Female Board Directorships and Related Party Transactions

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Abstract

Using a sample of Chinese firms from 2005 to 2018, we show that firms with female directors (either executive or independent) are characterised by fewer related party transactions (RPTs), particularly in state-owned enterprises (SOEs). Fewer RPTs are associated with improved subsequent operating performance and, in contrast, RPTs are associated with decreased performance for firms with no or fewer female directors, suggesting that female directors engage or allow only efficient but not opportunistic RPTs to facilitate the long-term strategic objectives of their firms. Our findings are robust for using an alternative measure of RPTs, female board directorships and methods to mitigate potential endogeneity issues.

Keywords: Female directors, gender, RPTs.

JEL codes: G30, G34

Introduction

The role of female directors in protecting shareholders' interests has been widely investigated. Adams and Ferreira (2009) suggest that independent female directors exercise better monitoring efforts than their male rivals do. In addition, Huang and Kisgen (2013) and Levi, Li and Zhang (2014) suggest that executive female directors are more risk-averse than their male counterparts, which thus affects the quality of their decision making. Extant studies already evince that female directors are one of the key players within the boardroom and their participation improves the quality of financial reporting (Cumming, Leung and Rui, 2015; Gull *et al.*, 2018; Gul, Srinidhi and Ng, 2011; Labelle, Gargouri and Francoeur, 2010; Srinidhi, Gul and Tsui, 2011).

Nevertheless, most of these studies have investigated the role of female directors in mitigating accruals-based earnings management or fraudulent financial reporting; a setting that is highly subject to external regulators and auditors' scrutiny. As noted by Lai *et al.* (2017), the participation of female directors should be complemented by the provision of higher-quality audits. Therefore, it is not clear whether the mere participation of female directors would be sufficient and, indeed, only limited studies investigate whether it is really the participation of female directors that creates value for shareholders or wheither this should be complemented by high audit quality. Therefore, the main objective of this paper is to investigate whether female directors protect shareholders' interests in areas that are difficult for external auditors to monitor. We believe that RPTs[1] might represent one of these areas. Arguably, external auditors may not perceive them as major risk factors[2] (AICPA, 2001; Gordon *et al.*, 2007;

[1] RPTs refer to the transfer of firms' resources, services or obligations to other related entities or parties (IASB, 2009). Examples of related parties include directors, big shareholders, or their family members. RPTs might include purchase or sales of goods, services, assets, equities or lending contracts with affiliated entities or parties.

[2] This is predominantly true for the Chinese environment characterised by a weak legal environment that would lead to an even weaker monitoring role of Chinese auditors than their Western counterparts (Jian and Wong, 2010) have. For example, over the period from 2001 to 2004, Dhaliwal *et al.* (2017) find only 25 cases against Chinese auditors and none of them has been convicted as responsible for any damage.

Levine *et al.*, 1997). Even if they perceive them as an opportunistic tool, RPTs represent one of the areas that are very difficult to audit. For instance, RPTs are characterised by the lack of an 'arm's length' relationship which subsequently increases the possibility of collusion between related parties to affect the occurrence, price and purpose of these transactions. That is, auditors cannot obtain cross-confirmation and sufficient information from involved parties to ensure the efficiency of RPTs and, therefore, are not able to prevent opportunistic resource expropriation (Fang *et al.*, 2018).

Indeed by misusing RPTs, some involved parties will achieve opportunistic gains by expropriating wealth from minority shareholders. For instance, RPTs were one of the key drivers of many of the losses incurred by Enron shareholders (Ryngaert and Thomas, 2012). Notably, not all RPTs are opportunistic and might in fact represent efficient contracts (Hope, Lu and Saiy, 2019). However, extant research commonly perceives RPTs as a tool shifting profit between affiliated parties in order to reduce taxes or prop up earnings (Lo and Wong, 2016). For example, it is possible that related parties might collude and accelerate sales or affect the prices of RPTs in order to inflate or deflate gross profit margin (Kohlbeck and Mayhew, 2017). In addition, RPTs were considered as one of the major reasons for restating financial statements (General Accounting Office, 2003). They are a common feature of fraud firms (Beasley *et al.*, 2010) and internal auditors also perceive them as one of the most effective red flags that might be used to identify fraud cases (Moyes *et al.*, 2005). Regulators and shareholders consider RPTs as a conflict of interest compromising not only managers' agency responsibilities but also the board's monitoring responsibility (Gordon, Henry and Palia, 2006). That is, RPTs might reflect managerial opportunism, which in turn might put minority shareholders at risk.

The anecdotal evidence also suggests that RPTs represent a common characteristic of accounting scandals in top-profile firms such as Enron and Adelphia. Additionally, empirical studies also suggest that firms abuse RPTs in order to inflate their earnings. For example, Berkman, Cole and Fu (2009)

suggest that Chinese firms tunnel their profit by the issuance of loan guarantees to their related parties. Focusing on initial public offering (IPO), Aharony *et al.* (2010) evince that Chinese firms abuse RPTs before the IPO period and subsequently tunnel profits to their parent firms after the IPO period in order to prop up their profits. Jian and Wong (2010) suggest that Chinese firms abuse RPTs in order to meet their earnings benchmarks and this abuse of RPTs is instead used as a substitute for accruals management. Thus, it seems that Chinese firms perceive RPTs as viable tools to prop up or tunnel their profit.

Despite the genuine concerns raised about the nature of RPTs, there is no evidence confirming or rebutting whether female directors play a role in protecting shareholders from opportunistic use of RPTs. We posit that this is an interesting research question given the ongoing concerns about abusive RPTs. Arguably, female directors are perceived as one of the important channels through which the board protects shareholders' interests. While there is common empirical evidence of their impact on other opportunistic financial reporting decisions, there is scant research on whether they are able to mitigate abusive RPTs.

We believe that investigating this research question would provide a relatively direct answer to the question of whether females are more risk-averse or more ethical than their male counterparts. Extant research (i.e. Cumming *et al.,* 2015; Gull *et al.,* 2018; Srinidhi *et al.,* 2011) perceives female directors to be more ethical or more risk-averse and asserts that, notably, being more ethical or more risk-averse should lead to less fraud and less earnings management. Arguably, fraud and earnings management are subject to intensive regulatory and public scrutiny and this of course will lead female directors, as more risk-averse, to mitigate such practices. However, we believe that this does not necessarily imply that they are more *ethical*. Therefore, to provide a relatively direct answer to the question of whether females are more ethical, researchers should use a setting (such as RPTs) where the

risk is low compared with fraud and earnings management. If female directors perceive RPTs as unethical, then they are more likely to exercise much effort and allocate more time to verify these transactions and collect sufficient information from the involved parties. Based on this information, female directors would not allow RPTs that lead to opportunistic gains by some related parties; they would only allow efficient transactions. In other words, firms with more female directors would be characterised by fewer RPTs than other firms are.

We are motivated to investigate this question in the Chinese setting for the following reasons. *First*, the number and the volume of RPTs between Chinese parent firms and their related parties is generally significantly high (Lo and Wong, 2016). In addition, Chinese firms use several instruments to conduct their RPTs; for instance, Habib, Jiang and Zhou (2020) note that several types of RPTs are being used by Chinese firms and, more importantly, the empirical evidence suggests that most of these transactions are conducted to manipulate earnings. That is, it seems that Chinese shareholders are at risk of being misled by RPTs, suggesting that RPTs represent an important corporate governance concern in China and pose one of the challenges for female directors too. *Second*, we argue that in the absence of strong monitoring services of external auditors in China (Jian and Wong, 2010), female directors can serve as an alternative mechanism to protect the interests of shareholders by monitoring the abusive use of RPTs.

Using a sample of Chinese firms over the period from 2005 to 2018, we find that firms with high female directors' participation are characterised by fewer RPTs, particularly in settings characterised by high RPTs, such as SOEs. This might demonstrate that female directors perceive RPTs as a tool that facilitates personal gains and expropriates firms' resources at the expense of minority investors, and it seems that female directors expend significant effort to scrutinise such transactions. In addition, while, we know theoretically, that all female directors are motivated to mitigate opportunistic RPTs, our

empirical evidence suggests that only female directors with relevant financial background mitigate RPTs. However, we find no evidence to suggest that female directors without financial background have a role in mitigating RPTs suggesting, therefore, that while some females might be motivated to mitigate RPTs, they should be equipped with the relevant financial background. Further, we find that both executive and independent female directors exhibit the same behavior towards RPTs irrespective of their position and therefore it seems that female directors are naturally different from their male counterparts.

Our paper offers many new insights into extant gender and corporate governance literature. *First*, while prior gender studies suggest that gender diversity play a key role in constraining managerial opportunism in settings subject to intense scrutiny by external auditors (i.e., Gull *et al.*, 2018; Cumming *et al.*, 2015; Srinidhi *et al.*, 2011), we show that gender diversity mitigate opportunistic RPTs, a setting that is very difficult for external auditors to audit and scrutinise, thus suggesting that female directors tend to act as a substitute for external audit quality. This is predominantly important for the Chinese setting characterised by a weak legal environment that would lead to an even weaker monitoring role of Chinese auditors than that of their western counterparts (Jian and Wong, 2010). In addition, while prior gender and managerial opportunism studies indirectly build their theoretical underpinning either on females' risk-aversion or ethical orientation, our study, by showing that female directors are less likely to approve RPTs, directly contributes to these studies and show that female directors are not only more risk-averse but also more ethical, a finding that prior gender studies failed to provide more direct evidence for. *Second*, while we know theoretically that all female directors are motivated to mitigate managerial opportunism (i.e. RPTs), we contribute to gender and governance studies (i.e., Cumming *et al.*, 2015; Lara *et al.*, 2017; Srinidhi *et al.*, 2011) by providing empirical evidence suggesting that only female directors with relevant financial background are able to mitigate managerial opportunism (i.e., RPTs). That is, we show that gender itself may not be sufficient but this should be complemented by the

relevant financial background in order to better understand the complexity of RPTs. *Third*, we show that the role of female directors in constraining RPTs is stronger in firms with inferior corporate governance quality, such as SOEs and therefore we show that the value of female directors is contingent on firms' corporate governance quality and they protect shareholders when their protection is most needed. *Finally*, our work contributes to the extant RPTs literature that focuses on the motivations of RPTs but provides little or no evidence on the implications of RPTs for firms' future performance. In particular, we contribute to these studies by showing that RPTs are informative for firms' subsequent performance and it seems that abusive RPTs destroy firms' future performance, while firms with more female directors exhibit better operating performance particularly when they utilise normal RPTs.

Literature review and hypotheses development

The existing literature on gender differences in leadership positions is, in general, still inconclusive. For example, based on occupational socialisation theory, there should be no significant differences between female and male directors performing the same job once they are exposed to the same organisational culture, training and incentives (Deaves *et al.*, 2009; Lara *et al.*, 2017). Alternatively, based on gender socialisation theory, female directors possess different values that make them behaviourally different from their male counterparts and these might include risk aversion and ethical behaviour.

A possible channel through which the presence of women in the boardroom may impact RPTs is their risk aversion. The behavioural studies suggest that women tend to be less overconfident, more risk-averse and more conservative compared to men, and more likely to adopt strategies that alleviate the worst outcomes (Byrnes, Miller and Schafer, 1999; Charness and Gneezy, 2012; Cumming *et al.*, 2015; Elsaid and Ursel, 2011; Powel and Ansic, 1997; Zalata, Ntim, Aboud and Gyapong 2019a) in order to protect their reputation. In addition, women prefer to abstain from losses by not taking extreme risks while men tend to take more risks than women (Schubert, 2006; Watson and McNaughton, 2007).

Extant studies (Cumming *et al.,* 2015; Wahid, 2019) contend that this risk aversion can serve as a mechanism to reduce the frequency of fraud.

In line with gender socialisation theory, Dawson (1997) states that decisions made by men and women are based on different moral principles because of the differences in their personality (masculine vs feminine) traits. Men are more concerned with their personal achievements, whereas women adhere to communal goals and focus more on interpersonal relationships (Carlson, 1972). This suggests that women are more likely to react in situations involving ethical dilemmas because they are less aggressive, less likely to harm others (Radtke, 2000), and more likely to demonstrate serious concerns over ethical issues (Cumming *et al.,* 2015; Gull *et al.,* 2018; Krishnan and Parson, 2008; Roxas and Stoneback, 2004; Zalata and Abdelfattah, 2021) than men are.

Prior research suggests that RPTs represent red flags, are one of the main drivers behind firms' fraud, and also trigger board-intensive monitoring to ensure that firms' long-term reputation is not tarnished (Hope *et al.,* 2019). Based on the behavioural differences between men and women, we believe that female directors would play a crucial role in protecting shareholders' interests and mitigating RPTs. Indeed, female directors are believed to be more socially independent than men who belong to the "boys club" due to their social networks (Perrault, 2015). Adams and Ferriera (2009) and Thiruvadi (2012) report that firms with gender-diverse boards arrange more board and audit committee meetings. Further, the presence of women on boards is expected to enhance the quality of discussions during board meetings because they tend to be better prepared for board meetings (Huse and Solberg, 2006; Izraeli, 2000), are more likely to ask questions and challenge the opinion of other directors (Bilimoria and Wheeler, 2000), and are more willing to initiate debate on controversial issues (Ingley and Van der Walt, 2005). More importantly, RPTs are also approved in board meetings (Cheung *et al.*, 2006). In a nutshell, the higher tendency of female directors to be ethical, risk-averse and strict monitors

demonstrates their motivation to protect shareholders from being expropriated through the use of RPTs. Therefore, we propose the following hypothesis.

H1: *Firms with more female directors are associated with fewer RPTs.*

Neverthless, Gore, Matsunaga and Yeung (2011) note that while the motivation to monitor is important, effective monitoring depends on directors' specialised knowledge in order to evaluate managerial decisions and that, without sufficient financial background, even motivated directors cannot decide whether the financial reporting decisions are truthful. In addition, Kim and Starks (2016) and Gull *et al.* (2018) note that directors with relevant functional expertise would not only increase the heterogeneity within boardrooms but also the quality of decisions made. RPTs is one of the areas that are very difficult to be challenged and monitored; therefore, female directors' motivation alone may not be enough to affect RPTs. Indeed, Fang *et al.* (2018) note that RPTs are characterised by the lack of an arm's length relationship which, in turn, increases the collusion between related parties. That is, we believe that, despite being motivated to protect the interests of minority shareholders, female directors may not be able to gain adequate information about RPTs and therefore may fail to prevent opportunistic resource expropriation. Thus, the combination of both the motivation and capabilities such as financial background is required to effectively monitor the use of RPTs. This argument is supported by Ahern and Dittmar (2012) who suggest appointing female directors based on their capabilities rather than on gender. Likewise, Gull *et al.* (2018; 2020), Abbasi *et al.* (2020) and Zalata et al. (2018, 2021) attribute less earnings management, reduction in the level of auditors' assessment of the risk of material misstatement, and high audit quality to female directors' financial background, respectively. That is, it seems that female directors possessing the relevant financial background is a key to curbing opportunistic behaviour. We therefore hypothesise that:

H2: *Female directors with financial background are associated with fewer RPTs than female directors without financial background.*

So far, the focus of discussion was on female directors irrespective of their role as executive or independent directors. Arguably, executive female directors would be more directly involved in RPTs than independent female directors would and, therefore, they should have more pronounced impact on RPTs than their independent rivals. However, extant research (i.e. Cheng and Warfield, 2005; Klein, 2002; Kuang, 2008; Osma, 2008) suggests that executive directors might behave opportunistically and work for their own interests instead of the shareholders' interests, while independent directors have incentives to monitor managers and work in the best interests of the owners. Indeed, Gallhofer (1998) criticises extant research for using the term "Female" as a unitary group which might lead to incorrect inferences that the observed behaviours are of equal relevance for all women, thereby resulting in a failure to address the differences between women. In this regard, Lara *et al.* (2017) find that only independent female directors are associated with high earnings quality and Nekhili *et al.* (2020) show that the presence of independent female directors on the board reduces the level of auditors' assessment of the risk of material misstatement. This highlights the need to control for female directors' position. We therefore expect that independent female directors are more likely than executive female directors to minimise the use of RPTs. Accordingly, we posit the following hypothesis.

H3: *The effect of independent female directors on RPTs is likely to be more negative than the effect of executive female directors.*

A prominent feature of the Chinese market is that the majority of the listed firms are owned and controlled by the state (SOEs). It is worth noting that 41.9% of firms in our sample are also SOEs. In SOEs, controlling shareholders (i.e. politicians) may appoint their delegates to the board of directors, who are likely to have less discretion and tend to serve their appointers – even to the detriment of the

minority shareholders (Jiang and Kim, 2020; Liu, Wei and Xie, 2014). In addition, due to the political involvement and the desire of the state to pursue different goals simultaneously, such as political, economic and social agendas, extant studies contend that state ownership impedes effectiveness and is averse to efficient corporate governance (He and Fang, 2016; Marquis and Qian, 2014). Conversely, the focus of other firms (non-SOEs) is solely on the wealth maximisation of their shareholders; therefore, they are likely to have stronger governance mechanisms in place than SOEs have to protect the interests of their shareholders (Chen *et al.*, 2006). As such, one might argue that the value of female directors would be minimal in SOEs compared with non-SOEs.

However, Gul *et al.* (2011) suggest that the inclusion of women to corporate boards may be helpful to overcome the issue of weak corporate governance to some extent. More precisely, board gender diversity may be detrimental (beneficial) for well-governed (poorly-governed) firms due to the tendency of female directors to monitor intensely (Adams and Ferreira, 2009).[3] Along similar lines, we expect female directors to exert more influence on RPTs in SOEs than non-SOEs. We therefore hypothesise that:

H4: *The effect of female directors on RPTs is likely to be more negative in SOEs than in non-SOEs.*

Our previous hypotheses are based on the aggregate RPTs without differentiating among the types of RPTs[4]. However, existing literature provides two opposing opinions about RPTs. The efficient transactions hypothesis proposes that RPTs may be used within business groups to make optimal use of available internal resources and to minimise transaction costs which, in turn, can improve firm

[3] Extensive monitoring by female directors may incur more costs than expected benefits for non-SOEs (i.e. well-governed firms) in the presence of strong governance mechanisms. However, extensive monitoring by motivated and capable female directors is likely to be value-enhancing for SOEs (i.e. poorly-governed firms) in the presence of weak governance mechanisms.

[4] We thank an anonymous reviewer for highlighting the importance of differentiating between the impact of female directors on both normal and abnormal RPTs.

performance (Khanna and Palepu, 2000). This suggests that efficient transactions can be used to maximise value for shareholders if a related party has in-depth knowledge of the operations and skills that the firm needs because related parties can perform the task more effectively than any outsider can (Gordon and Henry, 2005). Conversely, the opportunistic transactions hypothesis aligned with the premise of agency theory suggests that RPTs may be used opportunistically with an intention to confiscate resources from minority shareholders (Chang and Hong, 2000). Prior studies provide empirical evidence that opportunistic transactions (i.e. abnormal RPTs) reduce firm performance and value (Kohlbeck and Mayhew, 2010; Ryngaert and Thomas, 2012) because these transactions are likely to be conducted on non-market terms. Differentiating between opportunistic and efficient RPTs will certainly be based on information transparency between directors and other involved parties. Arguably, women are seen as friendly directors (Galbreath, 2018); this may help them to gather more information about RPTs which would allow them to differentiate between opportunistic (i.e. abnormal) and efficient RPTs. We therefore argue that if women really add value to their firms and are able to differentiate between RPTs, then, they should be negatively associated with abnormal RPTs. Accordingly, we hypothesise the following:

H5: *Firms with female directors are associated with fewer abnormal RPTs.*

Research design

Sample

Our initial sample is all A-share companies of China listed on the Shanghai and Shenzhen stock exchanges for the period 2005 to 2018. The information required to calculate the dependent, independent and control variables is collected from the China Stock Market and Accounting Research (CSMAR) database. Our initial sample with no missing data on RPTs and female directors consists of 32,995 firm-year observations. We drop firm-year observations with missing values on control

variables, and, therefore our final sample comprise 27,351 firm-year observations. Table 1 sets out further details about sample selection.

[Insert Table 1 here]

Measurement of RPTs

RPTs are measured in several ways in the existing literature; for example, by their *number* (Bennouri *et al.*, 2015), by their *monetary value* (Gordon *et al.*, 2006; Ryngaert and Thomas, 2012) or by a *dummy variable* (Kohlbeck and Mayhew, 2010). However, we use the number of RPTs as our main dependent variable for several reasons. *First*, there is no materiality threshold on the amount of RPTs (Kohlbeck and Mayhew, 2010) so the occurrence of these transactions is more important for outsiders than their monetary value is (Bennouri *et al.*, 2015). *Second*, our objective is to address the relationship between female board directorships and the use of RPTs. Therefore, we argue that using the dollar value of transactions deeply contradicts the ethical judgement arguments used in this paper. *Third*, the non-desirability of RPTs and their impact on investors does not depend on their dollar value. The mere existence of these transactions is important for outsiders, irrespective of their economic value, because there exists a negative relationship between the number of RPTs and market value of the firm (Nekhili and Cherif, 2011). *Fourth*, investors are concerned about the losses left to the counterparty of the transactions conducted on non-market terms, not the value of a transaction (Bennouri *et al.*, 2015; Ryngaert and Thomas, 2012). These arguments suggest that using the number of RPTs rather than their amount is more relevant to our research question.

To operationalise our measure of abnormal RPTs, we follow Jian and Wong (2010) and utilize equation (1) to separate the normal component of RPTs from the abnormal.

$$RPT\_Amount_{i,t} = \beta_0 + \beta_1 Firm\_Size_{i,t} + \beta_2 Leverage_{i,t} + \beta_3 Market\ to\ Book_{i,t} + \delta IndustryDum_{i,t} + \varepsilon_{i,y} \quad (1)$$

According to Jian and Wong (2010), normal RPTs are a function of firms' size (natural logarithm of total assets), leverage (total debt scaled by total assets), ratio of the market to book value, and industry classifications. That is, opportunistic or abnormal RPTs refer to the unexplained component from using this model or the residuals from this expectation model.

Empirical equation

We use the regression model given in equation (2) to investigate whether female directors have any effect on the use of RPTs.

$$\begin{aligned} RPT\_No_{i,t} = {} & \beta_0 + \beta_1 Female_{\,i,t} + \beta_2 B\_Size_{i,t} + \beta_3 B\_Ind_{i,t} + \beta_4 B\_Meet_{i,t} + \beta_5 B\_Own_{i,t} \\ & + \beta_6 B\_Own^2{}_{\,i,t} + \beta_7 CEO\_Own_{i,t} + \beta_8 Inst\_Own_{i,t} + \beta_9 SOE_{i,t} + \beta_{10} IAS24_{i,t} \\ & + \beta_{11} ROA_{i,t} + \beta_{12} Tobin\ Q_{i,t} + \beta_{13} Firm\_Size_{i,t} + \beta_{14} Firm\_Age_{i,t} \\ & + \beta_{15} Leverage_{i,t} + \delta YearDum_{i,t} + \delta IndustryDum_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

where *RPT_No* is the number of RPTs and *Female* represents the proportion of female directors on the board where we test H1, H4 and H5. While testing H2 and H3 *Female* refers to the proportion of female directors with prior financial experience and the proportion of independent or executive female directors, respectively. To test our hypotheses, we focus on the coefficient β1. If female directors minimise the use of RPTs, then the coefficients on *Female* (β1) should be negative and significant. We also control for variables that may influence the number of RPTs as suggested by existing studies (Bennouri *et al.*, 2015; Hope *et al.*, 2019; Jian and Wong, 2010; Kohlbeck and Mayhew, 2010). Control variables comprise board size (*B_Size*), board independence (*B_Ind*), board meetings (*B_Meet*), board ownership (*B_Own*), square of board ownership (*B_Own2*), CEO ownership (*CEO_Own*), institutional ownership (*Inst_Own*), state-owned enterprise (*SOE*), the implementation of International Accounting Standard 24 (*IAS24*), return on assets (*ROA*), tobin Q (*Tobin Q*), firm size (*Firm_Size*), firm age (*Firm_Age*), and leverage (*Leverage*). We also use industry and year fixed effects as well as cluster standard errors at firm and industry levels. Definitions of variables are given in Table 2.

[Insert Table 2 here]

However, we acknowledge that our estimation of equation (2) might be subject to endogeneity concerns. We therefore perform data analysis using two-stage least squares (*2SLS*) regression and use two external instrumental variables; namely, the ratio of female to male directors in the province (*Female_Province*) and the average of female directors in the industry (*Female_Industry*)[5]. We believe that firms operating in provinces with high female board participation will be able to find a good talented pool of female directors (Chen, Leung and Goergen, 2017). Similarly, we contend that firms operating in industries with more female directors are more likely to get a larger pool of skilled female directors to appoint from than other industries have access to (Hillman *et al.*, 2002, 2007; Zalata *et al.*, 2019).

Consistent with our expectations, the first-stage regression results reported in Tables 5-7 suggest that the coefficients on these instruments are significantly positive. In addition, the *F*-statistics of the first-stage regressions are higher than the recommended value of 10. Concerning weak identification tests, our results show that the Cragg-Donald Wald F-statistic is higher than Stock-Yogo's critical value. We thereby reject the null hypothesis that our instruments are weak. Finally, the Hansen *J*-statistic is insignificant in all Tables. We therefore accept the null hypothesis that our instrumental variables are jointly exogenous.

[5] To test H2 (female directors with financial expertive vs female directors without financial expertise and RPTs) and H3 (executive vs independent female directors and RPTs), we split the industry average of female directors into two variables (e.g., the industry average of female directors with and without financial expertise, and the industry average of executive and independent female directors, respectively). That is, while testing H2 and H3, we use three instruments.

Empirical results

Descriptive statistics

Table 3 reports the descriptive statistics for the full sample. It shows that Chinese firms, on average, engage in 27.228 RPTs. For amount, we observe that sample firms on average conduct RPTs worth 3.763 billion Yuans and the average proportion of female directors is 13.2%. These statistics demonstrate that female directors are still a minority group in China compared with the EU, and therefore there might be a call for more female participation on the board of directors. In addition, Table 3 reports the descriptive statistics for firms with at least one female director and firms with no female directors. Particularly, it shows that 72% of our sample comprises of firm-years with at least one female director and, as expected, firms with all male boards have statistically higher numbers and amounts of RPTs than firms with gender-diverse boards have. Table 4 reports the Pairwise correlation matrix, which also shows a negative relationship between female directors and RPTs.

[Insert Table 3 & 4 here]

Main results

Table 5 reports our analysis investigating whether or not RPTs are associated with the participation of female directors in the boardroom. Column 1 shows that the coefficient on female directors (*Fem_Pro*) is negative and significant at 1%, demonstrating that, consistent with the gender socialisation theory, firms with higher percentages of female directors are less likely to allow or engage in RPTs.[6] For the economic significance, we multiply the coefficient on *Fem_Pro* by its standard deviation. That is, if the percentage of female directors increases by one standard deviation, RPTs decreases by 0.28. A possible explanation for this negative association may be that, since female directors are both more ethical and

[6] We also use the number of women on the board of directors as an alternate measure of female board directorships and find results similar to those reported in Table 5. These unreported results are available from the corresponding author upon request.

risk-averse, they therefore perceive RPTs as tools that have the potential to facilitate managers' and controlling owners' personal gains via expropriation of firms' resources at the expense of minority investors.

We postulate, so far, that all females are able to mitigate RPTs. However, under H2, we expect female directors with relevant financial background to have a more pronounced impact on RPTs. To investigate this proposition, we classify female directors into two groups based on their financial background and re-estimate equation (2). We report these findings under Column 2 of Table 5 and, as expected, our reuslts suggest that RPTs are less prevalent only in firms with more female directors possessing relevant financial background (*Fem_Expert*) compared with those without such expertise (*Fem_Inexpert*). For instance, if *Fem_Expert* increases by one standard deviation, RPTs decreases by 0.74. Conversely, if *Fem_Inexpert* increases by one standard deviation, RPTs increases by 0.05. This suggests, therefore, that the observed benefit of female directors can be attributed to those with relevant financial background.

[Insert Table 5 here]

Our previous findings are based on the whole population of female directors. We therefore report our results under Colum 1 of Table 6 after considering female directors' position within the boardrooms and classifying them into executive (*Exe_Fem)* and independent directors (*Ind_Fem)*. Contrary to our expectations, the results of H3 show a negative and significant relationship between RPTs and both executive and independent female directors. For instance, if the percentage of executive and non-executive female directors increases by one standard deviation, RPTs decreases by 0.11 and 0.19, respectively. These results suggest that female directors, irrespective of their position, seem to be naturally different from male directors and thereby might impact board dynamics (Lara *et al.,* 2017).

Given this similar influence, to avoid any complication in presenting our findings, we focus on all female directors.

Arguably, SOEs are characterised by weak internal corporate governance and, if female directors create value to shareholders and care more about their reputation, their impact should be more pronounced in SOEs than in non-SOEs. To investigate this proposition (H4), we divide our sample into two groups (SOEs & non-SOEs) and report these findings under Column 2 of Table 6. In general, firms with more female directors have fewer RPTs in both SOEs and non-SOEs. However, as hypothesised (H4), it seems that female directors exert more significant influence on RPTs in SOEs than in non-SOEs. That is, the value of female directors seems to be more pronounced in firms with weak corporate governance (e.g., SOEs).

Hitherto, our analysis implicitly assumed that all RPTs are opportunistic. However, firms might use RPTs for efficient motives and we believe that, given the qualitative characteristics of female directors, they would be able to differentiate between opportunistic and efficient RPTs and therefore will mitigate opportunistic RPTs. After differentiating between RPTs, Column 3 of Table 6 interestingly show a negative relationship between *Fem_Pro* and *Abnormal_RPTs* suggesting therefore that female directors mitigate opportunistic RPTs which are likely to expropriate firms' resources at the expense of minority shareholders. That is, if the percentage of female directors increases by one standard deviation, opportunistic RPTs decreases by 0.48.

[Insert Table 6 here]

Female directors, RPTs and future performance

So far, our evidence suggests that firms with more female directors have fewer RPTs. However, this does not mean that female directors prevent all RPTs and, in principal, our results reported in Table 3 suggest that firms with female directors also allow some RPTs. In this section, we investigate whether

these allowed transactions are opportunistic or efficient. Given the behavioural differences between women and men, one might argue that female directors may delve more deeply into details, collect sufficient information about these RPTs, and consequently prevent these contracts with favourable terms for some related parties. That is, we argue that the reported evidence on the existence of some RPTs in firms with female directors might reflect efficient RPTs instead of those related to opportunistic motives. One way of assessing our conjecture is to investigate the link between RPTs and firms' performance. In particular, we use firms' performance as the dependent variable measured by *ROA*, and our independent variables include *Fem_Pro* and *RPT_No*. Our variable of interest is the interaction between *Fem_Pro* and *RPT_No* (*Fem_Pro x RPT_No*). If female directors allow efficient RPTs, we should find the interaction term to be positive and significant. As reported in Table 7, under Column 2, the coefficient on *RPT_No* is significantly negative suggesting that firms with fewer female directors are more likely to have engaged in opportunistic RPTs that might destroy their firms' performance. On the other hand, the coefficient on *Fem_Pro x RPT_No* is significantly positive suggesting that RPTs in firms with more female directors are associated with enhanced subsequent operating performance and this might demonstrate that female directors are more likely to allow efficient RPTs that lead to improved future performance.

[Insert Table 7 here]

Controlling for endogeneity

Although endogeneity has been addressed under the main analysis using *2SLS* estimates, we acknowledge that our findings might still be baised and subject to ommited variables problem. To further address endogeneity concerns related to ommited variables, we use propensity-score matching and fixed effect estimates.

Propensity-score matching (PSM)

As a further test to address endogeneity concerns, we use the propensity score (*PS*)-matched sample (Shipman, Swanquist and Whited, 2016). In doing this, we create a dummy variable (*Fem_Dummy*) taking the value of one if *Fem_Pro* is higher than the sample average and zero otherwise. Under Model 1 of Table 8, we regress *Fem_Dummy* on the control variables included in equation (2) and then calculate the predicted value of having female directors on the board, which consequently is used to match each firm with female directors with another pair with no female directors using the nearest-neighbour option. We set the maximum propensity score matching difference between both types of firms to be 1%. Using these procedures, we find 11,369 firm-year observations that match firms with female directors. Using the treatment and matched firms, we test whether there are significant differences in observable characteristics of these two samples and, as reported in Table 8, there are insignificant differences between treatment and matched firms compared with the pre-matched sample demonstrating, therefore, that the PSM procedures successfully eliminated all observable differences. Finally, we run our main equation (2) using the propensity score-matched sample and report the findings of this analysis in Model 3 of Table 8 which are qualitatively similar to our main results.

Fixed effect

As a final test addressing potential endogeneity concerns, we run equation (2) using fixed effect estimates. Using this technique, our reported findings under Model 4 of Table 8 still support our main conclusion that firms with female directors are characterised by fewer RPTs.[7]

[Insert Table 8 here]

[7] Nevertheless, when we cluster the standard errors at the firm level, the coefficient on female directors becomes less significant. This might be because female directors among other corporate governance data are relatively stable with small changes from year to year within clusters. In contrast to the small variations within firms among the variables, evidence suggests that between-firm variations can be significantly large and, therefore the fixed-effects model may not fit our datatype.

Robustness analysis

Under the main analysis, we use financial background as a proxy for female directors' ability to mitigate RPTs. As a robustness analysis, we use their participation on the audit committee as an alternative proxy. Arguably, the effectiveness of female directors might depend on their position within the board and only those holding key positions would be more able to create value for their firms. For instance, since the board of directors delegates important financial reporting decisions to its audit committee (Gull *et al.*, 2018; 2020), we expect, therefore, that having more female directors on the audit committee would better mitigate opportunistic RPTs. To investigate this proposition, we focus on the participation of female directors on the audit committee and report these results under Column 1 of Table 9. Consistent with our expectation, it seems that having more female directors on the audit committee would mitigate RPTs.

Under the main analysis, we measured RPTs based on their number and this was motivated by the talks held between Julie Fox Gorte, the director of research at Calvert, and the Wall Street Journal[8] that the amount of RPTs might be small; however, these small transactions might be a part of a bigger mosaic which would form the whole picture over a short period of time. Consistent with this view, we consider any RPTs, no matter how small they are, as a sign of expropriating firms' resources by some of its related parties, and we focus on the number of RPTs instead of their value. However, we acknowledge that this might bias our analysis and, therefore, as a robustness analysis, we measure RPTs based on the value and report the results of this analysis in Table 9, under Column 2, and they are still qualitatively similar to our main findings.

Arguably, the impact of female directors might be more prevalent in some industries and, therefore, the value of females might be contingent on the industry, so we address this concern using several approaches. For example, as a further robustness analysis, we cluster the standard errors at

[8] "Even Good Insider Deals Raise Doubts"; Wall Street Journal, May 7, 2003.

industry level and report this analysis under Column 3 of Table 9, and the results are similar to our findings reported under the main analysis.

[Insert Table 9 here]

Furthermore, male-dominated industries would be characterised by high risk-taking in order to achieve more prominent success (Cejka and Eagly, 1999; Cumming *et al.*, 2015; Glick, 1991) and, therefore, the occurrence of RPTs would be more pronounced in such industries. Consistent with the glass-ceiling argument we believe that, in such industries, female directors would come under more public scrutiny and thus they (as more risk-averse) would be more concerned about their reputation which might motivate them to exercise intensive monitoring and constrain opportunistic RPTs in male-dominated industries. Similarly, some industries are characterised by a high occurrence of RPTs (Ryngaert and Thomas, 2012) and therefore one may argue that female directors might be more vigilant in such industries and discharge their duties in an optimal manner, thereby exercising close monitoring over the use of RPTs. Therefore, we perform two robustness tests based on the industries. *First*, we classify our sample into two sub-samples: (i) firms operating in male-dominated industries and (ii) firms operating in female-dominated industries. Interestingly, Panel A of Table 10 shows that in female-dominated industries, the motivation for female directors to be good agents and monitors disappears, while we still find that their impact is more prevalent in male-dominated industries, suggesting that our previous findings under the main analysis are contingent on the industry and on female directors' motivation. However, it is also worth noting that the lack of a significant coefficient on female directors in female-dominated industries might be driven by relatively fewer observations in these industries compared with male-dominated industries. *Second*, we classify our sample into firms operating in industries with more RPTs and firms operating in industries with fewer RPTs. As expected, our findings reported in Panel B of Table 10 suggest that the impact of female directors is more prevalent in

industries with more RPTs and, therefore, reinforces the fact that female directors' behaviour is contingent on the industry.[9]

[Insert Table 10 here]

Discussion and Conclusion

Discussion of the findings

The question of whether female directors create value for their firms has been a controversial issue during the last two decades. It seems that there is a consensus among prior studies that female directors play a key role in improving the quality of financial reporting and protecting shareholders' interests. However, a key research question that prior studies did not investigate is whether female directors can act as a substitute for costly high audit quality. RPTs provide us with a unique setting to investigate our research question. Indeed, extant studies have already suggested that Chinese firms engage in such transactions for opportunistic reasons. It is difficult for auditors and regulators to ascertain whether these transactions are for opportunistic motives. That is, shareholders will be at significant risk of being misled by these transactions. Arguably, the value of female directors stems from the fact that they create a strong channel through which investors' investments are protected. In addition, investigating this research question would provide direct evidence on whether female directors are more risk-averse or more ethical or both. Arguably, risk aversion and high ethical standards are not obvious to outsiders and perceptions depend on each person's intent. Indeed, less fraud or manipulation does not imply that the person is more ethical and rather might mean that the person is more risk-averse due to their detection costs. Therefore, to provide direct evidence on whether female directors are more ethical, we should investigate their behaviour in a setting perceived to be unethical and less risky. While fraud and

[9] We also perfprm sensitivity analysis for other hypotheses (H2-H5) as performed for H1 and find results similar to those reported in Table 10 and 11. These unreported results are available from the corresponding author upon request.

manipulation meet the first condition (unethical), they do not meet the second condition (less risky) due to their detection cost. We believe that RPTs meet both conditions. Indeed, RPTs exist to facilitate personal gains and expropriate firms' resources at the expense of minority investors (unethical). In addition, RPTs represent one of the decisions that are difficult to be monitored and challenged (less detection cost). Given this, if firms with more female directors are characterised by fewer RPTs (despite its lower detection cost), this might imply that female directors are more ethical as well as more risk-averse.

Based on a sample of Chinese firms, our findings suggest that female directors allocate more time and effort to monitor RPTs and thereby protect minority shareholders. When we split our sample based on ownership structure, our findings imply that the impact of females is more pronounced in SOEs, an important finding demonstrating that female directors protect shareholders in a setting where their protection is most needed. Furthermore, our results suggest that both executive and independent female directors protect shareholders from being expeopriated through the use of opportunistic RPTs. While we know theoretically that females are motivated to mitigate RPTs, interestingly, our further evidence suggests that they should also have the ability to do so. Indeed, to mitigate RPTs, they should participate on the audit committee and have relevant financial background. Finally, our evidence suggests that, in firms with male directors, RPTs destroy firms' subsequent performance, while in firms with more female directors, RPTs are associated with improved performance. This demonstrates that female directors consider some RPTs as opportunistic which may facilitate personal gains of some related parties, and they expend much time and effort to collect more information about such transactions. Therefore, they are likely to eliminate those transactions that expropriate firms' resources and allow RPTs that seem to facilitate firms' strategic objectives. Consequently, our findings make a novel contribution to extant literature on RPTs by showing that the gender of directors is a boundary

variable of RPTs (efficient versus opportunistic). Thus, we offer a comprehensive explanation of how female directors can influence opportunistic RPTs.

Theoretical implications

While prior gender studies (i.e. Cumming *et al.*, 2015; Lara *et al.*, 2017; Srinidhi *et al.*, 2011) contend theoretically that female directors are either more risk-averse or ethical, they failed to provide compelling empirical evidence on whether female are more risk-averse, ethical or both. Indeed, our results showing that female directors are able to restrain RPTs, a setting perceived as less risky but unethical behaviour, offer a direct evidence that females are not only more risk-averse but also more ethical. Our paper, therefore, provides new insights on the theoretical explanation underpinning the observable financial reporting differences between female and male directors.

Practical implications

Our findings have important implications for investors and firms' boards of directors. For example, prior literature suggests that investors and regulators should pay careful consideration to RPTs. Our findings suggest that increasing gender diversity will lead to fewer RPTs and allow only those transactions that might improve firms' future performance. Therefore, gender might represent a channel through which firms can improve board dynamics in a way that enhances its monitoring effectiveness and aligns insiders' interests with those of the shareholders. That is, investors and boards of directors should pay nuanced consideration towards appointing more female directors, particularly in firms characterised by a high tendency to engage in RPTs.

Finally, our findings have an important implication for regulators. While we show theoretically that female directors are motivated (i.e., more ethical) to constrain opportunistic RPTs, it seems that the mere participation of female directors is not sufficient and indeed only female directors with relevant financial background and audit committee membership are more able to restrain RPTs. While we

acknowledge that current affirmative gender quotas have successfully increased the presence of women in the boardrooms, we believe that the time has come for regulators to go beyond blanket gender quotas, and pay particular attention to appointing more females with reasonable financial background and regulate the role that females should play within the boardrooms.

Limitations and guidance for future research

Nevertheless, similar to extant archival studies, we do not have access to the boards of directors' meeting minutes and therefore our study cannot provide direct explanations for how female directors differentiate between efficient and opportunistic RPTs. Future studies might consider other research methods (interviews or questionnaires) and provide us with direct evidence on the mechanisms that female directors apply in order to affect firms' outcomes. Athough we have used different measures for RPTs, we acknowledge that our findings might be biased and still subject to measurement limitations. Finally, we have used alternative methods to address potential endogeneity concerns; however, we acknowledge that it is impossible to eliminate the endogeneity problem completely.

Concluding remarks

Our paper extends prior gender studies by investigating the role of female directors in restraining one of the less risky but unethical business practices– namely, *RPTs*. Indeed our findings support gender socialisation theory that female directors are inherently different from male counterparts and more likely to improve board monitoring in a setting that is less subject to external regulators and auditors' scrutiny, a result that has important implication for both regulators and firms' board of directors.

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Table 1: *Year wise sample selection and descriptive statistics for board gender diversity and RPT*

Year	Initial sample	Firms with missing data	Final sample	Firms with one or more women	Average proportion of women	Average number of RPTs	Average amount of RPTs
2005	1,368	214	1,154	718	0.099	15.89	1.152
2006	1,455	456	999	613	0.097	17.581	1.779
2007	1,570	606	964	602	0.101	18.404	2.824
2008	1,625	679	946	597	0.102	20.755	3.261
2009	1,774	524	1,250	817	0.108	21.417	2.570
2010	2,129	491	1,638	1,113	0.116	20.510	3.161
2011	2,361	292	2,069	1,438	0.123	21.299	2.579
2012	2,488	179	2,309	1,643	0.127	22.869	2.908
2013	2,537	386	2,151	1,559	0.128	25.458	3.255
2014	2,649	436	2,213	1,655	0.135	28.951	4.038
2015	2,834	338	2,496	1,886	0.141	30.488	4.527
2016	3,119	354	2,765	2,143	0.147	33.412	5.027
2017	3,496	377	3,119	2,423	0.154	33.537	4.887
2018	3,590	326	3,264	2,571	0.157	36.233	5.248
Total	32,995	5,658	27,337	19,778	0.132	27.227	3.763

Note: The average amount of RPTs is in billions of Yuans.

Table 2: *Description of variables*

Variable	Description
RPT_No	Log of the number of total related party transactions.
RPT_Amount (Billions of Yuans)	Log of the total amount of related party transactions in billions of Yuans.
Fem_Pro	Proportion of female directors serving on the board.
Exec_Fem	Proportion of female executive directors serving on the board.
Ind_Fem	Proportion of female independent directors serving on the board.
Fem_AuditCom	Proportion of female directors serving on the audit committee.
Fem_Expert	Proportion of female directors with previous financial experience.
Fem_Inexpert	Proportion of female directors without previous financial experience.
Female_Industry	The industry average of female directors.
Female_Province	Defined as the ratio of female to male directors in the province.
B_Size	Total number of directors on the board.
B_Ind	Proportion of independent directors serving on the board.
B_Meet	Number of board meetings held during the year.
B_Own	Proportion of outstanding shares held by the company board of directors.
B_Own^2	Square of proportion of outstanding shares held by the company board of directors.
CEO_Own	Proportion of outstanding shares held by the company CEO.
Inst_Own	Proportion of outstanding shares held by the institutions.
SOE	Dummy variable equals 1 if the ultimate owner is central or local government and 0 otherwise.
IAS24	A dummy variable equals 1 for each observation after year 2007 and 0 otherwise.
ROA	Net profit divided by total assets.
Tobin Q	Firm's market value divided by the book value of the firm's total assets.
Firm Size	Log of total revenue.
Firm Age	Log of the number of years' firm is listed on the Shanghai or Shenzhen stock exchange.
Leverage	Total debt divided by total assets.

Note: All continuous variables are winsorized at 1% and 99% levels, respectively.

Table 3: *Descriptive statistic and mean difference test of firms with all male and gender-diverse boards*

	Whole Sample (N =27,337)		All male boards (N = 7,559)	Gender-diverse boards (N = 19,778)	Mean difference test
Variables	Mean	Standard Deviation.	Mean	Mean	t–value
RPT_No	27.228	37.599	29.079	26.517	4.967***
RPT_Amount	3.763	11.539	4.212	3.592	6.826***
Fem_Pro	0.132	0.118	-	-	-
B_Size	10.13	2.652	9.609	10.329	-20.232***
B_Ind	0.376	0.070	0.374	0.377	-3.476***
B_Meet	9.630	4.129	9.351	9.745	-7.060***
B_Own	0.296	0.637	0.228	0.322	-10.913***
CEO_Own	0.118	0.356	0.088	0.130	-8.845***
Inst_Own	0.067	0.081	0.068	0.066	1.703*
SOE	0.419	0.493	0.497	0.390	16.143***
IAS24	0.886	0.318	0.843	0.902	-13.749***
ROA	0.043	0.066	0.042	0.043	-1.037
Tobin Q	2.268	15.85	2.330	2.244	0.403
Firm Size	21.318	1.542	21.449	21.268	8.703***
Firm Age	2.641	0.454	2.594	2.658	-10.477***
Leverage	0.496	5.384	0.501	0.495	0.079

Note: All variables are as defined in Table 2.
The average amount of RPTs is in billions of Yuans.

Table 4: *Correlation matrix*

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1) RPT_No	1															
(2) Fem_Pro	-0.113*	1														
(3) B_Size	0.214*	-0.061*	1													
(4) B_Ind	-0.071*	0.058*	-0.121*	1												
(5) B_Meet	0.237*	0.021*	0.099*	0.049*	1											
(6) B_Own	-0.316*	0.122*	-0.164*	0.112*	-0.041*	1										
(7) B_Own^2	-0.175*	0.069*	-0.085*	0.055*	-0.032*	0.817*	1									
(8) CEO_Own	-0.238*	0.101*	-0.136*	0.098*	-0.042*	0.445*	0.524*	1								
(9) Inst_Own	0.059*	-0.016*	0.054*	-0.002	0.099*	-0.114*	-0.080*	-0.079*	1							
(10) SOE	0.301*	-0.187*	0.217*	-0.148*	-0.062*	-0.384*	-0.183*	-0.275*	0.040*	1						
(11) IAS24	0.090*	0.100*	0.052*	0.126*	0.107*	0.125*	0.060*	0.094*	-0.007	-0.181*	1					
(12) ROA	-0.155*	0.026*	-0.084*	0.044*	-0.064*	0.230*	0.163*	0.178*	0.180*	-0.117*	0.049*	1				
(13) Tobin Q	-0.040*	0.004	-0.006	0.008	-0.005	-0.010	-0.007	-0.007	0.012*	-0.024*	0.002	-0.036*	1			
(14) Firm Size	0.544*	-0.118*	0.264*	-0.021*	0.180*	-0.222*	-0.107*	-0.171*	0.203*	0.293*	0.097*	0.064*	-0.088*	1		
(15) Firm Age	0.194*	0.060*	0.110*	-0.003	0.129*	-0.202*	-0.107*	-0.140*	0.011	0.094*	0.272*	-0.124*	0.014*	0.135*	1	
(16) Leverage	0.005	-0.004	0.022*	-0.004	0.005	-0.018*	-0.009	-0.013*	-0.001	0.005	-0.024*	-0.064*	0.471*	-0.015*	0.011	1

Note: * Represent significance at 0.05.
All variables are as defined in Table 2.

Table 5: *Female directors and RPTs (H1 and H2)*

	Column 1 (Hypothesis 1)		Column 2 (Hypothesis 2)		
	Whole Sample (N=27,337)		Females with financial expertise vs. females without financial expertise (N=27,337)		
	First Stage (Fem_Pro)	Second Stage (RPT_No)	First stage (Fem_Expert)	First stage (Fem_Inexpert)	Second stage (RPT_No)
Fem_Pro	-	-2.407***			-
		(-3.13)			
Fem_Expert	-	-	-	-	-2.398***
					(-3.42)
Fem_Inexpert	-	-	-	-	-0.089
					(-0.10)
B_Size	-0.001	0.003	-0.001***	0.001**	0.005
	(-0.59)	(0.67)	(-3.95)	(2.25)	(1.25)
B_Ind	0.028*	-0.736***	0.017*	0.011	-0.775***
	(1.79)	(-5.06)	(1.74)	(0.86)	(-5.47)
B_Meet	0.000	0.044***	0.000	-0.000	0.043***
	(0.59)	(12.71)	(0.91)	(-0.11)	(12.75)
B_Own	0.011**	-0.491***	0.001	0.010***	-0.495***
	(2.42)	(-12.65)	(0.45)	(2.72)	(-12.98)
B_Own2	-0.001	0.065***	-0.000	-0.001	0.065***
	(-1.54)	(8.00)	(-0.38)	(-1.55)	(7.75)
CEO_Own	0.007	0.018	0.005	0.002	0.005
	(1.23)	(0.45)	(1.38)	(0.38)	(0.13)
Inst_Own	0.025	-0.424***	0.000	0.024	-0.423***
	(1.34)	(-2.74)	(0.05)	(1.63)	(-2.78)
SOE	-0.020***	0.269***	-0.006***	-0.014***	0.286***
	(-5.11)	(6.76)	(-2.74)	(-4.72)	(7.45)
IAS24	-0.004	0.692***	-0.005	-0.001	0.498***
	(-0.63)	(11.02)	(-1.02)	(-0.09)	(7.34)
ROA	0.014	-2.099***	-0.001	0.014	-2.098***
	(0.82)	(-13.05)	(-0.13)	(1.01)	(-13.13)
Tobin Q	-0.000**	-0.001	-0.000***	0.000	-0.001
	(-2.53)	(-0.96)	(-2.66)	(0.25)	(-0.83)
Firm Size	-0.008***	0.347***	-0.003***	-0.005***	0.354***
	(-6.95)	(25.27)	(-4.57)	(-5.50)	(26.92)
Firm Age	0.006	-0.004	0.007***	-0.000	-0.018
	(1.43)	(-0.10)	(2.66)	(-0.14)	(-0.49)
Leverage	0.000	0.002	0.000	0.000	0.002
	(1.39)	(0.95)	(1.58)	(0.38)	(0.84)
Female_Province	0.224***	-	0.098**	0.127**	-
	(3.26)		(2.36)	(2.51)	
Female_Industry	0.935***	-	-	-	-
	(11.79)				
FemaleExpert_Industry	-	-	0.994***	-0.030	-
			(16.92)	(-0.33)	
FemaleInexpert_Industry	-	-	-0.030	0.949***	-
			(-0.81)	(16.13)	
Constant	0.113***	-4.855***	0.010	0.103***	-5.093***
	(3.35)	(-13.62)	(0.55)	(3.78)	(-3.68)
Year and industry fixed effect	Yes	Yes	Yes	Yes	Yes
Standard error clustered at firm level	Yes	Yes	Yes	Yes	Yes
R-sq	0.103	0.398	0.110	0.082	0.412
F-test/ Chi-square	13.12***	6119.74***	46.53***	13.44 ***	6331.03***
Cragg-Donald Wald F statistic	154.119	-	116.770	116.770	-
Kleibergen-Paap F statistic	74.655	-	96.922	96.922	-
Stock-Yogo weak ID test	19.93	-	13.43	13.43	-
Hansen *J* (*p*-value)	-	0.891	-	-	0.595

Note: This table presents the results of 2SLS estimations for H1 and H2. In the first-stage regression of Column 1, we use two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the

board). *Female_Province* is the ratio of female to male directors in a given province and *Female_Industry* is industry average of female directors. In the first-stage regressions of Column 2, we use three instrumental variables (i.e., *Female_Province, FemaleExpert_Industry* & *FemaleInexpert_Industry*) and the dependent variable is *Fem_Expert and Fem_Inexpert* (the proportion of female directors with and without financial expertise, respectively). *FemaleExpert_Industry* and *FemaleInexpert_Industry* is industry average of female directors with and without financial expertise, respectively. In the second-stage models reported, the dependent variable is *RPT_No* (the natural log of the number of total related party transactions). Column 1 (second stage) provides results on the association between female board directorships and RPTs. Column 2 (second stage) provides results on the association between female directors' expertise (female directors with financial expertise vs. female directors without financial expertise) and RPTs. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Table 6: *Female directors and RPTs (H3,H4 and H5)*

	Column 1 (Hypothesis 3)			Column 2 (Hypothesis 4)				Column 3 (Hypothesis 5)	
	Independent vs. executive female directors (N=27,337)			SOEs Sample (N= 11,470)		Non-SOEs Sample (N= 15,867)		Abnormal RPTs (N=27,337)	
	First Stage (Exec_Fem)	First Stage (Ind_Fem)	Second Stage (RPT_No)	First stage (Fem_Pro)	Second stage (RPT_No)	First stage (Fem_Pro)	Second stage (RPT_No)		
Ind_Fem	-	-	-2.527***	-	-	-	-	-	-
			(-2.90)						
Exec_Fem	-	-	-2.310**	-	-	-	-	-	-
			(-2.19)					-	-
Fem_Pro	-	-	-	-	-3.393**	-	-1.576*	-	-4.069***
					(-2.17)		(-1.82)		(-3.05)
B_Size	0.001	-0.001*	0.003	0.001	0.004	-0.001	0.001	-0.001	0.012
	(0.64)	(-1.75)	(0.64)	(0.47)	(0.65)	(-0.89)	(0.20)	(-0.59)	(1.63)
B_Ind	-0.112***	0.140***	-0.708***	0.008	-0.875***	0.028	-0.493***	0.028*	-0.368
	(-9.72)	(13.39)	(-2.97)	(0.35)	(-3.42)	(1.35)	(-3.00)	(1.79)	(-1.56)
B_Meet	0.000	-0.000	0.044***	-0.000	0.030***	0.000	0.051***	0.000	0.072***
	(1.58)	(-1.03)	(12.56)	(-0.06)	(6.12)	(0.79)	(13.06)	(0.59)	(13.06)
B_Own	0.011***	-0.000	-0.492***	0.024	-1.162***	0.008*	-0.413***	0.011**	-0.434***
	(3.16)	(-0.09)	(-12.32)	(0.62)	(-3.05)	(1.68)	(-11.27)	(2.42)	(-6.16)
B_Own2	-0.001	-0.000	0.065***	0.001	0.265***	-0.001	0.052***	-0.001	0.061***
	(-1.56)	(-0.40)	(7.97)	(0.08)	(3.08)	(-0.99)	(7.11)	(-1.54)	(4.11)
CEO_Own	0.007*	-0.001	0.017	-0.033	-0.785	0.007	0.024	0.007	0.060
	(1.73)	(-0.15)	(0.43)	(-0.68)	(-1.33)	(1.37)	(0.62)	(1.23)	(0.75)
Inst_Own	0.020	0.005	-0.425***	0.021	-0.627***	0.027	-0.245	0.025	0.497*
	(1.48)	(0.46)	(-2.73)	(0.76)	(-2.88)	(1.12)	(-1.29)	(1.34)	(1.87)
SOE	-0.019***	-0.001	0.271***	-	-	-	-	-0.020***	-0.043
	(-6.48)	(-0.35)	(6.37)					(-5.11)	(-0.69)
IAS24	-0.008	0.003	0.630***	-0.009	1.026***	0.003	0.500***	-0.004	0.544***
	(-1.45)	(0.74)	(10.55)	(-0.94)	(11.07)	(0.30)	(5.44)	(-0.63)	(4.92)
ROA	0.013	0.001	-2.100***	-0.026	-0.679**	0.036	-2.516***	0.014	-4.933***
	(1.02)	(0.07)	(-13.07)	(-0.88)	(-1.97)	(1.62)	(-12.88)	(0.82)	(-17.93)
Tobin Q	-0.000	-0.000**	-0.001	-0.001	-0.036**	-0.000**	-0.000	-0.000**	0.001
	(-1.25)	(-2.44)	(-0.96)	(-0.67)	(-2.50)	(-2.30)	(-0.50)	(-2.53)	(0.69)
Firm Size	-0.004***	-0.003***	0.347***	-0.007***	0.241***	-0.009***	0.409***	-0.008***	-0.109***
	(-5.32)	(-5.00)	(25.28)	(-4.32)	(10.31)	(-5.19)	(26.13)	(-6.95)	(-5.22)
Firm Age	0.004	0.002	-0.004	0.013**	-0.118*	0.002	0.029	0.006	0.216***
	(1.15)	(0.88)	(-0.10)	(2.21)	(-1.67)	(0.32)	(0.66)	(1.43)	(3.52)
Leverage	0.000	0.000	0.002	0.002	0.406***	0.000	0.001	0.000	-0.007
	(1.21)	(1.18)	(0.95)	(0.23)	(3.07)	(1.61)	(0.57)	(1.39)	(-1.42)
Female_Province	0.185***	0.138***	-	0.312***	-	0.142**	-	0.224***	-
	(3.65)	(2.90)		(3.27)		(1.98)		(3.26)	
Female_Industry	-	-	-	0.711***	-	1.044***	-	0.935***	-
				(6.39)		(9.60)		(11.79)	

FemaleInd_Industry	0.016	0.916***	-	-	-	-	-	-	-
	(0.20)	(11.97)							
FemaleExec_Industry	0.959***	-0.025	-	-	-	-	-	-	-
	(11.90)	(-0.38)							
Constant	0.096***	0.018	-4.801***	0.058	-2.301***	0.151***	-6.303***	0.113***	0.113***
	(3.73)	(0.90)	(-13.03)	(1.28)	(-3.89)	(3.16)	(-15.42)	(3.35)	(3.35)
Year and industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard error clustered at firm level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.083	0.059	0.3984	0.098	0.313	0.120	0.401	0.103	0.141
F-test/ Chi-square	15.38***	15.38***	6115.65***	17.13***	7511.20***	17.03***	4701.77***	13.12***	1209.10***
Cragg-Donald Wald F statistic	96.196	96.196	-	70.543	-	81.225	-	154.119	-
Kleibergen-Paap F statistic	47.920	47.920	-	24.385	-	48.295	-	74.655	-
Stock-Yogo weak ID test	13.43	13.43	-	19.93	-	19.93	-	19.93	-
Hansen *J* (*p*-value)	-	-	0.865	-	0.509	-	0.209	-	0.891

Note: This table presents the results of 2SLS estimations for H3, H4 and H5. In the first-stage regressions of Column 1, we use three instrumental variables (i.e., *Female_Province, FemaleExec_Industry* & *FemaleInd_Industry*) and the dependent variable is Exec_*Fem and Ind_Fem* (the proportion of executive and independent female directors, respectively). *FemaleExec_Industry* and *FemaleInd_Industry* is industry average of executive and independent female directors, respectively. In the first-stage regressions of Column 2 and 3, we use two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the board). *Female_Province* is the ratio of female to male directors in each province and *Female_Industry* is industry average of female directors. In the second-stage models reported under Column 1 and 2, the dependent variable is *RPT_No* (the natural log of the number of total related party transactions). However, in the second-stage model reported under Column 3, the dependent variable is *Abnormal RPT_*(the abnormal amount of RPTs). Column 1 (second stage) provides results on the association between female directors (independent vs. executive) and RPTs. Column 2 (second stage) provides results on the association between female board directorships and RPTs (SOEs & non-SOEs subsample). Column 3 (second stage) provides results on the association between female board directorships and abnormal RPTs. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Table 7: *Female directors, RPTs, and firm performance nexus*

	Column 1	Column 2
	First stage (Fem_Pro)	Second stage (Future performance)
Fem_Pro	-	8.903**
		(2.43)
RPT_No	-	-0.346**
		(-2.08)
Fem_Pro *x* RPT_No	-	2.962**
		(2.49)
Female_Province	0.362**	-
	(3.47)	
Female_Industry	0.426**	-
	4.28	
Controls	Yes	Yes
R-sq	0.203	0.238
F-test/ Chi-square	45.75***	3477.20***
Cragg-Donald Wald F statistic	35.675	-
Kleibergen-Paap F statistic	27.378	-
Stock-Yogo weak ID test	19.93	-
Hansen *J* (*p*-value)	-	0.675
N	21,783	21,783

Note: This table presents the results of 2SLS estimations for the association between female board directorships, RPTs and future performance. Column 1 provides the results of the first-stage regression, where we use two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the board). *Female_Province* is the ratio of female to male directors in each province and *Female_Industry* is industry average of female directors. In the second stage, the dependent variable is future performance (ROA_{t+1}). Columns 2 (second stages) provide results on the association between female directors, RPTs and future performance. *Controls* refer to all control variables used in this study. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Table 8: *Female directors and RPTs (controlling further endogeneity issues through PSM and firm fixed effect)*

	Propensity Score Matching (PSM)									Fixed Effect
	Unmatched sample univariate analysis			Matched sample univariate analysis			Model 1 (Fem_Dummy)	Model 2 (Fem_Pro)	Model 3 (RPT_No)	Model 4 (RPT_No)
	Fem_Pro > 13.2%	Fem_Pro < 13.2%	t-stats	Fem_Pro > 13.2%	Fem_Pro < 13.2%	t-stats	PSM logit regression	2SLS First stage	2SLS Second stage	
RPT_No	2.398	2.658	(16.50)***	2.399	2.469	(4.06)***	-	-	-	-
Fem_Pro	-	-	-	-	-	-	-		-3.93**	-0.121**
									(-2.35)	(-2.12)
B_Size	10.012	10.214	(6.21)***	10.014	10.044	(0.83)	0.013	-0.001	0.002	0.004*
							(1.44)	(-1.95)	(0.35)	(1.94)
B_Ind	0.385	0.370	(-16.82)***	0.385	0.381	(-1.296)	2.078***	-0.045	-0.575***	-0.311***
							(7.49)	(-2.29)	(-3.02)	(-4.12)
B_Meet	9.746	9.557	(-3.74)***	9.750	9.711	(-0.61)	0.003	0.001	0.046***	0.028***
							(0. 69)	(0.20)	(11.68)	(19.76)
B_Own	0.375	0.240	(-17.43)***	0.374	0.369	(-0.61)	0.161***	0.001	-0.473***	-0.227***
							(2.15)	(-0.06)	(-10.13)	(-9.25)
B_Own^2	0.647	0.384	(-9.51)***	0.645	0.613	(-0.98)	-0.022	0.000	0.065***	0.033***
							(-1.46)	(0.05)	(6.83)	(7.18)
CEO_Own	0.154	0.093	(-14.22)***	0.154	0.144	(-1.04)	0.086	0.006	0.031	-0.043
							(1.05)	(1.00)	(0.62)	(-1.60)
Inst_Own	0.065	0.068	(3.10)***	0.065	0.064	(-0.81)	0.219	0.015	-0.582***	0.031
							(0.74)	(0.68)	(-2.98)	(0.42)
SOE	0.324	0.488	(27.37)***	0.325	0.319	(-0.96)	-0.355***	-0.005	0.266***	0.190***
							(-5.28)	(-1.19)	(5.99)	(6.57)
IAS24	0.921	0.861	(-1 5.63)***	0.922	0.922	(0.00)	0.752***	-0.002	0.677***	0.796***
							(7.26)	(-0.18)	(9.17)	(18.44)
ROA	0.045	0.042	(-3.28)***	0.045	0.045	(-0.11)	0.214	-0.003	-2.487***	-1.334***
							(0.70)	(-0.15)	(-12.26)	(-16.44)
Tobin Q	2.433	2.15	(-1.45)	2.433	2.237	(-1.14)	-0.001*	0.001	-0.001	-0.001
							(-1.83)	(-0.35)	(-0.41)	(-1.36)
Firm Size	21.128	21.454	(17.35)***	21.129	21.147	(0.94)	-0.130***	-0.003	0.374***	0.343***
							(-6.36)	(-1.26)	(25.35)	(46.56)
Firm Age	2.669	2.621	(-8.58)***	2.67	2.668	(-0.38)	0.099	0.002	-0.024	-0.013
							(1.34)	(0.30)	(-0.50)	(-0.35)
Leverage	0.513	0.484	(-0.436)	0.514	0.429	(-1.09)	0.005***	0.000	0.003	0.002*
							(2.04)	(0.51)	(0.39)	(1.91)
Female_Province	-	-	-	-	-	-	-	0.217***	-	-
								(2.59)		
Female_Industry	-	-	-	-	-	-	-	0.385***	-	-
								(4.75)		
Constant		-	-	-	-	-	1.259**	0.136***	-5.318***	-5.328***
							(2.52)	(3.96)	(-11.01)	(-32.00)
Year & industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Year & firm	-	-	-	-	-	-	-	-	-	Yes
Standard error clustered at firm level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
R-squared	-	-	-	-	-	-	0.155	0.057	0.300	0.39
F-test/ Chi-square	-	-	-	-	-	-	546.726***	13.65***	3468.35***	564.171***
Cragg-Donald Wald F statistic	-	-	-	-	-	-	-	90.088	-	
Kleibergen-Paap F statistic	-	-	-	-	-	-	-	36.834	-	
Stock-Yogo weak ID test	-	-	-	-	-	-	-	19.93	-	-
Hansen *J* (*p*-value)	-	-	-	-	-	-	-	-	0.194	-
N	11,392	15,959	-	11,369	11,369	-	27,337	22,738	22,738	27,337

Note: This table provides univariate analysis for unmatched as well as matched samples. Model 1 reports the results of logit regression of propensity score matching method where the dependent variable is *Fem_Dummy* (coded 1 if *Fem_Pro* is higher

than the sample average and 0 otherwise). Model 2 provides first-stage results of 2SLS using two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the board). *Female_Province* is the ratio of female to male directors in a given province and *Female_Industry* is industry average of female directors. Model 3 provides second-stage results for matched sample on the association between female directors and RPTs. Model 4 provides firm fixed effect regression results on the association between female directors and RPTs. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Table 9: *Female directors and RPTs (robustness tests)*

	Column 1 Audit committee gender diversity and RPTs		Column 2 Alternative measure of RPTs (RPT_Amount)		Column 3 2SLS with standard errors clustered at industry level	
	First stage (Fem_AuditCom)	Second stage (RPT_No)	First stage (Fem_Pro)	Second stage (RPT_Amount)	First stage (Fem_Pro)	Second stage (RPT_No)
Fem_AuditCom	-	-2.454**				
		(2.19)				
Fem_Pro	-	-	-	-4.329***	-	-3.048***
				(-3.23)		(-2.68)
Female_Province	0.448**	-	0.224***	-	0.198***	-
	(2.36)		(3.26)		(3.11)	
Female_Industry	0.568**	-	0.935***	-	0.868***	-
	2.57		(11.79)		(15.32)	
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year & industry fixed	Yes	Yes	Yes	Yes	-	-
Standard error clustered at firm level	Yes	Yes	Yes	Yes	-	-
Year fixed	-	-	-	-	Yes	Yes
Standard error clustered at industry level	-	-	-	-	Yes	Yes
R-sq	0.167	0.283	0.103	0.403	0.097	0.362
F-test/ Chi-square	51.93***	3852.12***	13.12***	6347.52***	29.09***	14563***
Cragg-Donald Wald F statistic	22.245	-	154.119	-	535.548	-
Kleibergen-Paap F statistic	26.616	-	74.655	-	193.088	-
Stock-Yogo weak ID test	19.93	-	19.93	-	19.93	-
Hansen *J* (*p*-value)	-	0.720	-	0.891	-	0.757
N	27,337	27,337	27,337	27,337	27,337	27,337

Note: This table presents the results of robustness analyses for the association between female board directorships, audit committee gender diversity and RPTs. In the first-stage regressions, we use two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the board). *Female_Province* is the ratio of female to male directors in a given province and *Female_Industry* is industry average of female directors. In the second stage of Columns 1 and 3, the dependent variable is *RPT_No* (the natural log of the number of total related party transactions). However, in the second stage of Column 2, the dependent variable is *RPT_Amount* (the natural log of the total amount of related party transactions in billions of Yuans) where we examine the association between female board directorships and RPTs amount. Column 1 (second stage) provides results on the association between audit committee gender diversity and RPTs. Column 3 (second stage) provides results on the association between female directors and RPTs by clustering standard errors at the industry level. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Table 10: *Female directors and RPTs (industry analysis)*

Panel A: Female-dominant vs. male-dominant industries

	Column 1 Female-dominated industries (N=5,803)		Column 2 Male-dominated industries (N=21,534)	
	First stage (Fem_Pro)	Second stage (RPT_No)	First stage (Fem_Pro)	Second stage (RPT_No)
Fem_Pro	-	-0.252	-	-3.152***
		(0.18)		(3.38)
Female_Province	0.090*	-	0.251***	-
	(1.88)		(3.28)	
Female_Industry	0.988***	-	0.906***	-
	(5.95)		(9.81)	
Controls	Yes	Yes	Yes	Yes
R-sq	0.087	0.402	0.105	0.373
F-test/ Chi-square	16.81***	1402.66***	14.19***	4626.12***
Cragg-Donald Wald F statistic	27.265	-	120.300	-
Kleibergen-Paap F statistic	18.329	-	52.840	-
Stock-Yogo weak ID test	19.93	-	19.93	-
Hansen *J* (*p*-value)	-	0.415	-	0.582

Panel B: More-RPT vs less-RPT industries

	Column1 More-RPTs industries (N=12,384)		Column 2 Less-RPTs industries (N=14,953)	
	First stage (Fem_Pro)	Second stage (RPT_No)	First stage (Fem_Pro)	Second stage (RPT_No)
Fem_Pro		-4.177***		-0.477
		(-2.61)		(-0.56)
Female_Province	0.252***	-	0.195**	-
	(2.61)		(1.99)	
Female_Industry	0.855***	-	0.992***	-
	(6.36)		(9.80)	
Controls	Yes	Yes	Yes	Yes
R-sq	0.116	0.319	0.086	0.421
F-test/ Chi-square	18.69***	2499.79***	14.51***	3836.53***
Cragg-Donald Wald F statistic	52.729	-	96.372	-
Kleibergen-Paap F statistic	23.280	-	50.296	-
Stock-Yogo weak ID test	19.93	-	19.93	-
Hansen *J* (*p*-value)	-	0.850	-	0.827

Note: This table presents the results of industry subsample analyses for the association between female board directorships and RPTs. Panels A and B provide results for the subsample of female-dominated vs male-dominated industries and more-RPTs vs less-RPTs industries, respectively. In the first-stage regressions, we use two instrumental variables (i.e., *Female_Province* & *Female_Industry*) and the dependent variable is *Fem_Pro* (the proportion of female directors on the board). *Female_Province* is the ratio of female to male directors in a given province and *Female_Industry* is industry average of female directors. In the second-stage regressions, the dependent variable is *RPT_No*. Robust *t-statistics* are shown in parentheses. *,**, and *** represent significance at 0.1, 0.05 and 0.01 levels, respectively. All variables are as defined in Table 2.

Appendix: *Classification of female-dominated vs. male-dominated industries and more-RPTs vs less-RPTs industries*

Serial No.	Code	Industry	Avg. No. of RPTs	Observations	No of Firms	Female-dominated industry	More-RPTs industry
1	A	Agriculture / Forestry / Stock raising / Fishery	22.22472	365	41	No	No
2	B	Mining	39.1967	676	79	No	Yes
3	C13	Manuf.farm and sideline food processing	26.00276	369	49	Yes	No
4	C14	Manuf. Food	17.39785	293	42	Yes	No
5	C15	Manuf.Wine and Beverage and Refined Tea	20.55422	420	42	Yes	No
6	C17	Manuf. Textiles	24.41549	289	35	Yes	No
7	C18	Manuf.Clothing	22.55263	270	38	Yes	No
8	C19	Manuf. Leather, fur, feathers and their products and footwear	12.25862	61	11	No	No
9	C20	Manuf. Wood Processing and Wood, Bamboo, Rattan and Brown Grass Products	20.12000	77	8	No	No
10	C21	Manuf. Furniture	12.6092	88	23	No	No
11	C22	Manuf. Paper	38.33193	243	28	No	Yes
12	C23	Manuf. Printing	21.34524	85	12	No	No
13	C24	Manuf. Culture, education, industry, sports, and entertainment products	12.39063	69	14	No	No
14	C25	Manuf. Petrochemicals	43.78571	155	17	No	Yes
15	C26	Manuf. Chemical raw materials and chemical products	27.31242	1,695	233	No	Yes
16	C27	Manuf. Medicine	18.18346	1,697	219	Yes	No
17	C28	Manuf. Chemical fiber	24.47291	214	22	No	No
18	C29	Manuf. Rubber and Plastic Products	21.766	464	74	No	No
19	C30	Manuf. Non - Metals Mineral	30.79434	689	84	No	Yes
20	C31	Manuf. Ferrous Metal Smelting and Rolling Processing	68.01944	364	36	No	Yes
21	C32	Manuf. Non - ferrous Metal Smelting and Rolling Processing	40.86281	610	69	No	Yes
22	C33	Manuf. Metals	22.10306	366	56	No	No
23	C34	Manuf. General equipment	22.36436	896	129	No	No
24	C35	Manuf. Special equipment	20.11727	1,296	199	No	No
25	C36	Manuf. motor	32.01429	854	127	No	Yes

26	C37	Manuf. Railway, Ship, Aerospace and Other Transportation Equipment	49.02083	391	47	No	Yes
27	C38	Manuf. Electronics	23.11553	1,665	233	No	No
28	C39	Manuf. Computer communication and other electronic equipment	22.97699	2,314	336	No	No
29	C40	Manuf. Instrument	14.91457	222	44	No	No
30	C41	Manuf. Other manufacturing	24.58333	126	19	No	No
31	C42	Manuf. Comprehensive Utilisation of Abandoned Resources	52.13158	38	5	No	Yes
32	D	Electricity/Gas/ Water (Utilities)	32.58158	1,025	110	No	Yes
33	E	Construction	35.10992	673	93	No	Yes
34	F	Wholesale/Retail trade	32.17021	1,563	167	No	Yes
35	G	Transportation/Storage	34.81051	929	104	No	Yes
36	H	Hotels and Catering	23.19811	110	10	Yes	No
37	I	Telecommunications, radio, television, and satellite transmission services	17.48000	1,824	271	Yes	No
38	J & K	Real estate	32.36907	2,084	223	No	Yes
39	L	Leasing	29.44386	395	52	No	Yes
40	M	Research and experimental development	16.33043	246	50	No	No
41	N	Social service	24.73297	374	51	Yes	No
42	P	Education	27.86	55	8	Yes	No
43	Q	Healthcare	22.53763	102	12	Yes	No
44	R	Communication / Cultural	24.41873	376	57	No	No
45	S	Conglomerate	24.37156	220	22	No	No
		Total	27.22779	27,337	3,601	5,803	12,384

***Note*:** Following Cumming *et al.* (2015), we define the following industries as female-dominated: food processing, clothing (textile, garment) manufacturing, medicine and biological product manufacturing, the retail clothing trade, food and beverage services, hotels, tourism, radio, film and television, and publishing. Adams (2016) suggests that women are more likely to be recruited in the service industries; we therefore also consider healthcare, education, and social service as female-dominated industries. Based on the average number of RPTs in our sample (27.227), we define those industries as more-RPTs (less-RPTs) industries who use more (less) RPTs than the sample mean.