**High-speed rail network and earnings management techniques usage trade-off: The moderating effects of governance and religion**

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**Abstract**

**Purpose** – This study investigates the impact of the development of high-speed rail network (HSR) on earnings management, especially on the trade-off between the usage of accruals-based earnings management (AM) and real earnings management (RM) techniques, and consequently, examines the extent to which the HSR network–earnings management nexus is moderated by governance and religion factors.

**Design/methodology/approach** – Using a sample of Chinese A-listed firms over a 11-year period, this study uses regression techniques as the baseline methodology, while controlling for industry and year fixed-effects. We also employ endogeneity tests (including instrumental variable method, Generalized Methods of Moments (GMM) estimation, and difference-in-difference (DID)) and different robustness checks.

**Findings** – The key findings are threefold. First, the HSR network development reduces AM. This suggests that the presence of HSR network is effective in reducing information asymmetry. Second, the use of RM technique increases with the HSR network development. This indicates that managers do not seem to engage in less earnings management with the HSR network development, but instead appear to switch from the easy-to-detect AM to the more costly RM approach. Finally, the HSR network and earnings management nexus is moderated by governance and religion factors.

**Originality/value** – This study provides new evidence on the trade-off between AM and RM by managers, and pioneers in examining the impacts of governance and religion factors on the relationship between HSR network and trade-off of earnings management techniques.

**Keywords**: High-speed rail network; accruals-based and real earnings management techniques; information asymmetry; governance and religion; China.

**JEL Classification**: M41, M10

**Paper type**: Research paper

1. **Introduction**

In July 2016, China announced a new ambitious “Mid- and Long-Term Railway Network Plan”, projecting that its high-speed rail (HSR) track length would reach 38,000 km by 2025. According to the latest report from the National Railway Administration of China, the HSR track length in operation had reached 42,000km by the end of 2022, achieving and exceeding the target length in advance. Also, the International Union of Railways (UIC) declared that China’s HSR track length was not only the largest in the world, but also accounted approximately for two-thirds of the entire HSR track worldwide. China has basically formed a network of “eight horizontal lines and eight vertical lines”, making 93% of the cities with over half a million population covered by high-speed rail. This significant development of the high-speed rail network makes China more economically competitive and connects the distant regions of this vast country as never before (Amos *et al*. 2010). In addition, HSR trains can be operated at a maximum speed of 300 km/h, which has its absolute advantage over traditional railways and highways, substantially reducing the travel time between cities and enhancing connectivity and accessibility (Jiao et al. 2020). It is widely recognized that HSR development has brought about enhanced mobility of human resources, capital, and other resources (Zhang *et al.* 2020b), largely improving the resources’ efficiency.

Prior studies have, for example, examined the effects of HSR development on: (i) tourism growth (Chen and Haynes 2015; Gao *et al.* 2019); (ii) railroad network accessibility and connectivity (Xu *et al*. 2018); (iii) environment (Chen *et al*. 2016); and (iv) macro-economy (Jiang et al. 2016; Yao *et al*. 2019). At the macro-economic level, the impact of HSR development has been discussed via improvement in regional accessibility, and reduction in transportation costs (Chen *et al*. 2016). At the firm level, recent studies (Zhang *et al.* 2020a) show that the development of the HSR network improves analysts’ forecasting accuracy and reduces the degree of information asymmetry. In particular, these studies emphasize that the development of the HSR network improves travel efficiency and facilitates communication and information flow among internal and external corporate stakeholders.

However, an important question that arises is whether the HSR network can reduce opportunistic managerial activities that may arise from information asymmetry. This question is important because it may not only help in evaluating the HSR impacts from a wider perspective and resulting in a more comprehensive assessment of the benefits of HSR development, but also guide firms to fairly identify the consequences of HSR development. Furthermore, in the context of business ethics, managerial opportunistic behaviour, such as earnings management, is viewed as unethical with respect to the negative consequences that earnings management could lead to. In particular, prior studies indicate that earnings management undertaken solely to satisfy managers’ personal goals (e.g., increased bonus or a positive performance evaluation) is unethical (Douglas and Wier 2000). Therefore, as an important ethical issue in accounting, studies exploring the determinants of earnings management have always been popular (e.g., corporate governance mechanism) (Yu 2008; Fan *et al.* 2021), geographic dispersion (Shi *et al*. 2015; Li *et al*. 2021), and religion (Cai *et al*. 2020; Du *et al*. 2015), among other factors. However, the link between modern transport infrastructure development and managerial accounting decision is rarely examined. Furthermore, in this study, we address whether managers choose RM instead of AM with the development of HSR because this switch can be more costly for firms in the future, seriously impairing shareholders’ value. This study is expected to draw the attention of firms’ external monitors (e.g., auditors, analysts), who are assumed to protect shareholders’ benefits. Since RM is hard to detect for auditors, our study can help auditors to better appreciate this more harmful earnings manipulation, and consequently avoiding the risk of reputation loss for auditors and enhancing audit quality.

In this case, we argue that the potentially better information environment that may result from HSR development can strengthen the capacity of internal and external stakeholders to monitor opportunistic managerial behaviour, such as earnings management, which is often used by managers to conceal the true firm performance in order to protect their private perquisites. Under such strict regulatory conditions, we contend that as AM is relatively easier to detect, and therefore, likely to be costly for managers to employ, they may be motivated to switch to other difficult-to-detect earnings management methods in order to continue to protect their private benefits (Zalata *et al*. 2019; Cohen *et al*. 2008).

In addition, we also expect that a number of extra factors may potentially affect or moderate the relationship between the development of the HSR network and earnings management. Specifically, we expect the level of earnings management activities to differ from firm to firm, particularly in two ways, the: (i) level of managerial monitoring/good governance, as measured by agency costs, analyst coverage, independent directors, and abnormal audit fees (Burgstahler and Eames 2006); and (ii) managerial ethical-orientation, as measured by the degree of religious values and morality held by managers (Cai *et al*. 2020; Chen *et al*. 2013). First, in terms of good governance, we expect firms with higher agency costs to be more likely to conduct earnings management (Bergstresser and Philippon 2006), while firms with a high proportion of independent directors and high analyst coverage often tend to be subjected to intense external monitoring, resulting in less earnings management activities (Yu 2008). Also, positive abnormal audit fees are related to lower earnings quality because auditors are easily affected by firm management in this situation; while negative abnormal audit fees are associated with higher earnings quality as auditors have little to lose if they exert more stringent monitoring (Larcker and Richardson 2004). Second, with respect to ethics/religion, we expect firms dominated by managers with strong religious beliefs, ethics, and values to engage in less earnings management in contrast to their non-religious counterparts (Du *et al*. 2015). We, therefore, argue that the improved information environment that is often brought about by the development of the HSR network could have distinct effects on earnings management in those firms. Accordingly, we further examine the moderating effects of governance in the form of agency costs (Bergstresser and Philippon 2006), independent directors (Osma 2008) , analysts following (Sun and Liu 2016), and abnormal audit fees (Larcker and Richardson 2004) along with religion (El Ghoul *et al*. 2012), respectively, on the relation between HSR network and earnings management.

Consequently, we make a number of new contributions to the extant accounting and auditing literature. First, we contribute to the existing financial reporting research by demonstrating that the development of the HSR network reduces AM by improving communication and information flow, thereby reducing information asymmetry among internal and external stakeholders of the firm. Second, we provide new evidence on the trade-off between AM and RM by managers. In particular, we provide novel insights into the financial reporting consequences of the development of HSR network in China by providing new evidence that suggests that firms switch from AM approach to RM technique when HSR networks increase, with existing evidence indicating that RM is more harmful than AM regarding long-term firm value (Kim and Sohn 2013).

Finally, prior studies indicate that different mechanisms determine firms’ engagement in earnings management, including (i) governance factors, such as agency costs (Bergstresser and Philippon 2006), analyst coverage (Yu 2008), and abnormal audit fees; and (ii) religiosity/religion (Du 2013). Nevertheless, to the best of our knowledge, none of the existing studies have examined the impact of these mechanisms on the effect of HSR network development on earnings management and/or trade-offs between different earnings management techniques. Therefore, we extend, as well as contribute to the extant literature by providing new evidence that suggests that: (a) higher agency costs strengthen the relationship between the HSR and earnings management; (b) religion and independent directors tend to curb that relationship by reducing managerial opportunism through improved monitoring and good governance; (c) increased analyst coverage increases the use of RM; and (d) higher abnormal audit fees strengthen the impact of HSR network on RM.

In the remainder of the paper, Section 2 reviews prior literature and develops research hypotheses; Section 3 discusses the methodology; Section 4 discusses the empirical results; Section 5 performs additional analysis, and the final section concludes the paper.

**2. Literature review and hypotheses development**

***2.1 HSR network and earnings management***

Recent studies show that HSR development eases transport and communication between firms and their stakeholders (Zhang *et al.* 2020a; Yang *et al.* 2019). Yang *et al*. (2019), for example, argue that the HSR network enhances information flow by reducing geographical barriers to communication and information flow. This enhances both the extent of analysts’ coverage and forecasting accuracy. Furthermore, *Zhang et al.* (2020a) also suggest that the geographic proximity that is usually achieved through the development of HSR can increase the rate at which institutional investors can pay a visit to company locations, and thereby enhance information flow and the monitoring of opportunistic managerial behaviour. The HSR development can also improve corporate investment efficiency (Wu et al. 2022) and labor investment efficiency *(Li et al.* 2023) through strengthening monitoring by external stakeholders and reducing information asymmetry.

It has been shown that geographically diverse firms (e.g., parent and subsidiary companies) have complex organizational structures, resulting in higher costs to monitor managerial decisions. Also, such firms are less transparent, which makes it difficult for financial analysts to analyze their performance (Duru and Reeb 2002). Hence, Vasilescu and Millo (2016) suggest that geographically diverse firms are subject to higher information asymmetry. However and since HSR development is effective in reducing information asymmetry between firm external and internal stakeholders (Zhang *et al.* 2020a), we infer that HSR network development in parent and subsidiary companies may constrain managers’ earnings management activities.

A stream of literature has examined the motives of AM. Zingales (1994) and Shleifer and Vishny (1997), for instance, indicate that if insiders’ private control benefits are detected by outsiders, insiders are likely to face outsiders’ disciplinary action. Thus, in order to protect their private control benefits from detection, insiders have incentives to conceal the firm’s true performance through opportunistic earnings management (Xi and Xiao 2022). Numerous studies have identified factors that constrain AM. For example, some studies propose that an effective legal system can protect outsiders by conferring on them the right to discipline insiders, or by enforcing contracts designed to limit insiders’ private control benefits (La Porta *et al*. 1998). Also, some studies provide evidence that high auditing quality can reduce insiders’ incentives for AM (Khurana and Raman 2004).

Recent studies suggest that further improved communication and information acquisition environment that is required by accounting standards, such as comparability and conditional conservatism are useful to restrain AM (Sohn 2016; García Lara *et al*. 2020). Specifically, Zang (2012) outlines the factors that affect AM, including the presence of high-quality auditors, heightened scrutiny of accounting practice, and firms’ accounting flexibility. Accordingly, we suggest that the development of HSR may be another factor that helps in mitigating managers’ motives for AM as HSR has the same function as other factors in making the information environment more transparent. If a firm is located in a city with a developed HSR network, it is likely to be less costly and easier for financial analysts, external auditors, shareholders, and other regulators to visit the firm place to have face-to-face communication with managers, reducing information asymmetry between firm managers and shareholders and strengthening monitoring on firm’s activities (e.g., financial reporting). Consequently, managers are less willing to engage in AM considering the risk of detection. Based on the above analysis, we posit the first hypothesis as:

***Hypothesis 1:*** *AM decreases with the development of the HSR network in parent-subsidiaries’ locations.*

Moreover, Cohen *et al*. (2008) indicate that the passage of the Sarbanes-Oxley Act (SOX) made managers switch from AM to RM due to the enhanced scrutiny relating to accounting practice. Cohen and Zarowin (2010) indicate that managers tend to decrease AM, while increasing RM around seasoned equity offerings. The above two studies both show that the stringent regulatory environment makes AM more costly. Subsequent research by Doukakis (2014) further reaffirms that managers compare the related costs of AM and RM when choosing between these two earnings management techniques. Managers will usually choose RM when the cost of AM is higher, and vice-versa (Zang 2012; Broye and Johannes 2023).

In this case, the development of the HSR network in parent-subsidiaries’ locations can lead to an increase in AM cost because the improved information environment makes AM easy to detect. Given this, we suggest that managers are likely to switch to RM when AM is limited because managers still need to maintain the level of reported earnings to conceal their private control benefits (Cohen and Zarowin 2010). In addition, RM is difficult to detect and less subject to external scrutiny (Roychowdhury 2006). Accordingly, we posit our second hypothesis as:

***Hypothesis 2:*** *RM increases with the development of the HSR network in parent-subsidiaries’ locations.*

***2.2 HSR network and earnings management: Moderating role of corporate governance***

A good corporate governance framework aims to maximize the benefits of all stakeholders. In the early 2000s, many stock exchanges and securities regulators around the world issued corporate governance codes in direct response to a number of corporate governance crises. China followed this trend and issued the “Code of Corporate Governance for Listed Companies in China” in January 2002. The content specifies the duties and responsibilities of shareholders, the board of directors, supervisors, and other stakeholders. Particularly, chapter 7 of this code relates to information disclosure. In general, these disclosure requirements seek to improve the information asymmetry between the management and stakeholders (Gaa 2009). Consequently, strong corporate governance leads to less earnings management activities (Dechow *et al*. 1996; Klein 2002).

Theoretically, agency costs arise from the agency conflict between owners and managers of a firm. Firms with high agency costs are represented by weak owners’ monitoring and serious information asymmetry (Jensen and Meckling 1976). Managers can take advantage of less intense owners’ supervision to maintain their private control benefits through AM practices (Bergstresser and Philippon 2006). Also, information asymmetry could lead managers to mispresent the true firm performance (Wang *et al*. 2018). Overall, AM activities are more active in firms with high agency costs. For firms with high agency costs, they can rely on high-speed rail networks to reduce information asymmetry and constrain AM. Hence, we predict that the trade-off effect between AM and RM will be more pronounced for firms with high agency costs. Based on the above, we propose the following hypothesis:

***Hypothesis 3a:*** *The effect of the HSR network on the trade-off between AM and RM is stronger in firms with high agency costs.*

In addition, the independence of the board plays a crucial role in ensuring good corporate governance. For example, independent directors can monitor managerial opportunism, with existing research indicating that a high proportion of independent directors on boards can reduce AM (Klein 2002). In addition, Osma (2008) concludes that board independence can also lower real earnings management. Therefore, we conjecture that the effect of the HSR network is less valuable in firms with a high proportion of independent directors since the firms are already under a stricter regulatory environment. Hereby, we posit the following sub-hypothesis as:

***Hypothesis 3b:*** *The effect of the HSR network on the trade-off between AM and RM is weaker in firms with a high proportion of independent directors.*

Further, financial analysts are a group of people employed by brokers, investment advisory services, and institutional investors (Jensen and Meckling 1976). Current studies indicate that analysts perform a vital monitoring role in corporate governance mechanisms (Degeorge *et al*. 2013). In particular, the external monitoring role is achieved through two major channels. Firstly, financial analysts track firms’ financial statements on a regular basis and directly raise questions t management on earnings performance (Zhou 2019).

Second, analysts distribute public and private information to investors through research reports and media. Consequently, Yu (2008) proposes that high analyst coverage can significantly reduce AM practices because of enhanced outside scrutiny. Regarding RM, Sun and Liu (2016) suggest that firms with high analyst coverage engage more in RM. They explained their results from two aspects. On the one hand, managers face more pressure to meet earnings benchmarks when the number of analysts following firms is high. On the other hand, high analyst coverage leads to stricter outside monitoring, and consequently, managers resort to RM in order to achieve earnings targets. In this case, high analyst coverage can be expected to result in less AM and more RM, and thus, we expect the substitution effect from AM to RM to be less sensitive to the HSR network when firms are covered by more analysts. We thus predict that the effect of the HSR network on the trade-off between AM and RM is weaker for firms with high analyst coverage. We propose our next sub-hypothesis as:

***Hypothesis 3c:*** *The effect of the HSR network on the trade-off between AM and RM is weaker in firms with high analyst coverage.*

Auditors, as another important external monitor for firms, are assumed to change their behaviors on accounting requirements depending on the abnormal audit fees paid by client firms (Larcker and Richardson 2004). Specifically, in terms of the economic bonding view (Choi et al. 2010), abnormally high audit fees are indicative of lower audit quality because auditors may lose independence when they receive extra benefits from clients (Asthana and Boone 2012). On the contrary, abnormally low audit fees are associated with higher audit quality as auditors can implement stricter accounting requirements without losing additional revenue. Hence, we expect that the relationship between the HSR network and the trade-off between AM and RM is weakened in firms with abnormally high audit fees as auditors may not take advantage of the HSR convenience in order to earn extra benefits from client firms. We posit the following sub-hypothesis as:

 ***Hypothesis 3d:*** *The effect of the HSR network on the trade-off between AM and RM is weaker in firms with abnormally high audit fees.*

***2.3 HSR network and earnings management: Moderating role of religion***

Religious tradition in China has a very long history. Buddhism and Taoism have settled in China for about 2,000 years. Although religious activities were seriously repressed during the period of the Cultural Revolution, the number of religious people and all kinds of religious activities have been growing fast after the Cultural Revolution with the strong support of country leaders and legislation (Cai et al. 2020). As of 2018, the number of religious people is around 0.2 billion in China, which is far more than the amount of Chinese Communist Party members, with a large number of corporate executives, directors, and employees (Li and Cai 2016). Also, many people who are not officially affiliated with a given religion practice religions or donate to religious facilities (Cai et al. 2020). Meanwhile, religious development in China is diverse and inclusive. Various religious groups keep harmonious coexistence. Therefore, Cai *et al*. (2020) claim that religious influence in China is economically significant, even though China is widely believed to be a non-religious country. Previous studies address the effect of religion on agency problems (Du 2013) or financial reporting irregularities. Until recently, Du *et al*. (2015) first directly linked religion to earnings management in China, and their evidence demonstrated a significant negative correlation between religion and earnings management in China. They argue that religion works as a social norm and affects local managers’ decisions regardless of their specific religious denomination (El Ghoul *et al*. 2012). They explicitly explain why earnings management is unethical from Buddhist and Taoist religious practices. Nevertheless, earnings management activity in Du *et al*. (2015) is limited to AM, while earnings management techniques include others, such as RM. A recent study by Cai *et al*. (2020) extends Du *et al*. (2015) research and find that religion has a positive association with RM. Similar to the above analysis in analyst coverage, we suggest that the potential switch from AM to RM may be mitigated by HSR development in firms located in religious areas. We hence propose the last hypothesis as:

***Hypothesis 4:*** *The effect of the HSR network on the trade-off between AM and RM is weaker in firms located in strong religious areas.*

**3. Data and research design**

***3.1 Sample selection***

To conduct this study, we use the sample of Chinese A-share listed firms over the 2008-2018 period. We start from 2008 because China’s first HSR network was put into operation in April of 2007. The data is extracted from the China Stock Market and Accounting Research database (CSMAR) and the RESSET database. We obtain data on HSR routes in parent and subsidiaries’ locations by hand collection. After matching the HSR network data with accounting information for sample firms, we then perform following criteria: (i) we exclude firms with negative equity or revenue due to the going-concern principle; (ii) we also exclude firms in the financial and insurance industries; (iii) we further delete firms that have been listed for less than one year or have not continuously disclosed their financial data for at least two years. Finally, firms without the full data required to be able to estimate the model are eliminated from the final sample. The final sample has 3,097 listed firms and 24,229 firm-year observations. In line with past studies, we winsorize all continuous variables at the top and bottom 1% in order to address possible outlier problems.

***3.2 Variables measurement***

***3.2.1 Measurement of the HSR network in parent-subsidiaries’ locations***

Following past studies (Li *et al*. (2018), we develop two proxies to measure the degree of HSR network in parent-subsidiaries’ locations (*Ln\_HSR* and *Mea\_HSR*). *Ln\_HSR* is calculated by taking the natural log of the number of HSR routes in the cities, where parent and subsidiary companies are located plus one. We compute *Mea\_HSR* by dividing the number of HSR routes in parent and subsidiaries’ locations by the number of parent and its subsidiaries. The higher *Ln\_HSR* and *Mea\_HSR*, the more developed the HSR network in parent-subsidiaries’ locations.

***3.2.2 Measurement of earnings management***

We use discretionary accruals to proxy for AM. Discretionary accruals are the difference between companies’ actual total accruals and the normal portion of accruals. Following Jones (1991) and Dechow *et al*. (1995), we employ the Jones model and modified Jones model to obtain *DA\_J* and *DA\_AJ* as our proxies for AM[[1]](#footnote-1).

As for RM, we follow Roychowdhury (2006) and Cohen and Zarowin (2010) to measure real earnings management in three ways: (i) abnormal cash flow from operations (*ACFO*); (ii) abnormal production costs (*APROD*); and (iii) abnormal discretionary expenses (*AEXP*). In addition, we follow Cohen and Zarowin (2010) to create one comprehensive measure *RM1[[2]](#footnote-2).* Based on the principle of these RM measures, lower *ACFO*, *AEXP*or higher *APROD*implies a greater level of RM. Overall, the higher *RM1*, the greater the extent of RM.

However, Cohen and Zarowin (2010) also noted that using *RM1* alone may not be sufficient because the three individual measures underlying *RM1* have different implications for earnings. Therefore, we conduct regression by separately using the comprehensive RM measure (*RM1*), as well as the three individual RM proxies (*ACFO, AEXP* and *APROD*), as dependent variables.

***3.2.3 Measurement of moderating mechanisms***

To analyze the moderating effects of (i) governance, including agency costs, independent directors and financial analysts and (ii) religion, we define several new variables. First, we measure agency cost (*Agent\_cost*) using the sum of selling, general, and administrative expenses scaled by sales revenue (Du 2013). Further, to control for the industry-year difference, we replace *Agent\_cost* with *Agent\_cost\_med*, which equals to *Agent\_cost* minus the industry-year median value. Second, independent director (*IND*) is measured by using the proportion of independent directors in the BOD. Third, we measure analyst coverage (*Analyst*) by taking the natural log of the number of analysts following one firm plus one (Degeorge *et al*. 2013). Fourth, we follow the method used by Larcker and Richardson (2004) to measure abnormal audit fees (*Ab\_auditfee*). Fifth, we measure religion (*Religious*) by taking the natural log of the number of temples in parent-subsidiaries’ places plus one (Chen *et al*. 2013).

***3.3 Regression model***

On account of the panel data structure, also we refer to prior research (Cohen and Zarowin 2010; Kim et al. 2019; Sohn 2016) that explore the determinants of the trade-off between AM and RM, we perform panel data regression techniques while controlling for industry and year fixed effects. The model is as follows:,

$EM\_{it}=α\_{0}+α\_{1}HSR\_{it}+α\_{2}GRO\_{it}+α\_{3}SIZE\_{it}+α\_{4}LEV\_{it}+α\_{5}CFO\\_LA\_{it}+α\_{6}ROA\_{it}+α\_{7}TAN\_{it}+α\_{8}LnAGE\_{it}+α\_{9}SOE\_{it}+α\_{10}SHR\_{it}+α\_{11}IND\_{it}+α\_{12}BOA\_{it}+α\_{13}SHE\_{it}+α\_{14}DUAL\_{it}+α\_{15}CREDIT\\_GDP\_{it}+α\_{16}STOCK\\_GDP\_{it}+α\_{17}GDP\\_GROW\_{t}+α\_{18}\sum\_{}^{}YEAR\_{t}+α\_{19}\sum\_{}^{}INDU\_{i}+ε\_{it}$ (Model 1)

where *EM* denotes the earnings management, which includes AM and RM. We use two variables (*DA\_J* and *DA\_AJ)* to proxy for the AM, and we utilize three separate variables (*ACFO*, *APROD* and *AEXP*) and one comprehensive variable (*RM1*) to represent the level of RM. HSR denotes the degree of HSR network in parent-subsidiaries’ locations, which is measured by two measures (*Ln\_HSR* and *Mea\_HSR*). *εit* is the error term. We include the year (*YEARt*) and industry (*INDUi*) fixed effects in our regression model (1) to control for the unobservable year or industry effects. Also, regarding the possible heteroscedasticity in the pooled OLS regression analyses, we use cluster-robust standard errors to calculate the *t*-statistics.

Regarding control variables, we include several variables that may affect the incentives of managers to engage in earnings management based on Prior *et al*. (2008). The detailed measurements of these control variables are described in Appendix II of online supplementary material.

**4. Empirical results**

***4.1 Descriptive statistics and correlation analysis***

Table 1 presents the results of the descriptive statistics of the main variables. The mean values of the two measures (*Ln\_HSR* and *Mea\_HSR*) for the level of HSR network are 2.021 and 0.647, with standard deviations of 0.964 and 0.316, which are fairly large, meaning that the HSR network level for parent-subsidiaries varies widely across firms. The mean values of the two measures (*DA\_J* and *DA\_AJ)* for the AM are 0.003 and 0.005, with standard deviations of 0.1 and 0.102. The sign and magnitude of AM proxies are similar to those reported in Qi *et al*. (2018). The means of the four proxies (*ACFO*, *APROD*, *AEXP* and *RM1*) for the RM are 0, -0.011. 0.003 and -0.014, with the standard deviations of 0.096, 0.154, 0.096 and 0.262, respectively. Other variables remain consistent with prior literature.

INSERT TABLE 1 HERE

The correlation analysis of the main variables used in model (1) is reported in Appendix III of online supplementary material, supporting our expectation, and the multicollinearity test shows that no serious multicollinearity issues appear to exist.

***4.2 Baseline regression results***

Table 2 reports the regression results of model (1). The independent variable in columns (1) - (3) is *Ln\_HSR*, while in columns (4) - (6) is *Mea\_HSR*. In columns (1) and (2), the dependent variables are two proxies for AM (*DA\_J* and *DA\_AJ*). The coefficient on *Ln\_HSR* is -0.006 and significant at the 1% level in both columns (1) and (2), implying that the development of the HSR network is negatively associated with AM, consistent with *H1*. Reviewing related research, we find that our evidence is in line with Li *et al*. (2018), who conclude that companies connected by HSR routes have lower AM. Column (3) reports the regression results with *RM1* as dependent variable[[3]](#footnote-3). The positive and significant coefficients depict that with an increase in the degree of HSR development, there is an increase in the real earnings management activities. This result indicates that managers are inclined to use RM to manage earnings when the firm’s locations are surrounded by more developed HSR network, consistent with *H2*. In terms of economic magnitude, holding all other controls constant, a 10% increase in HSR network value (i.e., Ln\_HSR) will result in an average decrease of 0.12%[[4]](#footnote-4) for AM and an increase of 0.18%[[5]](#footnote-5) for RM. Further, by analyzing the above results, we note that as the level of HSR network surrounding parent and its subsidiaries increases, managers appear to switch from AM to RM, consistent with prior research (Cohen and Zarowin 2010; Sohn 2016). We obtain the same results from columns (4) - (6).

As for the control variables, *GRO* is positively correlated with AM, while it is negatively correlated with RM, both with a 1% significance level. This implies that firms with high growth opportunities tend to engage in more AM, but less RM. Evidence from Gao *et al*. (2017) supports this result. *SIZE* is not correlated with AM, but is negatively correlated with RM, meaning that large-scale companies are inclined to engage in less RM. *LEV* has a significantly negative correlation with AM and a positive correlation with RM, indicating that companies with high leverage level use less AM and more RM. Consistent with the studies of Kothari *et al*. (2005) and Dechow *et al*. (1998), *CFO\_LA* is negatively correlated with both AM and RM, showing that companies with low liquidity are likely to engage in more earnings management activities, and that *ROA* has a significantly positive correlation with AM and a negative correlation with RM.

INSERT TABLE 2 HERE

***4.3 HSR and earnings management: The moderating effects of corporate governance and religion mechanisms***

Next, we focus on the interactive effects of corporate governance and religion factors on the link between HSR network and earnings management. To test our hypotheses, we respectively interact *Agent\_cost, IND, Analyst, Ab\_auditfee,* and *Religious* with the proxies of HSR network (*Ln\_HSR* and *Mea\_HSR*) and then individually include these interaction terms into model (1) to rerun the regression. In Panel A of Table 3, the effects of agency cost are given[[6]](#footnote-6). In columns (1) and (2), the dependent variables are *DA\_J* and *DA\_AJ*, and the coefficients on *Ln\_HSR*\**Agent\_cost* are both significant and negative at the 1% level. In column (3), the coefficient on *Ln\_HSR*\**Agent\_cost* is significantly positive with *RM1* as dependent variable. We obtain the same results focusing on the coefficients of *Mea\_HSR*\**Agent\_cost*. Further, to control for the industry-year difference, we replace the *Agent\_cost* with *Agent\_cost\_med*, which equals to *Agent\_cost* minus the industry-year median value. The unreported results still stand. These results support our prediction that high agency cost can stimulate the switch from AM to RM with the development of HSR network.

In Panel B of Table 3, the effects of independent directors are displayed[[7]](#footnote-7). In column (3), the coefficient on *Ln\_HSR\*IND* is significant and negative at the 10% level. This is consistent with existing literature indicating that the RM is constrained in firms with high proportion of independent directors (Osma 2008). Moreover, we note that the coefficient on interaction term is significantly negative for AM in columns (1) and (2), which is inconsistent with those of past research suggesting that board independence is effective in reducing AM. However, that may be explained in Sohn (2016) that suggests that monitors may encourage, not deter, income-decreasing earnings management through AM. The results on *Mea\_HSR\*IND* is similar.

In Panel C of Table 3, the effects of analysts are presented[[8]](#footnote-8). The coefficient on *Ln\_HSR\*Analyst* is 0.012, significant at the 1% level. This implies that the RM, however, is more encouraged by the development of the HSR network when more analysts follow the firm. The possible reason of this result is because managers face more pressure to achieve earnings target often set by financial analysts, when firms are followed by large number of analysts. Hence, managers would have more incentives to use RM (Sun and Liu 2016). The same results can be observed from *Mea\_HSR\*Analyst*.

Panel D of Table 3 reports the moderating effect of abnormal audit fees. In columns (1) and (2), the dependent variable is AM, and the positive and significant coefficients on *Ln\_HSR\*Ab\_auditfee* show that the impact of HSR on AM is weaker in firms with high abnormal audit fees; while in column (3) that the dependent variable is RM, the positive and significant coefficient indicates that the impact of HSR on RM is stronger in such firms. We obtain the same results from columns (4)-(6).

In Panel E of Table 3, the effects of religion are presented[[9]](#footnote-9). The coefficients on *Ln\_HSR\*Religious* are insignificant when the dependent variable is AM in columns (1) and (2), and significantly negative with *RM1* in column (3). We obtain the same results with *Mea\_HSR*\**Religious* in columns (4)-(6). In sum, the results show that religion plays an external governance role to restrain the trade-off from AM to RM when the HSR network develops in parent-subsidiaries’ locations

INSERT TABLE 3 HERE

***4.4 Endogeneity issue***

The reverse causality issue may arise because earnings management activities may facilitate the managers’ investment decisions (McNichols and Stubben 2008), and managers may choose places with HSR stops to establish subsidiaries considering the convenience, which can lead to higher rate of HSR networks in parent-subsidiaries’ locations. We use the following three methods to address this reverse causality issue.

***4.4.1 Instrumental variable technique***

First, referring to Shi *et al*. (2015), we define the first instrumental variable for the HSR network-*HSR\_MZ*, which is measured by the average value of the degree of HSR network of other firms, whose parent companies are located in the same province, but operating in different industries. This instrumental variable is chosen because, first, the degree of HSR network for other firms, whose parent companies are located in the same province is closely related to the HSR network level of the sampled firms. Then, earnings management activities in the sampled firms can hardly influence the degree of HSR network for firms operated in other industries. Table 4, Panel A shows the first-stage regression results of the instrumental variable *HSR\_MZ*. In sum, all tests results show that this instrumental variable is valid. Panel B displays the second-stage regression results.[[10]](#footnote-10) The coefficients on the fitted value of the degree of HSR network (*Ln\_HSR* hat and *Mea\_HSR* hat) are significantly negative at the 1% level when dependent variables are proxies of AM and are significantly positive at the 1% level when the dependent variable is *RM1*, implying that with the development of HSR network, managers switch from AM to RM, confirming the prior results. Meanwhile, another instrument *RDLS\_MZ* is tested, and the detailed results are reported in Appendix VI of online supplementary material.

INSERT TABLE 4 HERE

***4.4.2 Generalized method of moments (GMM) technique***

Second, referring to Baum *et al*. (2003), the usual approach when facing heteroscedasticity of unknown form is to use the *generalized method of moments (GMM)*. Also, considering the endogeneity issue, Baum *et al*. (2003) indicate that it is useful to resort to GMM estimation if the OLS estimator is biased and inconsistent. Therefore, we employ system GMM estimation to re-estimate our main regression. Specifically, following Meng *et al*. (2019) and Ratti *et al*. (2008), we take the first lags (t-1) of all the variables in model (1) as instrumental variables, and we control for industry and year fixed effects. The estimation results displayed in Table 5 support the main findings.[[11]](#footnote-11)

INSERT TABLE 5 HERE

***4.4.3* *Difference in difference (DID) technique***

Last, to further alleviate the concerns about endogeneity arising from reverse causality, we resort to the *difference-in-difference (DID)* approach to examine whether there is a significant change to the earnings management activities for firms as their located areas begin to have HSR relative to other firms. Different from the general DID model, our treatments occur at different points in time. In particular, the opening time for HSR routes varies across different regions. Following Al Guindy (2021), we establish the regression model as below:

$EM\_{it}=γ\_{0}+γ\_{1}HSR\*After\_{it}+γ\_{2}\sum\_{}^{}YEAR\_{t}+γ\_{3}\sum\_{}^{}INDU\_{i}+δ\sum\_{}^{}Controls\_{it}+μ\_{it}$ (Model 2)

where *HSR* takes the value of 1 if there are HSR stops in parent-subsidiaries’ locations, and 0 otherwise. *After* equals 1 in the years after the located areas of parent-subsidiaries have HSR, and 0 otherwise. We also control for the industry and year fixed effects. The other control variables are the same as in model (1). The coefficient of interest is $γ\_{1}$. $γ\_{1}$ is expected to be positive and significant with *RM1* as the dependent variable and to be significantly negative with *DA\_J* and *DA\_AJ* as the dependent variables. The regression results displayed in Table 6 are consistent with our expectation[[12]](#footnote-12), indicating that the opening of HSR makes managers reduce AM and increase RM.

INSERT TABLE 6 HERE

***4.5 Robustness test***

To reinforce the relationship between the HSR network and earnings management, we use the following three ways to test the robustness of our results. First, we develop four alternative measures for the degree of HSR network to re-estimate the main regression.[[13]](#footnote-13) Second, we also apply alternative measures of AM and RM in baseline regression.[[14]](#footnote-14) In addition, considering the association between the HSR network and earnings management in parent-subsidiaries may be caused by the geographic clustering effect, leading to firms located in megacities are likely to engage in less AM and more RM because of the high costs related to AM (Cohen *et al*. 2008), we remove those firms whose parent companies are located in Beijing, Shanghai, Shenzhen, and Guangzhou, because these four cities are the most developed in China.[[15]](#footnote-15) Finally, based on Shi and Xu (2018), we additionally include province-fixed effects of parent companies, year province-fixed effects, and industry province-fixed effects in our model (1) to control the effects of potential unobservable variables and regional heterogeneity.[[16]](#footnote-16)

**5. Conclusion**

Our findings are threefold. First, our findings show that the development of HSR network reduces AM. Second, we find that as the use of AM decreases, the use of RM increases with the development of the HSR network. Third, we also find that the substitution effect between the use of AM and RM techniques is strengthened when agency cost is high and is constrained when the extent of religion or proportion of independent directors is high. In addition, high analyst coverage and abnormally high audit fees encourage real activities manipulation.

The study offers some practical implications. First, the construction of HSR track around the parent and its subsidiaries can indeed improve the financial reporting quality of firms because the increased level of external monitoring brought by HSR development reduces AM incentives. However, our study provides an insight into an adverse consequence of HSR development, which suggests that firms switch from AM to RM when the HSR routes increase. According to Kim and Sohn (2013), RM is more harmful than AM for long-term firm value. Thus, this evidence may be of interest to policy-makers and regulators. Second, effective corporate governance can restrain earnings management activities. Therefore, management of firms should put much effort into designing and following good corporate governance systems. Third, from auditing perspective, auditors’ independence may be influenced by the fees paid by client firms. In this context, while examining the moderating role of abnormal audit fees, we find that abnormally high audit fees not only restrain the effect of the HSR network in reducing AM, but also aggravate the usage of RM. This result shows that abnormally high audit fees provide incentives for managers to conduct opportunistic behaviors as auditors are on their side. This governance issue should attract attention from shareholders and related regulators. Finally, to the best of our knowledge, our paper is the first to study the impact of HSR on the trade-off effect between the use of AM and RM techniques. On the one hand, our findings suggest that researchers interested in the effect of the HSR can expand their research scope on the various business outcomes brought by HSR construction, such as impacts of the HSR on other outcomes in the accounting and finance field. On the other hand, our research contributes to the literature on the trade-off between the use of AM and RM techniques (Cohen et al. 2008; Shi et al. 2015).

Although our findings are important and robust, their limitations need to be explicitly acknowledged. For example, due to data limitations, our study has focused on China alone. However, several countries have developed HSR network, especially in Africa, Asia, Europe, Middle East, North America and South America that can be studied. As more data becomes available, future researchers can extend our study by collecting data from a large number of countries. Similarly, we have investigated the effect that a relatively small set of firm-level factors, such as corporate governance and religious beliefs impact on the link between HSR network development and earnings management, as well as limited number of firm-level control variables in our models, future studies may explore other country-level and firm-level control factors, such as national culture and governance may impact this association. Furthermore, similar to archival studies of this nature, our proxies for HSR, earnings management and corporate governance may or may not reflect practice. In this case, future researchers may attempt to obtain more in-depth insights by conducting case studies and interviews with internal and external stakeholders of the firm regarding these issues.

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**Table 1: Descriptive statistics**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | N | Mean | P50 | Min | Max | Std. Dev | Variance |
| Ln\_HSR | 24229 | 2.021 | 2.079 | 0 | 4.595 | 0.964 | 0.93 |
| Mea\_HSR | 24229 | 0.647 | 0.741 | 0 | 1 | 0.316 | 0.1 |
| DA\_J | 24229 | 0.003 | 0.001 | -0.336 | 0.367 | 0.1 | 0.01 |
| DA\_AJ | 24229 | 0.005 | 0.003 | -0.329 | 0.384 | 0.102 | 0.01 |
| ACFO | 24229 | 0 | 0 | -0.366 | 0.307 | 0.096 | 0.009 |
| APROD | 24229 | -0.011 | 0.007 | -0.695 | 0.45 | 0.154 | 0.024 |
| AEXP | 24229 | 0.003 | -0.011 | -0.311 | 0.422 | 0.096 | 0.009 |
| RM1 | 24229 | -0.014 | 0.015 | -1.424 | 1.127 | 0.262 | 0.068 |
| GRO | 24229 | 0.203 | 0.098 | -0.356 | 3.391 | 0.467 | 0.218 |
| SIZE | 24229 | 20.83 | 20.694 | 18.926 | 24.657 | 0.979 | 0.958 |
| LEV | 24229 | 0.341 | 0.332 | 0.033 | 0.755 | 0.173 | 0.03 |
| CFO\_LA | 24229 | 0.025 | 0 | -0.235 | 0.288 | 0.08 | 0.006 |
| ROA | 24229 | 0.06 | 0.051 | -0.039 | 0.286 | 0.062 | 0.004 |
| TAN | 24229 | 0.215 | 0.187 | 0 | 0.722 | 0.157 | 0.025 |
| LnAGE | 24229 | 2.109 | 2.708 | 0.317 | 3.258 | 1.067 | 1.138 |
| SOE | 24229 | 0.145 | 0 | 0 | 1 | 0.352 | 0.124 |
| SHR | 24229 | 0.03 | 0.011 | 0.001 | 0.292 | 0.051 | 0.003 |
| IND | 24229 | 0.204 | 0.333 | 0 | 0.556 | 0.183 | 0.034 |
| BOA | 24229 | 1.497 | 2.079 | 0 | 2.708 | 1.021 | 1.042 |
| DUAL | 24229 | 0.172 | 0 | 0 | 1 | 0.378 | 0.143 |
| SHE | 24229 | 0.073 | 0 | 0 | 0.633 | 0.149 | 0.022 |
| CREDIT\_GDP | 24229 | 1.05 | 1.027 | 0.852 | 1.464 | 0.142 | 0.02 |
| STOCK\_GDP | 24229 | 0.387 | 0.38 | 0.133 | 1.206 | 0.241 | 0.058 |
| GDP\_GROW | 24229 | 0.111 | 0.099 | 0.059 | 0.188 | 0.034 | 0.001 |

Notes: This table presents the descriptive statistics for all variables and all the continuous variables are winsorized at the 1% level. See Appendix A for variable definitions.

**Table 2: Regression results for the impact of HSR network on earnings management**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.006\*\*\* | -0.006\*\*\* | 0.009\*\*\* |  |  |  |
|  | (-6.469) | (-6.403) | (2.682) |  |  |  |
| Mea\_HSR |  |  |  | -0.013\*\*\* | -0.013\*\*\* | 0.040\*\*\* |
|  |  |  |  | (-4.772) | (-4.474) | (3.742) |
| GRO | 0.028\*\*\* | 0.039\*\*\* | -0.068\*\*\* | 0.028\*\*\* | 0.039\*\*\* | -0.067\*\*\* |
|  | (9.461) | (12.504) | (-9.290) | (9.338) | (12.391) | (-9.213) |
| SIZE | -0.000 | -0.001 | -0.010\*\* | -0.001 | -0.002\* | -0.008\* |
|  | (-0.316) | (-0.609) | (-2.214) | (-1.384) | (-1.668) | (-1.846) |
| LEV | -0.024\*\*\* | -0.023\*\*\* | 0.110\*\*\* | -0.025\*\*\* | -0.025\*\*\* | 0.113\*\*\* |
|  | (-4.338) | (-4.136) | (4.545) | (-4.674) | (-4.461) | (4.674) |
| CFO\_LA | -0.094\*\*\* | -0.098\*\*\* | -0.459\*\*\* | -0.094\*\*\* | -0.099\*\*\* | -0.459\*\*\* |
|  | (-8.667) | (-8.975) | (-9.315) | (-8.723) | (-9.029) | (-9.302) |
| ROA | 0.088\*\*\* | 0.091\*\*\* | -0.183\*\* | 0.088\*\*\* | 0.090\*\*\* | -0.179\*\* |
|  | (5.790) | (5.886) | (-2.534) | (5.801) | (5.902) | (-2.503) |
| TAN | 0.004 | 0.002 | 0.070\*\*\* | 0.005 | 0.003 | 0.072\*\*\* |
|  | (0.685) | (0.423) | (2.915) | (0.836) | (0.587) | (2.990) |
| LnAGE | -0.003\*\* | -0.003\*\* | -0.010 | -0.003\*\* | -0.003\*\* | -0.010 |
|  | (-2.150) | (-2.100) | (-1.252) | (-2.139) | (-2.090) | (-1.268) |
| SOE | 0.004 | 0.004 | 0.018\* | 0.004 | 0.004 | 0.019\* |
|  | (1.513) | (1.542) | (1.744) | (1.529) | (1.564) | (1.794) |
| SHR | -0.003 | 0.001 | -0.008 | -0.004 | -0.000 | -0.009 |
|  | (-0.206) | (0.052) | (-0.114) | (-0.268) | (-0.008) | (-0.131) |
| IND | 0.008 | 0.007 | -0.079\* | 0.008 | 0.007 | -0.081\* |
|  | (0.861) | (0.775) | (-1.650) | (0.884) | (0.793) | (-1.675) |
| BOA | 0.000 | 0.000 | 0.009 | 0.000 | 0.000 | 0.010\* |
|  | (0.250) | (0.354) | (1.644) | (0.161) | (0.275) | (1.718) |
| DUAL | -0.003 | -0.003 | 0.007 | -0.003 | -0.003 | 0.008 |
|  | (-1.147) | (-1.221) | (0.717) | (-1.175) | (-1.243) | (0.759) |
| SHE | 0.011\* | 0.013\*\* | 0.022 | 0.012\*\* | 0.014\*\* | 0.019 |
|  | (1.867) | (2.102) | (0.774) | (1.994) | (2.217) | (0.666) |
| CREDIT\_GDP | 0.016 | 0.018\* | -0.049 | 0.021\*\* | 0.023\*\* | -0.056 |
|  | (1.491) | (1.717) | (-0.970) | (1.984) | (2.205) | (-1.118) |
| STOCK\_GDP | 0.004 | 0.004 | -0.003 | 0.005 | 0.005 | -0.004 |
|  | (0.963) | (1.052) | (-0.131) | (1.224) | (1.310) | (-0.214) |
| GDP\_GROW | -0.072\*\* | -0.074\*\* | -0.035 | -0.073\*\* | -0.074\*\* | -0.031 |
|  | (-2.107) | (-2.128) | (-0.204) | (-2.124) | (-2.141) | (-0.180) |
| Constant | 0.009 | 0.010 | 0.207\*\* | 0.024 | 0.026 | 0.175\* |
|  | (0.378) | (0.444) | (2.005) | (1.076) | (1.123) | (1.699) |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.037 | 0.053 | 0.059 | 0.037 | 0.053 | 0.060 |

Notes: The independent variable HSR has two proxies which are *Ln\_HSR* and *Mea\_HSR*. The dependent variable EM has two types: AM (*DA\_J* and *DA\_AJ*); RM (*ACFO*, *APORD*, *AEXP* and *RM1*). For brevity, we only report results with *RM1* as proxy for real earnings management in this table. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions. T-statistics are based on clustered (by firm) standard errors and are presented in parentheses.

**Table 3: The effects of moderating factors on the relationship between HSR network and earnings management**

**Panel A: Role of agency cost in the effect of HSR network on AM and RM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.003\*\* | -0.003\*\* | -0.001 |  |  |  |
|  | (-2.488) | (-2.447) | (-0.082) |  |  |  |
| Ln\_HSR\*Agent\_cost | -0.020\*\*\* | -0.020\*\*\* | 0.085\*\* |  |  |  |
|  | (-3.248) | (-3.191) | (2.347) |  |  |  |
| Mea\_HSR |  |  |  | -0.006 | -0.006 | 0.006 |
|  |  |  |  | (-1.613) | (-1.407) | (0.364) |
| Mea\_HSR\*Agent\_cost |  |  |  | -0.051\*\*\* | -0.051\*\*\* | 0.287\*\*\* |
|  |  |  |  | (-2.654) | (-2.589) | (2.665) |
| Agent\_cost | 0.039\*\* | 0.039\*\* | -0.833\*\*\* | 0.032\*\* | 0.033\*\* | -0.855\*\*\* |
|  | (2.513) | (2.495) | (-8.202) | (2.080) | (2.061) | (-8.424) |
| Constant | 0.004 | 0.005 | 0.444\*\*\* | 0.021 | 0.022 | 0.408\*\*\* |
|  | (0.165) | (0.231) | (4.538) | (0.912) | (0.957) | (4.156) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.038 | 0.053 | 0.129 | 0.037 | 0.053 | 0.130 |

**Panel B: Role of independent directors in the effect of HSR network on AM and RM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.002\* | -0.002\* | 0.013\*\*\* |  |  |  |
|  | (-1.778) | (-1.712) | (3.095) |  |  |  |
| Ln\_HSR\*IND | -0.020\*\*\* | -0.020\*\*\* | -0.026\* |  |  |  |
|  | (-5.317) | (-5.323) | (-1.906) |  |  |  |
| Mea\_HSR |  |  |  | -0.008\*\* | -0.008\* | 0.060\*\*\* |
|  |  |  |  | (-2.064) | (-1.854) | (4.013) |
| Mea\_HSR\*IND |  |  |  | -0.028\*\* | -0.028\*\* | -0.108\*\* |
|  |  |  |  | (-2.266) | (-2.255) | (-2.260) |
| IND | 0.046\*\*\* | 0.046\*\*\* | -0.028 | 0.025\*\* | 0.025\*\* | -0.014 |
|  | (3.923) | (3.873) | (-0.508) | (2.135) | (2.064) | (-0.257) |
| Constant | -0.004 | -0.003 | 0.190\* | 0.021 | 0.023 | 0.164 |
|  | (-0.181) | (-0.120) | (1.833) | (0.951) | (0.997) | (1.593) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.038 | 0.054 | 0.060 | 0.037 | 0.053 | 0.061 |

**Panel C: Role of analysts in the effect of HSR network on AM and RM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.009\*\*\* | -0.009\*\*\* | -0.001 |  |  |  |
|  | (-6.770) | (-6.781) | (-0.218) |  |  |  |
| Ln\_HSR\*Analyst | 0.001 | 0.001 | 0.012\*\*\* |  |  |  |
|  | (0.711) | (0.774) | (7.106) |  |  |  |
| Mea\_HSR |  |  |  | -0.014\*\*\* | -0.014\*\*\* | 0.008 |
|  |  |  |  | (-3.429) | (-3.403) | (0.658) |
| Mea\_HSR\*Analyst |  |  |  | 0.001 | 0.001 | 0.012\* |
|  |  |  |  | (0.712) | (0.995) | (1.878) |
| Analyst | 0.007\*\*\* | 0.007\*\*\* | -0.071\*\*\* | 0.006\*\*\* | 0.006\*\*\* | -0.052\*\*\* |
|  | (6.346) | (6.345) | (-14.909) | (5.368) | (5.232) | (-9.845) |
| Constant | 0.056\*\* | 0.058\*\* | -0.039 | 0.069\*\*\* | 0.072\*\*\* | -0.102 |
|  | (2.428) | (2.529) | (-0.400) | (3.045) | (3.141) | (-1.050) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.048 | 0.064 | 0.124 | 0.046 | 0.062 | 0.117 |

**Panel D:** **Role of abnormal audit fees in the effect of HSR network on AM and RM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.007\*\*\* | -0.006\*\*\* | 0.006\* |  |  |  |
|  | (-6.959) | (-6.791) | (1.879) |  |  |  |
| Ln\_HSR\*Ab\_auditfee | 0.002\*\* | 0.002\*\* | 0.009\*\*\* |  |  |  |
|  | (2.362) | (2.004) | (2.813) |  |  |  |
| Mea\_HSR |  |  |  | -0.012\*\*\* | -0.012\*\*\* | 0.042\*\*\* |
|  |  |  |  | (-4.389) | (-4.095) | (3.903) |
| Mea\_HSR\*Ab\_auditfee |  |  |  | 0.014\*\*\* | 0.014\*\*\* | 0.032\*\* |
|  |  |  |  | (3.806) | (3.763) | (2.512) |
| Ab\_auditfee | -0.002 | -0.002 | -0.017\* | -0.009\*\*\* | -0.009\*\*\* | -0.015 |
|  | (-0.799) | (-0.619) | (-1.765) | (-3.387) | (-3.408) | (-1.430) |
| Constant | 0.031 | 0.030 | 0.238\*\* | 0.022 | 0.023 | 0.179\* |
|  | (1.267) | (1.217) | (2.224) | (0.917) | (0.949) | (1.678) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.038 | 0.053 | 0.060 | 0.037 | 0.053 | 0.061 |

**Panel E: Role of religion in the effect of HSR network on AM and RM**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.004 | -0.004 | 0.068\*\*\* |  |  |  |
|  | (-1.201) | (-1.134) | (7.366) |  |  |  |
| Ln\_HSR\*Religious | -0.001 | -0.001 | -0.005\*\*\* |  |  |  |
|  | (-0.111) | (-0.162) | (-4.054) |  |  |  |
| Mea\_HSR |  |  |  | -0.008 | -0.006 | 0.115\*\*\* |
|  |  |  |  | (-0.875) | (-0.614) | (3.558) |
| Mea\_HSR\*Religious |  |  |  | -0.001 | -0.001 | -0.012\*\* |
|  |  |  |  | (-0.488) | (-0.668) | (-2.153) |
| Religious | -0.002\* | -0.002\* | -0.021\*\*\* | -0.002\*\* | -0.002\* | -0.016\*\*\* |
|  | (-1.690) | (-1.664) | (-4.804) | (-2.066) | (-1.900) | (-3.627) |
| Constant | 0.016 | 0.018 | 0.276\*\*\* | 0.029 | 0.030 | 0.197\* |
|  | (0.693) | (0.748) | (2.633) | (1.248) | (1.249) | (1.915) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-square | 0.038 | 0.054 | 0.081 | 0.038 | 0.054 | 0.075 |

Notes: \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions. T-statistics are based on clustered (by firm) standard errors and are presented in parentheses.

|  |
| --- |
| **Table 4: Regression results using two-stage least squares (2SLS) method****Panel A:** **First-stage regression results for the instrumental variable *HSR\_MZ*** |
| Variable | (1) | (2) |
| Ln\_HSR | Mea\_HSR |
| HSR\_MZ | 0.341\*\*\* | 0.655\*\*\* |
|  | (9.005) | (16.419) |
| Constant | -2.433\*\*\* | 0.047 |
|  | (-6.710) | (0.436) |
| Control variables | Included | Included |
| Observations | 24229 | 24229 |
| Industry and Year FE | Yes | Yes |
| Adjusted R-square | 0.389 | 0.311 |
| **Tests for relevance of instruments** |  |  |
| First-stage F-statistic | 81.08\*\*\* | 269.51\*\*\* |
| Partial R2 | 0.01 | 0.05 |
| **Under-identification test** |  |  |
| Kleibergen–Paap rk LM statistic (x2) | 75.32\*\*\* | 269.51\*\*\* |
| **Weak identification test** |  |  |
| Kleibergen–Paap Wald rk F-statistic(Critical value = 16.38) | 81.08\*\*\* | 36.68\*\*\* |
| **Weak-instrument robust inference test** |  |  |
| Anderson–Rubin Wald test (F-statistic) | 12.12\*\* | 10.13\*\* |
| Stock–Wright LM S statistic (x2) | 11.65\*\* | 9.68\*\* |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR hat | -0.061\*\*\* | -0.062\*\*\* | 0.124\*\*\* |  |  |  |
|  | (-5.335) | (-5.332) | (3.152) |  |  |  |
| Mea\_HSR hat |  |  |  | -0.050\*\*\* | -0.050\*\*\* | 0.217\*\*\* |
|  |  |  |  | (-3.664) | (-3.655) | (3.029) |
| Constant | -0.091\*\* | -0.091\*\* | 0.414\*\*\* | 0.040\* | 0.041\* | 0.100 |
|  | (-2.439) | (-2.416) | (3.175) | (1.648) | (1.703) | (0.931) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Chi2 | 353.641 | 456.400 | 434.477 | 445.844 | 570.084 | 468.588 |

**Panel B: Second-stage regression results for the instrumental variable *HSR\_MZ***

Notes: This table presents the regression results using 2SLS method. *Ln\_HSR* hat is the fitted value of *Ln\_HSR* obtained from the first stage, and *Mea\_HSR* hat is the fitted value of *Mea\_HSR* obtained from the first stage. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions. T-statistics are based on clustered (by firm) standard errors and are presented in parentheses.

**Table 5: Regression results using GMM estimation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| DA\_J | DA\_AJ | RM1 | DA\_J | DA\_AJ | RM1 |
| Ln\_HSR | -0.013\*\*\* | -0.014\*\*\* | 0.024\*\*\* |  |  |  |
|  | (-4.896) | (-5.300) | (12.077) |  |  |  |
| Mea\_HSR |  |  |  | -0.024\*\*\* | -0.023\*\*\* | 0.077\*\*\* |
|  |  |  |  | (-6.032) | (-5.791) | (10.702) |
| Constant | 0.341 | 0.429 | 0.482 | -0.162 | -0.103 | 1.141\* |
|  | (0.975) | (1.213) | (0.771) | (-0.473) | (-0.299) | (1.833) |
| Control variables | Included | Included | Included | Included | Included | Included |
| Observations | 24229 | 24229 | 24229 | 24229 | 24229 | 24229 |  | Included | Included | Included |
| Industry and Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Chi2 | 374.468 | 460.155 | 627.467 | 238.403 | 303.397 | 593.567 |

Notes: This table presents the regression results using GMM estimation. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions. T-statistics are based on clustered (by firm) standard errors and are presented in parentheses.

**Table 6: Regression results using DID method**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | (1) | (2) | (3) |
| DA\_J | DA\_AJ | RM1 |
| HSR\*After | -0.020\*\*\* | -0.020\*\*\* | 0.022\*\* |
|  | (-7.784) | (-7.618) | (2.408) |
| GRO | 0.028\*\*\* | 0.039\*\*\* | -0.068\*\*\* |
|  | (9.454) | (12.502) | (-9.274) |
| SIZE | -0.001 | -0.001 | -0.008\*\* |
|  | (-1.011) | (-1.305) | (-1.975) |
| LEV | -0.025\*\*\* | -0.024\*\*\* | 0.112\*\*\* |
|  | (-4.643) | (-4.434) | (4.644) |
| CFO\_LA | -0.095\*\*\* | -0.099\*\*\* | -0.457\*\*\* |
|  | (-8.781) | (-9.090) | (-9.282) |
| ROA | 0.091\*\*\* | 0.093\*\*\* | -0.186\*\* |
|  | (5.968) | (6.063) | (-2.574) |
| TAN | 0.006 | 0.004 | 0.067\*\*\* |
|  | (0.999) | (0.731) | (2.799) |
| LnAGE | -0.003\*\* | -0.003\*\* | -0.010 |
|  | (-2.178) | (-2.128) | (-1.250) |
| SOE | 0.004 | 0.004 | 0.018\* |
|  | (1.580) | (1.608) | (1.711) |
| SHR | -0.002 | 0.001 | -0.007 |
|  | (-0.188) | (0.076) | (-0.105) |
| IND | 0.007 | 0.006 | -0.078 |
|  | (0.765) | (0.680) | (-1.623) |
| BOA | 0.001 | 0.001 | 0.009 |
|  | (0.280) | (0.385) | (1.633) |
| DUAL | -0.003 | -0.003 | 0.007 |
|  | (-1.092) | (-1.168) | (0.694) |
| SHE | 0.011\* | 0.013\*\* | 0.023 |
|  | (1.826) | (2.063) | (0.794) |
| CREDIT\_GDP | 0.020\* | 0.022\*\* | -0.055 |
|  | (1.897) | (2.120) | (-1.111) |
| STOCK\_GDP | 0.005 | 0.005 | -0.004 |
|  | (1.142) | (1.231) | (-0.189) |
| GDP\_GROW | -0.074\*\* | -0.076\*\* | -0.033 |
|  | (-2.175) | (-2.195) | (-0.196) |
| Constant | 0.027 | 0.029 | 0.182\* |
|  | (1.211) | (1.266) | (1.765) |
| Observations | 24229 | 24229 | 24229 |
| Industry and Year FE | Yes | Yes | Yes |
| Adjusted R-square  | 0.037 | 0.053 | 0.059 |

Notes: This table presents the regression results using the DID model. The variable of interest is *HSR\*After*. \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% levels, respectively. See Appendix A for variable definitions. T-statistics are based on clustered (by firm) standard errors and are presented in parentheses.

**Appendix A. Variable definitions and measurements**

|  |  |
| --- | --- |
| Variable | Description |
| *Dependent variables:-* |  |
| DA\_J | Discretionary accrual is calculated by using the Jones model. |
| DA\_AJ | Discretionary accrual is calculated by using the modified Jones model. |
| ACFO | Abnormal cash flow from operations is measured by the difference between actual value of lagged asset-deflated CFO and its expected value computed using equation (4). |
| APROD | Abnormal production cost is measured by the difference between the actual value of lagged asset-deflated production cost and its expected value computed using equation (5). |
| AEXP | Abnormal discretionary expense is measured by the difference between the actual value of lagged asset-deflated discretionary expense and its fitted values computed using equation (6). |
| RM1 | RM1 is measured by the sum of –ACFO, APROD, and –AEXP. |
| *Independent variables:-* |  |
| Ln\_HSR | Ln\_HSRis calculated by taking the natural log of the number of HSR routes in the cities where parent and subsidiary companies are located plus one. |
| Mea-HSR | Mea\_HSR is measured by dividing the number of HSR routes in parent and subsidiaries’ locations by the number of parent and its subsidiaries. |
| *Control variables:-* |  |
| GRO | GRO is calculated by the asset growth rate. |
| SIZE | SIZE is measured by the natural log of total assets. |
| LEV | LEV is measured by the ratio of total liabilities to total assets. |
| CFO\_LA | CFO\_LA is computed using operating cash flow divided by assets at the beginning year. |
| ROA | ROA is return on assets, using net income divided by assets at the beginning year. |
| TAN | TAN is calculated by the ratio of net fixed assets to total assets. |
| LnAGE | LnAGE is the natural log of time to market plus one. |
| SHR | SHR is shareholder concentration, measured by the shareholding ratio of the largest shareholder. |
| IND | IND is computed by the number of independent directors scaled by the total number of directors on the board. |
| BOA | BOA is measured by the natural log of the number of board directors. |
| SHE | SHE is measured by the shareholding ratio of companies’ top management. |
| DUAL | DUAL is a dummy variable that equals 1 if the general manager is also the chairman, and 0 otherwise. |
| SOE | SOE is a dummy variable, taking the value of 1 if the firm is state-owned, and 0 otherwise. |
| CREDIT\_GDP | CREDIT\_GDP is measured by the value of loans divided by GDP. |
| STOCK\_GDP | STOCK\_GDP is computed by the value of total shares traded on the stock market divided by GDP. |
| GDP\_GROW | GDP\_GROW is the annual growth rate of GDP. |

1. The detailed process of obtaining *DA\_J* and *DA\_AJ* is described in Appendix I of online supplementary material. [↑](#footnote-ref-1)
2. The detailed process of obtaining *ACFO, APROD*, *AEXP* and *RM1* is described in Appendix I of online supplementary material. [↑](#footnote-ref-2)
3. We additionally conduct the regressions using *ACFO*, *APROD* and *AEXP* as proxies for RM, and the results are provided in the Appendix IV of online supplementary material. [↑](#footnote-ref-3)
4. -0.12%=-0.006×10%×2.021, where 2.021 is the average value of *Ln\_HSR*. [↑](#footnote-ref-4)
5. 0.18%=0.009×10%×2.021, where 2.021 is the average value of *Ln\_HSR*. [↑](#footnote-ref-5)
6. Regression results with *ACFO*, *APROD* and *AEXP* as proxies for RM are presented in Appendix V of online supplementary material for brevity. [↑](#footnote-ref-6)
7. Regression results with *ACFO*, *APROD* and *AEXP* as proxies for RM are presented in Appendix V of online supplementary material for brevity. [↑](#footnote-ref-7)
8. Regression results with *ACFO*, *APROD* and *AEXP* as proxies for RM are presented in Appendix V of online supplementary material for brevity. [↑](#footnote-ref-8)
9. Regression results with *ACFO*, *APROD* and *AEXP* as proxies for RM are presented in Appendix V of online supplementary material for brevity. [↑](#footnote-ref-9)
10. We also conduct the regressions with *ACFO*, *APROD* and *AEXP* as proxies for RM, and the results are provided in Appendix VI of online supplementary material for brevity. [↑](#footnote-ref-10)
11. We also conduct the regressions with *ACFO*, *APROD* and *AEXP* as proxies for RM, and the results are provided in Appendix VII of online supplementary material for brevity. [↑](#footnote-ref-11)
12. For brevity, we report the regression results with *ACFO*, *APROD* and *AEXP* as proxies for RM in the Appendix VIII of online supplementary material. [↑](#footnote-ref-12)
13. The regression results of using alternative independent variable are presented in Appendix IX of supplementary material. [↑](#footnote-ref-13)
14. The regression results of applying alternative measures for earnings management are displayed in Appendix X of supplementary material. [↑](#footnote-ref-14)
15. The detailed results after removing these four cities are presented in Appendix XI of supplementary material. [↑](#footnote-ref-15)
16. The regression results with multiple fixed effects are displayed in Appendix XII of supplementary material. [↑](#footnote-ref-16)