Ownership and Non-performing Loans: Evidence from Taiwan’s Banks

Jin-Li Hu, Yang Li, and Yung-Ho Chiu*

Abstract
We first derive a theoretical model to predict that the relation between non-performing loan ratios and government shareholdings can be downward-sloping, upward-sloping, U-shaped, and inversely U-shaped. An increase in the government’s shareholding does facilitate political lobbying. On the other hand, the private shareholding will induce more non-performing loans to be manipulated by corrupt private owners. We adopt a panel data set with 40 Taiwanese commercial banks during 1996-1999 for empirical analysis. The rate of non-performing loans decreases as the government shareholding in a bank goes higher (up to 63.51 percent), while the rate thereafter increases. Banks’ sizes are negatively related to the rate of non-performing loans. Rates of non-performing loans are shown to steadily increase from 1996 to 1999. Banks established after deregulation, on average, have a lower rate of non-performing loans than those established before deregulation.

Key words: mixed ownership, political lobbying, corrupt private sector, immature civil society, Asian financial crisis, risky output

JEL classification: C22, C51, L33

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I. Introduction

Loans are the major output provided by banks, but loan is a risk output - there is always an ex ante risk for a loan to finally become non-performing. Non-performing loans (NPLs) can be treated as undesirable outputs or costs to a bank, which will decrease the bank’s performance (Chang 1999). The risk from NPLs mainly arises when the external economic environment becomes worse off such as during economic depressions (Sinkey and Greenawalt 1991). Since the 1997 Asian financial crisis, NPLs have been swiftly accumulating in many Asian economies (Chang 1998; Lauridsen 1998; Robinson and Posser 1998; Wade 1998). Controlling NPLs is hence very important for both an individual bank’s overall performance (McNulty et al. 2001) and an economy’s financial environment.

The 1997 Asian financial crisis has had a great impact on Taiwan. Listed companies are now reportedly facing a series of their own financial crises. As a result, stock collaterals pledged to banks have depreciated steeply due to a drastic fall in local stock prices caused by the financial crisis. At the same time, the real estate prices have also dropped, with many investors facing a hard time with their own insolvency problems. As a result, the NPL ratio of Taiwan’s financial institutions jumped from 4.18 percent at the end of 1997 to 7.48 percent in June 2002.

As Economist reported (Nov. 11, 2000), bad loans among Taiwan’s domestic banks rocketed to new highs and a local financial crisis is very imminent. The New York Times (Dec. 5, 2000) and Business Weeks (Dec. 11, 2000) cited Salmon Smith Barney that the ratio of NPLs among listed banks in Taiwan amounted to more than 6 percent, and because of the narrow definition in official NPLs statistics, it could in reality be as high as between 10 to 15 percent. On December 6, 2000 Standard & Poors also revised its outlook on Taiwan from ‘stable’ to ‘negative.’ According to official statistics by Taiwan’s Bureau of Monetary Affairs, the NPL ratio in Taiwan is in fact rising very fast. Many researchers are warning that Taiwan may have a looming banking crisis (Montgomery 2002).

Most existing literature finds that state-owned banks are vulnerable to political lobbying and administrative pressure, resulting in a higher NPL ratio. Walter and Werlang (1995) find that state-owned financial institutions underperform the market, because their portfolios concentrate on NPLs indebted by the state. They take Brazil and Argentina as examples. Jang and Chou (1998) adopt the ratio of non-performing loans to total loans as
the measure of risk. They then use 1986-1994 data of 13 Taiwanese banks for an empirical study. The average risk-adjusted cost efficiency of the four provincial government-owned banks is the lowest among the sample banks.

The famous Coase Theorem says that the assignment of property rights (ownership) will not affect economic efficiency as long as the transaction cost is zero (Coase 1960; Cheung 1968, 1969). However, the real world is imperfect and the transaction cost can be sufficiently high. In an imperfect world with high transaction costs, ownership does matter to economic efficiency, making different ownership types be associated with different transaction costs (Cooter and Ulen 2000). In this case, we can change the conduct and the corresponding performance by changing ownership (Stiglitz 1974, 1998). Therefore, privatization may help a bank resist political lobbying and administrative pressure and hence reduce its politics-oriented loans.

After the Conservative Party led by Margaret Thatcher won the 1979 election, the U.K. started to privatize its public enterprises with full effort. The privatization experience there has since become an example followed up by many developed and developing countries. One of the main objectives of privatization is to improve the efficiency of a public enterprise (Bishop et al. 1994). Most countries fulfill privatization through the transfer of ownership, but during the process of privatization, the government may not transfer all of its shareholdings. As a result, private and public sectors will jointly own an enterprise. Boardman et al. (1986) define a mixed enterprise as “encompassing various combinations of government and private joint equity participation.” In the early 1990s, Taiwan began to pursue privatization of its own public enterprises in order to enhance competition and economic efficiency across all industries.

Deregulation in Taiwan’s banking industry consists of two major aspects: Privatization of public enterprises and entrance opportunity. During the past 12 years, 9 state-owned banks have been privatized, including Chang Hwa Commercial Bank, First Commercial Bank, Hua Nan Commercial Bank, Taiwan Business Bank, Taiwan Development & Trust Corporation, Farmers’ Bank of China, Chiao Tung Bank, Bank of Kaohsiung, and Taipei Bank. Taiwan’s government in 1991 released the Commercial Bank Establishment Promotion Decree in order to relieve the legal entrance barriers to its banking markets. Twenty-four new commercial banks were established afterwards, bringing the total number of domestic commercial banks in Taiwan to forty-eight by 2002.
Taiwan’s government is still trying to make its banking markets more competitive for public, mixed, and private banks.

In an imperfect (but real) world, the public ownership may help improve a bank’s performance. Bureaucratic power here becomes more important to productivity in a more centralized, constrained, or imperfect economic environment. Tian (2000) explicitly models bureaucratic power and degree of market perfection into a Cobb-Douglas production function. His model predicts that in an imperfect economic environment a mixed enterprise maximizes social surplus by balancing the bureaucratic procurement power and the manager’s incentive.

The major goal of a private enterprise is of course profit maximization. However, for public enterprises, profit maximization is never the primary goal. Public enterprises are required to achieve particular social ends, such as reducing the unemployment rate, promoting economic development, etc. Most governments set up mixed enterprises so as to combine the economic efficiency of private enterprises with a socio-political goal of public enterprises.

Eckel and Vining (1985) provide the first step towards analyzing mixed enterprises’ performance. They suggest that there are three reasons for converting public enterprises to mixed enterprises: First, mixed enterprises easily achieve higher profitability and social goals at a lower cost than public enterprises. Second, mixed enterprises have less bureaucratic restrictions than public enterprises. Third, mixed enterprises need less capital investment from the government than public enterprises. Boardman et al. (1986) also point out that mixed enterprises have three major advantages in comparison with public enterprises: The first advantage is that mixed enterprises demand less capital cost than public enterprises. The second advantage is that mixed enterprises are more efficient than public enterprises, while the third advantage is flexibility whereby mixed enterprises achieve both profitability and social goals are more efficient than public enterprises.

Boardman et al. (1986) indicate that the conflict of interest between shareholders and managers reduces mixed enterprises’ performance. Boardman and Vining (1991) further discuss the effect of government vis-a-vis private ownership on the internal management of an enterprise. They argue that public ownership is inherently less efficient than private ownership since public banks lack a sufficient incentive and generate higher cost inefficiencies. Moreover, “Different ownership conditions affect the extent to which mixed
enterprises engage in profit maximization, socio-political goal maximization, and managerial utility maximization; it also affects the degree of conflict between one owner and another.” They further predict that mixed enterprises have more owner conflict and poor performance – the worst of both worlds. However, more empirical evidence is required to judge whether or not mixed enterprises have the highest inefficiencies.

Corruption is not unusual in many countries. According to the 2001 Global Corruption Report, investigated and reported by Transparency International (2001), corruption is still a worldwide phenomenon, especially in developing countries. People pay bribes to buy licenses, jobs, and votes, and to reduce taxes as well as for lenient enforcement, etc. (Tullock 1996). Bribery does take place in a corrupt society and as Lui (1996) summarizes, corruption has three important aspects: (a) It is a rent-seeking activity induced by deviation from the perfectly competitive market. (b) It is illegal. (c) It involves some degree of power. With the existence of corruption, the market is no longer perfectly competitive.

The public sector is absolutely not the only corruptible sector in society, because the private sector can also be corruptible. In many developing countries, the civil society is still immature and it is a long way from learning to achieve a lifestyle of democracy and rule of the law (Finkel and Sabatini 2000; Johnson and Wilson 2000). People are not used to legally contracting and democratic decision-making. As a result, the private sector also resorts to informal connections and illegal means for seeking economic rents. In this case, 100% privatization of a public bank may not be able to decrease its NPL ratio. For example, in Taiwan many financial institutions manipulated by families and/or local political factions have higher rates of NPL ratios. In this case, government shareholding may help complement their weak internal control.

We will explain how government shareholding affects civil corruption and lobbying and hence NPL ratios. A panel data set of 40 banking firms in Taiwan during the period 1996-1999 is used for estimation. This paper is organized as follows: Section II provides the theoretical model. Section III consists of the data source, econometric modeling, and empirical results. Section IV concludes this paper.
II. The Theoretical Model

Three essential factors should be taken into account to determine the NPL ratio and ownership: political lobbying, civil corruption, and joint ownership. Interest groups engage in political lobbying in order to affect administrative decisions. The state-owned banks monitored by both the administrative and legislative branches are more vulnerable to political lobbying than private banks. In a country with a corrupt private sector, private banks easily become a family-owned business, illegally supplying risky loans to enterprises controlled by the same family. Mafias and local political factions can also control financial institutes for illegal laundering money and for borrowing money. Interaction between public and private owners can also affect the loan quality: If they check and balance each other, then the default risk can be reduced. However, if they collude with each other, then the default risk will be increased.

In our model, there is a bank under \( S (0 \leq S \leq 1) \) portion of the government shareholdings. A bank makes loans to either the public sector or the private sector (or both). Therefore, for any bank the sum of loans ratio to public and private sectors must be exactly one. In every society with limited loans, public and private sectors compete for bank loans. Without losing generality, we assume that initially these two sectors equally split the loans of a bank.

The public sector puts political pressure on this bank, in order to gain loans so as to fulfill policy targets or to save enterprises with good political connection. The extra loans ratio gained by political lobby is \( B \). The extra benefit of politically-gained loans ratio to the public sector is \( R \times B \), where the parameter \( R > 0 \) represents the marginal benefit of the public sector to increase its loans ratio.

Political lobbying becomes more effective in obtaining a loan as the government share increases. It is reasonable to assume that there is a marginal increasing political lobbying cost function. Without loss of generality, the political cost function can be expressed as \( \frac{\Gamma}{2} \alpha (1-S) \Gamma B^2 \). The parameter \( \Gamma \) is strictly positive and a higher \( \Gamma \) corresponds to a higher difficulty in political lobbying. The effectiveness of political lobbying is strictly increasing with the government stock share, with the parameter \( \alpha > 0 \), while the political lobbying cost is marginally increasing with the private stock share and gained loans.

In a corrupt civil society, internal control decreases with the government stock share.
That is, in a society that lacks civil self-discipline, government regulation may help complement the deficiency in a bank’s internal control. The extra loans ratio here gained by civil corruption is \( b \). Assume that the benefit of lobbying-gained loans to the private sector is \( r \cdot b \). The parameter \( r > 0 \) is the marginal benefit of the private sector to gain extra loans.

Private corruption becomes more effective in obtaining loans as the private stock share increases. Without loss of generality, the civil corruption cost function can be expressed as \( \frac{\gamma}{2} S^\beta b^2 \). The parameter \( \gamma \) is strictly positive and a higher \( \gamma \) corresponds to a higher difficulty in gaining loans through civil corruption. The civil corruption cost is marginally increasing with the government stock share and gained loans, where the parameter \( \beta > 0 \). Therefore, the net benefit of the government concerning this bank is

\[
G(B) = R \left( \frac{1}{2} + B - b \right) - \frac{\Gamma}{2} (1-S)^\alpha B^2, \tag{1}
\]

Benefit of Political Lobbying         Cost of Political Lobbying

The net benefit of the private sector concerning this bank is

\[
g(b) = r \left( \frac{1}{2} + b - B \right) - \frac{\gamma}{2} S^\beta b^2 \tag{2}
\]

Benefit of Civil Corruption         Cost of Civil Corruption

The expected net benefit maximization problems of the public and private sectors concerning this bank are

\[
\begin{align*}
\max_B & \quad \mathbb{E}[G(B)] = R \left( \frac{1}{2} + B - b \right) - \frac{\Gamma}{2} (1-S)^\alpha B^2, \tag{3} \\
\max_b & \quad \mathbb{E}[g(b)] = r \left( \frac{1}{2} + b - B \right) - \frac{\gamma}{2} S^\beta b^2. \tag{4}
\end{align*}
\]

We first solve the two sectors’ net benefit maximization problems and obtain equilibrium extra loans gained by political lobbying and civil corruption from this bank:

\[
[B^*, b^*] = \left[ \frac{R}{(1-S)^\alpha \Gamma}, \frac{r}{S^\beta \gamma} \right]. \tag{5}
\]

The second-order conditions are \(-\Gamma(1-S)^\alpha < 0\) and \(-\gamma S^\beta < 0\), which always hold under our parameter setup. Note that \( B^* \) strictly increases with \( R \), but strictly decreases with \( \Gamma \).

Note that \( \frac{\partial B(S)}{\partial S} = \alpha (1-S)^{-\alpha-1} \frac{R}{\Gamma} > 0 \) and \( \frac{\partial^2 B(S)}{\partial S^2} = \alpha (1+\alpha)(1-S)^{-\alpha-2} \frac{R}{\Gamma} > 0 \).

That is, \( B \) is a strictly convex function of \( S \) for all \( \alpha > 0 \). As long as the increasing marginal
costs (the decreasing returns) assumption is imposed, then $B$ is a strictly convex function of $S$. Similarly, we also have
\[
\frac{\partial b(S)}{\partial (1-S)} = \beta S^{-\beta-1} \frac{r}{\gamma} > 0 \quad \text{and} \quad \frac{\partial^2 b(S)}{\partial (1-S)^2} = \beta (1 + \beta) S^{-\beta-2} \frac{r}{\gamma} > 0.
\]
That is, $b$ is a strictly convex function of $(1-S)$ for all $\beta > 0$. As long as the increasing marginal costs (the decreasing returns) assumption is imposed, then $b$ is a strictly convex function of $(1-S)$.

Not every case of loans gained by lobbying will necessarily turn out to be non-performing, but part of these lobbying-gained loans do turn into non-performing: A proportion $\Psi$ of loans to the public sector and a proportion $\psi$ of loans to the private sector will become non-performing, making up the total amount of non-performing loans. The variable $U$ is a non-negative random variable with the mean $\overline{U} > 0$, representing the stochastic non-performing loan ratio. Therefore, this bank’s NPL ratio caused by political lobbying ($NPPL$) are $\Psi\left(\frac{1}{2} + B - b\right)$ and the non-performing loans ratio caused by civil corruption ($NPCC$) is $\psi\left(\frac{1}{2} + b - B\right)$. Moreover, there is a joint ownership effect on this bank’s NPL ratio ($NPJO$): $\rho S^\theta (1-S)^{1-\theta}$, with $0 < \theta < 1$. The coefficient $\rho$ is positive if two sectors act collusively to obtain loans, and is negative if two sectors check and balance each other. Note that the joint ownership effect becomes zero if the bank is purely public ($S = 1$) or purely private ($S = 0$).

To sum up, we can express this bank’s total non-performing loans ratio ($TNPL$) function as
\[
TNPL = \Psi\left(\frac{1}{2} + B - b\right) + \psi\left(\frac{1}{2} + b - B\right) + \rho S^\theta (1-S)^{1-\theta} + U
\]
\[= NPPL + NPCC + NPJO + U.\] (6)
This bank’s expected total non-performing loans ratio is
\[
E(TNPL) = \Psi\left(\frac{1}{2} + B - b\right) + \psi\left(\frac{1}{2} + b - B\right) + \rho S^\theta (1-S)^{1-\theta} + \overline{U}
\]
\[= NPPL + NPCC + NPJO + \overline{U}.\] (7)
Substituting (5) into (7), we can express this bank’s expected non-performing loans ratio can be explicitly expressed as a function of the government stock share:
\[
E(TNPL(S)) = \frac{1}{2} (\Psi+\psi) + (\Psi-\psi) [B(S) - b(S)] + \rho S^\theta (1-S)^{1-\theta} + \overline{U}. \] (8)
Note that \( \frac{\partial [B(S) - b(S)]}{\partial S} = \frac{\partial B(S)}{\partial S} + \frac{\partial b(S)}{\partial (1 - S)} > 0 \); that is, without the joint ownership effect, the total nonperforming loans ratio is strictly increasing [decreasing] with government’s shareholdings if \( \Psi - \psi > [<] 0 \).

Figures 1 to 6 depict the relation between the government’s stock share and the TNPL ratio from Equation (8). Without the joint ownership effect, the expected NPL ratio will be strictly increasing (when \( \Psi - \psi > 0 \)) or decreasing (when \( \Psi - \psi < 0 \)) with the government’s stock share: The first case is when the public sector has a higher NPL ratio and the associated NPL ratio ranking is: public, mixed, and private banks (see Figure 1). The second case is when the civil sector has a higher NPL ratio and the associated TNPL ranking is: private, mixed, and public banks (see Figure 2). In both cases, our theoretical model predicts that a mixed bank on average will have the medium TNPL and the total NPL ratio is either upward or downward-sloping in government stockholdings.

Without the joint ownership effect, the expected NPL ratio will be strictly increasing or decreasing with the government’s stock share: The first case is when the public sector has a higher NPL ratio and the associated NPL ratio ranking is: public, mixed, and private banks (see Figure 1). The second case is when the civil sector has a higher NPL ratio and the associated TNPL ranking is: private, mixed, and public banks (see Figure 2). In both cases, our theoretical model predicts that a mixed bank on average will have the medium TNPL and the total NPL ratio is either upward or downward-sloping in government stockholdings.

When the joint ownership effect on the NPL ratio is negative and its magnitude is sufficiently large, then a mixed bank may have the highest NPL ratio, and the relation between the NPL ratio and government shareholdings is U-shaped (Figures 3 and 4). That is, the mixed bank ownership then minimizes the NPL ratio by balancing the political lobbying pressure and civil corruption. When the joint ownership effect on the NPL ratio is positive and sufficiently large, then a mixed bank may have the highest NPL ratio, and the relation between the NPL ratio and government shareholdings is inversely U-shaped (Figures 5 and 6). That is, the mixed bank ownership then maximizes the NPL ratio by suffering the collusion between the public and private owners. From the above discussion, we obtain the following propositions:
Proposition 1] Without the joint ownership effect, a bank’s NPL ratio is strictly decreasing or increasing with respect to government shareholdings.

Proposition 2] If the joint ownership effect on NPL ratios is negative and its magnitude is sufficiently large, then the relation between a bank’s NPL ratio and government shareholdings is U-shaped.

Proposition 3] If the joint ownership effect on NPL ratios is positive and sufficiently large, then the relation between a bank’s NPL ratio and government shareholdings is inversely U-shaped.

III. Empirical Analysis

Our data set consists of 40 Taiwanese commercial banks (all established before 1996) during the period of 1996-1999. In 1996 this data set consists of 4 public commercial banks (where the government’s shareholding in a bank is almost 100%), 10 mixed commercial banks (where the government’s shareholding in a bank ranges from 1%-99%), and 26 private commercial banks, giving a total of 40 commercial banks in our sample set. Because Taiwan’s government continued the process of privatization, by the end of 1999 there were 2 public commercial banks, 10 mixed commercial banks, and 28 private commercial banks. The data sources are financial releases and public statements and Taiwan Economic News Service reports.

When analyzing the panel data, ordinary least squares (OLS) estimators may be inconsistent and/or meaningless if heterogeneity exists across firms (Hsiao 1986). The fixed- and random-effects models can take into account the heterogeneity across firms by allowing variable intercepts. The choice among these three models is based on some statistical tests: F-test (the OLS model vs. the fixed-effects model), LM test (the OLS model vs. the random-effects model), and the Hausman test (the random-effects model vs. the fixed-effects model). We will employ these three tests to choose the best model to perform our empirical analysis. The dependent variable is the rate of NPLs of commercial banks.

As shown by our theoretical model, state-owned banks monitored by both the
administrative and legislative branches are easily distorted by interest groups, which engage in heavy political lobbying. The government share may hence be positively related to the rate of non-performing loans. However, private banks in the corrupt private sector can easily become family-owned businesses, which may supply risky loans to enterprises controlled by the same family. This indicates that private banks might possibly have higher rates of non-performing loans. The joint ownership effect depends on whether or not the two types of owners check and balance each other. These three effects suggest that a downward-sloping, upward-sloping, U-shaped, or inversely U-shaped effect may exist for government shareholding on the NPL ratio. In other words, mixed banks might have the highest, medium, or lowest rate of non-performing loans. We will hence include the linear and quadratic terms of government shareholding in the empirical model. Coefficients of the linear and quadratic terms can be used to check the effects of government shareholding on the NPL ratio.

Large-sized banks have more resources to evaluate and to process loans. These can improve the quality of loans and thus effectively reduce the rate of non-performing loans. A bank’s size is hence expected to be negatively related to non-performing loans, but at a diminishing rate.

The return on loans is a bank’s major source of revenue. Banks sometimes have to accept some risky loans, because of the pressure to create revenue. If banks can successfully diversify their sources of revenues, then they should be able to ease the pressure of revenue from loans and thus effectively reduce the rate of non-performing loans. We apply the entropy index to measure the degree of diversification. It is defined as

\[ \text{Entropy index} = - \sum_{j=1}^{n} S_j \ln S_j , \]

where \( S_j \) is the share of \( j \)th revenue and \( n \) is the number of revenues. The larger the entropy index is, the higher the bank’s diversification is. We consider three types of bank revenue: the provision of loan services (including business and individual loans), portfolio investment (mainly government securities and equity shares, along with public and private enterprise securities), and non-interest income (including transaction fees, revenue from securities investment, and other business revenue).

In 1991 Taiwan’s government released the Commercial Bank Establishment Promotion Decree in order to relieve the legal entrance barriers to its banking markets.
Banks established after 1991 have quite different business cultures and/or strategies in comparison with those established before 1991. Furthermore, the older a bank is, the more the accumulated non-performing loans which they seem to have. Therefore, this study consists of a dummy variable to represent whether or not a bank was established after 1991.

The *Economist* (November 11, 2000), the *New York Times* (December 5, 2000), and *Business Week* (December 11, 2000) all mentioned that Taiwan might suffer its own version of a financial crisis because non-performing loans have risen so dramatically. Our data set also shows this pattern where the average NPL ratios are 4.39, 4.42, 4.72, and 5.52 from 1996 to 1999, respectively. Therefore, we include a variable to represent time factor. According to the pattern of the NPLs, we expect the coefficient of the time variable to be positive. As such, the empirical model is specified as

\[
NPL_{nt} = \beta_0 + \beta_1 SHARE_{nt} + \beta_2 SHARESQ_{nt} + \beta_3 SIZE_{nt} + \beta_4 SIZEQS_{nt} + \beta_5 ENTROPY_{nt} + \beta_6 D1991_{nt} + \beta_7 TIME_{nt} + \epsilon_{nt},
\]

where \(\epsilon_{nt}\) are random disturbances with mean 0 and variance \(\sigma^2\); \(\beta_{0n} = \beta_0\) for all \(n\) in the OLS model; \(\beta_{0n}\) are fixed in the fixed-effects model; \(\beta_{0n} \sim N(\beta_0, \sigma_0^2)\) and both \(\beta_{0n}\) and \(\epsilon_{nt}\) are independent in the random-effects model. The definition and sample mean of the variables in Equation (10) are presented in Table 1.

The empirical results from the government shareholding and the non-performing loans are represented in Table 2. Since \(D1991\) is a time-invariant dummy variable, the fixed-effects model encounters the problem of collinearity if we include this time-invariant variable. Hence, when we perform the \(F\)-test, the LM test, and the Hausman test, we exclude the time-invariant dummy variable \(D1991\). The \(F\)-test and the LM test suggest that both fixed- and random-effects models are better than the OLS model; in other words, heterogeneity exists across firms. Moreover, based on the result of the Hausman test, the random-effects model is better than the fixed-effects model. Hence, we only present and interpret the random-effects model which has been re-estimated by adding the time-invariant variable \(D1991\).

The estimated coefficients not only significantly affect non-performing loans, but are also consistent with the expected signs except for the insignificant coefficient of entropy.
index. The quadratic effects of the coefficients of government shareholding on the non-performing loans imply that the NPL ratio decreases as the government shareholding in a bank goes higher (up to 63.51 percent), while after that the NPL ratio increases. These results support the Proposition 2 of our theoretical model. That is, mixed banks have the lowest rate of non-performing loans among Taiwanese public, mixed, and private commercial banks. In other words, the joint ownership effect on NPL ratios should be negative and its magnitude is sufficiently large in Taiwan’s banking industry.

Political lobbying and private corruption both increase the NPL ratio in Taiwan. When the government share is greater than 63.51 percent, the rate of non-performing loans of a commercial bank then decreases with privatization. However, when the government share is less than 63.51 percent, the NPL ratio will then increases through privatization.

Bank size is negatively related to the rate of non-performing loans, which supports our argument that larger banks have more resources to improve the quality of loans. The positive coefficient of the quadratic term implies that this effect appears at a diminishing rate. According to the empirical results, the optimal bank size on average to achieve the lowest rate of non-performing loans is NT$ 14.12 trillion.

The coefficient of the entropy index is the only insignificant coefficient in the empirical model. One possible explanation is that bank revenue mainly comes from loans. The data set shows that the average revenue share resulting from loans are 97.78 percent. The highest value achieves 99.22 percent; even the lowest value has 92.41 percent. Hence, revenue source diversification cannot effectively reduce the rate of non-performing loans.

The significant time effect suggests that the NPL ratios are steadily increased from 1996 to 1999. This may reflect the fact that the Asian financial crisis did affect Taiwan’s bank industry. The coefficient of the time-invariant dummy variable $D_{1991}$ is significantly different from zero, indicating that the random-effects model should include this variable. This empirical result illustrates that banks established after deregulation, on average, have lower NPL ratio than those established before deregulation. More precisely, the NPL ratio for banks established after deregulation, on average, is 4.81 percent lower than that for banks established before deregulation.
IV. Concluding Remarks

In this paper we first establish a theoretical model to predict the relation between government shareholding and non-performing loans. When both public and private sectors are corrupt (imperfect), the relation between government shareholding and the non-performing loans rate can be upward-sloping, downward-sloping, U-shaped, or inversely U-shaped. Therefore, a mixed bank on average may have the highest, medium, or the lowest NPL ratio.

We then adopt a panel data set with 40 Taiwanese commercial banks during 1996-1999 for empirical analysis. Based on the result of the Hausman test, the random-effects model is better than the fixed-effects model. Our major empirical findings in this paper are: (1) The rate of non-performing loans decreases as government shareholding in a bank goes higher (up to 63.51 percent), while thereafter it increases. (2) Bank size is negatively related to the rate of non-performing loans. (3) Revenue source diversification cannot effectively reduce the rate of non-performing loans. (4) Rates of non-performing loans are steadily increased from 1996 to 1999. (5) Banks established after deregulation, on average, have a lower rate of non-performing loans than those established before deregulation.

This paper’s findings advocate the following propositions: (1) In a society with an imperfect private sector, government shareholding may help improve performance. (2) In an economic environment with high transaction costs, ownership types will affect economic efficiency. This also provides further evidence why mixed ownership can be an efficient ownership type and explains (justifies) its existence.

References


Figure 1: A Case without Joint Ownership Effect ($\Psi - \psi > 0$)
Figure 2: A Case without Joint Ownership Effect ($\Psi - \psi < 0$)
Figure 3: A Case with Joint Ownership Effect ($\Psi - \psi > 0$ and $\rho < 0$)
Figure 4: A Case with Joint Ownership Effect ($\Psi - \psi < 0$ and $\rho < 0$)
Figure 5: A Case with Joint Ownership Effect ($\Psi - \psi > 0$ and $\rho > 0$)
Figure 6: A Case with Joint Ownership Effect ($\Psi - \psi < 0$ and $\rho > 0$)
<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Sample Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPL</td>
<td>The rate of non-performing loans</td>
<td>4.7614</td>
</tr>
<tr>
<td>SHARE</td>
<td>The percentage of government stock share</td>
<td>17.8971</td>
</tr>
<tr>
<td>SHARESQ</td>
<td>Square of SHARE divided by 100.</td>
<td>12.9688</td>
</tr>
<tr>
<td>SIZE</td>
<td>Real assets (NT$ 100 billion)$^a$</td>
<td>5.4552</td>
</tr>
<tr>
<td>SIZESQ</td>
<td>Square of SIZE divided by 100.</td>
<td>4.6316</td>
</tr>
<tr>
<td>ENTROPY</td>
<td>Entropy index for revenues.</td>
<td>0.1152</td>
</tr>
<tr>
<td>D1991</td>
<td>1 if the bank was established after deregulation; 0 otherwise.</td>
<td>0.4000</td>
</tr>
<tr>
<td>TIME</td>
<td>Time factor, the year of the data period minus 1995.</td>
<td>2.5000</td>
</tr>
</tbody>
</table>

$^a$ We divide the nominal assets by the GDP deflator (1996 = 1.00) to obtain real assets.

$^b$ There are three types of revenue: the provision of loan services (including business and individual loans), portfolio investment (mainly government securities and equity shares, along with public and private enterprise securities), and non-interest income (including transaction fees, revenue from securities investment, and other business revenues).
Table 2. Empirical Results of Government Shareholding and Non-performing Loans (The Random-Effects Model)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>t-ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.0396</td>
<td>7.570</td>
<td>0.0000</td>
</tr>
<tr>
<td>SHARE</td>
<td>-0.0630</td>
<td>-2.264</td>
<td>0.0236</td>
</tr>
<tr>
<td>SHARESQR</td>
<td>0.0496</td>
<td>2.022</td>
<td>0.0432</td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.3845</td>
<td>-3.480</td>
<td>0.0005</td>
</tr>
<tr>
<td>SIZESQR</td>
<td>0.1362</td>
<td>3.457</td>
<td>0.0006</td>
</tr>
<tr>
<td>ENTROPY</td>
<td>3.4269</td>
<td>0.789</td>
<td>0.4299</td>
</tr>
<tr>
<td>D1991</td>
<td>-4.8094</td>
<td>-5.288</td>
<td>0.0000</td>
</tr>
<tr>
<td>TIME</td>
<td>0.4807</td>
<td>6.000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

| $F$-test (d.f.)$^a$  | 28.329       | (39, 115) | 0.000 |
| LM test (d.f.)$^a$   | 104.49       | (1)       | 0.000 |
| Hausman test (d.f.)$^a$ | 0.10       | (6)       | 0.999 |

$R^2$ 0.3416

Number of Cross-sections (Observations) 40 (160)

** P-value $\leq$ 0.05, *** P-value $\leq$ 0.01.

$^a$ Since $D1991$ is a time-invariant dummy variable, we exclude this time-invariant dummy variable when we perform the $F$-test, the LM test, and the Hausman test.