirect, and total effects are 0.0.059, 0.003, and 0.062, respectively. Similarly, for FD, the direct, indirect, and total effects are 0.039, 0.014, and 0.053, respectively. The results from our additional analysis confirm our main findings. The coefficients on control variables are consistent with those in Table 3.

6. Conclusion

This study extends prior research on PMC and AFQ by proposing reporting quality as an important potential channel in the PMC-AFQ relationship. Specifically, this study examines the mediating role of FRQ in the relationship between PMC and AFQ. The underlying idea is that PMC influences a firm's FRQ (especially earnings quality), which in turn influences AFQ. This research uses the HHI to measure PMC, the modified Jones model developed by Dechow et al. (1995) to measure FRQ, and analyst forecast accuracy and forecast dispersion as measures of AFQ. Further, this study employs a three-step mediation model following the Baron and Kenny (1986) approach to estimate the proposed mechanism. The results of the mediation model support our hypotheses by revealing the mediating role of FRQ in the relationship between PMC and AFQ, thus suggesting that PMC enhances the FRQ of Chinese-listed firms, in turn enhancing their AFQ.

Our findings on the relationship of PMC with AFQ are in line with those of Ali et al. (2014) and Iqbal et al. (2020), who suggest that an increase in PMC enhances AFQ. However, our results are in sharp contrast to those of Hab et al. (2014), who suggest a negative impact of PMC on AFQ. Similarly, our findings on the PMC-FRQ relationship support the bright-side view of competition, which states that PMC improves FRQ (see, e.g., Hart, 1983; Laksmana & Yang, 2014; Schmidt, 1997). More broadly, our results confirm previous research that identifies PMC as a significant predictor of a firm's financial and nonfinancial disclosure policies (see, e.g., Ali et al., 2014; Cheng et al., 2013; Holmstrom, 1982; Laksmana & Yang, 2014; Li, 2010; Stivers, 2004; Verrecchia, 1983). Further, our mediation analysis confirms previous research that identifies both financial and nonfinancial disclosures, among other factors, as significant determinants of AFQ (see, e.g., Ali et al., 2014; Eng and Teo, 1999; Hope, 2003; Lang et al., 2003; Lang & Lundholm, 1996; Rajgopal et al., 2003; Vanstraelen et al., 2003; Yu, 2010). Overall, the results of this study provide further theoretical and empirical evidence on the disciplinary role of PMC (see, e.g., Hart, 1983; He, 2012).

Our findings have a few important implications. First, as PMC overcomes managerial opportunistic behavior and significantly improves the quality of the financial reports disclosed, investors' decisions based on accurate numbers are expected to be more economically useful. Second, given the disciplinary role of PMC in China, before developing their forecasts, financial analysts must consider the nature of the industry competition. In the case of concentrated industries, they must be cautious about using financial reports as inputs in developing their forecasts. Third, given the poor quality of the Chinese corporate governance system, the relevant government regulatory bodies should encourage competition as an external disciplinary mechanism, representing an effective alternate to traditional corporate governance. We also encourage future research to identify and reveal more channels and related contingencies in the PMC-AFQ relationship.

Declaration of competing interest

There is no conflict of interest.

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