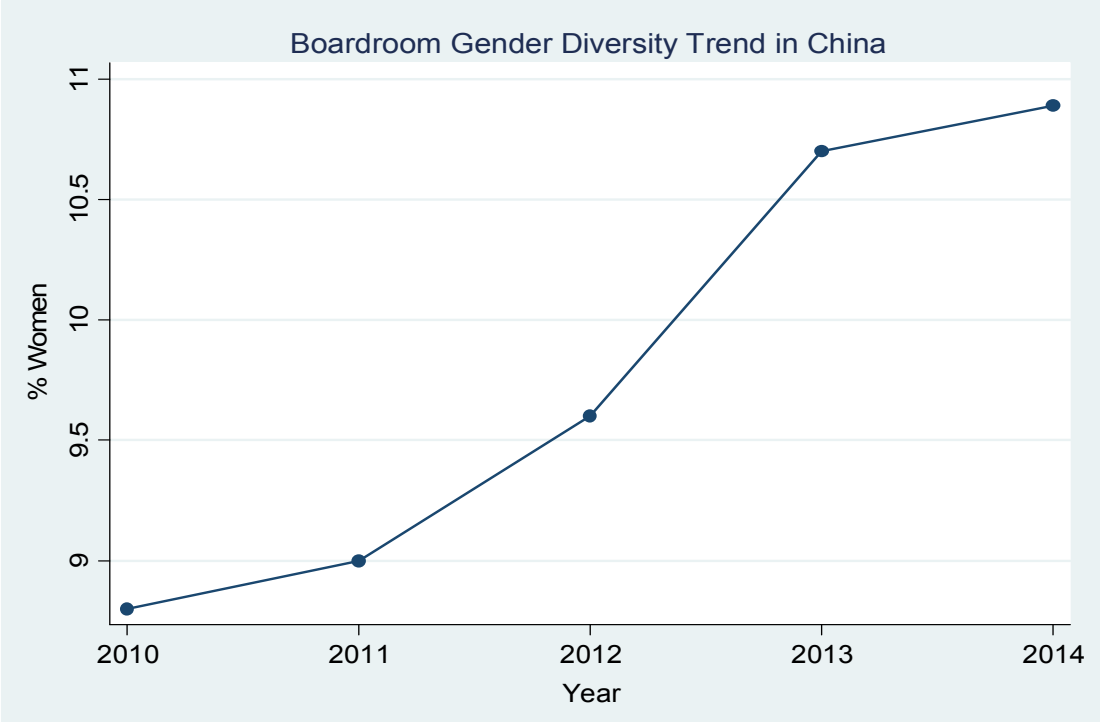
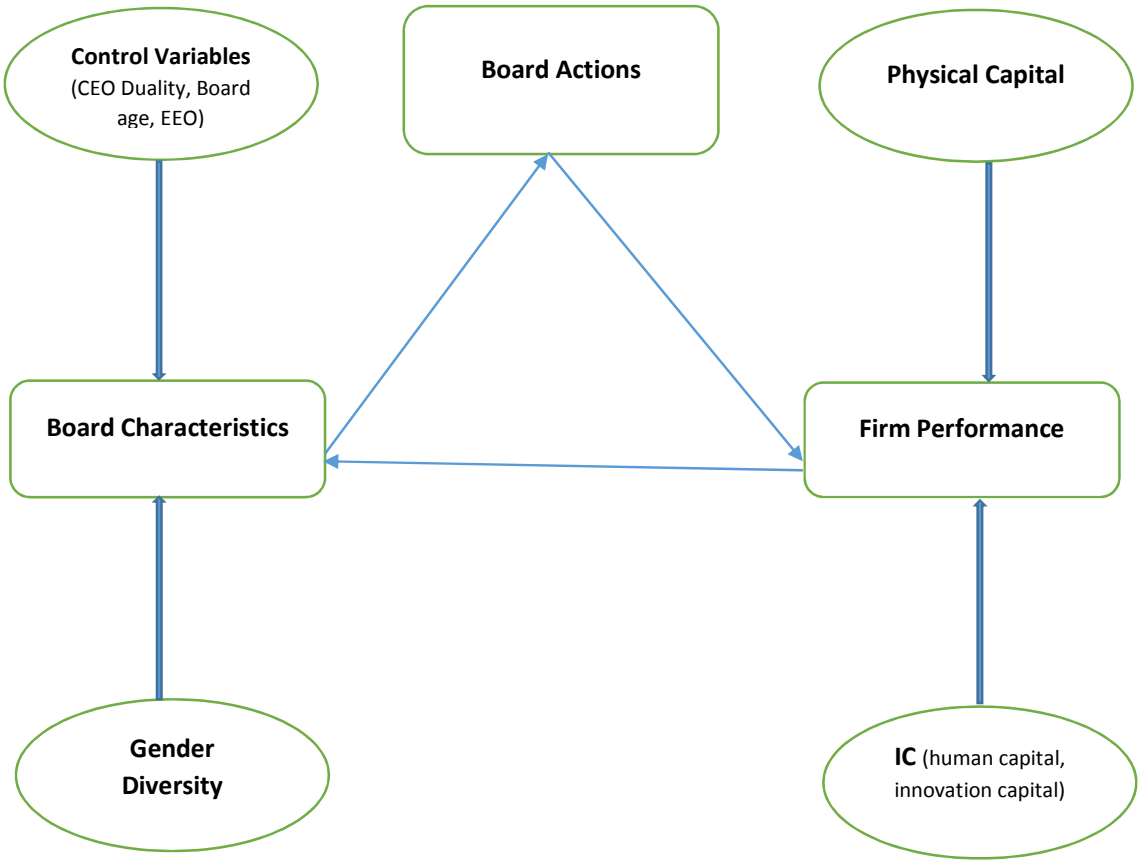
Figure 1. Boardroom Gender Diversity Trend in Chinese Listed Firms



Source: All data is sourced from CREDIT SUISSE Publications[1]

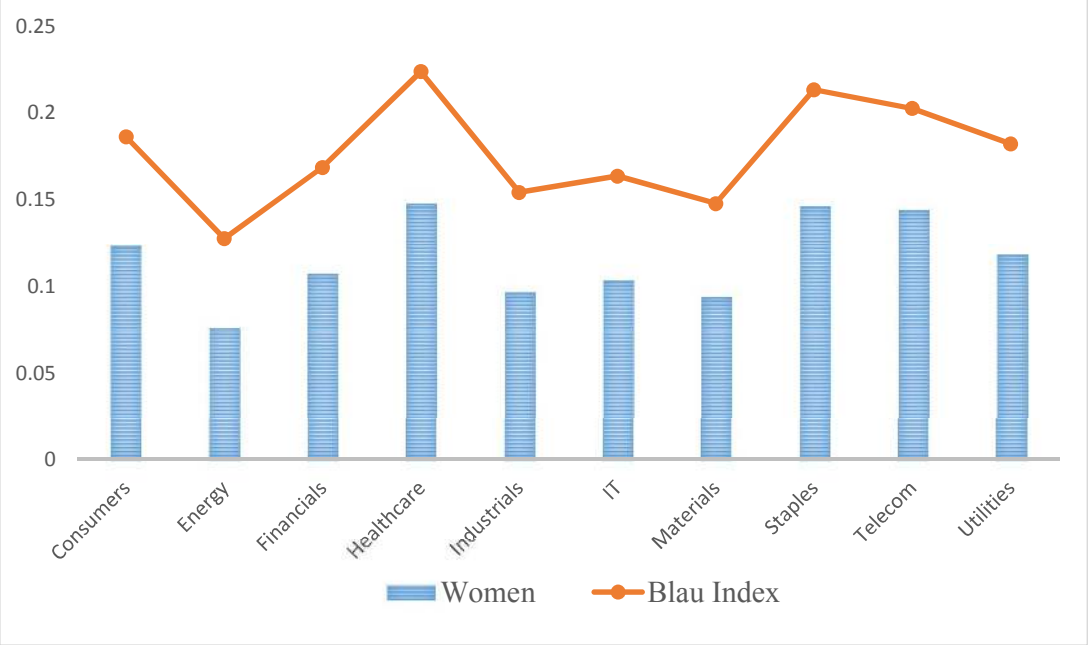
[1] All data is obtained from Credit Suisse website (https://publications.credit-suisse.com/tasks/render/file/index.cfm?fileid=8128F3C0-99BC-22E6-838E2A5B1E4366DF)

Figure 2. Gender diversity and IC framework



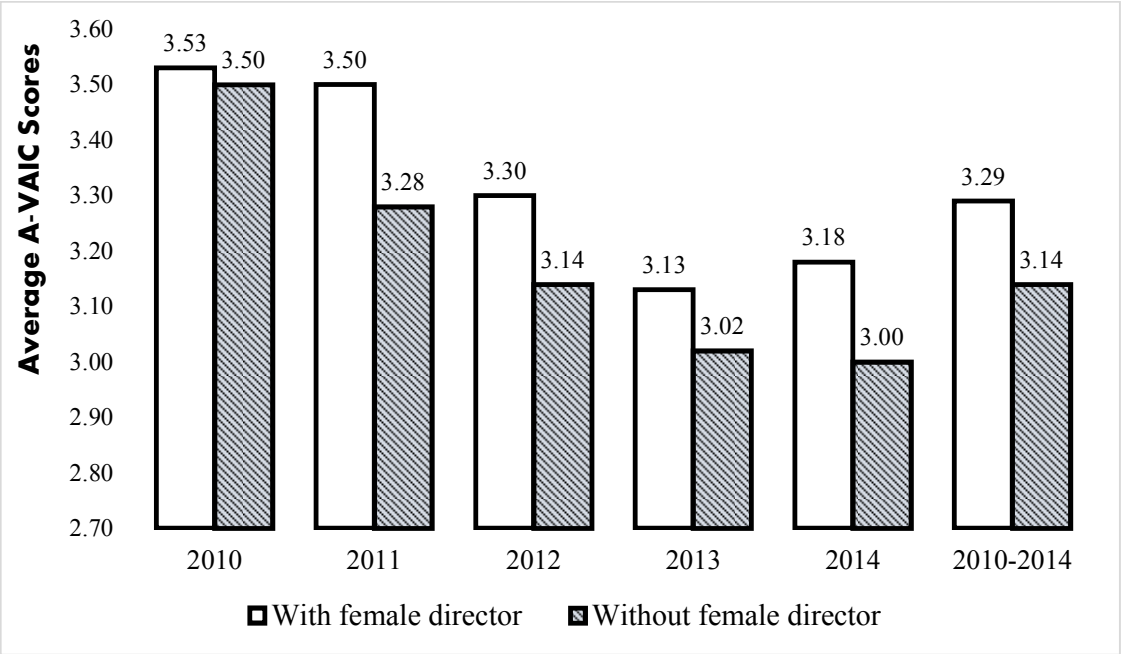
Source: Originally taken from Hermalin and Weisbach (2001) and then modified.

Figure 3. Industry-wise gender diversity in China's Boardroom



Source: Author's calculations

Figure 4. Average A-VAIC scores for firms with and without female directors



Source: Author's calculation

Boardroom Gender Diversity and Intellectual Capital Efficiency: Evidence from China

Purpose: This study investigates the relationship between boardroom gender diversity and intellectual capital (IC) efficiency in China – while the previous literature focuses only on traditional accounting based performance measures such as ROA or Tobin's Q.

Methodology: A well-developed Arrelano-Bond generalized method of moment (GMM) is applied to account for endogeneity – mainly because of simultaneity and unobserved heterogeneity. Moreover, this study uses an adjusted-VAIC model to measure the IC efficiency of 906 Chinese listed firms for 2010-2014.

Findings: The empirical analysis shows a significant relationship between gender diversity and IC efficiency, in static OLS estimation, but this disappears when endogeneity is accounted for using dynamic GMM. This insignificant relationship remains consistent, even when two alternative proxies of gender diversity *i.e.* the Blau index and the women dummy, are used.

Practical Implications: This study provides some useful insights into the traditional Chinese corporate structure where females cannot utilize their powers to bring corporate changes in firms. Our findings show that gender-related stereotypical attitudes continue to exist in China. The regulators, therefore, should look into strengthening gender related regulations – which are currently non-existent in China.

Originality/Value: This is the first study of its kind to investigate the relationship between gender diversity and IC efficiency in China using the A-VAIC model and GMM to mitigate endogeneity.

Keywords: Gender diversity, Intellectual capital, System GMM, China

1. Introduction

Corporate governance in general and boardroom gender diversity in particular are perhaps the most pondered elements of corporate board composition and have been linked as a source of competitive advantage for the firms (Burke, 1997, Burke, 2003, Zelechowski et al., 2004, Radin et al., 2006, Midavaine et al., 2016). According to the authors, women are not only socially well minded but are also considered to have sufficient knowledge of consumer markets. The monitoring duty of directors on the board is highly dependent on their unique characteristics such as multiple directorships, remuneration types and their share ownership (Campbell et al., 2008). This monitoring task has gained significant attention especially after the failure of top companies such as Enron and WorldCom. Recent research suggests that better monitoring activities may be attributed to female directors, thereby enhancing audit and monitoring efforts (Gul et al., 2008, Adams et al., 2009, Post et al., 2015). Therefore gender diversity, as a source of board effectiveness, has emerged as a new strand of research in recent years.

There is ample research on the relationship between corporate governance (CG) and firm performance (see for example, Alves and Mendes, 2004; Carter, Simkins, and Simpson, 2003; Elsayed, 2007; Laing and Weir, 1999; Harford, Mansi, and Maxwell, 2012), but the literature specifically on gender diversity and firm performance is still very limited (see for example: Joecks, Pull, and Vetter, 2013; Chapple and Humphrey, 2014; Mahadeo, Soobaroyen, and Hanuman, 2012; Nguyen, Locke, and Reddy, 2015). The quest for research on gender diversity has received enormous popularity especially after the global financial crises and the researchers are interested in what would have happened had more women been on corporate boards (Adams et al., 2012). The greatest reason for this phenomenon is the recent results indicating that women executives are more risk averse in investments decision making than their male counterparts (Huang et al., 2013, Levi et al., 2014). Moreover, female directors are thought to be more cautious and pay more attention to the details as compared to male directors (Adams et al., 2009).

Nonetheless, the aforementioned existing studies have focused on tangible assets based accounting ratios for firm performance such as ROA, ROE – hence ignoring the importance of intangibles i.e. Intellectual Capital (IC from here onward) indicators. For example, CanÄibano et al. (2000) argued that a majority of the manufacturing economies have been

replaced by “knowledge driven, fast changing and technologically intensive economies”, where IC has become the major driver of value creation processes for the firms. The resource based view (RBV) of the firm, introduced by Barney et al. (2001), argues that a firm’s competitive advantage should lie in the use of inimitable values, skills, knowledge and processes which can be combined under one term “Intellectual Capital”. Sullivan Jr et al. (2000) stated that there is a major shift from physical assets based to intangibles based companies where the firm’s value is associated with intangible assets rather than tangible assets. In this regard, Bontis (2001) has argued that knowledge assets have become the major driver of competitive advantage, therefore a variety of models to measure IC efficiency are being introduced in the literature. Nonetheless, the above discussion postulates that the focus on tangibles as compared to intangibles has been shifting toward the latter and therefore needs more research to understand its value generation mechanisms.

A few studies have tried to link CG in general and gender diversity in particular with IC, but these studies rather focus on the disclosure side of IC (for example Cerbioni et al. (2007) and Hidalgo et al. (2011)). The novelty of this study lies in its contribution to the literature by focusing on IC efficiency as a corporate performance measure. It is worth mentioning here that the studies on CG and IC in general, and gender diversity and IC in particular, are very limited around the world and non-existent in China.

The first study in the literature linking CG and firm performance in terms of IC was by Ho et al. (2003)[1] and since then just a few more studies (Abidin et al., 2009, Mohd-Saleh et al., 2009) have been carried out on CG and IC during the last almost 13 years. It is pertinent to mention here that these studies ignored an important and emerging aspect of board composition i.e. gender diversity. Ho et al. (2003), departing from the literature, examined the relationship between board composition and IC performance in a comparative study of the UK, Sweden and South Africa. The study however was heavily criticised by Khurana (2003) for several reasons. Firstly, Ho et al's (2003) study did not develop a formal channel through which CG variables influence firm performance (Khurana, 2003). The second and most important criticism was that the study ignored the potential existence of endogeneity as documented in the contemporary research (see for example, Hermalin and Weisbach, 2001), as well as in the recent research (see for example, Wintoki, Linck, and Netter, 2012).

Third, the reliability of the VAIC model used to measure IC efficiency was also questioned by Khurana (2003). Similarly, the VAIC model by Pulic (2000) has been criticised by many other researchers (see among others, Ståhle, Ståhle, and Aho, 2011) especially the structural capital measure of the VAIC model.

As far we are aware, no existing study has investigated the effect of boardroom gender diversity on IC efficiency. Hence, one of the major contributions of our study is to fill this gap in the literature and rejuvenate the topic – as gender diversity, apart from the ethicality of it, is believed to be economically beneficial for the corporates[2].

This study, while mitigating all the above mentioned problems in part, contributes to the body of literature in other different ways. First, this study examines the participation of female executives in China where gender diversity at board level is still very limited as compared to the rest of the world (Liu et al., 2014). Unlike other studies, we also control for other board characteristics such as CEO duality, average board age and firm provision of equal employment opportunity (EEO) etc. and industry types. Secondly, this study, while matching *Resource Based Theory*, uses IC efficiency as a corporate performance measure[3] – thereby highlighting the importance of IC in modern day knowledge based economies. Moreover, this study takes the original VAIC model and replaces its structural capital measurement with innovation capital (using R&D expenditures as its proxy) to overcome the general criticism of the VAIC model. Finally, we apply Arellano et al's (1991) system GMM estimator to produce consistent results in the presence of endogeneity.

Our findings from 906 Chinese listed firms, for the period of 2010-2014, reveal insignificant relationships between gender diversity and IC efficiency. These results remain consistent when we use two alternative proxies of gender diversity namely the Blau index and the women dummy variable. We also replace IC efficiency with a traditional firm performance measure *i.e.* ROA and the result shows an insignificant relationship with gender diversity. These findings support the general arguments that there are no gender diversity quotas and legislation in China[4]. Our findings therefore cannot endorse resource dependency and agency theories in the context of China which means that China is still a male dominated economy.

The rest of the paper is organised as follows: Section 2 provides a dynamic framework of the relationship between gender diversity and IC performance and the hypotheses development of the study. Section 3 describes the data and methodology used in this study. Section 4 reports and discusses empirical results. Section 5 concludes the discussion with some possible directions for future research.

2. Literature review and hypotheses development

2.1 Gender diversity and board composition in China

"Women hold up half the sky", a famous saying by Chinese Chairman Mao about 40 years ago, motivated Chinese women's participation in the labour force. Having no set quotas for women's participation at board level, there has been a gradual rise in the female percentage on corporate boards in China (see Figure 1). Similarly to European firms, Chinese firms also follow a two-tiered board structure (Cumming et al., 2015) – a supervisory board and a board of directors. According to Cumming et al. (2015), the board functions of Chinese firms are quite similar to their US counterparts. For example, corporate boards of Chinese firms can remove managers with large ownerships. Similarly, the basic duties of a supervisory board are to take part in long-term decision making and the removal from and appointment of new directors to the corporate board. The construction of a supervisory board includes three members who cannot be from the board of directors, financial officers and general managers. The board of directors on the other hand, is responsible for monitoring the day-to-day operations of the management.

Insert figure 1 about here

China still does not have any kind of legislation in place to promote gender diversity on corporate boards. This might be one of the reasons China is still behind other Asia-Pacific counterparts, as far as boardroom gender diversity is concerned (see Table 1). Table 1 show that the percentage of women in Chinese boardrooms is 10.70 which is far less than Australia (15.10), New Zealand (17.50) and also less than the developing country of the Philippines (11.90). Moreover, women's participation as board chairs is also very low in China (3.50) compared to Asia-Pacific countries such as Australia, New Zealand, Hong Kong, and the Philippines (see Table 1). Nonetheless, despite the adaptation of gender equality related codes of corporate governance and increasing social orientations, women's

participation at corporate board level, around the world in general and in China in particular, is still very low – apart from some developed countries such as the US (Kang et al., 2007, Adams et al., 2009). Surveys report that in China alone, about 40% of listed public firms still do not have any females on their boards[5]. However, the momentous contribution from women on corporate boards cannot be overruled. Catalyst et al. (2004) documented that Fortune 500 firms with females in their boardrooms earned 35% more return on equity than their counterparts without such females. Therefore, this study attempts to answer the following question: Does boardroom gender diversity improve IC efficiency in China?

Insert table 1 about here

2.2 Theories related to gender diversity

2.2.1 Resource dependence (RD) theory

Under the RD theory, the survival of the firms depends on the resources which are owned by external forces (Pfeffer et al., 2003). This dependency on external forces thus poses significant risks for the firms. However, this risk can be minimized through developing corporate board linkages with external forces. In this regard, Broadbridge et al. (2006) and Kravitz (2003) have argued that gender diverse boards have higher ability to resolve complex issues and better communicate with the external environment. Similarly, the representation of women in the boardroom promotes women's rights, thereby increasing the firm's legitimacy in society (Cox et al., 1991). Further, resource dependency theory posits that gender diverse boards are beneficial for firms operating in the 21st century – not only for ethicality reasons, but also to maintain good relationships with the external environment to acquire resources.

2.2.2 Agency theory

Corporate managers (agents) are hired to act on behalf of shareholders (principals) and agency problems occur when managers are unable to act in the best interests of the shareholders. Among many other solutions, Fama et al. (1983) recommended a better monitoring system to overcome this problem. Recent research postulates that better monitoring activities are attributed to female directors, thereby enhancing audit and monitoring efforts (Gul et al., 2008, Adams et al., 2009). Gender diverse boards however,

sometimes can be over-monitoring which then can become a cause of low gender diversity and firm performance (Adams et al., 2009). Since gender diversity, corporate governance and other institutional attributes are less developed in China compared to developed countries such as the US (Allen et al., 2005), over-monitoring should not be a problem in China (Liu et al., 2014). Thus, gender diverse boards can be more beneficial for firms under the agency theory.

2.3 Framework and hypotheses development

Most of the studies on CG and firm performance define a firm's performance based on accounting measures such as ROA and ROE or market based measures such as market-to-book value (Ho et al., 2003, Low et al., 2015). Very few studies have conceptualized the firm's performance in terms of value added or IC indicators (Hermalin et al., 1991). It is well documented in the literature that firm performance is dependent on a variety of resources such as physical resources as well as intellectual resources, including human capital and structural capital (Huselid et al., 1997, Core et al., 1999, Delios et al., 2001). We argue that good corporate governance in general and gender diversity in particular will lead to an increase in IC efficiency which can then enhance the overall performance of the firm. We therefore, adopt the theoretical framework proposed by Hermalin et al. (2001) and modify it as under.

Insert figure 2 about here

Resource dependency and agency theories hypothesise how gender diversity can help firms enhance their communication with different stakeholders and can make the monitoring systems intense –thereby reducing the chances of agency problems. Studies on gender diversity and firm performance however, have documented quite divergent results (Post et al., 2015). For example, Lückerath-Rovers (2013) and Perryman et al. (2016) reported significant relationships between gender diversity and firm performance. The authors concluded that firms with women in the boardroom perform better than those without boardroom gender diversity. Furthermore, Nguyen et al. (2015) and Low et al. (2015) found that there was a positive and significant relationship between boardroom gender diversity and firm performance in a transitional economy of Vietnam and four Asian economies

respectively. Wintoki et al. (2012) however, documented that previous studies which produced significant relationships bore the problems of endogeneity and that there is no relationship between CG and firm performance, once the endogeneity problem is mitigated. Similarly, McGuinness et al. (2015) found no big differences in dividend distributions of firms with a male or female CEO, suggesting that the ability to take or avoid risk is same for both genders. Melero (2011) however, examined the difference in management styles of the workforce with and without females in the management. The author concluded that a workplace with females in the boardroom promotes a channel of communications and monitors employee feedback more professionally compared to a workplace without females in the boardroom (Post et al., 2015). Furthermore, boardroom gender diversity has also been linked to better performance in banks (García-Meca et al., 2015). The following relationship is hypothesized.

Hypothesis 1: Boardroom gender diversity positively influences IC efficiency.

Where IC efficiency means how efficiently firms used their IC to add value, has been measured using the VAIC model by Pulic (2004). This model is a composite measure of IC resources as well as physical capital (see section 3). The IC resources include human capital and structural capital – structural capital in this study is replaced with innovation capital. Human capital efficiency in the VAIC model means how efficiently firms used their human resources to add value. Pulic (2004) used total personnel cost as a proxy for human capital.

Female directors are thought to be more cautious and pay more attention to the details as compared to male directors (Adams et al., 2009). Furthermore, women possess a unique cognitive style which is particularly needed to create harmony and are also considered to be better sources of information dissemination (Earley et al., 2000). Hence, it can be argued that gender diversity can enhance the overall performance of the human capital resources of the firm. Broadbridge et al. (2006) and Kravitz (2003) have argued that gender diverse boards are attributed with higher ability to resolve complex issues and better communicate with the external environment. Furthermore, Krishnan et al. (2005) argued that since women directors have to face tough challenges in their position, they will put more efforts into maintaining their prestige. This is similar to Dezsö et al's (2012) study which concluded that social and informational benefits from women on boards enhance the overall behaviour and performance of the employees. Furthermore, Daily et al. (1999) argued that

female representation on boards improves human capital within an organisation by offering valuable services, such as insights into strategic issues and providing positive feedback on consumers and business partners.

The following relationship is hypothesized:

Hypothesis 2: Boardroom gender diversity positively influences human capital performance.

Campbell et al. (2008) stated that gender diversity leads to more creativity and innovation in the products and services offered by the firm. Women can contribute more positively towards creativity as they are considered more diligent and committed in their duties (Broadbridge et al., 2006). The extant literature agrees that R&D is the major source of innovation capital and women possess unique characteristics relating to problem solving and creativity, hence, it can be argued that more gender diverse boards can utilize innovation capital more efficiently. This argument is similar to the findings of Dezsö et al. (2012) who reported that gender diversity enhances firm performance in general and innovation strategies in particular. The following relationship is hypothesized:

Hypothesis 3: Boardroom gender diversity positively influences innovation capital efficiency.

Where R&D spending are taken as proxy for innovation capital and innovation capital efficiency is calculated in Table 3.

A unique attribute of the VAIC model is that it is a composite of both traditional accounting based indicators *i.e.* physical capital and IC indicators including human and structural capital (Pulic, 2004, Alhassan et al., 2016). Pulic (2004) argued that IC cannot perform separately rather it needs support from physical capital to perform better. The literature is rich in studies on CG and accounting based performance measures such as ROA, ROE and the very less used ROS (return on sales). Vafaei et al. (2015), for example, found a significant positive relationship between boardroom diversity and firm performance measured in terms of ROA, ROE, Tobin Q and cash flow from operations to total assets ratio. Furthermore, Liu et al. (2014) documented that boardroom gender diversity strongly influences the financial performance of the firms in terms of ROA and ROS. They further reported a strong positive effect on firm performance when a female serves as an executive director rather than an independent director. Female directors are found to be more effective in monitoring

activities as compared to their male counterparts, but this attribute can sometime result in over-monitoring which can then affect firm performance negatively. Adams et al. (2009) documented a negative relationship between boardroom gender diversity and firm performance in the US mainly because of over-monitoring effects from female directors. Krishnan et al. (2008) on the other hand reported a positive and significant relationship between boardroom gender diversity and firm performance measured in terms of accounting earnings, ROE and annual stock returns. The following relationship is hypothesized:

Hypothesis 4: Boardroom gender diversity has a positive influence on physical capital efficiency.

3 Data and methodology

3.1 Sample and data

We selected publicly listed firms in China from the *Bloomberg* database for the period 2010-2014. Our initial sample consisted of all publicly listed firms in China. Firms with missing data for more than two years were dropped and the firms in our sample should have at least three years of data. The final sample consists of 906 firms from 10 industries (see Table 2). Our final sample represents more than 43% of the total firms which is still higher than many studies in this domain.

Insert table 2 about here

3.2 Dependent variables

Firm performance in our study is measured in terms of IC efficiency. The adjusted-VAIC model, after a few adjustments have been made to the original VAIC, is used to measure the efficiency of IC. The VAIC model, which is based on a value added concept, is the sum of both intangible assets efficiency and physical capital efficiency (Pulic, 2000). The model has received some criticism, especially on its structural capital efficiency measure (Ståhle et al., 2011). Superimposition between human capital and structural capital in the VAIC model has been a major reason for this criticism[6]. Since the extant literature refers to R&D investments as the major source of structural capital (Keong Choong, 2008), we replaced the structural

capital measure with R&D investments as innovation capital. Table 3 defines the variables of this current study.

Insert table 3 about here

3.3 Independent variables

Gender diversity is the variable of interest in our study. Three variables used as proxies for gender diversity including: (a) the percentage of women on the boards, (b) a dummy variable which takes the value of 1 if the boards have at least one female and 0 otherwise and (c) the Blau[7] index of gender diversity – where b and c are applied for robustness checks. The women dummy variable is used to differentiate between boards with women and those without women – to test whether the presence of females in the boardroom has any impact on IC efficiency.

The second alternative, the Blau (1977) index, is employed as it measures the variation in overall diversity (Vafaei et al., 2015) and combines both effects of women for checking the robustness of the variable. Blau's (1977) calculations as followed by Nguyen et al. (2014) are, $1 - \sum_{i=1}^{2} P_i^2$

where *i*= (1, 2) is the number of gender categories (two i.e. male and female) and *Pi* is the board proportion in each category. The minimum and maximum values of the Blau Index of Heterogeneity involve 0 (perfectly homogeneous boards) and 0.5 (perfectly heterogeneous boards) respectively

Following Wintoki et al. (2012) and Nguyen et al. (2015), this study applies two sets of control variables. The first set includes board-specific characteristics such as CEO duality, board age and EEO and the second set consists of financial characteristics such as firm size, leverage and return on assets (see Table 3).

3.4 Empirical model

Since the firms in our study have some missing values for some variables, hence our data set can be termed as unbalanced panel data. This data set enables us to study the gender diversity-IC performance relationship for several firms over several consecutive years. Our basic empirical model can be written as.

$$IC_{it} = \alpha + \beta X_{it} + \lambda Z_{it} + year + industry + \eta_i + \varepsilon_{it} \ldots\ldots\ldots (1)$$

Where IC is intellectual capital efficiency and its individual components, β and λ are vectors of coefficients on gender diversity variables (X_{it}) and control variables (Z_{it}), respectively. η and ε are unobserved time-invariant firm effects and error term for firm *i* at time *t,* respectively.

4. Empirical results and discussion

4.1 Descriptive statistics

Table 4 presents the summary statistics of the dependent, independent and control variables. In Table 4 the women percentage varies from 0 to 44.44 percent with an average of 10.98. This result is consistent with Deloitte's 2014 report where the mean female participation in Chinese boardrooms was 10.70%. The mean percentage of women directors in our study (10.98) is however slightly higher than those reported by Liu et al. (2014) in China (10.20) which means that female participation in Chinese boardrooms is gradually increasing over time. Furthermore, the women percentage on boards of directors in our study (10.98) is greater than those reported by Catalyst (2012)[8] for many countries, for example, Indonesia (4.50%), Japan (0.90%), Malaysia (7.80%), Singapore (6.90%), Thailand (8.70%) and South Korea (1.90%). With no gender related quotas whatsoever in China, boardroom gender diversity in China is somewhat better than many developing Asia-Pacific countries.

Similarly, the mean women dummy in Table 4 is 0.63 which implies that about 63% of the firms in our study sample have at least one woman on their boards – which is greater than that reported by Liu et al. (2014) in China (36.5%). Furthermore, this figure (63%) is greater than that in Spain (23.70%) reported by Campbell et al. (2008) and Singapore (40%) reported by CGIO (2011). The average age of the board members in our sample is 51.30 years. The mean Blau index is 0.17 with a minimum value of 0 and a maximum 0.49 (showing perfectly heterogeneous boards). This result is similar to the findings in Paul Hastings' report which shows that China is home to two of the world's top companies which have all females on the board. Only 18% of CEOs in our study serve as board a chair which

means that dual roles in Chinese firms are less common as compared to those reported by Nguyen et al. (2015) in Vietnam (32%). The mean return on assets for Chinese firms is 5.55% with a standard deviation of 5.94%. The mean ROA is greater than that reported by Liu et al. (2014) in China (3.2%). Table 4 shows the mean A-VAIC scores for Chinese firm are 3.24 with a minimum score of 1.42 and a maximum of 7.31.

Insert table 4 about here

Campbell et al. (2008) argued that gender diversity can differ significantly across different industries because of the demographic composition of customers and employees. One can argue that the industries which are close to customers will have more gender diverse boardrooms. This argument was investigated by Brammer et al. (2007) in UK, who reported that retailing industries such as banking and media had a higher percentage of women on their boards as compared to producer oriented industries, such as engineering, which had fewer women on their boards. Figure 3 shows China's highest boardroom gender diversity is observed in consumer oriented industries such as healthcare, telecom and the consumer industry. Producer oriented industries such as industrial, energy and materials depict the lowest gender diversity in China's boardroom.

Insert figure 3 about here

Figure 4 compares the mean IC efficiency (A-VAIC scores) of firms with women in the boardroom to those without women in the boardroom. Firms with gender diverse boards show higher A-VAIC scores as compared to their counterparts without women in the boardroom.

Insert figure 4 about here

This becomes clearer when we conduct a *t*-test to note the differences among the firms with and without women in boardrooms in terms of their IC performance. Table 5 reports the results of the *t*-test for equal population means but with unequal variances. We conduct this test following Adams et al. (2009) as it does not only allow us to analyse the differences within cross-sections but also across firm-year observations. The null hypothesis of equal means can be rejected in almost all years and for all IC performance indicators (i.e. A-VAIC, HCE, INVCE and CEE).

Insert table 5 about here

These results provisionally support our argument that gender diversity leads to better IC efficiency. Furthermore, Table 6 shows that almost all the explanatory variables are significantly correlated with the dependent variables. The Pearson correlation in Table 6 however, does not exceed 0.8 in any case – which means that there is no problem of multicollinearity in our data[9].

Insert table 6 about here

4.2 Empirical results

Wintoki et al. (2012) have shown how the corporate governance and firm performance relationship is dynamic and possesses endogeneity (mainly because of simultaneity and unobserved heterogeneity). Further, Nguyen et al. (2015) argued that CG and the firm performance relationship in general and the gender diversity and firm performance relationship in particular bear the problem of endogeneity. The criticism by Khurana (2003) on the only study on CG and IC performance by Ho et al. (2003) also stated that CG and the IC performance relationship pose endogeneity problems. Wintoki et al. (2012) described that this kind of relationship should be measured in dynamic models rather than static models. Equation (1) can be written in a dynamic form as:

$$IC_{it} = \alpha + \gamma IC_{t-k} + \beta X_{it} + \lambda Z_{it} + year + industry + \eta_i + \varepsilon_{it} \quad \ldots\ldots\ldots (2)$$

Where IC_{t-k} is the lagged dependent variable. An important point here concerns how many lags of the dependent variable should be included in equation (2), in order to capture the influence of the past. To answer this question, we run an OLS regression of current IC efficiency on past IC efficiency – controlling for firm-specific factors. More precisely we run the following model.

$$IC_{it} = \alpha + \gamma IC_{t-k} + \lambda Z_{it} + year + industry + \eta_i + \varepsilon_{it} \quad (t = 2013, 2012, 2011) \ldots (3)$$

Table 7 reports the results. We first include two lags and notice that the first two lags are highly significant. In the next regression we include the 3rd and 4th lags (dropped lags 1 and 2) and note that only the 3rd lag is significant. Finally, we include all four lags and un-

tabulated results show that only the first lag is significant in most cases. This shows that the effect of older lags is subsumed in the first lag – hence we include only the first lag of IC as the regressor[10] and deeper lags can be used as instruments.

Insert table 7 about here

Dynamic models (such as equation 2) can be estimated using different estimators such as 2SLS and 3SLS which can mitigate the endogeneity problem (Wintoki et al., 2012). These estimators however, require strictly exogenous external instruments – which are difficult to find in the field of finance (Wintoki et al., 2012). Moreover, these estimators merely take into account the dynamic nature of endogeneity which is always present in the gender diversity and firm performance relationship (Adams et al., 2009). Under these circumstances, a well-developed Blundell et al. (1998) two-step system GMM is considered to be the best estimator as it can incorporate internal instruments to deal with endogeneity (Wintoki et al., 2012). Furthermore, the system GMM is specifically designed to deal with panel data with larger *N* and shorter *T* (as in our case). In this regard, Flannery et al. (2013) in their simulation analysis showed that the system GMM is the best estimator for a data set with shorter panel endogeneity problems and dynamic panel bias. Hence, we run two-step system GMM to estimate equation (2). Table 8 reports the results. We also run traditional OLS, fixed-effects and dynamic OLS for comparison purposes.

Insert table 8 about here

Table 8 shows the women percentage is significantly correlated (p = 0.069) with IC efficiency in the OLS estimation. But this positive and significant relationship disappears when we add firm fixed-effects in FE estimation[11]. Furthermore, we run OLS on the dynamic model that is, we include the lagged dependent variable as the regressor. The results in the fourth column of Table 8 show quite similar results to the FE. It is worth noting here that there is a significant increase in R^2 from static OLS to dynamic OLS (from 0.29 to 0.78). According to Wintoki et al. (2012) this is a clear sign that the model is dynamic in nature and the application of static estimators such as OLS and FE will produce biased results. Hence, we run twostep system GMM to measure the dynamic relationship between gender diversity and IC performance. The last column in Table 8 shows that the women percentage is statistically insignificant (p = 0.493) with IC efficiency. This means that gender diversity has

no significant influence on IC efficiency in Chinese listed firms. The results do not support hypothesis 1 of this study. These findings are consistent with general studies on CG and firm performance (Hermalin et al., 1991, Mehran, 1995, Wintoki et al., 2012) who also reported no significant relationship. Our findings are also consistent with the only study on CG and IC performance by Ho et al. (2003) who reported that CG has no significant impact on IC performance – though they relied on static estimation.

Since A-VAIC is a composite measure of three elements, namely human capital, innovation capital and physical capital, we also run separate regressions to test the relationship between gender diversity and individual components of IC efficiency. Table 9 reports quite similar results and once again gender diversity is statistically insignificant with any of the individual elements of IC performance. This means that hypotheses 2 to 4 of this study are not supported.

Insert table 9 about here

Paul Hastings' 2013 reports show that about 40% of Chinese publicly listed firms still do not have any females in their boardrooms. Further, there is no such legislation in China to increase women's participation at board level. This might be one reason that gender diversity does not influence IC efficiency significantly in China. Nonetheless, in Tables 8 and 9 *p*-values of AR1 and AR2 show that there is first-order autocorrelation, but no second-order – which is the requirement of GMM (Roodman, 2006)[12]. Furthermore, both *p*-values of the Hansen J. test and the difference-in-Hansen test are well above any conventional significance level – indicating that the instruments are valid and that the subsets of instruments used in our estimation are exogenous.

4.3 Robustness checks

4.3.1 The impact of alternative proxies of gender diversity on IC performance

Following Campbell et al. (2008) and Nguyen et al. (2015) we employ two alternative proxies of gender diversity *i.e.* the Blau index and the women-dummy. Column two in Table 10 shows there is no significant relationship between the Blau index and IC efficiency (p = 0.625). We also employ a dummy variable which takes the value of 1 if there is at least one

female on board and 0 otherwise. The third column in Table 10 shows that this proxy is also insignificant (p = 0.639) with IC efficiency – proving the robustness of our results.

Insert table 10 about here

4.3.2 Gender diversity and Accounting based firm performance measure – ROA

One may argue that gender diversity might not have any impact on intangible assets' efficiency because many firms still consider physical assets as main resources. We therefore, replace IC performance with an accounting based firm performance measure i.e. ROA, which is the commonly used measure in the literature (Bhagat et al., 2001, Wintoki et al., 2012, Liu et al., 2014). The last column in Table 10 shows gender diversity is insignificant with ROA (p = 0.814). This suggests that gender diversity has no bearing on IC efficiency or at least not on its own in China. Nonetheless, our results cannot support hypotheses 1-4 as well as resource-dependency and agency theories.

We also controlled for two types of variables, namely firm specific and board specific variables in our analysis. Firm specific variables include firm size, leverage and ROA, whereas board specific variables include board age, board independence, board meetings, board size, CEO duality, independent directors on audit committees and non-executive directors on audit committees. Among the control variables, only firm size and ROA are significant (p = 0.011, 0.005). This means that larger firms utilize IC more efficiently. These results are consistent with past studies (Wintoki et al., 2012) where firm specific control variables are significant with firm performance. The coefficient on leverage is insignificant but shows a positive sign, meaning that an increase in leverage leads to higher IC efficiency. As there is still considerable state ownership in Chinese firms, pressure from the Government on the management to perform efficiently, especially when the manager adds more debt, could be one possible reason for this positive relationship. Board age is significant with CEE (p = 0.088) which means that senior management increases capital employed efficiency and this is realistic as senior management can make more optimal investment decisions based on past experience.

5 Conclusion and Policy Implication

The role of gender diversity in firm performance has gained enormous popularity over the past decade, especially after the failures of world renowned companies such as Enron. It has been argued that women possess unique characteristics such as being risk averse and are ethically stronger than men; hence, gender diverse boards can outperform the boards without women. Most of the studies in the literature have targeted developed countries such as the USA and European countries. Furthermore, the literature focused only on the financial aspects of firm performance – undermining the importance of intellectual resources for the firm. This study applied IC indicators as firm performance to investigate the effectiveness of boardroom gender diversity in China.

Our results did not find any significant relationship between gender diversity and IC efficiency and between gender diversity and ROA – the relationship however, is significant in static OLS estimation. The results do not endorse resource-dependency and agency theories in the context of the Chinese market. These findings are generally in line with the arguments by Liu et al. (2014) that gender diversity related government rules and regulations in China are still very poor compared to developed markets such as the US and UK. Furthermore, our findings endorse the argument in Paul Hastings' 2013 publications that there is no significant legislation in China in terms of gender diversity quotas. Overall our findings suggest China can be categorized as a male dominant economy. This is further consistent with De Jonge (2014) who argued that family-owned firms are more likely to have gender diverse boards compared to state-owned firms as in China. State-ownership is still significant in emerging countries in general and China in particular (Saeed et al., 2016) and Du (2014) explained how state-ownership hinders gender diversity in state-owned firms. Hence we expect that state-ownership might be one possible reason for not finding any significant relationship between gender diversity and IC efficiency. This study provides some insight into the traditional Chinese corporate structure where females cannot utilize their powers to bring corporate changes in firms. The Chinese government, therefore, needs to look into gender diversity legislation to promote gender diversity and ensure conducive work environments where women can perform their jobs effectively. This is not only required from an ethicality point of view, but low gender diversity means ignoring a pool of talent which otherwise can contribute significantly towards firm value.

Our study contributes to the literature in several ways. Firstly, our study explores the role of gender diversity in China, characterised by poor CG related legislation and significant state-ownership. Secondly, our study replaces traditional accounting based firm performance measures with IC indicators to highlight the importance of IC in terms of competitive advantage. Extending the scope of the only study on CG & IC by Ho et al. (2003), our study includes an important aspect of CG, i.e. gender diversity in order to capture more information on CG structure. We employed a twostep system GMM estimator to mitigate the problem of endogeneity (due to simultaneity and unobserved heterogeneity) which is inherent in CG-FP studies in general and gender diversity and IC in particular (Khurana, 2003). Our findings are important for the authorities to develop legislation for mitigating gender-related stereotypical attitudes in China. The regulators should look into strengthening gender related regulations and promote an environment where women can use their potential towards firm performance.

This study however, is not free from limitations which can be addressed in future research. As argued by Wintoki et al. (2012), board composition adjustments take a relatively longer time period, hence the time period of five years in our study may entail a shorter time period bias. It is therefore recommended that future study should increase the study period in order to capture more information relating to CG dynamics. Secondly, our dataset only includes listed firms which are generally considered to be more transparent and hence future research can include private firms to better understand the role of gender diversity. Future research may also use different methods such as the Skandia navigator, to measure the efficiency of IC. This study explores the direct link between gender diversity and IC efficiency and finds no significant relationship. Future research can therefore look into some other channels through which gender diversity might affect IC performance – this could be interesting as Chinese firms follow a two tier governance system.

Endnotes

[1]We researched from the internet using different keywords such as corporate governance and intellectual performance, gender diversity and intangibles etc. on different websites such as google scholar, journals websites but were only able to find a few studies such as, Ho and Williams (2003), Mohd-Saleh, N., Rahman, C. A., & Ridhuan, M. (2009) and Abidin, Z. Z., Kamal, N. M., & Jusoff, K. (2009).

[2]Cumming, Leung, and Rui (2015) for example, argue that boardroom gender diversity is not only important from an ethical point of view but gender diverse boardrooms have been linked to better firm performance around the world.

[3]Hermalin and Weisbach (1991) and Clarkson et al. (1994) for example, argue that the primary objective of the firm is to maximize the wealth (also known as value added) of the organization more than just the financial performance. Pulic's VAIC model is based upon the value added feature thereby making it a popular measure of a value added or wealth creation indicator.

[4]For example, in Spain a bill was passed in 2009 requiring listed firms to increase the female percentage up to 40% on boards. Similarly, France proposed a female quota on boards effective from 2017. Similar kinds of thoughts are under consideration in Belgium, Germany, Netherlands, and the UK to promote gender diversity on corporate boards (Liu, Wei, and Xie 2014).

[5]See for example Paul Hastings publications at https://www.paulhastings.com/genderparity/pdf/Gender_Parity_Report.pdf

[6]Structural capital in the VAIC model is calculated by subtracting human capital from value added which posits superimposition between human capital and structural capital (Ståhle, Ståhle, and Aho 2011).

[7]Originally developed by Simpson (1949), the Blau (1977) index is used to measure the diversity in different groups such as gender, ethnicity and education, etc. Another unique characteristic of the Blau index is that it combines both the women percentage (known as balance) and the women dummy (known as variety). The values of the Blau index varies from 0 (perfectly homogeneous boards) to 0.5 (perfectly heterogeneous boards).

[8]Catalyst reports can be found at http://www.catalyst.org/publication/271/women-ceos-of-the-fortune-1000Fortune

[9]Gujarati (2012) states that if correlation among variables exceed 0.8 one can expect the problem of multicollinearity. In our case the highest correlation is 0.60 between ROA and CEE.

[10]This is also in line with Nguyen, Locke, and Reddy (2015) who include only the first lag of the dependent variable.

[11]We also performed the Hausman test and the results show that fixed-effect is appropriate rather than random-effects.

[12]The validity of GMM results strongly depend on underlying assumptions such as autocorrelation and the validity of instruments. In this regard, Arellano and Bond (1991) suggested certain diagnostic tests which can be used to judge the reliability of GMM results. For example, AR1 and AR2 are used to check for the presence of first and second order autocorrelation. According to Roodman (2006) one should always reject the null hypothesis of AR1 but not for AR2. Similarly, the Hansen J. test is suggested in order to check for over-identifying restrictions and one should not reject the null hypothesis that the instruments are correctly identified. Moreover, the difference-in-Hansen test is used to check the exogeneity of instruments and Roodman (2006) suggested that one should not reject the null hypothesis of this test. Finally, according to Roodman (2006) the reliability of instruments can also be checked from the number of instruments that is, the number of instruments should always be less than the number of groups – which is also true in our case.

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Table 1. Boardroom gender diversity and governance structure in Asia-Pacific region

Country	% of Women on board	Total Women on board	% of Women as board chairs	% of Women on audit committee
Australia	15.10	190	5.60	18.70
China	10.70	119	3.50	9.30
Hong Kong	10.80	68	5.40	7.10
India	8.30	91	2.70	6.00
Indonesia	5.00	8	2.90	1.90
Japan	1.60	146	0.80	7.50
Korea	2.40	12	3.90	1.00
Malaysia	10.90	46	0.00	11.90
New Zealand	17.50	19	5.60	20.00
Philippines	11.90	13	5.30	3.50
Singapore	9.70	33	7.00	12.30
Taiwan	11.83	70	3.10	4.90
Thailand	18.50	44	0.00	12.10

Source: All data is sourced from Deloitte (2014) Corporate Governance Publications

Table 2. Industry-wise firms in study sample

Industry	Firms
Consumers	125
Staples	74
Energy	36
Financials	91
Healthcare	66
Industrials	218
IT	85
Materials	165
Telecommunication	2
Utilities	44
Total	**906**

Source: Bloomberg Database

Table 3. Definition and measurement of variables

Variable name	Abbreviation	Definition (measure)
Dependent variables		
Human capital efficiency	HCE	Value added[a]/total personnel cost (natural logged)
Innovation capital efficiency	INVCE	Value added/R&D costs (natural logged)
Physical capital efficiency	CEE	Value added/capital employed (where capital employed is the total firm capital) (natural logged)
Adjusted Value Added Intellectual Coefficient	A-VAIC	HCE+INVCE+CEE (natural logged)
Independent variables		
Gender diversity	Women	The ratio of female to total directors
Blau Index for gender diversity	Blau	$1 - \sum_{i=1}^{2} P_i^2$ where *i* = (1, 2) number of gender categories which is two, Pi is the proportion of board members in each category.
Dummy variable for women	WomenD	1 if there is at least one female on board, 0 otherwise
Control variables		
Board specific characteristics		
Board Age	Age	Average age of the board members
CEO duality	CEOD	Dummy variable equal s 1 if CEO is also chair, 0 otherwise
Equal employment opportunity	EEO	Dummy variable equals 1 if firm offers equal employment opportunity, 0 otherwise
Board Independence	B.Ind	Independent directors on board
Board Meetings	B.Meetings	Number of board meetings
Board Size	B.Size	Number of directors on board
Independent directors	I.Dir.on.Audit	Number of independent directors on audit committee
Non-Executive on audit	Non-Exe-on-audit	Number of nonexecutive directors on audit committee
Financial variables		
Firm size	Size	Natural log of total assets
Leverage	Lev	Total debt to total assets ratio
Return on assets	ROA	Net income/total assets
Other control variables		
Lagged dependent variable	Lagdv	Lagged values of dependent variables (HCE, INVCE, CEE and A-VAIC)
Year dummy	yeard	A dummy variable for the years 2011-2014 (except for 2010 which is benchmark)
Industry dummy	Indd	An industry dummy for all the industries (except for one industry which is treated as benchmark)

[a] Where value added is the sum of operating profit, depreciation and amortization, total wages and salaries and R&D investments

Table 4. Summary statistics of dependent, independent and control variables

	Mean	Std	Median	Min	Max
Women %	10.98	11.29	11.11	0.00	44.44
Blau-index	0.17	0.15	0.20	0.00	0.49
Women dummy	0.63	0.48	1.00	0.00	1.00
Average board age	51.30	3.80	51.22	42.86	61.11
CEO dummy	0.18	0.39	0.00	0.00	1.00
EEO	0.25	0.43	0.00	0.00	1.00
Firm Size	22.79	1.45	22.65	20.21	27.92
Leverage	0.86	3.29	0.46	0.00	5.28
ROA	5.55	5.94	4.30	-7.68	24.46
lnHCE	1.71	0.82	1.64	-0.07	3.84
lnINVCE	2.74	1.54	2.28	0.42	7.37
lnCEE	0.16	0.12	0.14	-0.03	0.53
lnA-VAIC	3.24	1.29	2.88	1.42	7.31
Board Independence	3.45	0.81	3.00	2.00	6.00
Board Meetings	9.59	4.16	9.00	4.00	24.00
Board Size	9.44	2.09	9.00	5.00	17.00
Ind-Dir-on-Audit	2.44	0.67	2.00	2.00	4.00
Non-exe-on-Audit	3.84	1.34	3.00	2.00	7.00

Note: All variables are as defined in table 3.

Source: Author's calculations

Table 5. t-Test for equal population mean with unequal variances

		2010	2011	2012	2013	2014	2010-2014
A-VAIC	With women	3.53	3.50	3.30	3.13	3.18	3.29
	Without women	3.50	3.28	3.14	3.02	3.00	3.14
	Difference	0.03	0.22***	0.16***	0.12	0.18**	0.14*
HCE	With women	1.89	1.85	1.71	1.65	1.66	1.74
	Without women	1.81	1.73	1.61	1.59	1.58	1.65
	Difference	0.08	0.12**	0.09**	0.06	0.08***	0.09*
INVCE	With women	3.07	3.01	2.83	2.61	2.65	2.79
	Without women	3.05	2.78	2.65	2.49	2.46	2.64
	Difference	0.02	0.23***	0.18***	0.11	0.18***	0.15*
CEE	With women	-1.91	-1.96	-1.99	-2.03	-2.02	-1.98
	Without women	-2.05	-1.99	-2.06	-2.09	-2.08	-2.06
	Difference	0.14*	0.03	0.07***	0.05	0.06	.07*

Note: *, ** and *** show significance at 0.01, 0.05 and 0.10, respectively.

Source: Author's calculation

Table 6. Pearson correlation for dependent, independent and control variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Women	1.00															
Board age	-.117**	1.00														
CEO duality	.071**	-.076**	1.00													
EEO	-.045**	.051**	0.01	1.00												
Firm Size	-.108**	.176**	-.138**	.136**	1.00											
Leverage	-.083**	.046**	-.073**	0.02	.438**	1.00										
ROA	.093**	-.049**	.099**	0.02	-.218**	-.503**	1.00									
HCE	.055**	0.00	-0.01	-0.01	.059**	.047**	.212**	1.00								
INVC	0.01	0.02	.047**	-.039*	-0.03	0.01	.099**	.227**	1.00							
CEE	.044**	0.02	.051**	0.01	-.132**	-.312**	.428**	.089**	.042**	1.00						
A-VAIC	0.02	0.02	.064**	-0.03	-.067**	-0.02	.101**	.354**	.926**	.053**	1.00					
Board Indep	-.095**	.119**	-.136**	.074**	.392**	.195**	-.116**	-0.02	-0.02	-.077**	-.048**	1.00				
Board-meetings	-0.01	-0.02	0.02	0.03	.150**	.157**	-.100**	-0.01	-0.02	-.120**	-0.03	0.02	1.00			
Board Size	-.084**	.080**	-.177**	.086**	.385**	.177**	-.104**	0.00	-0.02	-.062**	-.040*	.797**	0.00	1.00		
Ind-dir-on-audit	-0.06	.162**	-.081**	.077*	.374**	.218**	-.157**	-.080**	-0.02	0.00	-0.06	.443**	.112**	.376**	1.00	
Non-exe-on-audit	0.01	.306**	-0.02	.330**	.358**	.255**	-.195**	-0.12	-.233**	0.05	-.244**	.701**	0.07	.619**	.670**	1.00

Note: * and ** show significance at 0.05 and 0.01 levels, respectively

Source: Author's calculation

Table 7. How many lags of IC efficiency are significant?

	A-VAIC	HCE	INVCE	CEE
IC Performance (t-1)	0.416**	0.553*	0. 404**	0.440*
	(0.021)	(0.000)	(0.021)	(0.000)
IC Performance (t-2)	0.436*	0.665*	0.368*	0.732*
	(0.000)	(0.000)	(0.001)	(0.000)
IC Performance (t-3)	0.051	0.561*	-0.221	0.403**
	(0.701)	(0.002)	(0.460)	(0.025)
IC Performance (t-4)	0.118	0.724**	0.111	0.391***
	(0.830)	(0.024)	(0.121)	(0.081)
Avg. Board Age	0.014	1.091	-3.932	0.160
	(0.954)	(0.231)	(0.303)	(0.140)
CEO duality	0.827*	-0.053	1.130*	-0.001
	(0.002)	(0.620)	(0.002)	(0.978)
EEO	0.001	0.154***	0.299	0.020
	(0.976)	(0.090)	(0.509)	(0.236)
Firm size	0.037**	0.014**	0.018	0.124*
	(0.031)	(0.036)	(0.361)	(0.001)
Leverage	0.047	0.038*	0.030**	0.007
	(0.728)	(0.000)	(0.036)	(0.236)
ROA	0.025*	0.025*	0.016*	0.047*
	(0.000)	(0.000)	(0.000)	(0.001)
Board Independence	-0.033	-0.060	-0.011	0.023
	(0.858)	(0.506)	(0.964)	(0.724)
Board Meetings	0.013	0.002	0.013	-0.008
	(0.662)	(0.798)	(0.771)	(0.304)
Board Size	-0.044	0.028	-0.076	0.007
	(0.623)	(0.329)	(0.535)	(0.744)
Ind. Directors on Audit	0.655**	0.076	0.838**	0.157*
	(0.021)	(0.400)	(0.030)	(0.054)
Non-Exe-Dir-on-Audit	0.011	-0.090	0.102	-0.140*
	(0.962)	(0.028)	(0.768)	(0.094)
R^2 (when t-1&2)	0.79	0.80	0.79	0.75
R^2 (when t-3&4)	0.68	0.69	0.50	0.58

Note: All variables are as defined in table 3. Asterisks *, ** and *** significance at 0.01, 0.05 and 0.10, respectively

Source: Author's calculation

Table 8. The effect of gender diversity on IC efficiency

	Static models		Dynamic models	
	Pooled OLS	Fixed-effects	Pooled OLS	System GMM
Women %	0.048***	-0.017	-0.010	0.060
	(0.069)	(0.655)	(0.560)	(0.493)
Board age	5.616***	19.752**	-1.830	-10.146
	(0.084)	(0.050)	(0.446)	(0.196)
CEO duality	0.982*	2.041**	0.564*	1.508
	(0.002)	(0.011)	(0.006)	(0.379)
EEO	0.596	0.048	0.019	-0.111
	(0.120)	(0.421)	(0.937)	(0.906)
Firm size	0.147	1.803 ***	0.075	0.797**
	(0.320)	(0.080)	(0.424)	(0.011)
Leverage	-0.210	-0.508	0.021	0.004
	(0.223)	(0.403)	(0.844)	(0.249)
ROA	0.065	0.004	0.059***	0.176*
	(0.249)	(0.948)	(0.092)	(0.005)
Board Independence	-0.432***	0.199	-0.106	0.289
	(0.050)	(0.545)	(0.474)	(0.531)
Board Meetings	0.010	0.001	0.041***	0.023
	(0.783)	(0.983)	(0.073)	(0.622)
Board Size	0.170***	0.175	0.030	-0.216
	(0.094)	(0.489)	(0.634)	(0.282)
Ind. Directors on Audit	0.848*	-0.550	0.239	-0.334
	(0.002)	(0.102)	(0.195)	(0.491)
Non-Exe-Dir-on-Audit	-0.552**	-0.371	0.013	0.530
	(0.028)	(0.158)	(0.944)	(0.209)
Lag A-VAIC			0.758*	0.233
			(0.000)	(0.038)
Industry dummies	Yes	Yes	Yes	No
Year dummies	Yes	Yes	Yes	Yes
R-squared	0.65	0.24	0.78	
F-statistic	38.49	37.64	22.21	7.62
Number of instruments				41
Number of groups				595
AR 1 (*p*-values)				0.038
AR 2 (*p*-values)				0.227
Hansen J. test (*p*-values)				0.739
Difference-in-Hansen test (*p*-values)				0.409

Note: All variables are as defined in table 3. The *p*-values are in parentheses. *, ** and *** show significance at 0.01, 0.05 and 0.10, respectively.

Source: Author's calculation

Table 9. Gender diversity and individual components of IC – twostep robust system GMM results

	HCE	INVCE	CEE
Women %	0.010	0.004	-0.003
	(0.574)	(0.847)	(0.545)
Board age	-0.723	-0.044	0.037***
	(0.816)	(0.758)	(0.088)
CEO duality	0.602	0.294	0.458
	(0.148)	(0.943)	(0.664)
EEO	0.012	-0.994	0.574**
	(0.940)	(0.756)	(0.014)
Firm size	0.138	0.731	-0.233
	(0.786)	(0.587)	(0.261)
Leverage	-0.100	0.018	-0.001
	(0.460)	(0.341)	(0.721)
ROA	-0.032	0.364***	0.038
	(0.593)	(0.080)	(0.465)
Lag-performance	0.576***	0.145***	0.406
	(0.065)	(0.091)	(0.196)
Board Independence	0.230	0.264	0.150
	(0.306)	(0.787)	(0.509)
Board Meetings	0.055**	0.034	0.061**
	(0.014)	(0.667)	(0.015)
Board Size	-0.023	-0.355	-0.047
	(0.850)	(0.315)	(0.536)
Ind. Directors on Audit	-0.024	0.215	-0.019
	(0.922)	(0.816)	(0.949)
Non-Exe-Dir-on-Audit	0.052	0.477	0.059
	(0.717)	(0.432)	(0.876)
Year dummies	Yes	Yes	Yes
Number of instruments	43	41	43
Number of groups	117	613	883
AR 1 (*p*-values)	0.08	0.473	0.091
AR 2 (*p*-values)	0.367	0.227	0.472
Hansen J. test (*p*-values)	0.843	0.802	0.093
Difference-in-Hansen test (*p*-values)	0.723	0.805	0.845

Note: All variables are as defined in table 3. The *p*-values are in parentheses. *** show significant at 0.10.

Source: Author's calculation

Table 10. Robustness check with alternative proxies of gender diversity and firm performance – Twostep robust system GMM results

	Blau-index	Women-dummy	ROA
Women %			-0.015
			(0.814)
Blau-Index	0.466		
	(0.625)		
Women-dummy		0.127	
		(0.639)	
Board age	-0.050	-0.045	-0.112
	(0.331)	(0.215)	(0.783)
CEO duality	1.198	0.982	12.237
	(0.371)	(0.313)	(0.318)
EEO	-2.224**	-2.023**	-7.045
	(0.020)	(0.010)	(0.436)
Firm size	0.910***	0.849**	2.238
	(0.071)	(0.015)	(0.527)
Leverage	0.008	0.006	-0.639***
	(0.305)	(0.242)	(0.094)
ROA	0.216**	0.213*	
	(0.011)	(0.001)	
Board Independence	0.547	0.074	-0.227
	(0.757)	(0.877)	(0.617)
Board Meetings	0.160	0.150***	0.087
	(0.313)	(0.057)	(0.323)
Board Size	-0.135	-0.035	0.145
	(0.854)	(0.916)	(0.315)
Ind. Directors on Audit	0.192	0.823	-0.169
	(0.891)	(0.146)	(0.781)
Non-Exe-Dir-on-Audit	-0.590	-0.437	0.240
	(0.496)	(0.551)	(0.525)
Lag-performance	0.211**	0.217**	0.421
	(0.045)	(0.023)	0.003
Year dummies	Yes	Yes	Yes
Number of instruments	20	22	67
Number of groups	595	595	892
AR 1 (*p*-values)	0.050	0.049	0.003
AR 2 (*p*-values)	0.250	0.190	0.698
Hansen J. test (*p*-values)	0.595	0.849	0.335
Difference-in-Hansen test (*p*-values)	0.720	0.609	0.554

Note: This table presents robust results using two alternative proxies of gender diversity including: (a) Blau index, and (b) women dummy, and an alternative proxy for firm performance i.e. ROA. All variables are as defined in table 3. The p-values are in parentheses. * and ** show significance at 0.01 and 0.05 respectively.

Source: Author's calculation