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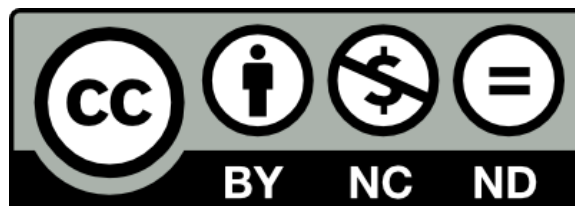
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Corporate governance, product market competition and managerial incentives:  
Evidence from four Pacific Basin countries

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**Corporate Governance, Product Market Competition and Managerial Incentives:  
Evidence from Four Pacific Basin Countries**

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**Highlights**

- Competition leads to strong pay-performance sensitivity (PPS) for widely-held firms
- Competition does not lead to strong PPS for family- or state-controlled firms
- Our study deepens our understanding on how competition shapes managerial incentives

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## INTRODUCTION

Product market competition has been identified as an important industry-level governance mechanism<sup>1</sup> that can shape managerial incentives (e.g., Giroud and Mueller 2010, 2011; Hart, 1983; Holmstrom, 1982; Nalebuff and Stiglitz, 1983). Using sample firms from the United States, Karuna (2007) finds that a higher competition level results in higher pay-performance sensitivity and concludes that competition acts as a disciplinary mechanism. However, extant studies on the association between industry competition and managerial incentives are silent on the potential influences of firm-level corporate governance (e.g., Karuna, 2007; Raith, 2003), such as ownership structures. By focusing on four Pacific-Basin markets, namely, China, Hong Kong, Singapore, and Taiwan, this study examines how ownership structures affect the role of competition in influencing pay-performance sensitivity. Specifically, we examine how the positive effect of industry competition on pay-performance sensitivity is affected by concentrated ownership structures (i.e., family ownership and state ownership).

In Pacific-Basin countries, family ownership and state ownership are the most prevalent concentrated ownership structures. Compared with the shareholders of widely held firms, controlling shareholders of family firms have better access to firm-specific information and rely less on product market information to monitor managers. Moreover, family firms are more likely to be group-affiliated and thus more likely to receive support from controlling owners when liquidation risk is high, weakening the liquidation risk effects of competition. In addition, we assume that for family firms, the effects of the marginal value of cost reduction on managerial incentive are also weaker. Therefore, we predict that the role of product market competition in influencing managerial incentives is weaker in family firms than in widely held firms. Prior studies find that family firms tend to expropriate minority shareholders through excessive pays (Wang and Xu, 2005; Ke et al., 2008; Sun and Tong,

2003; Faccio et al., 2001). Their findings suggest that managerial pay is unlikely to be affected by external factors such as market competition. Other than family ownership structure, state ownership structure is also common in East Asian markets. Executives in state-owned firms usually obtain a small pay because their pay systems and policies are ineffective due to the outdated salary systems being followed (Bai et al., 2004; Kato and Long, 2005). Product market information hardly plays a role in affecting the pay-performance sensitivity because managerial pays are mainly in accordance with government policies. Furthermore, SOEs are likely to receive government support when liquidation risk is high, thus weakening the liquidation risk effects of competition. Altogether, we conjecture that the positive association between competition and pay-performance sensitivity is less pronounced in family firms or state-owned enterprises (SOEs).

Following Firth, Fung, and Rui (2006) and Conyon and He (2011), we construct a regression model, with average director pay as the dependent variable and firm performance as the independent variable, to capture pay-performance sensitivity. The coefficient on firm performance is regarded as a measure of pay-performance sensitivity. Following Karuna (2007), we measure competition in three specific dimensions, namely, product substitutability, market size, and entry cost. The Herfindahl-Hirschman Index is included to control competition. Claessons, Djankov, and Lang (2000) document the popularity of family ownership and state ownership in East Asian countries. For instance, in East Asia, about 60% of firms with concentrated ownership are controlled by families. Therefore, East Asia countries are a good research setting to investigate our research questions. We include four East Asian countries, namely, China, Hong Kong, Singapore, and Taiwan,<sup>2</sup> in this study because of data availability. Using 33,214 firm-year observations from the four East Asian regions from 2001 to 2012, we find that the positive association between industry competition and pay-performance sensitivity is significantly more pronounced in the

non-concentrated ownership structure than in the family or state ownership structure. This finding indicates that industry competition leads to strong pay-performance sensitivity for widely held firms but not for family- or state-controlled firms. These findings suggest that industry competition does not play an effective governance role when firms are controlled by family or state.

This paper contributes to the literature in a number of ways. First, to the best of our knowledge, this is the first study to show that competition leads to strong pay-performance sensitivity for widely held firms but not for family- or state-controlled firms. By introducing ultimate ownership as an important firm-level corporate governance mechanism, we find that the positive association between industry competition and pay-performance sensitivity is less pronounced when firms are controlled by family or the state. Second, our finding suggests that industry competition does not play a governance role when firms are controlled by family or the state. The results enhance our understanding of the association between industry-level and firm-level governance mechanisms. The findings in this paper are important to the literature on the role of industry competition and ownership structures.

The rest of the paper is organized as follows. The following section reviews relevant literature and develops hypotheses. Section 3 presents the research design and variable measurements. Section 4 describes the sample selections and descriptive statistics. Section 5 exhibits the empirical results and robustness tests. The final section provides the conclusion.

## LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### Competition and Managerial Incentives

Prior research suggests that competition among firms affects managerial incentives by supplying additional information, changing liquidation risk, and influencing the marginal value of cost reduction. First, from the information perspective, previous studies indicate that product market competition provides additional information that can be used in performance evaluation, thus strengthening pay-performance sensitivity (e.g., Holmstrom, 1982; Nalebuff and Stiglitz, 1983). Second, Schmidt (1997) shows that competition will lead to high liquidation risk if a firm faces managerial slack and high costs, which lead to increased managerial effort and strong managerial incentives. However, strong competition also lowers firm profits, and it demotivates high managerial effort. Third, some studies argue that competition influences managerial incentives through the marginal value of cost reduction initiatives (e.g., Hermalin, 1992; Schmidt, 1997). They argue that the business-stealing and scale effects influence the relation between competition and managerial incentives. Raith (2003) illustrates that the business-stealing effect dominates scale effects when the market structure is endogenously determined by free entry and exit in the industry, which leads to a positive relation between competition (i.e., greater product substitutability, greater market size, and lower entry costs) and managerial incentives. Karuna (2007) provides empirical evidence that supports the conclusion of Raith (2003).

However, these studies neglect the effects of firm-level corporate governance on the relation between competition and incentives. The present study investigates how competition and industry-level governance mechanism interact with firm-level governance mechanisms in affecting managerial incentives. Specifically, we focus on ultimate ownership as firm-level corporate governance. Following prior studies, we use pay-performance sensitivity to proxy for managerial incentives.



## Ultimate Ownership, Competition, and Managerial Incentives

We argue that product market competition may play a marginal role in enhancing managerial incentives in the case of concentrated ownership. This paper examines two types of concentrated ownership structure, namely, family ownership and state ownership, as these types of ownership are the most prevalent ones in East Asia (Fan, Wong, and Zhang 2005).

When firms are controlled by family, the shareholders have great knowledge of the business activities of firms and can directly monitor managers (Demsetz and Lehn, 1985; Fan, Wong, and Zhang, 2007), thus dampening the information effect of competition. Accordingly, shareholders do not rely much on the additional information provided by product market information, which weakens the association between competition and pay-performance sensitivity. Moreover, business groups are created as internal capital markets in East Asia countries, usually by a family (Khanna and Papepu, 2000, Claessens, Fan, and Lang, 2006). Therefore, family firms tend to obtain support from their group members when liquidation risk is high, thus weakening the liquidation risk effects of competition. In addition, we predict that the effects of the marginal value of cost reduction on managerial incentive for family firms are weak. Indeed, prior studies report that managers in family firms tend to receive excessive pay and are not paid according to firm performance (i.e., weak pay-performance sensitivity). This finding implies that managers in family firms are not that sensitive to the marginal value of cost reduction (e.g., Firth et al., 2007; Filatotchev et al., 2005; Claessens et al., 1999; Claessens et al., 2000). Overall, we predict that the effects of competition on managerial incentive are not that pronounced in family firms. Therefore, we hypothesize that

***H1: The positive association between competition and managerial incentives is less pronounced in family-controlled firms than that in widely-held firms.***

State-controlled ownership is another common form of ownership structure in East Asian markets, specifically in China. Sun and Tong (2003) conclude that most of the listed

firms in China are controlled by the government despite the privatization of a great number of enterprises in past decades. SOEs tend to receive support from the government when liquidation risk is high, thus weakening the liquidation risk effects of competition. Moreover, they have weak incentive to pursue profit maximization and increase firm value (Shleifer and Vishny, 1997; Megginson and Netter, 2001; Fan, Wong, and Zhang, 2013). Therefore, the effects of the marginal value of cost reduction on managerial incentive are weak for SOEs, thus weakening the association between competition and incentive for SOEs. In addition, the pay systems and policies in state-owned firms tend to be rigid and follow the “early salary system,” which is deemed inflexible and ineffective because of the lack of updates by the government since their establishment (Li et al., 2007). Particularly, the executives in SOEs tend to receive lower pay than those in other forms of ownership structures (Bai et al., 2004; Kato and Long, 2005; Wang and Xu, 2005; Ke et al., 2008). The executive pay levels are maintained even if firm performance continues to improve or deteriorate. This situation indicates that the link between pay and performance is insignificant in SOEs. In other words, managerial pays are mainly set according to government policies and, therefore, are less likely to be affected by product market information provided by the industry. Based on the above discussion, we hypothesize the following:

***H2: The positive association between industry competition and managerial incentives is less pronounced in state-controlled firms than that in widely-held firms.***

## RESEARCH DESIGN AND VARIABLES

To examine our hypotheses (H1a, H1b, and H2), we follow prior studies (e.g., Karuna, 2007) and estimate the following model:

$$\begin{aligned}
 \text{PAY}_{i,t} = & \beta_0 + \beta_1 \text{DIFF}_{i,t} + \beta_2 \text{MKTSIZE}_{i,t} + \beta_3 \text{ENTCOST}_{i,t} + \beta_4 \text{HHI}_{i,t} \\
 & + \beta_5 \text{PERF}_{i,t} + \beta_6 \text{DIFF}_{i,t} \times \text{PERF}_{i,t} + \beta_7 \text{MKTSIZE}_{i,t} \times \text{PERF}_{i,t} \\
 & + \beta_8 \text{ENTCOST}_{i,t} \times \text{PERF}_{i,t} + \beta_9 \text{HHI}_{i,t} \times \text{PERF}_{i,t} \\
 & + \text{Firm-level Control}_{i,t} + \text{Country-level Control}_{i,t} \\
 & + \text{Country dummy} + \text{Industry dummy} \\
 & + \text{Year dummy} + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

We separate our full sample into three subsamples according to firm ownership structures: family, state, and others. To test Hypothesis 1, we regress Eq. (1) into two ownership subgroups, namely, family and others. To test Hypothesis 2, we also regress Eq. (1) into two ownership subgroups, namely, state and others. To alleviate the concern of latent common factors and reverse causation, we follow Wintoki, Linck, and Netter (2012) in using dynamic panel estimation.

Prior research (e.g., Claessens et al., 2000) shows that immediate ownership is insufficient in characterizing the ownership and control structure of East Asian firms because firms in these markets are commonly associated with complicated indirect ownership. Therefore, we focus on ultimate ownership and define ultimate owner as the shareholder who has over 20% of total issued shares (La Porta et al., 1999). Family ownership structure (FAM) is a dummy variable equal to 1 if the total shareholding by the controlling shareholders (or all family members) exceeds 20% of total issued shares and 0 otherwise. Similarly, state ownership structure (STATE) is equal to 1 if the state shareholding exceeds 20% of the total issued shares and 0 otherwise. The last type of ownership structure is others (OTHERS), which includes widely held financial institutions, such as banks or insurance companies,

widely held corporations, and miscellaneous (i.e., a cooperative, a voting trust, or a group with no single controlling investor).

Dependent variable, PAY, is the natural log of the average director pay (total directors pay divided by the number of directors).<sup>3</sup> Total director pay includes both cash and non-cash compensations. Independent variables, product substitutability (DIFF), market size (MKTSIZE), and entry cost (ENTCOST), are the industry competition measurements (Karuna, 2007; 2008). Prior studies provide mixed results on how industry competition affects executive behavior or the incentives provided to managers. Some studies suggest that competition can be the substitute for managerial incentives (Scharfstein, 1988), and others suggest that it can serve as a complement to such incentives (e.g., Hart, 1983; Schmidt 1997). These studies mainly used the level of concentration as the sole measure of competition. This measurement was questioned by Raith (2003), who suggested that competition encompasses several dimensions, including product substitutability, market size, and entry costs, given the level of concentration. Karuna (2007) further provides empirical evidence to support that competition can be measured effectively by the three dimensions of product substitutability, market size, and entry costs. Therefore, in this study, we follow Karuna (2007) in using the three dimensions to proxy for industry competition. The small DIFF, small ENTCOST, and large MKTSIZE represent a competitive industry environment. Therefore, the expected signs of DIFF and ENTCOST are negative, whereas that of MKTSIZE is positive. To control for the level of competition that can affect managerial incentives, we also include the Herfindahl-Hirschman index (HHI), which is calculated as the sum of the squared market shares of firms competing in each industry-country sample. Drawing on prior studies, all industry memberships of the four proxies are classified by the three-digit Standard Industrial Classification (SIC) code (Harris, 1998; DeFond and Park, 1999; Engle, Hayes, and Wang, 2003; Karuna, 2007; 2008). To calculate the competition measures (i.e., DIFF, MKTSIZE,

ENTCOST, and HHI), we obtain the financial data of both public and private firms in the four countries from the Bureau van Dijk (BvD) Orbis<sup>4</sup>. We use observations of both public and private firms in the four countries to calculate the four competition measures to accurately reflect the extent of product market competition rather than the ratios constructed using only the data from Worldscope, which are comprised almost entirely of publicly traded firms (Ali et al. 2009). PERF refers to firm performance, which is measured similarly to return on asset (ROA; calculated as net income before extraordinary items divided by total assets), return on equity (ROE; calculated as the net income before extraordinary items divided by shareholders' equity), or Tobin's Q (ratio of the book value of total assets minus the book value of equity plus the market value of equity to book value of total assets). Finally, we include five firm-level control variables (i.e., firm size, debt ratio, market-to-book ratio, research and development intensity, and the number of listing years) and three country-level control variables (i.e., gross national product per capita, stock market capitalization to gross domestic product (GDP), and inflation).

## SAMPLE AND DATA

The sample consists of listed companies from four East Asian markets, namely, China, Hong Kong, Singapore, and Taiwan. The sample period spans from 2001 to 2012 because directors' pay data before 2001 are scarce. Financial data are obtained from Worldscope. Directors' pay and board structure data of the China and Taiwan markets are obtained from CSMAR Solution and Taiwan Economic Journal, respectively. Directors' pay and board structure data of the Hong Kong and Singapore markets are hand-collected from annual reports. All firms have identical four-digit SIC codes across all databases for observations included in the final sample. These data are obtained from Compustat. Considering prior studies (e.g., Karuna, 2007), we omit observations in financial institutions. All currencies are converted to U.S. dollars to adjust for the differences in exchange rates.

Our initial sample (45,874 firm-year observations) is extracted from the CSMAR Solution, Taiwan Economic Journal, and annual reports of Hong Kong and Singapore listed firms. We then exclude 7,321 firm-year observations because of missing values on the financial data, and 5,339 firm-year observations because of missing data on competition and control variables.<sup>5</sup> Our final sample comprises 33,214 firm-year observations and 3,970 firms from 294 industries in the four countries.

Table I presents the descriptive statistics for the variables and the number of firm-year observations for each country. Panels A and B present the descriptive statistics for the major variables and control variables, respectively. The average directors' pay of Chinese listed companies is the lowest (\$10.498) among the four regions. By contrast, the directors of the Singaporean listed companies earn nine times higher than the others and are the highest paid directors in the four regions (\$11.564). Hong Kong and Taiwan rank second and third, respectively. The findings on terms of ownership structure are consistent with those on prior research (e.g., Claessens et al., 2000; Kato and Long, 2005). In China, 53% of firms are

controlled by the state, and 15% are controlled by families. The family ownership structure dominates in Hong Kong at 71%, and only 3% of the sample firms are controlled by the state. In Singapore, 44% of the sample firms are controlled by the state, and 37% are controlled by families. The family ownership structure dominates at 62% in Taiwan, and only 3% of the sample firms are controlled by the state.

Industry competition has four measurements, namely, product substitutability (DIFF), market size (MKTSIZE), entry cost (ENTCOST), and competition (HHI). The average DIFF of the four regions is 1.783 with China having the highest value (2.028) and Hong Kong having the lowest (1.485); Taiwan (1.817) ranks second and Singapore (1.513) comes in at third. The results imply that China has the least competitive environment, whereas Hong Kong has the most one in terms of the extent of product substitutability.

The average MKTSIZE of the four regions is 21.236. Singapore has the largest MKTSIZE at 23.123, followed by Hong Kong at 22.788, China at 22.023, and Taiwan at 20.726. These results indicate that Singapore has the most competitive environment, whereas Taiwan has the least competitive one in terms of market size.

The average Log ENTCOST of the four regions is 15.112. Taiwan has the highest ENTCOST (16.328), followed by Hong Kong at 14.853, China at 14.553, and Singapore at 12.659. These results suggest that Taiwan has the least competitive environment, whereas Singapore has the most competitive one in terms of entry cost. HHI represents the extent of product market competition. The average HHI of the four regions is 0.067. China has the least concentrated environment (0.029), whereas Singapore has the most concentrated (0.105); Hong Kong ranks second (0.075) and Taiwan comes in at third (0.070).

We further analyze the competition variables by ownership structures. In terms of product substitutability (DIFF), widely held firms operate in the least competitive environment (1.969), whereas state-owned firms operate in the most competitive environment

(1.485). In terms of market size (MKTSIZE), state-owned firms operate in the least competitive environment (20.101), whereas family-owned firms operate in the most competitive environment (21.139). In terms of entry cost (ENTCOST), family firms operate in the least competitive environment (15.356), whereas state-owned firms operate in the most competitive environment (14.639). In terms of product market competition (HHI), family-owned firms operate in the least competitive environment (0.067), whereas state-owned firms operate in the most competitive environment (0.032). These results show that competition variables and ownership structures are not related in specific patterns. These results are consistent with those of Raith (2003) and Karuna (2007, 2008) in that different competition measurements lead to different results. Therefore, competition should be measured in various dimensions instead of using a single proxy.

The listed companies in Singapore show the best performance in terms of accounting measures (ROA: 0.054; ROE: 0.063), followed by Taiwanese companies (ROA: 0.045; ROE: 0.058), Chinese companies (ROA: 0.026; ROE: 0.034), and Hong Kong companies, which exhibited the worst performance among the four regions (ROA: 0.024; ROE: 0.028). The listed companies in Hong Kong have the best stock market performance (RET: 0.083). The median RET is negative for all the countries except China.

Panel B of Table I presents the descriptive statistics of the control variables. On average, the listed companies in Taiwan are the largest in terms of total assets (13.657), and those in Hong Kong are the smallest (5.849). The companies in China have the highest average leverage ratios (0.553), whereas those in Taiwan have the lowest (0.458). In terms of growth opportunity, China has the highest MB (1.321) and Taiwan has the lowest MB (0.908). In terms of research and development, China has the highest Log R&D (0.143) and Taiwan has the lowest value (0.111).



Compared with those of the other regions, the stock market of China is rather undeveloped. Therefore, the average firm age of the Chinese market is the youngest (7.955 years) among the regions. Among the four markets, the oldest company in our sample is listed in Hong Kong, and it has 140 years of listing history. The highest average firm age is the Taiwan market (18.514 years).

For the three country-level control variables, China has the lowest GNP per capita (3.364) and stock market capitalization to GDP (0.161), but the country experienced the highest rate of inflation among the four regions (105.254). By contrast, Singapore has the highest GDP (4.558), and Hong Kong has the highest stock market capitalization to GDP (5.457).

Panel C of Table I presents the Pearson correlations among all variables. These correlations are generally consistent with those in previous studies (e.g., Core and Guay, 1999; Karuna, 2007). The correlations among industry competition measures are significant with small coefficients. Similar to Karuna (2007), a moderately high correlation coefficient is found between MKTSIZE and ENTCOST at 0.63, which is significant at the 1% level. Karuna (2007) considers that firms in large industries or markets also invest in heavy capital stock, such as plants, machinery, and buildings, thus leading to high entry barriers to the industry.

## EMPIRICAL ANALYSIS

The empirical tests are conducted using dynamic panel estimation. We report robust t-statistics in all tables after correcting for firm clustered standards errors that are likely to be present in the panel data (Petersen 2009). The main results are shown in Table II.

### **Pay-performance Sensitivity, Industry Competition, and Family Ownership Structure**

Table II shows the regression results based on Eq. (1) by family, state-owned, and other ownership structures. The results in this paper are generated with either ROA (Columns 1, 2, and 3) or RET (Columns 4, 5, and 6) as performance measures.

The coefficients on PM are insignificant in family ownership and state ownership subgroups, and significant in the “other” subgroup. The results indicate that directors’ pay in family firms or state-owned firms is insignificantly associated with firm performance. By contrast, directors’ pay is strongly associated with firm performance when firms are widely held (i.e., non-family and non-state firms).

As shown in Table II, the coefficient on DIFF x ROA in the family ownership subgroup is 0.000, the coefficient on MKTSIZE x ROA is 0.001, the coefficient on ENTCOST x ROA is -0.001, and the coefficient on HHI x PERF is 0.012. None of these coefficients is statistically significant. Similarly, we find no significant results for the coefficients of interactions between competition measures and RET for family firms. In terms of state ownership, Table II shows that the coefficient on DIFF x PERF in the state ownership subgroup is 0.000, the coefficient on MKTSIZE x PERF is 0.001, the coefficient on ENTCOST x PERF is -0.001, and the coefficient on HHI x PERF is 0.021. The signs of these variables are inconsistent with those predicted, and none of them is statistically significant. However, in the other ownership subgroups, the coefficient on DIFF x ROA is -0.014 at the 1% significant level, the coefficient on MKTSIZE x ROA is 0.006 at the 1% significant level,

the coefficient on  $\text{ENTCOST} \times \text{ROA}$  is -0.042 at the 1% significant level, and the coefficient on  $\text{HHI} \times \text{ROA}$  is -0.063 at the 1% significant level. The results are similar when  $\text{RET}$  is used to proxy for firm performance. Consistent with Karuna's findings (2007), these results indicate that great product substitutability, large market size, and low entry costs are positively associated with pay-performance sensitivity for widely held firms only.

To further explore the differential effect between family and widely held ownership structures on the association between market competition and pay-performance sensitivity, we examine whether or not the coefficients on the interaction variables between the family and the other subgroups differ. Table II shows that the p-values between the family ownership subgroup and the other ownership subgroups are significant:  $\text{DIFF} \times \text{ROA}$  is 0.000,  $\text{MKTSIZE} \times \text{ROA}$  is 0.000,  $\text{ENTCOST} \times \text{ROA}$  is 0.013, and  $\text{HHI} \times \text{PERF}$  is 0.000 ( $\text{DIFF} \times \text{RET}$  is 0.000,  $\text{MKTSIZE} \times \text{RET}$  is 0.000,  $\text{ENTCOST} \times \text{RET}$  is 0.000, and  $\text{HHI} \times \text{RET}$  is 0.012. Similarly, the p-values between the state ownership subgroup and the other ownership subgroup are also significant and consistent with our prediction. These results show that the positive association between industry competition and pay-performance sensitivity is significantly more pronounced in the non-concentrated ownership structure than in the family and state ownership structures. To summarize, industry competition leads to strong pay-performance sensitivity for widely held firms but not for family- or state-controlled firms. This finding suggests that industry competition does not play a governance role when firms are controlled by family or state. Overall, the coefficients for the control variables have the expected signs and are generally significant at the 5% level or better. These results support Hypotheses 1 and 2.

## SENSITIVITY TEST

We perform a series of robustness tests on the empirical results.

### **Endogeneity**

Our analysis so far suggests that firm-level corporate governance affects the association between competition and pay-performance sensitivity. However, our empirical tests may suffer from endogeneity problems. Endogeneity can arise because of unobservable heterogeneity when unobservable firm-specific factors influence both corporate governance and the association between competition and incentives. To account for these issues, we perform 2SLS estimation. As documented by Roberts and Whited (2012), a proper instrument must satisfy both relevance and exclusion conditions. Following these criteria, we use the average percentage of closely held shares of other firms in the same industry and legal origin as instrumental variables. We report the results of the instrumental variable approach in Table III. The results are generally consistent with those reported in Table II, thus suggesting that our conclusion holds after controlling for endogeneity based on the instrumental variable methodology.

### **Using Alternative Measures for Firm Performance**

We also regress the model using the alternative performance measures of ROE and Tobin's Q. The results are qualitatively the same. We do not report the result with ROE because it is also an accounting-based performance measure similar to ROA. Table V shows that Tobin's Q, a capital market-based measure, generates similar results.

(Insert Table IV around here)

### Other Sensitivity Tests

Besides the sensitivity tests above, we also conduct the following tests. For brevity, we do not report the detailed results.

First, following La Porta et al. (1999), we add an alternative cutoff for ownership structures. The empirical results remain the same when 10% of the total issued shares is used as the cutoff for family and state ownership structures. Second, independent non-executive directors tend to get lower pay than executive directors. To test if the dependent variable (PAY) is underestimated, we remove the independent non-executive directors' pay and recalculate the PAY. The results remain the same. Third, the International Financial Reporting Standards (IFRS) continuously changes through the years. Thus, the quality and quantity of the disclosure level of Hong Kong and Singapore are affected because these two markets follow IFRS closely. The listing rules of Hong Kong and Singapore require listed companies to disclose the share-based payment for directors starting from 2005 and 2006, respectively. To examine if this change in accounting standards affects directors' pay thus leading to biased results, we assess the 2001–2005 data of both Hong Kong and Singapore markets while retaining the qualitative aspect of the empirical results. Finally, in case the results are biased, we run the regression model year by year using particular year(s) of data. The results remain qualitatively the same.

### CONCLUDING REMARKS

This paper examined how ownership structures affect the association between industry competition and managerial incentives. Using samples from four East Asian markets (China, Hong Kong, Singapore, and Taiwan) from 2001 to 2006, we obtain the following results. First, industry competition leads to strong pay-performance sensitivity for widely held firms but not for family- or state-controlled firms. This finding suggests that industry competition does not play an effective governance role when firms are controlled by family or the state.

This paper contributes to the literature in several ways. Our study elucidates the role of ownership structure, which affects the association between industry competition and pay-performance sensitivity. By introducing ownership structure as an important firm-level corporate governance mechanism, we find that the monitoring role of industry competition in affecting pay-performance sensitivity is not that pronounced when firms have concentrated ownership. The results expand existing knowledge on the relationship between firm-level and industry-level governance. This paper is the first to show that industry competition does not play a governance role when firms are controlled by family or the state.

Overall, this paper finds that industry competition plays an effective governance role only in the widely held ownership structure. These findings suggest that regulators should promote diffused ownership structures to reduce the expropriations of controlling shareholders by receiving excessive pay and to mitigate agency problems between controlling and minority shareholders. These findings provide valuable insights into regulators in East Asian countries that would like to promote effective corporate governance and develop their capital markets. For instance, when ownership is concentrated, minority shareholders and regulators should realize that the governance role of industry competition may be limited and should introduce or strengthen other governance mechanisms or regulations, such as auditing, independent directors, or mandatory disclosures.

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## Appendix A Variable Definitions

Variable	Definition
<b>Country Variables</b>	
$GDP_t$	GDP per capita (constant 2000 US\$). These data are from the World Development Indicators database.
$SMGDP_t$	Market capitalization of listed companies divided by the GDP. These data are taken from the World Development Indicators database.
$INF_t$	Annual inflation rate. These data are taken from the World Development Indicators database.
<b>Industry Variables</b>	
$HHI_t$	Herfindahl-Hirschman index is the sum of the squared market shares of firms competing in each industry-country sample. Industry membership is classified by the three-digit SIC code. These data are obtained from Bureau van Dijk (BvD) Orbis.
$DIFF_t$	DIFF is equal to the sales/operating costs for each industrial segment: operating costs include the cost of goods sold; selling, general, and administrative expenses; and depreciation, depletion, and amortization. Industry segment is classified by the three-digit SIC code. DIFF measures the extent of product substitutability in the industry.
$MKTSIZE_t$	Natural logarithm of industry sales (industry sales is computed as the sum of segment sales for firms operating in the industry). Industry segment is classified by the three-digit SIC code.
$ENTCOST_t$	Natural logarithm of the weighted average of the gross value of the cost of property, plants, and equipment for firms in an industry weighted by each firm's market share in the industry. Industry membership is classified by the three-digit SIC code.
<b>Firm Variables</b>	
$PAY_t$	Average director pay which is calculated as total director pay divided by the number of directors. Total director pay includes both cash compensation and non-cash compensation, such as granted options, stocks, and so on.
$ROA_t$	Return on assets is computed as net income divided by total assets.
$ROE_t$	Return on equity is computed as net income divided by market value of equity.
$RET_t$	Annual percentage change in total sales.
$TOBINQ_t$	Tobin's Q is calculated as market value of equity divided by book value of equity.
$LEV_t$	Leverage is the total debt deflated by the average total assets.
$SIZE$	Firm size is the natural logarithm of the total assets (in millions of U.S. dollars) at the end of fiscal year t.
$MB_t$	is the natural log of (1+ the sum of the market value of equity and book value of total liabilities, divided by the book value of total assets).
$RD_t$	RD is calculated as the natural logarithm of R&D expenses divided by sales.
$AGE_t$	Age is the natural logarithm of the number of years since IPO.

**TABLE I**  
**Descriptive Statistics and Correlations**

**Panel A. Descriptive statistics of the major variables**

Region (N)	PAY			Ownership Structures (%)		
	Mean	Median	S.D.	Family	State	Others
China (14,741)	10.498	10.544	1.026	15%	53%	32%
Hong Kong (8,134)	11.305	11.382	1.234	71%	3%	26%
Singapore (5,548)	11.564	11.120	1.173	37%	44%	19%
Taiwan (4,791)	10.661	10.629	0.876	62%	3%	35%
Total (33,214)	10.761	10.675	1.246			

Region (N)	DIFF			MKTSIZE			ENTCOST			HHI		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
China (14,741)	2.028	1.698	1.240	22.023	21.400	2.629	14.553	14.500	1.112	0.029	0.011	0.041
Hong Kong (8,134)	1.485	1.494	0.875	22.788	21.076	2.275	14.835	15.000	1.780	0.075	0.061	0.051
Singapore (5,548)	1.513	1.326	0.697	23.123	22.910	2.620	12.659	12.260	2.390	0.105	0.096	0.067
Taiwan (4,791)	1.817	1.330	1.027	21.920	20.726	2.806	16.328	16.451	1.836	0.070	0.043	0.073
Total (33,214)	1.783	1.452	1.984	21.236	21.361	2.574	15.112	14.914	2.131	0.067	0.063	0.054

	DIFF			MKTSIZE			ENTCOST			HHI		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
Family	1.776	1.691	1.025	21.139	20.733	3.143	15.356	15.101	2.091	0.067	0.044	0.064
State	1.485	1.400	0.862	20.101	20.400	1.683	14.639	14.551	1.199	0.032	0.011	0.044
Others	1.969	1.844	1.052	20.876	20.488	2.700	15.202	15.000	1.893	0.062	0.038	0.063

Region (N)	ROA			ROE			RET		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
China (14,741)	0.026	0.033	0.128	0.034	0.071	0.086	0.076	0.050	0.415
Hong Kong (8,134)	0.024	0.047	0.139	0.028	0.074	0.096	0.083	-0.037	0.612
Singapore (5,548)	0.054	0.058	0.123	0.063	0.084	0.132	0.019	-0.058	0.471
Taiwan (4,791)	0.045	0.042	0.107	0.058	0.059	0.095	0.035	-0.049	0.470
Total (33,214)	0.046	0.048	0.125	-0.003	0.005	0.094	0.065	-0.039	0.510

**Notes:** This panel presents the description of the major variables of our sample. Average directors' pay is calculated as total directors' pay divided by the number of directors. Log average directors' pay is the natural logarithm of average directors' pay. DIFF is sales divided by operating costs for each industrial segment. Operating costs include the cost of goods sold; selling, general, and administrative expenses, and depreciation, depletion, and amortization. Industry segment is classified by the three-digit SIC code. Log MKTSIZE is the natural log of industry sales (industry sales is computed as the sum of segment sales for firms operating in the industry). Log ENTCOST is the natural log of the weighted average of the gross value of the cost of property, plants, and equipment for firms in an industry weighted by each firm's market share in the industry. HHI is the sum of the squared market shares of the firms competing in each industry-country sample. ROA is defined as the net income before extraordinary items divided by the total assets. ROE is the net income before extraordinary items divided by shareholders' equity. TOBIN'S Q is defined as the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of total assets.

## Panel B. Descriptive statistics of the control variables

Region	SIZE			LEV			MB			RD			AGE		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
China	8.678	8.458	0.451	0.553	0.531	0.702	1.321	1.389	0.194	1.143	0.124	0.057	7.955	10.000	4.531
Hong Kong	5.849	5.897	0.988	0.478	0.376	0.288	1.253	1.264	0.277	0.124	0.120	0.055	13.383	14.000	10.887
Singapore	12.361	12.921	1.865	0.487	0.465	0.232	0.932	0.898	0.254	0.119	0.114	0.052	10.970	9.000	7.779
Taiwan	13.657	13.937	1.678	0.458	0.465	0.524	0.908	0.903	0.299	0.111	0.104	0.046	18.514	17.000	9.599
Total	10.244	9.214	2.788	0.468	0.459	1.298	1.157	1.151	0.329	0.124	0.122	0.049	14.579	12.005	9.255

Region	GDP			SMGDP			INF		
	Mean	Median	S.D.	Mean	Median	S.D.	Mean	Median	S.D.
China	3.364	3.354	0.112	0.161	0.179	0.068	105.254	106.013	3.4123
Hong Kong	4.534	4.461	0.026	5.457	5.241	2.210	94.349	93.434	1.781
Singapore	4.558	4.612	0.026	2.631	2.978	0.354	105.362	105.258	0.5241
Taiwan	4.322	4.345	0.039	1.314	1.411	0.264	103.355	102.588	1.998
Total	3.947	4.311	0.632	1.881	1.324	2.333	102.336	103.344	4.567

Note: This panel presents the description of the control variables of our sample. SIZE is the natural log of total assets. LEV is calculated as the total long- and short-term debt divided by shareholders' equity. MB is the natural log of (1+ the sum of the market value of equity and book value of total liabilities, divided by the book value of total assets). RD is the natural log of (1 + research and development expenditure divided by sales). AGE is the natural log of the number of years since IPO. GDP is the natural log of the ratio of the dollar value of a country's final output of goods and services to its population. SMGDP is the ratio of the country's value of listed shares to its GDP. INF is measured by consumer price index, which measures a country's general level of prices based on the cost of a typical basket of consumer goods and services.

## Panel C. Pearson correlation coefficients among the variables

	PAY	HHI	DIFF	MKTSIZE	ENTCOST	ROA	RET	FAM	STATE	OTHER	SIZE	LEV	MB	RD	AGE	GDP	SMGDP	INF
PAY	1.00	0.20 <sup>a</sup>	0.00	0.11 <sup>a</sup>	0.11 <sup>a</sup>	0.05 <sup>a</sup>	0.02 <sup>b</sup>	0.30 <sup>a</sup>	-0.37 <sup>a</sup>	0.02 <sup>a</sup>	0.07 <sup>a</sup>	-0.05 <sup>a</sup>	0.14 <sup>a</sup>	0.05 <sup>a</sup>	0.32 <sup>a</sup>	0.62 <sup>a</sup>	0.44 <sup>a</sup>	-0.30 <sup>a</sup>
HHI		1.00	0.02 <sup>a</sup>	-0.10 <sup>a</sup>	0.00	0.00 <sup>b</sup>	0.03 <sup>c</sup>	0.11 <sup>a</sup>	0.22 <sup>a</sup>	0.09 <sup>a</sup>	0.05 <sup>b</sup>	-0.04 <sup>b</sup>	0.01 <sup>b</sup>	0.04 <sup>a</sup>	0.14 <sup>a</sup>	0.39 <sup>a</sup>	0.25 <sup>a</sup>	-0.17 <sup>a</sup>
DIFF			1.00	-0.02 <sup>b</sup>	-0.00	0.01 <sup>b</sup>	0.02 <sup>b</sup>	0.00 <sup>c</sup>	0.02 <sup>b</sup>	0.01	-0.03 <sup>a</sup>	-0.00	0.00	0.00	0.03 <sup>b</sup>	0.04 <sup>a</sup>	0.07 <sup>a</sup>	-0.04 <sup>a</sup>
MKTSIZE				1.00	0.63 <sup>a</sup>	0.00 <sup>b</sup>	0.01	0.13 <sup>a</sup>	0.13 <sup>a</sup>	0.01	0.38 <sup>a</sup>	-0.01	0.23 <sup>a</sup>	0.06 <sup>c</sup>	0.22 <sup>a</sup>	0.14 <sup>a</sup>	-0.01 <sup>a</sup>	0.05 <sup>a</sup>
ENTCOST					1.00	0.02 <sup>b</sup>	0.00	0.08 <sup>a</sup>	0.13 <sup>a</sup>	0.03 <sup>a</sup>	0.32 <sup>a</sup>	-0.01	0.14 <sup>a</sup>	0.07 <sup>a</sup>	0.32 <sup>a</sup>	0.16 <sup>a</sup>	0.08 <sup>b</sup>	-0.02 <sup>b</sup>
ROA						1.00	0.08 <sup>a</sup>	0.04 <sup>a</sup>	0.03 <sup>a</sup>	0.02 <sup>a</sup>	0.03 <sup>c</sup>	0.15 <sup>a</sup>	0.01 <sup>b</sup>	0.00	0.04 <sup>a</sup>	0.04 <sup>a</sup>	0.04 <sup>a</sup>	-0.04 <sup>a</sup>
RET							1.00	0.04 <sup>a</sup>	0.03 <sup>a</sup>	0.02 <sup>c</sup>	0.02 <sup>b</sup>	-0.01	0.03 <sup>a</sup>	0.00	-0.00	0.04 <sup>a</sup>	0.02 <sup>a</sup>	-0.02 <sup>b</sup>
FAM								1.00	-0.42 <sup>a</sup>	-0.58 <sup>a</sup>	0.09 <sup>a</sup>	-0.02 <sup>c</sup>	0.16 <sup>a</sup>	0.03 <sup>a</sup>	0.25 <sup>a</sup>	0.47 <sup>a</sup>	0.26 <sup>a</sup>	-0.21 <sup>a</sup>
STATE									1.00	-0.43 <sup>a</sup>	-0.14 <sup>a</sup>	0.01 <sup>c</sup>	0.39 <sup>a</sup>	-0.00	-0.22 <sup>a</sup>	-0.60 <sup>a</sup>	-0.34 <sup>a</sup>	0.31 <sup>a</sup>
OTHER										1.00	0.03 <sup>a</sup>	0.00	0.22 <sup>a</sup>	0.03 <sup>a</sup>	0.01	0.08 <sup>a</sup>	0.06 <sup>a</sup>	-0.07 <sup>a</sup>
SIZE											1.00	-0.02 <sup>a</sup>	-0.32 <sup>a</sup>	-0.15 <sup>a</sup>	0.30 <sup>a</sup>	0.11 <sup>a</sup>	-0.42 <sup>a</sup>	0.49 <sup>a</sup>
LEV												1.00	0.00	0.00	0.00	-0.02 <sup>b</sup>	-0.01	0.01 <sup>c</sup>
MB													1.00	0.17 <sup>a</sup>	-0.14 <sup>a</sup>	-0.35 <sup>a</sup>	0.03 <sup>b</sup>	-0.05 <sup>a</sup>
RD														1.00	-0.13 <sup>b</sup>	-0.13 <sup>a</sup>	0.00	-0.01
AGE															1.00	0.39 <sup>a</sup>	0.18 <sup>a</sup>	-0.12 <sup>a</sup>
GDP																1.00	0.62 <sup>a</sup>	-0.552 <sup>a</sup>
SMGDP																	1.00	-0.69 <sup>a</sup>
INF																		1.00

Note: This panel reports the Pearson correlation of the variables used. All variables are defined in Panel A and Panel B of Table I; a, b, and c denote that the statistics differs from zero at the 1%, 5%, and 10% levels (two-tailed), respectively.

TABLE II

Effects of ownership structures on the association between competition and managerial incentive

VARIABLES	PM=ROA			PM=RET		
	(1) FAM=1	(2) STATE=1	(3) OTHER=1	(4) FAM=1	(5) STATE=1	(6) OTHER=1
Lag(Pay)	0.267** (2.420)	0.176** (2.128)	0.135* (1.949)	-0.113 (-0.664)	0.036 (0.177)	0.197 (1.023)
HHI	0.020 (0.043)	0.326 (0.397)	-0.344 (-0.702)	-0.250 (-1.512)	0.370 (0.963)	0.116 (0.530)
DIFF	-0.003* (-1.808)	-0.005 (-0.156)	-0.000 (-0.091)	-0.002 (-0.917)	0.055 (0.826)	-0.002 (-0.345)
MKTSIZE	0.064*** (5.010)	0.079*** (3.495)	0.022* (1.667)	0.049*** (3.116)	0.110** (2.372)	0.025 (1.232)
ENTCOST	-0.053*** (-3.684)	-0.117*** (-3.932)	-0.022 (-1.403)	-0.065*** (-3.154)	-0.114** (-2.218)	-0.044* (-1.902)
HHI*PM	0.012 (0.897)	0.021 (0.366)	-0.063*** (-3.152)	-0.003 (-0.026)	0.237 (0.627)	-0.416*** (-3.398)
DIFF*PM	0.000 (0.453)	0.000 (0.012)	-0.014*** (-2.947)	0.001 (0.144)	0.094 (1.058)	-0.052*** (-2.986)
MKTSIZE* PM	0.001 (0.064)	-0.001 (-0.142)	0.006*** (3.543)	-0.011 (-0.688)	-0.011 (-0.165)	0.072*** (3.465)
ENTCOST* PM	-0.001 (-0.269)	-0.001 (-0.441)	-0.042*** (-2.871)	0.030 (1.571)	0.075 (1.013)	-0.097*** (-4.076)
PM	0.010 (1.434)	0.015 (0.594)	0.032** (2.038)	0.282 (1.299)	1.130 (1.055)	1.273** (2.770)
SIZE	0.384*** (12.615)	0.725*** (10.240)	0.341*** (10.171)	0.407*** (8.281)	0.847*** (5.463)	0.287*** (5.676)
LEV	0.000 (0.002)	-0.029 (-1.206)	-0.000 (-0.242)	-0.000 (-0.567)	-0.126 (-1.610)	0.010 (1.080)
MB	0.000 (0.258)	0.016** (2.132)	0.001 (0.551)	-0.000 (-0.269)	0.133** (2.339)	0.002 (0.400)
LOG(RD)	0.520*** (5.564)	0.837*** (4.534)	0.166* (1.667)	0.463*** (3.995)	0.163 (0.444)	0.433*** (3.347)
AGE	0.145*** (3.666)	0.041 (1.139)	0.111*** (3.751)	0.185*** (2.750)	0.031 (0.431)	0.169*** (2.779)
GDP	0.000 (0.441)	0.000 (1.354)	-0.000 (-0.447)	0.000 (0.970)	0.000 (1.065)	-0.000 (-0.366)
SMGGDP	0.041** (2.337)	-0.039 (-0.479)	0.052** (2.567)	0.036* (1.694)	-0.043 (-0.503)	0.050* (1.783)
INF	0.393*** (2.629)	0.126 (0.690)	0.463*** (2.841)	0.344* (1.758)	0.026 (0.065)	0.342 (1.337)
Constant	5.080*** (3.783)	0.016 (0.013)	6.341*** (4.562)	9.381*** (4.503)	1.092 (0.363)	7.419*** (3.608)
COUNTRY	YES	YES	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES	YES	YES
YEAR	YES	YES	YES	YES	YES	YES
Observations	14,341	7,638	11,235	14,341	7,638	11,235

p-value of coefficient differences	(1)-(2)	(1)-(3)	(4)-(5)	(4)-(6)
HHI*PM	0.000***	0.000***	0.012**	0.000***
DIFF* PM	0.000***	0.000***	0.000***	0.000***
MKTSIZE* PM	0.000***	0.000***	0.000***	0.000***
ENTCOST* PM	0.013**	0.021**	0.000***	0.000**

Notes: This table presents the results of dynamic panel estimation of Eq. (1) in the subsamples. Columns (1), (2), and (3) use ROA to proxy for firm performance, and Columns (4), (5) and (6) use stock returns to proxy for firm performance. ROA is return on assets, which is calculated as net income divided by total assets. RET is the annual market-adjusted stock returns in the fiscal year. This table also presents the p-value of coefficient differences among the subsamples for the major variables. Competition is measured by three specific dimensions: product substitutability (DIFF), market size (MKTSIZE), and entry cost (ENTCOST). FAM is a dummy variable that is equal to one if a firm is controlled by family or zero otherwise. STATE is a dummy variable that is equal to one if a firm is controlled by state or zero otherwise. OTHERS is a dummy variable that is equal to one if a firm is widely held or zero otherwise. Competition is controlled by the Herfindahl-Hirschman index (HHI). SIZE, LEV, MB, RD, and AGE are firm-level control variables, and GDP, SMGDP, and INF are country-level control variables. See Appendix A for the details of the variable definitions. This table presents robust (clustered) t-statistics in parentheses (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All variables are winsorized by year at the extreme 1% and 99%.



**TABLE III**  
**Sensitivity analysis: Using the instrumental variable approach**

VARIABLES	PM=ROA			PM=RET		
	(1) FAM=1	(2) STATE=1	(3) OTHER=1	(4) FAM=1	(5) STATE=1	(6) OTHER=1
HHI*PM	0.014 (0.898)	0.005 (0.057)	-0.069*** (-3.135)	0.087 (0.719)	0.061 (0.399)	-0.374** (-2.399)
DIFF*PM	-0.000 (-0.643)	0.007 (1.034)	-0.006** (-2.667)	0.000 (0.066)	0.120 (1.083)	-0.052** (-2.513)
MKTSIZE* PM	0.001 (0.449)	0.001 (0.451)	0.004** (2.445)	-0.001 (-0.035)	-0.017 (-0.257)	0.061** (2.422)
ENTCOST* PM	0.001 (0.594)	0.004 (1.279)	-0.003* (-1.940)	0.024 (1.037)	0.054 (0.742)	-0.063** (-2.441)
Observations	14,341	7,638	11,235	14,341	7,638	11,235
Coefficient differences		(1)-(2)	(1)-(3)		(4)-(5)	(4)-(6)
HHI*PM		0.000***	0.000***		0.009***	0.012**
DIFF* PM		0.048**	0.007***		0.008***	0.006***
MKTSIZE* PM		0.068*	0.063*		0.009***	0.007***
ENTCOST* PM		0.032**	0.011**		0.007***	0.006**

Notes: This table presents the analysis to address endogeneity concerns on the effect of ownership structures on the association between competition and managerial incentives. Instrumental variable approach is applied. PM is firm performance measured by ROA and RET. This table also presents the p-value of coefficient differences among the subsamples for the major variables. The variable definitions are similar to those in TABLES I and II. For brevity, we only report the coefficients for the items important to our research questions, and the coefficients of other variables are omitted in the table. This table presents robust (clustered) t-statistics in parentheses (\*\*p<0.01, \*\*p<0.05, \*p<0.1).

**TABLE IV**  
**Sensitivity analysis: Using alternative firm performance measure (PM = Tobin's Q)**

VARIABLES	PM=Tobin's Q		
	(1) FAM=1	(2) STATE=1	(3) OTHER=1
HHI*PM	0.005 (1.276)	0.029 (1.152)	-0.010*** (-3.705)
DIFF*PM	-0.000 (-0.330)	-0.001 (-0.345)	-0.002*** (-2.855)
MKTSIZE* PM	0.000 (0.980)	-0.000 (-0.014)	0.005*** (3.721)
ENTCOST* PM	-0.000 (-0.999)	0.003 (1.523)	-0.007*** (-3.404)
Observations	14,341	7,638	11,235
Coefficient differences		(1)-(2)	(1)-(3)
HHI*PM		0.000***	0.002***
DIFF* PM		0.022**	0.017**
MKTSIZE* PM		0.013**	0.001*
ENTCOST* PM		0.057*	0.000***

Notes: This table replicates Tables II and III using Tobin's Q as an alternative performance measure. Tobin's Q is market value of equity divided by book value of equity. This table also presents the p-value of coefficient differences among the subsamples for the major variables. Competition is measured by three specific dimensions: product substitutability (DIFF), market size (MKTSIZE), and entry cost (ENTCOST). FAM is a dummy variable that is equal to one if a firm is controlled by family or zero otherwise. STATE is a dummy variable that is equal to one if a firm is controlled by the state or zero otherwise. OTHERS is a dummy variable that is equal to one if a firm is widely held or zero otherwise. Variable definitions are the same as those in TABLE I. For brevity, we only report the coefficients for the items important to our research questions, and the coefficients of other variables are omitted. This table presents robust (clustered) t-statistics in parentheses (\*\*\*)  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ ).

#### Notes:

<sup>1</sup> Prior studies indicate that managers of firms in competitive industries are under constant pressure to reduce slack, improve efficiency, and maximize profits so that they can survive in the business (Giroud and Mueller 2010; Giroud and Mueller 2011; Hart 1983). Moreover, productivity shocks are normally correlated across firms in the same industry, thus a greater number of competitors may provide more information that can be used to lower moral hazard (Holmstrom (1982), Nalebuff and Stiglitz (1983)). Therefore, product market competition represents a natural constraint on the extraction of private benefit and could serve as important industry-level corporate governance.

<sup>2</sup> We are not able to include other East Asian countries, such as Malaysia, Thailand, Korea, Indonesia, and the Philippines, because of the lack of disclosure on directors' pay data and English annual reports for some companies.

<sup>3</sup> As stated in Indjejikian (1999), Main et al. (1996), and Dogan and Smyth (2002), the total board pay is a better measure for executive pay than the CEO pay. In East Asia, the agency problem mainly exists between the controlling shareholders and the minority shareholders because of the concentrated ownership structure (La Porta et al., 1999), in which boards mostly consist of family members. Therefore, using directors' pay to measure pay-performance sensitivity is more meaningful than CEO pay. We do not divide the directors' pay into cash and non-cash components because of data availability.

<sup>4</sup> If we follow Dhaliwal et al. (2008) in using data of public firms to calculate the four competition measures, our empirical results will remain qualitatively unchanged.

<sup>5</sup> Most of the missing data come from operating costs, sales, book value and market value of equity. The other missing financial data include ROA, ROE, costs of property, plants and equipment, and research and development expenditure.