

EFFECTS OF CORPORATE GOVERNANCE ON THE COST EFFICIENCY OF THE BANKING INDUSTRY – A COMPARISON OF TAIWAN AND CHINA

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ABSTRACT. *Corporate governance has been important to the banking industry for preventing wealth expropriation and financial crises, but research seldom sheds light on a comparison of banks in Taiwan and China in terms of the different impacts of corporate governance on their efficiency. Through the stochastic frontier analysis, our empirical results show that corporate governance factors significantly affect the cost efficiency of China and Taiwan banks, but the direction of effects differs in three aspects. (1) board governance and monitoring: there is a significantly positive influence in the factors of board governance and monitoring on Taiwan banks' cost efficiency, while no significant effect exists for China banks. (2) Ownership structure: there is a significantly positive influence in the factors of ownership structure on the cost efficiency for both China and Taiwan banks. (3) Independent supervisory: a significantly positive influence exists for independent supervisors on Taiwan banks' cost efficiency, while there is a negative influence of independent supervisors on China banks' cost efficiency.*

Keywords: Corporate governance, Cost efficiency, Stochastic frontier analysis, Banking

1. Introduction. The crisis of confidence and credibility that marked the investment environment in the past few years has increased public criticism of corporate governance especially in terms of banking industry reforms. The academic literature on corporate governance issues related to China's state-owned enterprises has been growing very rapidly in recent years, but very few studies have looked at corporate governance and efficiency issues of China's banks.

With Chinese banking sectors being increasingly liberalized in the past twenty years, bank managers have gradually gained more control over their business decisions. Since China's banks are currently encouraged to adopt a shareholding ownership structure, governance issues and the relevant efficiency problems have become more obvious than before. Although efficiency remains a serious challenge, the overall achievement of financial reforms in China seems to have been accomplished [1].

After joining the World Trade Organization (WTO) in 2001, Taiwan formulated and executed the Financial Holding Act in order to solve the problems of too many domestic financial institutions and of a lack of competition among banks. Since then, a large number of Taiwanese banks has joined with financial holding companies in an attempt to enhance their internal corporate governance, to integrate and streamline all their businesses, and

to save management costs. A decade after implementing the distinctive financial reforms, Taiwan's financial market has been deemed an overall reconstructed [2].

Certain effort has been devoted to examining the impact of various structures of corporate governance on the operating efficiency of banks [3]. Studies have used a financial or accounting index to evaluate the general governance effectiveness of an enterprise [4]. Among these academic developments, little attention has been paid to comparing different regions and countries. This paper sheds some light on the issue of whether or not different efficiency effects exist in China's and Taiwan's banks by using stochastic frontier analysis.

We incorporate corporate governance into the stochastic cost frontier function and explore the impact of the internal corporate governance mechanism, which mainly focuses on three domains: (1) director board governance and monitoring, (2) ownership of insiders, and (3) independent supervisory. We utilize a set of unbalanced panel data, which includes 12 China banks and 32 Taiwan banks from 2001 to 2008. The data are collected from the Taiwan Economic Journal (TEJ) Database and the websites of those banks. We first apply the Principal Component Analysis (PCA) method to extract three constructs (named as "board governance and monitoring", "insider ownership", and "independent supervisory") of corporate governance from six factors of corporate governance indicators. Second, based on the stochastic frontier analysis of Battese and Coelli [5], for each group of banks we estimate the translog cost model and the inefficient model simultaneously through the Maximum Likelihood Method.

This paper consists of five sections. Following the introduction section, the second section reviews the literature regarding corporate governance and efficiency. The third section illustrates the research method and model specification. The fourth section shows the empirical results of the translog cost function as well as inefficiency function. The final section offers conclusions and suggestions for future research.

2. Corporate Governance and Internal Mechanisms. In the literature all governance issues can be divided into several categories. For example, a five-aspect classification includes the rights of shareholders, the equitable treatment of shareholders, the responsibility of the board, disclosure and transparency, and the role of stakeholders. The whole system of corporate governance can also be separated into internal corporate mechanisms and external corporate mechanisms. Due to China's limitations in the due process of law along with a variety of institutional constraints [6], ready-to-use relevant official data might either be suspicious or have availability problems. Thus, there is a call for systematic data collection by researchers in this region to resolve these challenges. Without adequate outside mechanisms, internal incentives become crucial. External governance mechanisms are thus not taken into consideration in this study.

This paper mainly targets the impacts of the internal control of corporate governance on efficiency in three parts: (1) director board governance and monitoring, (2) ownership of insiders, and (3) independent supervisory. **Director Board Governance and Monitoring.** Analyzing a sample of 260 U.S. banks, Belkhir [7] reported that the ownership and characteristics of the board of directors are correlated to a bank's performance. Bozec and Dia [8] argued that board structure can affect a corporation's efficiency directly. They found that external directors are important when evaluating mergers. **Insider Ownership.** Gursoy and Aydogan [9] described the main characteristics of the ownership structure of Turkish non-financial listed firms and examined the impact of ownership structure on the performance and risk-taking behavior of Turkish firms. They concluded that higher concentration leads to better market performance but less financial efficiency. **Independent Supervisory.** Yeh [10] indicated that a firm's performance can increase with the enhancement of supervisors' independency. Chao [11] noted that more than 50%

of China firms hiring independent directors/supervisors do not show a higher performance than other firms.

3. Model Specification and Variable Selection.

3.1. Model specification. Based on Battese and Coelli [5] model, we specify the following translog multiproduct cost function, with three input prices and three outputs:

$$\begin{aligned} \ln TC_{it} = & \alpha_0 + \sum_{n=1}^3 \alpha_n \ln Y_{n,it} + \sum_{m=1}^3 \beta_m P_{m,it} + \frac{1}{2} \sum_{n=1}^3 \sum_{j=1}^3 \delta_{nj} \ln Y_{n,it} \ln Y_{j,it} \\ & + \frac{1}{2} \sum_{m=1}^3 \sum_{k=1}^3 \gamma_{mk} \ln P_{m,it} \ln P_{k,it} + \sum_{n=1}^3 \sum_{m=1}^3 \rho_{nm} \ln Y_{n,it} \ln P_{m,it} + v_{it} + u_{it} \end{aligned} \tag{1}$$

Here, TC_{it} represents the total cost of the decision-making unit (DMU); Y_n is the n th output (loans, investment income, and non-interest income respectively); P_m is the m th input price (price of funding, labor, and capital, respectively); i is banking firm; α , β , δ , γ , and ρ are coefficients to be estimated; v_{it} and u_{it} are random error terms, assumed to be individually and mutually independent, respectively; u_{it} is a function of firm-specific factors that affect cost inefficiency – specifically, u_{it} belongs to a truncated normal distribution, given by $u_{it} \sim N^+(m_{it}, \sigma_u^2)$ and $v_{it} \sim N(0, \sigma_v^2)$.

We also specify the following regression model to capture the main determinants of X-inefficiency in corporate governance for banks in Taiwan and China:

$$m_{it} = b_0 + b_1 B_{1it} + b_2 B_{2it} + b_3 B_{3it} + b_4 B_{4it} + b_5 B_{5it} \tag{2}$$

We select five environmental variables that might affect the cost inefficiency of banks. Since there are many variables to represent the index of corporate governance, we thus adopt principal component analysis to choose the key components of these variables. After the normalizing process, we estimate Equations (1) and (2) simultaneously through Frontier 4.1 software. We then calculate the cost inefficiency of each bank by defining the cost inefficiency function as $CE_{it} = e^{u_{it}}$, with $CE_{it} \geq 1$, meaning that as the *CE score* increases, cost efficiency decreases.

3.2. Selection of variables and data resources. Our data are from the Taiwan Economic Journal (TEJ), and we form an unbalanced panel data with 32 Taiwanese banks and 12 Chinese banks from 2001 to 2008. Since many data in TEJ are incomplete, we only select those banks that have at least 3 years of completed data. The final total sample is 313 banks: 237 Taiwan and 76 China banks. We adopt an intermediation approach to define the inputs and outputs of financial institutions. Based on Huang et al. [12], the selected input factors are labor, capital, and funding. The output variables consist of loans, total investment (including short-term and long-term investments), and non-interest income (including transaction fee and other commercial income). Three components are extracted by PCA. The three components are: (1) director board governance and monitoring, (2) ownership by insiders, and (3) independent supervisory. They are the focus of this study in examining the effects of corporate governance indicators on the cost efficiency of the banking industry.

4. Empirical Results Analysis.

4.1. Stochastic cost efficiency model estimation. We use the Maximum Likelihood estimation method to simultaneously estimate the stochastic cost efficiency model and the inefficient model. Table 1 shows the results of the estimated stochastic cost frontier function. The Likelihood Ratio test (LR test) is used to verify if the proposed inefficiency model is well specified. Our LR test statistic for Taiwan's banks is 60.1037, which is greater than $\chi_{0.01}^2(28) = 48.278$. The null hypothesis is thus rejected. For China's banks, it is 46.681, which is greater than $\chi_{0.1}^2(28) = 37.916$. The null hypothesis is also rejected. Therefore, the proposed inefficiency models are suitable for both countries.

TABLE 1. Empirical results of the stochastic cost frontier function

VARIABLE	TAIWAN				CHINA			
	Estimate coefficient		Standard error	t-value	Estimate coefficient		Standard error	t-value
Constant	-28.024	***	10.982	-2.5517	-41.013	***	0.9930	-41.301
$\ln Y_1$	3.2843	**	1.7327	1.8954	-4.1266	***	0.8650	-4.7703
$\ln Y_2$	0.7684		0.8881	0.8652	7.4545	***	0.8569	8.6989
$\ln Y_3$	0.4279		0.8846	0.4837	-3.7615	***	0.8740	-4.3036
$\ln(P_1/P_2)$	1.1786		1.0497	1.1227	-8.7334	***	0.8815	-9.9083
$\ln(P_3/P_2)$	0.6577		0.8138	0.8082	-1.9038	***	0.9458	-2.0129
$1/2(\ln Y_1)^2$	-0.0044		0.1796	-0.0247	0.3808	***	0.1043	3.6484
$1/2(\ln Y_2)^2$	0.0929	**	0.0528	1.7576	-0.4344	***	0.1694	-2.5642
$1/2(\ln Y_3)^2$	0.1801	***	0.0690	2.6074	-0.1130		0.0817	-1.3830
$1/2(\ln(P_1/P_2))^2$	0.0727		0.1184	0.6144	-0.3039	***	0.1165	-2.6082
$1/2(\ln(P_3/P_2))^2$	-0.0558	*	0.0365	-1.5261	0.0181		0.0589	0.3071
$\ln Y_1 \ln Y_2$	-0.1697	***	0.0801	-2.1169	0.0725		0.1269	0.5709
$\ln Y_1 \ln Y_3$	-0.0891		0.0832	-1.0705	-0.1778	***	0.0862	-2.0615
$\ln Y_2 \ln Y_3$	0.0046		0.0411	0.1133	0.2595	***	0.0855	3.0350
$\ln(P_1/P_2) \ln(P_3/P_2)$	-0.1577	***	0.0633	-2.4903	-0.2465	***	0.1016	-2.4247
$\ln Y_1 \ln(P_1/P_2)$	-0.1389	**	0.0836	-1.6614	0.2606	***	0.1002	2.5992
$\ln Y_1 \ln(P_3/P_2)$	-0.0467		0.0704	-0.6631	-0.2184	***	0.0787	-2.7747
$\ln Y_2 \ln(P_1/P_2)$	-0.0565		0.0541	-1.0446	0.4010	***	0.1176	3.4074
$\ln Y_2 \ln(P_3/P_2)$	-0.0314		0.0345	-0.9098	0.1319		0.0946	1.3933
$\ln Y_3 \ln(P_1/P_2)$	0.1870	***	0.0684	2.7316	-0.4889	***	0.0782	-6.2468
$\ln Y_3 \ln(P_3/P_2)$	-0.0893	**	0.0452	-1.9751	0.1037		0.0751	1.3810
sigma-squared: σ^2	0.3959	***	0.1438	2.7523	0.0237	***	0.0033	7.0960
Gamma: γ	0.9820	***	0.0089	109.845	0.9999	***	0.0188	53.091
LR test	60.1037				46.6810			

Note: *** 1% significant level; ** 5% significant level; * 10% significant level.

We use the Wald test for testing the marginal effect of the bank's total cost with respect to all outputs and all input prices. The majority of the marginal effects for the outputs are consistent with the condition of monotonicity for both Taiwan's and China's banks. All marginal effects for inputs satisfy the condition of non-decreasing input prices for both groups' banks. Moreover, to make sure that our estimated functions fit with the other regular conditions of the cost function, we use the Wald test again to verify the Hessian Matrix and share equations of estimated functions. For both Taiwan's and China's banks, the Wald test results of cost shares satisfy the theory. The Wald test results of the Hessian Matrix of both countries are also roughly consistent with the conditions of concavity, although some of them are not significant due to the fact that we do not simultaneously estimate the cost function with the share function. In sum, the estimated translog cost functions of Taiwan's and China's banks are congruent with the cost theory.

4.2. Inefficiency model estimation. Table 2 shows the empirical results of the inefficiency model that examines the effects of corporate governance indicators and other

TABLE 2. Empirical results of the inefficiency model

VARIABLE	TAIWAN				CHINA			
	Estimate coefficient	Standard error	<i>t</i> -value	Estimate coefficient	Standard error	<i>t</i> -value		
Intercept (Z_0)	3.6533 ***	0.9869	3.7015	0.2232	0.6256	0.3569		
Director board of governance (Z_1)	-0.4508 ***	0.2240	-2.0123	-0.0361	0.1006	-0.3587		
Ownership of insiders (Z_2)	-0.3446 ***	0.1363	-2.5281	-1.4853 **	0.7810	-1.9016		
Independent supervisory (Z_3)	-0.3171 ***	0.1424	-2.2260	0.9716 ***	0.4691	2.0712		
Loan ratio (Z_4)	-0.7984 ***	2.6120	-3.0567	-2.4655 ***	0.1285	-19.181		
Years of bank (Z_5)	0.0047 *	0.0029	1.6410	0.0026 ***	0.0009	2.7129		

Note: *** 1% significant level; ** 5% significant level; * 10% significant level.

control variables on the cost efficiency of the bank industry. We discuss the implication of the results as follows.

(1) Director board governance and monitoring (Z_1): The estimated coefficients are -0.4508 and -0.0361 for Taiwan’s banks and China’s banks, respectively; only the former is significant (p -value < 0.01), which indicates that Taiwan banks are more capable of improving their cost efficiency through stronger director board governance and monitoring. These results are consistent with the findings of Dwivedi and Jain [13] and Bozec and Dia [8]. On the side of China, the function of director board governance and monitoring might not be implemented well enough to increase banks’ operating efficiency, perhaps because China just introduced the requirement of independent directors – that is, from January 2006 through Article 123 of Company Law. Other factors may also cause the insignificant result for China banks, such as the loosening of requirements in terms of the procedure of selecting independent directors, an inadequate incentive mechanism for independent directors, and an incomplete internal control and audit system.

(2) Ownership by insiders (Z_2): The results indicate that the corporate governance mechanism has significant effects on the bank’s cost efficiency for both China and Taiwan banks. The significant negative coefficients (0.05 and 0.01 for China and Taiwan banks, respectively) mean the larger the insiders’ ownership is, the lower the total operating costs will be for China and Taiwan banks. The results suggest that an increase in insiders’ ownership is beneficial for improving a bank’s cost efficiency.

(3) Independent supervisory (Z_3): The estimated coefficients are significant at p -value < 0.01 for Taiwan and China banks. The negative coefficient of -0.3171 for Taiwan banks demonstrates that their hiring of more independent supervisors is significantly helpful in reducing total operating costs (i.e., it results in better cost efficiency) – a result consistent with the finding of Yeh et al. [14]. However, a significantly positive coefficient of 0.9716 for China banks indicates their hiring of more independent supervisors, by contrast, increases their total operating costs, implying that China banks are less cost efficient when they hire more independent supervisors. The result for China banks may be explained by the malfunction or failure of China’s two-tier board system (director and supervisory board) and weakened power characterizing the supervisory board in terms of performing its monitoring role; these conditions cause lower cost efficiency in terms of the bank’s operations – for example, wealth tunneling, as discussed in Chao [11].

5. Concluding Remarks. Our empirical results show that all factors in the three categories of corporate governance do significantly influence the cost efficiency of both groups’ banking systems, although the direction of influence of these factors might be different. First, for director board governance and monitoring, Taiwan banks are more capable of

improving their cost efficiency through stronger director board governance and monitoring. However, in China's bank industry it may not be implemented well enough to increase a bank's operating efficiency. Second, ownership of insiders has significant effects on a bank's cost efficiency for both bank groups, suggesting that increasing insiders' ownership is beneficial for improving a bank's cost efficiency. Third, for independent supervisory, Taiwan banks' hiring of more independent supervisors is significantly helpful in reducing total operating costs while China banks are less efficient when doing so. In summary, our results find that director board governance and monitoring as well as independent supervisory are the major differences between China's and Taiwan's bank industries in terms of the effects of corporate governance indicators on a bank's cost efficiency. Taiwan banks demonstrate higher efficiency than China banks with regard to these two variables.

Although there are many indicators that can be used to measure corporate governance, current research only has finite sources to collect the related data. Since a large portion of China's banks do not release their information on corporate governance to the public, this limits our study to a small sample size and a few usable indicators to measure corporate governance. Hence, the level of information transparency for both China's and Taiwan's bank industries may be an important barometer for doing further research to understand the influence of corporate governance on banks' operating efficiency. Data availability also hinders research in exploring related issues of corporate governance, such as the differences between family-controlled ownership in Taiwan banks and state-controlled ownership in China banks, the effects of foreign-institutional holding shares, and so on.

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