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Ownership transformation and bank performance in Taiwan: how should the reform proceed?

Abstract

This paper aims to jointly analyze the static, selection, and dynamic effects of ownership on bank performance in Taiwan using data from 1995 to 2010 period. Capital adequacy, asset quality, management, earnings, liquidity, and growth are used as criteria to measure the performance. The results demonstrate that, among the five types of banks identified, the purely state-owned banks and the banks involved in private mergers and acquisitions (M&As) performed better while the banks selected for participations and acquisitions (P&As) by foreign capital performed particularly worse. One special selection effect is that the state-owned banks that are involved in privatization have higher financial leverage and lower liquidity, revealing their more aggressive mode of operation. As for the primary dynamic effects, both the privatization of the state-owned banks and the P&As by foreign capital appear to improve performance while the performance of the banks involved in private M&As appears to deteriorate in several ways following the ownership changes. The recommendations for further financial reforms in Taiwan are to retain the existing two purely state-owned banks for special missions or policy implementation, to continue to introduce foreign capital participation or acquisitions for management improvement, and to allow the banks that have experienced private M&As to play a leading role in the process of bank consolidation.

Keywords: bank, ownership, performance, privatization, M&A, foreign, Taiwan.

JEL Classification: G21, G32, G34.

Introduction

Taiwan's banking industry has experienced dramatic changes in ownership structures over the past two decades. Encouraged by government policies, some banks that were originally state-owned were privatized, some were involved in local mergers and acquisitions (M&As), and others were selected for participations and acquisitions (P&As) by foreign capital. These changes have substantially affected the governance of the banking organizations operating in Taiwan and resulted in at least five types of ownership in the industry: the state-owned banks without ownership changes (pure-state), the private banks without ownership changes (pure-private), the privatized state-owned banks (privatized-state), the banks experienced private M&A with domestic banks (private-M&A)¹, and the banks experienced P&A by foreign capital (foreign-P&A). An investigation of how these ownership types and changes connect to bank performance is therefore warranted, particularly at present, as the government and the banks are urging for further integration or innovation of the banking industry to enhance its competitiveness. Enormous attention is being focused on what the next step should be for the banking industry. For policy development, the issues explored in this study should provide importance insights.

Overall performance of Taiwan's banking industry has long been ranked close to the last in terms of

return on assets (ROA) in East Asia. Possible reasons include the dominance of state-owned banks, large number of small private banks, and conservative policy by regulators. The serial changes in ownership structure beginning in the latter half of 1990s were aimed to address these unfavorable features. This study is thus designed to examine not only the performance differentials of the various ownership types of banks, which we call the static and the selection effects, but also the performance shift after the ownership changes, which we call the dynamic effects. Examining these three effects together will allow not only the connection between bank ownership and performance but also the policy effects to be fully understood.

Berger et al. (2005) stressed and verified the importance of including all of the relevant effects from the type and the change of ownership structure into a unified model while exploring its connection with bank performance; otherwise, such model could be misspecified and deliver misleading results. Consequently, we apply a methodology that comprehensively considers the static, selection, and dynamic effects of ownership structure to examine how bank ownership relates to bank performance in Taiwan.

Specifically, we use the bank performance measures as dependent variables and use the dummies that represent the static, selection, and dynamic effects from ownership types and changes as independent variables to conduct a joint analysis. Capital adequacy, asset quality, management, earnings, liquidity, and growth (CAMELG) are used as criteria to measure performance. Meanwhile, we test whether the performance differences between the state-

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¹ This paper considers only the M&A activities among private banks.

owned and the private banks are driven by political consideration. Some bank characteristics are also considered as control variables in our model.

The results demonstrate that, among the five types of banks identified, the pure-state banks and the private-M&A banks performed better while the foreign-P&A banks performed particularly worse. One special selection effect is that the privatized-state banks have the highest use of financial leverage and the lowest liquidity, which reveals that they have a more radical mode of operation. As for the main dynamic effects, both the privatization of the state-owned banks and the P&As by foreign capital appear to improve bank performance while the performance of the private-M&A banks appears to deteriorate in several ways following the ownership changes.

Accordingly, this paper contributes not only to the understanding of the relative performance of various types of banks but also to the further insights of the various effects of the ownership transformations in the banking industry in Taiwan. Policy makers in Taiwan or even in other countries can use this information to aid them in designing and implementing banking regulations.

The remainder of the paper is organized as follows. Section 1 outlines the literature that is critical to the issues included in this study. Section 2 describes the data, the sample, and the empirical model. Section 3 presents the empirical results, and the final section concludes the paper.

1. Literature review

Previous studies on the connection between bank ownership and performance have primarily focused on the banking industry in emerging countries or in nations that are transitioning from a communist economy into a market economy, particularly those nations in Central and Eastern Europe. Some of them focused on a single nation (Kraft and Tirtiroglu, 1998; Jemric and Vujcic, 2002; Matousek and Taci, 2002; Nikiel and Opiela, 2002; Hasan and Marton, 2003; Weill, 2003), and the others considered multiple nations (Drakos, 2002; Grigorian and Manole, 2002; Bonin et al., 2005a, 2005b; Fries and Taci, 2005; Yildirim and Philippatos, 2007). The common findings of these studies demonstrate that the private banks and the banks acquired or managed by foreign capital perform better in general than the state-owned banks.

China, a nation with a similar background to the post-communist countries in Central and Eastern Europe, commenced the adjustment of its ownership structure for the banking industry in the mid and late 1980s. As China plays an increasingly

important role in the world, the connection between its bank ownership and performance has begun to attract the interest of academic research. Lin and Zhang (2009), for example, observed the poor performance of the Big Four state-owned banks in terms of profitability, efficiency, and asset quality compared with the other types of banks (policy banks were excluded) in a panel data set from 1997 to 2004. The banks that received Chinese-foreign joint-equity investment or that had IPOs outperformed those that did not encounter any ownership change. Additionally, Berger et al. (2009) used the data from 1994 to 2003 to analyze the connection between bank ownership and efficiency and observed similar results: the Big Four state-owned banks were the least efficient, and the foreign banks were the most efficient. The banks selling shares to foreign-equities apparently improved their efficiencies.

For the studies on the influence of the privatization, Beck et al. (2005a) explored the effects from the transformation of the Brazilian state banks under a special program on bank performance and efficiency. They found that the privatized banks improved their performance, while the restructured banks did not. Beck et al. (2005b) assessed the effect of privatization on performance in a panel of Nigerian banks for the period of 1990-2001. They found evidence of performance improvement in nine completely privatized banks, but found negative effects on the performance of many Nigerian banks with the continuing minority government ownership. Williams and Nguyen (2005), in addition, examined the impact of changes in bank governance on bank performance for a sample of commercial banks operating in Southeast Asia between 1990 and 2003. Their data period was characterized by financial deregulation, the Asian crisis, and bank restructuring programs. To resolve financial distress, the Southeast Asian authorities implemented *inter alia* bank privatization programs and widened access for foreign ownership. Their results tend to support bank privatization and the repeal of state ownership on economic grounds. The results also suggest that the potential benefits of foreign ownership can take longer to be realized and that for domestic privately-owned banks, the challenges improved bank efficiency.

Regarding the research on Taiwan's banking industry, Yeh and Chen (1998) made a comparison between the state-owned banks and the private banks in terms of operating efficiency and concluded that the private banks outperform the state-owned banks. Lin (2003) analyzed the performance of state-owned banks before and after privatization and found that

their operating efficiency apparently did not vary during the three years before and after privatization. These studies focused on this region generally examined only one effect at a time.

In the aspect of empirical models, Berger et al. (2005) emphasized that all related factors and effects concerning bank performance should be taken into account; otherwise, the model might be incorrectly established and led to an improper inference. Bonin et al. (2005a) and Berger et al. (2005), accordingly, proposed a joint-analysis model that comprehensively considered the static, selection, and dynamic effects of various ownership types and changes on bank performance. This model has been widely applied in empirical studies on the banking industry across countries such as the research on the Eastern European nations by Bonin et al. (2005a, 2005b), on Argentina by Berger et al. (2005), on Brazil by Beck et al. (2005a), on Nicaragua by Beck et al. (2005b), on the countries of Southeast Asia by Williams and Nguyen (2005), and on China by Lin and Zhang (2009) and Berger et al. (2009). Micco et al. (2007) also based on this model and used multinational data to interpret the relationship between bank ownership and performance. They further analyzed the impact of the political factor on bank performance by checking whether the differential between the performance of state-owned and private banks tended to expand during election years. The outcome that the private banks outperform the state-owned banks is found in developing nations but not obvious in industrialized countries. The performance differential between state-owned banks and private banks is found expanding during election years indicating that political factors might be influential.

2. Data and model

2.1. Data. *2.1.1. Bank classification.* We first thoroughly examined the banks that operated in Taiwan's banking industry from 1995 to 2010, sorted their history and evolution, and divided them into two major groups: static banks and dynamic banks. The former includes those banks that have not experienced any ownership change ever over the sample period, and the latter are banks that have undergone at least an ownership change and, for which thus, at least one ownership change could be observed over the sample period. The static banks can be further categorized into two types: the pure-state (Bank of Taiwan, for example) and the pure-private (such as the Shanghai Commercial and Savings Bank). The dynamic banks can be further categorized into three types: the privatized-state banks (such as the Hua Nan Bank), the private-M&A banks (such as the China Trust Commercial Bank), and the foreign-

P&A banks (such as the Cosmos Bank)¹. In total, therefore, the sample banks in this study are divided into five distinct sets in terms of ownership, which are the pure-state, the pure-private, the privatized-state, the private-M&A, and the foreign-P&A. The pure-state combined with the privatized-state banks are what we call the "pan-state" banks because the government holds stakes, no matter 100% or minority, in these banks. Eventually, we included 36 banks in our sample.

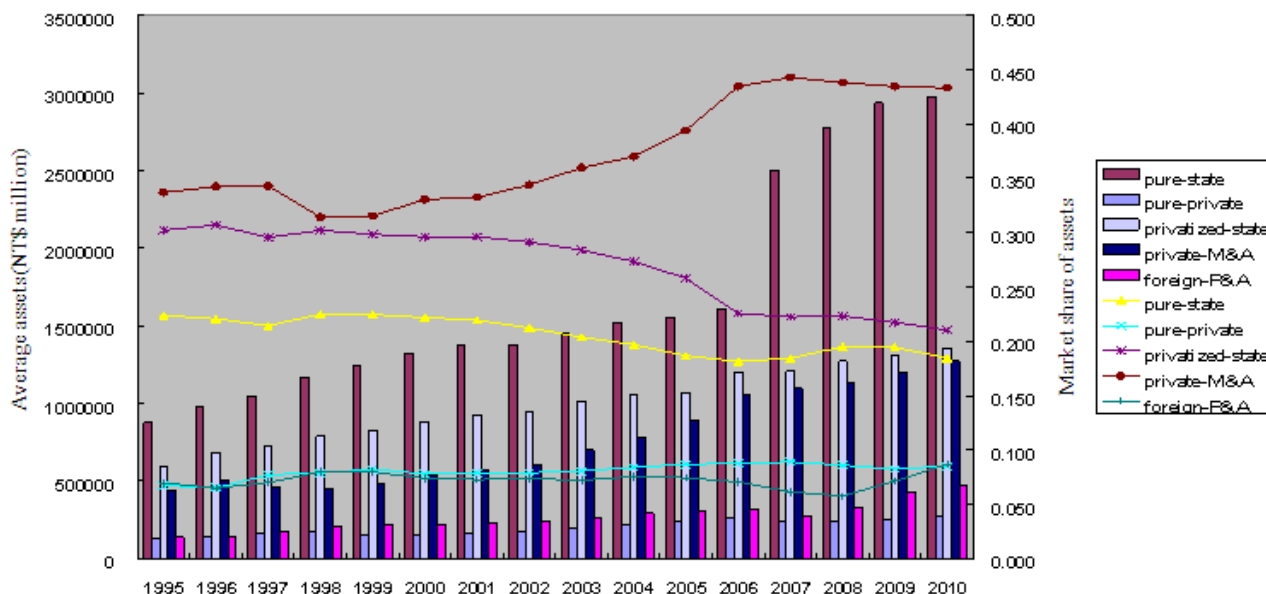
2.1.2. Sample and observation. The sample in this study, collected from the Taiwan Economic Journal (TEJ) Data Bank, is an unbalanced panel containing a cross-section of 36 banks and time-series over a 16-year period from 1995 to 2010 that amounts to 541 observations in total. Table 1 shows the number, the market share, and the average assets of the sample banks by type of ownership across years. Of the 36 sample banks, 13 (36%) are classified as static banks and 23 (64%) as dynamic banks. Observing Table 1 and Figure 1, it can be seen that the market share of the private-M&A banks is continually the highest across the sample years and displays an ascending trend since 2000 due to the Financial Institutions Merger Act that was legislated that very year. On the contrary, the market shares of the pan-state banks, namely the pure-state combined with the privatized-state banks, are gradually declining. Specifically, before 2002, their market shares remained at over 50% and thereafter began to decline and reached a low of 39.5% in 2010. This evidence shows that the financial reform in 2000 led to the decline in the market shares of state-owned banks and to the growth of those for private banks. As for the pure-private and the foreign-P&A banks, their market shares remained in the bottom two places, though those of the foreign-P&A banks began to rise in 2008 due to the realization of the actual involvement of the foreign banks or equities in Taiwan's domestic banks. In a comparison of average assets, the pure-state banks maintain the highest average assets, followed by the privatized-state banks, with the private-M&A banks standing third, the foreign-M&A banks standing fourth, and the pure-private banks following with the lowest average assets. It is thus evident that the pan-state banks have scale advantages, but the average assets of the private M&A banks, through their M&A activities, grow year by year and are approaching the average level of the privatized-state banks.

¹ It is noteworthy that some of the banks have changed their ownership more than once. The class to which they are categorized depends on their last ownership status or change. The determination of the year of change is also the year of the last change.

Table 1. Number, market share, and average assets of the bank observations

Total observations	Total	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	541	30	30	33	33	35	35	35	35	35	35	35	34	34	34	34	34
Number of banks by ownership																	
1. Static banks	182	9	9	10	10	12	12	12	12	12	12	12	12	12	12	12	12
a. Pure-state	44	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2
b. Pure-private	138	6	6	7	7	9	9	9	9	9	9	9	9	10	10	10	10
2. Dynamic banks	359	21	21	23	23	23	23	23	23	23	23	23	22	22	22	22	22
a. Privatized-state	91	6	6	6	6	6	6	6	6	6	6	6	5	5	5	5	5
b. Private-M&A	172	9	9	11	11	11	11	11	11	11	11	11	11	11	11	11	11
c. Foreign-P&A	96	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Market share of assets by ownership																	
1. Static banks	0.283	0.291	0.286	0.292	0.304	0.307	0.300	0.298	0.291	0.284	0.281	0.273	0.269	0.273	0.281	0.277	0.270
a. Pure-state	0.201	0.224	0.221	0.214	0.225	0.225	0.222	0.219	0.212	0.204	0.197	0.187	0.182	0.184	0.195	0.194	0.185
b. Pure-private	0.082	0.067	0.065	0.077	0.079	0.082	0.078	0.079	0.079	0.081	0.084	0.087	0.088	0.089	0.086	0.082	0.085
2. Dynamic banks	0.717	0.709	0.714	0.708	0.696	0.693	0.700	0.702	0.709	0.716	0.719	0.727	0.731	0.727	0.719	0.723	0.730
a. Privatized-state	0.259	0.302	0.307	0.296	0.302	0.298	0.296	0.296	0.291	0.284	0.273	0.258	0.226	0.222	0.223	0.217	0.210
b. Private-M&A	0.385	0.337	0.343	0.343	0.314	0.315	0.330	0.332	0.344	0.360	0.370	0.394	0.435	0.443	0.438	0.435	0.433
c. Foreign-P&A	0.072	0.070	0.065	0.070	0.080	0.080	0.074	0.073	0.074	0.072	0.075	0.074	0.071	0.061	0.058	0.071	0.087
Average assets by ownership (NT\$ million)																	
1. Static banks																	
a. Pure-state	1566873	875194	983598	1048356	1170148	1244362	1318758	1375387	1373451	1453290	1516344	1550129	1609726	2501837	2776683	2936071	2978510
b. Pure-private	203200	131539	145165	161411	175873	151615	154226	164807	170104	191519	215938	240032	258694	241436	244707	249190	274461
2. Dynamic banks																	
a. Privatized-state	975308	591152	684626	722360	786704	827069	880349	928624	943077	1012473	1052168	1071604	1200284	1208241	1270764	1313347	1357717
b. Private-M&A	766179	439504	509253	457238	446299	476629	535892	568286	607256	699540	776830	892600	1050739	1093557	1134285	1193856	1270994
c. Foreign-P&A	262451	136112	144812	170815	207582	220660	219373	228022	238176	257308	289978	308512	313311	277849	328432	430994	466361

Note: This table shows the distribution, the market share, and the average assets of the sample banks across years by ownership type. Our overall sample is an unbalanced panel containing 36 banks and 541 observations covering the 16-year period from 1995 to 2010.



Note: The straight bars represent the average assets of each type of bank, and the lines represent the market share of the assets for each type of bank.

Fig. 1. The market shares and average assets of the various types of banks year by year

2.2. Model. Following the approach developed and illustrated by Berger et al. (2005), we construct a regression model as equation (1), which jointly considers the static, selection, and dynamic effects of bank ownership and explores the link between bank ownership and CAMELG performance. We choose a particular type of static bank as the control group, that is, as a benchmark, and the coefficient β_1 of the static dummies indicates the static effects that represent the differential of the dependent performance measure between one type of static bank and the control group. By the same token, the coefficient β_2 of the selection dummies indicates the selection effects that represent the differential of the dependent performance measure between the control group and one type of dynamic bank. There are two types of dynamic effects: one is the short-term (overall) dynamic effect, corresponding to the coefficient β_3 , and the other is the long-term (gradual) dynamic effect, corresponding to the coefficient β_4 . Both show the performance difference of the dynamic banks before and after the ownership change.

In addition, to determine whether the differential in performance between state-owned and private banks is driven by political considerations, a dummy variable representing a pan-state bank in a major election year is incorporated into the model; this variable takes the value one if the bank observation belongs to a pan-state bank and is in a major election year and zero otherwise. In addition, four characteristic variables for banks' asset scale, non-interest income ratio, financial business cost ratio, and operating income ratio, are included as control variables to help understand the links of scale and scope economies and cost efficiencies to bank performance. For the model that includes period fixed effects, we tested whether the period fixed effects exist and found that both the period F-statistics and the period chi-square statistics rejected the null hypothesis of redundant fixed effects with extreme significance, showing that period fixed effects do exist. Our model, hence, subsumes the year fixed dummies to catch these effects. The basic regression model is as follows:

$$\begin{aligned}
 \text{Bank Performance Measure} = & \text{Constant} + \beta_1 \times \text{Static Dummies} + \beta_2 \times \text{Selection Dummies} + \beta_3 \times \\
 & \times \text{Short-Term Dynamic Dummies} + \beta_4 \times \text{Long-Term Dynamic Dummies, Years Since Ownership Change} + \beta_5 \times \\
 & \times \text{Pan-State Dummy} \times \text{Election-Year Dummy} + \beta_6 \times \text{Control Variables} + \beta_7 \times \text{Year Fixed Dummies} + \\
 & + \text{Error Term.}
 \end{aligned}
 \tag{1}$$

Below, we describe the model variables and list their definitions in Table 2.

2.2.1 Dependent variables. The dependent variables in this model are performance measures that are selected based on the six aspects CAMELG. The combination of the former five, CAMEL, is the well-known international bank-rating system. For the six aspects of performance, we used the capital adequacy

ratio (CAR) to assess capital adequacy; the non-performing loan ratio (NPL) to assess asset quality; the total asset turnover (TAT) and the net worth turnover (NWT) to assess management; the net profit margin (NPM), the return on assets (ROA), and the return on equities (ROE) to assess earnings; the liquidity reserve ratio (LLR) and the loan to deposit ratio (LTD) to assess liquidity; and the loan and discount

loan growth rate (LDG) to assess growth. The reason that the three earnings measures are included together is that they convey distinct information about profitability according to the Du Pont Analysis. NPM indicates the profit that every dollar of revenue can earn. However, a high NPM does not necessarily lead to a high ROA because ROA equals NPM times TAT. In addition to the information regarding earning ability, ROA can convey information on how efficiently or intensively a firm uses its assets to generate sales¹. Similarly, a high ROA does not necessarily bring a high ROE because ROE equals ROA times the equity multiplier. When two banks have the same ROA, the bank with greater financial leverage will have a higher ROE. Therefore, ROE, compared with ROA, contains additional information about the degree of leverage that a firm possesses. Rhoades (1998) also argued that the ROA will be biased upwards if much of a bank's profits come from off-balance sheet transactions because the revenues and expenses generated from these activities are not based on assets. Hence it is necessary to include ROE in the analysis to provide an alternative measure for bank earnings.

2.2.2. Independent variables. As equation (1) shows, we include seven sets of dependent variables to explain bank performance. The number of static dummies equals the number of static types minus 1 because one type of static bank has to be set as the control group and hence has no corresponding dummy. Because there are two types of static ownership in this study, the pure-state and the pure-private, only one static dummy needs to be introduced. Here, we regard the pure-private banks as the control group and hence set "static_pure-state" as the only static dummy. The dummy equals 1 for all periods for a state-owned bank if it underwent no ownership change over the entire sample period and equals 0 otherwise. The coefficients of this static dummy, therefore, reflect the performance differences between the pure-state and the pure-private banks.

Next, the number of selection dummies equals the number of dynamic types. Because we have three types of dynamic banks in this study, three selection dummies are introduced: one for the privatized-state banks (selection_privatized-state), another for the private-M&A banks (selection_private-M&A), and the other for the foreign-P&A banks (selection_foreign-P&A). The selection dummy equals one for all periods for a dynamic bank that experiences the corresponding ownership change and equals 0 for all periods otherwise. The coefficients of these dummies thus identify the performance difference between the dynamic banks and the pure-private banks.

The dynamic effects aim to observe the performance difference for the dynamic banks before and after their ownership change. The number of dynamic dummies is, therefore, exactly the same as the number of dynamic types and is also the same as the number of selection dummies. There are two kinds of dynamic effects: short-term and long-term effects. The former examines the short-term impact of ownership change on performance; the latter captures the overtime effect of ownership change on performance. Accordingly, three short-term dynamic dummies are introduced; dynamic_ST_privatized-state, dynamic_ST_private-M&A, and dynamic_ST_foreign-P&A. These dummies indicate the periods following an ownership change and thus equal 1 for all periods that follow the corresponding ownership change, and equal 0 for the periods prior to the change, and also equal 0 for all periods of the banks that are not observed this change. Three long-term dynamic dummies, similarly, are introduced to measure the time that has lapsed since the ownership change: dynamic_LT_privatized-state, dynamic_LT_private-M&A, and dynamic_LT_foreign-P&A. Because we use yearly observations for the sample, these dummies are measured at an annual frequency. The dummies equal 1 in the year of change, 2 in the first year following the change, and so on. Because there are several interventions during the year of ownership change, for example, legal fees, consultant expenses, and due diligence costs, among others, following the previous studies, we delete the observations for the years encountering ownership change.

Referencing Micco et al. (2007), we employ the product of two dummies: the pan-state dummy multiplied by the election-year dummy to consider the political factor and to represent the condition of a pan-state bank in a major election year² in which the politicians or bureaucrats are most likely to exert their influence. The product of the two dummies equals 1 for an observation where the cross section is a pan-state bank and for which the time series point is a major election year. The value of the product equals 0 as long as one of the two requirements above does not hold.

Four control variables for the scale (bank size), revenue scope, and cost and expense ratios are also included to observe the links between the banks' own characteristics and their performance. The four control variables comprise the logarithm of the lagged asset (\ln_asset_{t-1}), the percentage of non-interest income to total revenue (non-interest income ratio), the ratio of financial business costs (FBC), and the operating expense ratio (OER).

¹ ROA, therefore, is usually employed as an indicator for evaluating banks' overall performance.

² Election years refer to the years when major elections are held. In this study, we define major elections as the presidential election, the legislative election, and the municipal elections.

Table 2. Variable definitions

Variable symbol	Definition
Dependent variables	
Capital adequacy	
CAR	Capital adequacy ratio = Total risk-based capital / Risk-weighted assets × 100%
Asset quality	
NPL	Non-performing loan ratio = Non-performing loans / Total loans × 100%
Management	
TAT (number of times)	Total asset turnover = Net operating revenue / Average total assets
NWT (number of times)	Net worth turnover = Net operating revenue / Average net worth
Earnings	
NPM	Net profit margin = Net income / Net operating revenue × 100%
ROA	Return on assets = Net income / Average total assets × 100%
ROE	Return on equity = Net income / Average net worth × 100%
Liquidity	
LRR	Liquidity reserve ratio = Current assets / Deposits that should provide liquidity reserve × 100%
LTD	Loans to deposits = Loans / Deposits × 100%
Growth	
LDG	Loan and discount loan growth rate = (Loan and discount loan – Loan and discount loan of the former period) / The absolute value of the loan and discount loan of the former period × 100%
Independent variables	
Static dummies	
Static_pure-state	Dummy equals 1 for all periods for a pure-state bank if it undergo no ownership change over the 1995 to 2010 period and equals 0 for all periods otherwise.
Selection dummies	
Selection_privatized-state	Dummy equals 1 for all periods for a state-owned bank that is selected for privatization over the 1995 to 2010 period and equals 0 for all periods otherwise.
Selection_private-M&A	Dummy equals 1 for all periods for a private bank that is selected for private M&A over the 1995 to 2010 period and equals 0 for all periods otherwise.
Selection_foreign-P&A	Dummy equals 1 for all periods for a private bank that is selected for foreign P&A over the 1995 to 2010 period and equals 0 for all periods otherwise.
Short-term dynamic dummies	
Dynamic_ST_privatized-state	Dummy indicating the years following a bank's privatization over the 1995 to 2010 period. Equals 0 for the years prior to the privatization and equals 1 for all periods following the privatization. Equals 0 for all periods for the banks that did not undergo privatization.
Dynamic_ST_private-M&A	Dummy indicating the years following a private bank's M&A over the 1995 to 2010 period. Equals 0 for the years prior to the private M&A and equals 1 for all periods following the private M&A. Equals 0 for all periods for banks that did not undergo private M&A.
Dynamic_ST_foreign-P&A	Dummy indicating the years following a private bank's being participated in or acquired by foreign capital over the 1995 to 2010 period. Equals 0 for the years prior to the foreign P&A and equals 1 for all periods following the foreign P&A. Equals 0 for all periods for banks that did not undergo foreign P&A.
Long-term dynamic dummies	
Dynamic_LT_privatized-state	Number of years since privatization. Equals 0 for all periods prior to a state-owned bank's privatization and starts with 1 for the year of change, 2 for the first year following the change and so on. Equals 0 for all periods for the banks that did not undergo privatization.
Dynamic_LT_private-M&A	Number of years since the private M&A. Equals 0 for all periods prior to a private bank's M&A and starts with 1 for the year of change, 2 for the first year following the change and so on. Equals 0 for all periods for banks that did not undergo private M&A.
Dynamic_LT_foreign-P&A	Number of years since the foreign P&A. Equals 0 for all periods prior to a private bank's being participated in or acquired by foreign capital and starts with 1 for the year of change, 2 for the first year following the change and so on. Equals 0 for all periods for banks that did not undergo foreign P&A.
Political dummy	
Pan-state_dummy × election-year_dummy	Dummy indicating a pan-state bank in a major election year. Equals 1 for an observation where the cross section is a pan-state bank and for which the time series point is a major election year. Equals 0 as long as one of the two above requirements does not hold. That is, equals 1 for the major election years for a pan-state bank and equals 0 for the years without an election. Equals 0 for all periods for banks that are not pan-state.
Control variables	
In_asset_t-1	Natural logarithm of bank assets with a one year lag for each bank
Non-interest income ratio	The percentage of non-interest revenue to total revenue. We use the equation (total revenue – interest revenue) / total revenue to compute this ratio.
FBC	Financial business cost ratio = Financial business costs / Operating revenue × 100%; financial business costs are comprised of interest expense, fee and commission expenses, expenditures for credit card business, losses from various financial businesses, and so on.
OER	Operating expense ratio = Operating expenses / Net operating revenue × 100%; operating expenses are comprised of costs for marketing, management, research and development (R&D), employee training, financial consultation, and so on.
Year fixed dummies	Year dummies

Note: This table provides the definitions of the dependent and independent variables in regression (1).

Table 3. Descriptive statistics and correlations

Variables	CAR (%)	NPL (%)	TAT (number of times)	NWT (number of times)	NPM (%)	ROA (%)	ROE (%)	LRR (%)	LTD (%)	LDG (%)	In_asset_t-1	Non-interest income ratio (%)	FBC (%)	OER (%)
Panel A: Descriptive statistics, 1995-2010														
Observations	509	508	501	501	507	501	501	502	502	515	511	517	507	507
Mean	11.320	3.302	0.054	0.834	3.746	0.209	2.277	19.221	83.236	7.982	12.793	24.423	68.742	27.440
Median	10.790	2.460	0.050	0.750	7.420	0.350	5.280	16.945	82.145	6.760	12.538	17.899	68.290	24.580
Std. dev.	2.795	2.696	0.027	0.528	19.464	0.893	13.983	9.159	17.618	12.128	1.011	17.656	22.842	11.374
Min	5.050	0.140	0.020	0.150	-143.910	-5.520	-108.020	6.670	7.710	-48.100	10.615	-2.734	9.580	3.720
Max	29.830	18.580	0.240	5.620	54.510	2.480	24.390	59.790	231.310	90.720	15.138	92.839	206.790	82.150
Panel B: Correlations														
CAR (%)	1.0000													
NPL (%)	-0.2481	1.0000												
TAT (number of times)	0.1047	0.2474	1.0000											
NWT (number of times)	-0.1686	0.2593	0.7910	1.0000										
NPM (%)	0.1688	-0.2351	0.0145	-0.0770	1.0000									
ROA (%)	0.1910	-0.2105	0.1331	-0.0115	0.9322	1.0000								
ROE (%)	0.2004	-0.2006	0.1098	0.0150	0.9242	0.9420	1.0000							
LRR (%)	0.2928	-0.3330	-0.2654	-0.1956	0.1664	0.0895	0.0873	1.0000						
LTD (%)	-0.0648	-0.0205	0.2339	0.2094	0.0516	0.1072	0.0967	-0.2846	1.0000					
LDG (%)	0.0633	-0.2271	0.1566	-0.0503	0.3316	0.3940	0.3213	-0.0965	0.0934	1.0000				
In_asset_t-1	-0.0581	-0.1813	-0.2882	-0.0268	0.1334	0.0766	0.1119	0.4218	-0.0797	-0.2137	1.0000			
Non-interest income ratio (%)	0.0187	-0.4670	-0.3991	-0.2651	0.0572	-0.0348	-0.0458	0.4415	-0.2305	-0.0802	0.3649	1.0000		
FBC (%)	-0.1304	0.3475	0.2381	0.2711	-0.8777	-0.7769	-0.7867	-0.1897	0.0977	-0.2880	-0.0585	-0.2146	1.0000	
OER (%)	-0.0227	-0.3029	-0.6127	-0.4704	-0.1442	-0.2542	-0.2127	0.1538	-0.3509	-0.0930	-0.1023	0.4341	-0.2610	1.0000

Note: This table provides the descriptive statistics and the correlations of 10 performance measures and 4 control variables.

There is a wide variation in performance and characteristics across banks and over time. Table 3 provides the descriptive statistics and the correlations of 10 performance measures and 4 control variables. Figures 2 and 3 illustrate the year-by-year trend of the median values of these variables.

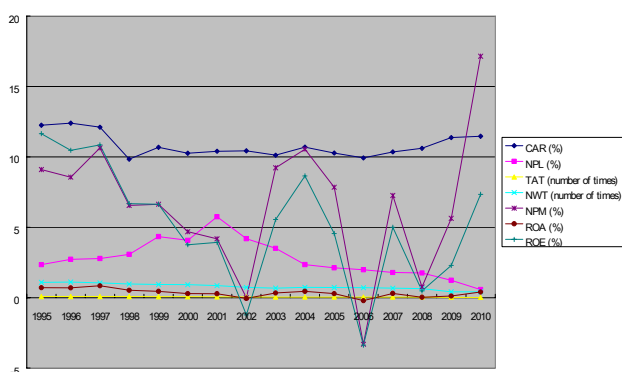


Fig. 2. The median values of the performance variables for capital adequacy, asset quality, management, and earnings year by year

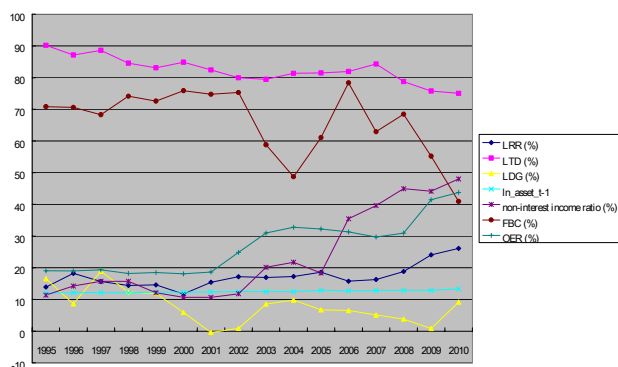


Fig. 3. The median values of the performance variables for liquidity and growth and the four control variables year by year

3. Empirical results

Table 4 presents the main results obtained from running the full regression model of equation (1) using “period weights” for the observations in the Generalized Least Squares (GLS) specification and “clustered errors” for controlling the correlations between the error terms of the individual banks. The period weights allow for period heteroskedasticity. The clustered errors are robust estimates for the standard errors and covariances computed by the White cross-section method¹.

3.1. The main findings for the effects of ownership on bank CAMELG performance. As Table 4 illustrates, beginning with the static effects, the pure-state banks realized significantly higher CAR and TAT than the pure-private banks, indicating that the pure-state banks have more prudent capital

holding strategies and better management performance. In asset quality, the pure-state banks also significantly outperformed the pure-private banks in terms of NPL. As for earnings, the pure-state banks had significantly higher NPM than the pure-private banks, which is consistent with the common knowledge that state-owned banks in Taiwan have a higher profit margin because their cost of deposit capital is relatively cheaper.

With respect to the selection effects, the results suggest that the state-owned banks that were selected to be privatized, namely the privatized-state banks, have the lowest CAR among the five types of banks by a significant amount, which indicates that they have the highest use of financial leverage, bringing them the significantly highest NWT and ROE even given their unsatisfactory TAT and ROA. For asset quality, similar to the pure-state banks, the privatized-state banks significantly outperformed the pure-private banks in terms of NPL. In the area of liquidity, however, the privatized-state banks significantly had the lowest LRR and the highest LTD, showing their more aggressive lending philosophy yet lower liquidity reserve, which implies that they face a potentially higher possibility of loan losses and operation risks. Because the privatized-state banks have the highest level of LTD, which means that their loans might reach the limit or even beyond and that there might be little space for them to grow further, it naturally follows that their LDG performs significantly the least among the five types of banks.

Another selection effect for the banks undergoing private M&A shows that the private-M&A banks have a statistically significantly better performance on asset quality and management in terms of NPL, TAT, and NWT than the pure-private banks; they also have significantly higher ROE, LTD, and LDG than the pure-private banks. The private M&A banks can be said to be the best performing banks, second only to the pure-state banks, indicating that in Taiwan, the banks with the ability to merge with or acquire others and still survive often perform relatively well.

The other selection effect for the banks involved in foreign P&As shows that the foreign-P&A banks have a lower CAR and a higher NPL. Their NWT is higher than that of the pure-private banks, which might be caused by their higher financial leverage. At the same time, their ROA is not only significantly worse than the pure-private banks' but is also the worst among the five types. All of these results suggest that in Taiwan, the banks available for P&As by foreign capital were limited to those with inferior operating conditions, a result that particularly opposes the findings of Lin and Zhang

¹ This method treats the pool regression as a multivariate regression (with an equation for each cross-section) to compute the robust standard errors and the covariances for the system of equations.

(2009). These authors found that the banks involved in foreign acquisitions performed better, and they therefore argued that the Chinese government selected better banks for foreign acquisition to attract foreign investors. The Taiwanese government, on the contrary, is more concerned about introducing the capital, the know-how, and the management of foreign banks to solve the problems of bad assets and banks. Combining the results of the static and the selection effects and comparing them to those in Table 5, we discover that the estimated coefficients for both of the effects dummies are quite robust to the exclusion of long-term dynamic indicators.

Respecting the dynamic effects of ownership transformation, the privatized-state banks show significant short-term enhancements for the measure of capital adequacy, CAR, after the ownership changes. That their degree of financial leverage declines subsequent to the privatization might be one of the reasons for the significant drop on their NWT and ROE for the short-term dynamic effects after the privatization. The privatized-state banks' ROE, though deteriorates in the short term, displays significant long-term improvement, as does another measure of earnings, NPM. These results indicate that privatization allowed the earnings of the privatized-state banks to experience a short-term decrease but a long-term enhancement. In addition, the long-term dynamic effects for the privatized-state banks on asset quality show a significant increase for the measure of NPL, indicating that their asset quality deteriorates gradually after the privatization. As for the liquidity measure, LTD, both of the coefficients for the short-term and long-term dynamic dummies show significant decreases. These decreases indicate that after privatization, the privatized-state banks modify their too-high LTD; this modification gains them the space for the further growth of loans, driving the short-term dynamic effects of LDG to display significant increases.

In the case of the dynamic effects for the private-M&A banks, their NPL shows a significant increase in both the short and long term after the ownership changes, indicating that their asset quality is dragged down after the M&A activities. In other words, the banks acquired by the private-M&A banks perform worse in asset quality than the private-M&A banks. Moreover, the NWT of the private-M&A banks displays significant long-term improvement, while their ROA for the long-term dynamic effects presents a highly significant drop. As for the LTD and LDG of these banks, both display a significant short-term rise but a long-term decline.

Concerning the dynamic effects for the foreign-P&A banks, the P&A activities by foreign capital do resolve the issues around their relatively high NPL, which shows a significant decrease regardless of the short- or long-term dynamic effects. This result confirms Lin and Zhang's (2009) statement that "foreign acquisitions usually involve detecting past non-performing assets and writing them off using gross profits." The foreign-P&A banks' CAR, however, shows a significant increase in the short term after the foreign-P&As, which represents either the foreign capital injection or the efforts to consolidate the banks' capital adequacy. For the management measures, the TAT of the foreign-P&A banks shows significant enhancement in the long term, while the NWT shows significant deterioration in the short term but enhancement in the long term; these results jointly indicate that the foreign P&A banks' management encountered continual improvement as time passed subsequent to the P&A activities.

In analyzing the connection between the political factors and the bank CAMELG performance, we observe that in major election years, the pan-state banks showed a significantly poorer performance for the TAT and ROA measures, although their NWT at those times displayed a significantly higher value. At the same time and worthy of particular note, the LTD also displayed significantly higher values, which is consistent with the prediction that those in political power generally desire to ease monetary environment during election years and thus affect the pan-state banks to approve more loans, making their LTD higher than that of the other banks.

Observing the connections between the four control variables and the CAMELG performance, we first note that \ln_asset_{t-1} showed a significant positive connection with the measures NPL, ROE, and LRR; yet, it had a significant negative relationship with the measures TAT, LTD, and LDG. Second, we note that the non-interest income ratio had a significant positive connection with the measures CAR, TAT, NPM, ROA, LRR, and LDG, yet showed a significant negative relationship with the measure NPL. Third, the FBC showed a significant positive connection with the measures NPL, TAT, and NWT, yet had a significant negative relationship with the measures CAR, NPM, ROA, ROE, LRR, and LDG. As for the OER, it had a significant positive connection with the measures for NPL, yet it displayed a significant negative relationship with the measures for TAT, NPM, ROA, ROE, LRR, and LTD.

3.2. Robustness checks for the main results. We assessed the robustness of our bank-level results along several dimensions. First, we excluded the

long-term dynamic dummies to re-run the regression, reported the results in Table 5, and found that only some of the results for the short-term dynamic dummies, especially in terms of the earnings measures, are different from those of the main results in Table 4. That is, the estimated coefficients and their significance for both the static and the selection effects are quite robust to the exclusion of the long-term dynamic indicators.

Second, we used a no-weighting estimation to re-run the full model in which the clustered error terms were still under consideration. The results show that the unweighted R-squared for all meas-

ures obviously decreases and the unweighted sum of the squared residual increases, indicating that the use of the period weighting estimation method generates a better performance. Third, we used the conventional estimates for the coefficient standard errors and the covariances to recalculate the t-statistics and to re-test the significance of the coefficients, while the coefficient estimates are the same as those in Table 4. The results show that not considering the clustered error terms leads many of the coefficients, in terms of NPL, TAT, NWT, NPM, ROA, LRR, and LTD, to become insignificant¹.

Table 4. Bank ownership and CAMELG performance: full model, period weighting estimation, and clustered error terms

Performance	Capital adequacy	Asset quality	Management		Earnings			Liquidity		Growth
Variables	CAR	NPL	TAT	NWT	NPM	ROA	ROE	LRR	LTD	LDG
Constant	12.3011 (6.0884)***	0.3317 (0.2554)	0.1219 (4.9474)***	1.1843 (1.5754)	81.5940 (26.8972)***	3.1564 (9.2737)***	36.3818 (4.8997)***	-8.3166 (1.0895)	170.2729 (12.2377)***	59.0503 (4.3206)***
Static dummies										
Static_pure-state	1.9930 (4.8995)***	-1.0677 (4.0100)***	0.0091 (1.8350)*	0.2140 (1.3901)	1.1953 (2.2914)**	0.0910 (1.6157)	1.3286 (0.8713)	1.2715 (0.9506)	2.5916 (1.0995)	4.5224 (1.3783)
Selection dummies										
Selection_privatized-state	-2.1464 (2.0294)**	-0.6054 (2.1026)**	0.0031 (1.1640)	0.4186 (2.6631)***	0.2186 (0.7933)	-0.0789 (1.5877)	1.9472 (1.9127)*	-5.2440 (2.2072)**	35.3412 (4.2858)***	-7.2499 (2.0826)**
Selection_private-M&A	0.3311 (1.1546)	-1.7475 (5.8007)***	0.0055 (2.9918)***	0.1721 (3.5244)***	0.1713 (0.6069)	0.0032 (0.0593)	1.1590 (2.2565)**	-0.3250 (0.3477)	3.7305 (3.0316)***	3.3727 (1.7810)*
Selection_foreign-P&A	-1.1896 (3.5503)***	0.8161 (6.0029)***	0.0010 (0.7225)	0.0908 (3.0343)***	-0.2067 (1.1225)	-0.1240 (3.4989)***	-0.8802 (1.6301)	-1.1475 (1.1962)	2.0429 (1.6114)	0.2443 (0.1512)
Short-term dynamic dummies										
Dynamic_ST_privatized-state	2.8468 (2.4236)**	-0.4431 (1.4255)	-0.0061 (1.4884)	-0.4165 (2.8384)***	-1.4068 (2.0327)**	0.0726 (1.0737)	-3.2628 (3.6070)***	1.7472 (0.7585)	-20.0473 (2.1554)**	10.7190 (2.8299)***
Dynamic_ST_private-M&A	0.1235 (0.3633)	0.8348 (2.6463)***	0.0030 (0.8515)	-0.1408 (1.5930)	-0.5792 (0.6062)	0.0868 (1.0463)	-1.3410 (1.1008)	-2.6240 (1.5426)	4.6749 (2.0367)**	8.4649 (3.0574)***
Dynamic_ST_foreign-P&A	7.2622 (2.4027)**	-0.6059 (4.3177)***	0.0017 (0.4365)	-0.2090 (2.0851)**	12.9350 (8.0836)***	-0.1968 (1.2475)	16.2857 (4.6525)***	12.4692 (5.7766)***	15.7087 (3.8461)***	-12.5541 (1.2347)
Long-term dynamic dummies										
Dynamic_LT_privatized-state	-0.0304 (0.4410)	0.0497 (2.1187)**	0.0004 (1.0613)	0.0028 (0.3093)	0.4275 (2.8182)***	0.0098 (1.2050)	0.2986 (3.5242)***	0.0148 (0.0571)	-0.8084 (1.8587)*	0.1898 (0.5366)
Dynamic_LT_private-M&A	-0.0511 (0.5075)	0.0787 (3.1023)***	-0.0005 (0.8003)	0.0319 (1.8089)*	-0.0813 (0.2435)	-0.0419 (2.8940)***	0.0499 (0.2803)	-0.4976 (1.2533)	-0.8339 (2.1747)**	-1.6848 (3.2719)***
Dynamic_LT_foreign-P&A	-0.7948 (1.0051)	-0.1469 (3.2707)***	0.0039 (4.2495)***	0.0782 (3.4141)***	-5.1094 (14.5135)***	0.0168 (0.4404)	-4.1993 (5.1122)***	-0.6944 (1.3972)	-8.2373 (7.7888)***	4.2766 (1.7412)*
Political dummy										
Pan-state * election-year	-0.1719 (0.8149)	0.0532 (0.3603)	-0.0050 (2.4130)**	0.1406 (1.7112)*	-0.5567 (1.5086)	-0.0845 (1.8849)*	0.7597 (1.6211)	0.0239 (0.0126)	6.6316 (5.1160)***	-0.8845 (0.4056)
Control variables										
ln_asset_t-1	-0.0503 (0.3334)	0.1682 (1.6707)*	-0.0049 (2.6431)***	-0.0387 (0.6840)	-0.0053 (0.0326)	0.0182 (0.8884)	1.0828 (2.2572)**	2.3886 (4.3682)***	-5.8754 (6.7201)***	-3.4482 (3.2062)***
Non-interest income ratio	0.0140 (1.6780)*	-0.0103 (3.1339)***	0.0001 (2.2895)***	-0.0011 (0.9592)	0.0327 (2.6680)***	0.0061 (5.0237)***	-0.0116 (0.9614)	0.1595 (4.3802)***	-0.0375 (1.3770)	0.0930 (2.5480)**
FBC	-0.0158 (4.3094)***	0.0152 (4.1445)***	8.05E-05 (2.9557)***	0.0036 (4.0947)***	-0.8248 (48.9920)***	-0.0364 (15.5586)***	-0.5589 (16.4202)***	-0.0296 (2.3835)**	0.0173 (0.8395)	-0.1377 (3.9902)***
OER	0.0064 (0.5111)	0.0181 (3.6201)***	-0.0006 (3.0322)***	-0.0075 (1.6323)	-0.8016 (16.9180)***	-0.0287 (7.9963)***	-0.3574 (4.6098)***	-0.1548 (2.1603)**	-0.6388 (5.2539)***	-0.0515 (0.7263)
Observations	490	486	491	491	492	491	491	480	480	492
R-squared	0.333661	0.649202	0.784573	0.407342	0.956360	0.877667	0.858614	0.467317	0.368549	0.409566

Note: All specifications include year-fixed effects (not shown). The absolute values of the t-statistics for the coefficients of the independent variables are shown in the parentheses, and their superscripts *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

¹ The results for both robustness checks are not shown for the limited length.

Table 5. Bank ownership and CAMELG performance: robustness check – excluding long-term dynamic dummies

Performance	Capital adequacy	Asset quality	Management		Earnings			Liquidity		Growth
Variables	CAR	NPL	TAT	NWT	NPM	ROA	ROE	LRR	LTD	LDG
Constant	12.2703 (6.0533)***	0.2419 (0.1919)	0.1227 (5.0990)***	1.2203 (1.6628)*	80.7357 (25.6001)***	3.1492 (9.1068)***	35.3761 (4.7219)***	-8.5338 (1.1341)	167.4145 (11.3208)***	58.8421 (4.2487)***
Static dummies										
Static_pure-state	2.0019 (4.8605)***	-1.0358 (3.8320)***	0.0087 (1.7806)*	0.2203 (1.4376)	1.2723 (2.2253)**	0.0870 (1.4877)	1.3926 (0.8997)	1.2540 (0.9358)	2.9647 (1.2989)	4.5460 (1.4006)
Selection dummies										
Selection_privatized-state	-2.1403 (2.0376)**	-0.5149 (1.7437)*	0.0031 (1.1778)	0.4263 (2.7024)***	0.3406 (1.0005)	-0.0769 (1.5865)	2.1794 (2.1572)**	-5.2970 (2.2837)**	35.0758 (4.2305)***	-7.2005 (2.1018)**
Selection_private-M&A	0.3153 (1.1225)	-1.6880 (5.5276)***	0.0058 (3.2495)***	0.1786 (3.7060)***	0.1777 (0.6360)	0.0073 (0.1332)	1.2946 (2.5335)**	-0.3340 (0.3447)	3.0277 (2.5408)**	3.3777 (1.8233)*
Selection_foreign-P&A	-1.2041 (3.7784)***	0.8609 (5.8480)***	0.0012 (0.9370)	0.0971 (3.1078)***	-0.2123 (1.1549)	-0.1226 (3.3332)***	-0.7769 (1.4309)	-1.1858 (1.2676)	1.4850 (1.1618)	0.2101 (0.1292)
Short-term dynamic dummies										
Dynamic_ST_privatized-state	2.6247 (2.5742)**	0.0057 (0.0240)	-0.0028 (1.3698)	-0.3972 (3.0177)***	0.4461 (1.1966)	0.1310 (3.4678)***	-1.7577 (2.2111)**	1.8362 (0.9839)	-25.7225 (3.0220)***	12.0764 (4.5352)***
Dynamic_ST_private-M&A	-0.0251 (0.0975)	1.1223 (4.1411)***	0.0002 (0.1369)	-0.0205 (0.4369)	-1.4894 (2.9072)***	-0.0728 (1.1611)	-1.7447 (2.1678)**	-4.5508 (4.8358)	2.7705 (1.8270)*	1.2705 (0.7782)
Dynamic_ST_foreign-P&A	4.6385 (8.4701)***	-1.2005 (10.4919)***	0.0134 (7.1220)***	0.0116 (0.2967)**	-2.3749 (0.9766)	-0.1310 (2.5905)***	1.7688 (0.7005)	10.4438 (11.1398)***	5.6670 (1.1640)	3.0335 (1.0075)
Political dummy										
Pan-state * election-year	-0.1911 (0.9361)	0.0001 (0.0008)	-0.0049 (2.4246)**	0.1396 (1.7828)*	-0.7527 (1.5541)	-0.0888 (2.0715)**	0.5501 (1.2570)	0.0177 (0.0096)	6.4050 (4.1759)***	-1.0174 (0.4645)
Control variables										
ln_asset_t-1	-0.0502 (0.3326)	0.1655 (1.6780)*	-0.0049 (2.7005)***	-0.0415 (0.7498)	0.0537 (0.3085)	0.0208 (0.9921)	1.1291 (2.3618)**	2.4192 (4.5304)***	-5.7554 (6.0037)***	-3.3705 (3.1218)***
Non-interest income ratio	0.0141 (1.7673)*	-0.0095 (2.8856)***	0.0001 (2.1582)**	-0.0009 (0.8159)	0.0334 (2.5826)**	0.0056 (4.4093)***	-0.0091 (0.7657)	0.1536 (4.1039)***	-0.0373 (1.2781)	0.0801 (1.9715)**
FBC	-0.0154 (4.3643)***	0.0157 (4.1264)***	7.79E-05 (2.8766)***	0.0036 (4.0251)***	-0.8225 (46.7781)***	-0.0365 (15.5413)***	-0.5543 (16.3037)***	-0.0298 (2.4235)**	0.0225 (1.1219)	-0.1453 (4.1742)***
OER	0.0070 (0.5418)	0.0193 (3.5795)***	-0.0006 (3.2235)***	-0.0078 (1.7355)*	-0.7960 (16.2772)***	-0.0291 (7.9107)***	-0.3512 (4.4245)***	-0.1548 (2.1138)**	-0.6002 (4.7770)***	-0.0502 (0.6282)
Observations	490	486	491	491	492	491	491	480	480	492
R-squared	0.332490	0.641458	0.780526	0.404706	0.954874	0.876635	0.856691	0.464760	0.348853	0.400952

Note: All specifications include year-fixed effects. The absolute values of the *t*-statistics for the coefficients of the independent variables are shown in the parentheses, and their superscripts *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

3.3. The effects of ownership on bank characteristics. We use equation (1) but replace the dependent variables that measure performance with the four control variables to see how the bank ownership types and transformation connect to their characteristics. We also use the four different specifications in Tables 4 and 5 and the other two robustness checks to obtain the bank characteristic regression results, but in Table 6, we only report the findings with the highest R-squared values.

First, the pure-state banks are found to significantly have the largest asset scale but the lowest non-interest income ratio and OER. The privatized-state banks appear to significantly have the second largest asset scale yet, similar to the pure-state banks, the second lowest non-interest income ratio. Both results prove the general belief that state-owned banks have larger scales but less innovation. For the pure-state banks, moreover, the proportion spent on the operating ex-

penses, which are comprised of costs for marketing, R&D, employee training, and so on, is found to be significantly the least. Second, the private-M&A banks are found to significantly have the third largest asset scale and the highest OER but the lowest FBC ratio, indicating that they emphasize marketing, R&D, staff training and have more economic and efficient financial business costs. Third, the foreign-P&A banks significantly have the fourth largest asset scale but a lower non-interest income ratio than the pure-private banks; in particular, they have the highest FBC among the five types of banks.

To sum up, combining the static and selection effects, the pan-state banks in Taiwan have a larger asset scale, while the private banks have a stronger ability to innovate. It is worth noticing that the private-M&A banks significantly have the highest OER yet the lowest FBC, which might signal their competitiveness. Comprehensively considering the

private-M&A banks' better performance, we argue that they are suitable for playing a leading role in future consolidation.

As for the dynamic effects of ownership changes on bank characteristics, the privatized-state banks show no significant changes for either the short-term or the long-term dynamic dummies for all of the characteristic measures. The private-M&A banks exhibit significant short-term enlargement and a long-term diminishment of their asset scale as well as a short-term decrease and a long-term increase on the non-interest income ratio. Regarding the foreign-P&A banks, all of the coefficients for both the short-term and the long-term dynamic dummies for all of the characteristic measures are statistically significant, indicating the strong changes, especially in the short

term, that are brought by the participation of foreign capital in bank management. Specifically, the foreign-P&A banks' asset scale shows a short-term enlargement but a long-term diminishment, and their non-interest income ratio, FBC, and OER demonstrate a short-term increase but a long-term decrease.

Respecting the connections between the various bank characteristics, the asset scale has a significantly positive connection with the non-interest income ratio but a negative connection with the OER. The non-interest income ratio has a significantly negative connection with both the FBC and the OER. As for the relationship between FBC and OER, they appear to have a negative correlation. In the case of the political dummy, it only shows a significantly positive relationship with asset size.

Table 6. Ownership effects and bank characteristics

Dependent variables	ln_asset_t-1	Non-interest income ratio	FBC	OER
Constant	12.4901 (63.7284)***	-25.2885 (1.4256)	84.7554 (12.1322)***	52.9718 (13.1164)***
Static dummies				
Static_pure-state	1.3465 (11.4308)***	-5.7583 (3.1967)***	2.1369 (0.9205)	-4.9674 (3.8007)***
Selection dummies				
Selection_privatized-state	0.9373 (3.8945)***	-3.8836 (1.8229)*	-0.5771 (0.2929)	0.7206 (0.7064)
Selection_private-M&A	0.7618 (9.6257)***	0.7495 (0.5258)	-3.3159 (1.7559)*	2.7262 (9.2079)***
Selection_foreign-P&A	0.2896 (6.7634)***	-2.2021 (3.0756)***	3.4685 (2.6541)***	0.2389 (0.7508)
Short-term dynamic dummies				
Dynamic_ST_privatized-state	0.0862 (0.2951)	-2.2761 (1.0068)	-3.0500 (1.2210)	-0.9665 (0.6619)
Dynamic_ST_private-M&A	0.5595 (2.4493)**	-10.1380 (3.7110)***	-1.9632 (0.2641)	-3.1750 (1.3531)
Dynamic_ST_foreign-P&A	0.6518 (3.2870)***	22.2586 (2.2635)**	52.1432 (11.8712)***	26.2739 (15.4217)***
Long-term dynamic dummies				
Dynamic_LT_privatized-state	0.0115 (0.4114)	-0.0942 (0.2857)	0.6790 (1.2648)	-0.1393 (0.6921)
Dynamic_LT_private-M&A	-0.0816 (2.5191)**	3.3471 (3.1890)***	1.3308 (0.9914)	0.3517 (0.5957)
Dynamic_LT_foreign-P&A	-0.1548 (3.4084)***	-4.6518 (1.7885)*	-13.0267 (16.9685)***	-6.2435 (13.2650)***
Political dummy				
Pan-public*election-year	0.5776 (4.7130)***	-3.3005 (1.4412)	3.2100 (1.5914)	0.1379 (0.1150)
Control variables				
ln_asset_t-1		4.6276 (3.8131)***	-0.4570 (0.8731)	-1.8592 (4.8628)***
Non-interest income ratio	0.0168 (5.4336)***		-0.2015 (3.3321)***	-0.0713 (2.8169)***
FBC	0.0010 (0.8007)	-0.0440 (1.5740)		-0.0097 (0.5539)
OER	-0.0323 (7.2898)***	-0.1669 (1.2003)	-0.2193 (1.9625)*	
Observations	492	492	492	492
R-squared	0.661260	0.671172	0.448655	0.737890

Note: All specifications include the year-fixed effects. The absolute values of the *t*-statistics for the coefficients of the independent variables are shown in the parentheses, and their superscripts *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Conclusion

The banking industry in Taiwan has experienced dramatic ownership transformations over the past two decades. These changes can thus make the banks in Taiwan be divided into five types by ownership: the pure-state, the pure-private, the privatized-state, the private-M&A, and the foreign-P&A. This paper aims to investigate the effects of these ownership types or transformations on bank performance in Taiwan using data from 1995 to 2010 period. Our empirical model considers the static, selection, and dynamic effects of ownership that are relevant to Taiwan's banking industry simultaneously so as to avoid potentially biased and misleading results. The period heteroskedasticity and clustered error terms are also considered in the model's estimation to obtain more robust results.

We also test the connections between bank ownership and characteristics in terms of asset scale, innovation, and cost efficiencies. These tests help to trace some sources of the effects of bank ownership on performance and comprehend how the bank characteristics change following the ownership changes.

The main findings regarding the static effects of bank ownership on performance suggest that the pure-state banks tend to have better performance overall than the pure-private and other types of banks. In fact, the pure-state banks can be said to perform the best. The main selection effects suggest that the banks involved in private M&As might have performed better than average before the M&A events, and those selected for foreign P&As performed particularly worse prior to the P&As. In fact, the private-M&A banks are the banks with the second-best performance, while the foreign-P&A banks performed the worst. As to the selection effects for the state-owned banks involved in privatization, the results suggest that the privatized-state banks have the highest financial leverage (the lowest CAR), the lowest LRR, and the highest LTD, which reveals that they have a more radical mode of operation. The strongest selection effects belong to the private-M&A banks and the foreign-P&A banks: the former had the best performance for asset quality, while the latter performed the worst for the same measure in advance of the ownership changes.

The main dynamic results suggest that the privatization of state-owned banks appears on the surface to improve the bank performance in several ways; for example, the degree of financial leverage decreases in the short term following the ownership change, the earning ability increases in the long term, and the excessive lending improves for both the short and long term. Similarly, the foreign-P&A banks

appear to improve their performance tremendously. Their NPL declines for both the short and long term, their management efficiency increases in the long term, and some of their earning measures improve substantially as well. However, the main cause for these improvements is almost surely the placement of most of their nonperforming loans into residual entities or the Resolution Trust Corporation (RTC). The performance of the private-M&A banks, in contrast, appears to deteriorate tremendously following the ownership changes; for example, the NPL increases in both the short and long term, and some of their earning measures, especially ROA, decline in the long term.

The bank characteristic regressions suggest that the pan-state banks have a larger scale while the private banks have a higher non-interest income ratio. The main dynamic results suggest that the private-M&A banks exhibit significant short-term enlargement and long-term diminishment of their asset scale, yet a short-term decrease and a long-term increase in the measure of their non-interest income ratio. Regarding the foreign-P&A banks, all of the coefficients for both the short- or long-term dynamic dummies for all of the characteristic measures are statistically significant, indicating that the foreign capital brought material changes, especially in the short term, to the banks in which they participated or acquired.

Based on the above results, we put forward three proposals for Taiwan's further financial reforms:

1. Retain the existing two (and only the two) pure-state banks as entities that bear special tasks, implement government policies, and relieve market failures when necessary.
2. In view of the negative effects of the continuing minority government ownership on bank performance, we argue that the privatized-state banks should be further privatized, incorporating the business concepts and models of the private sector to enhance their performance. We, therefore, advocate bestowing the private-M&A banks with a leading place in the integration of the privatized-state and private banks so that they can become bigger and stronger together and thus enhance their competitiveness.
3. The P&As by foreign capital does enhance bank performance and, to a certain extent, solves the problems of poor assets and banks in Taiwan. The government, therefore, ought to properly encourage and allow foreign capital or institutions to participate in the operation and management of domestic banks with the hope that the synergy could be elaborated and those banks' technical level and service quality could be further enhanced.

References

1. Beck, T., Crivelli, J.M., Summerhill, W. (2005a). "State bank transformation in Brazil – choices and consequences", *Journal of Banking and Finance*, 29, pp. 2223-2257.
2. Beck, T., Cull, R., Jerome, A. (2005b). "Bank privatization and performance: empirical evidence from Nigeria", *Journal of Banking and Finance*, 29, pp. 2355-2379.
3. Berger, A., Clarke, G.R.G., Cull, R., Klapper, L., Udell, G.F. (2005). "Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership", *Journal of Banking and Finance*, 29, pp. 2179-2221.
4. Berger, A., Hasan, I., Zhou, M. (2009). "Bank ownership and efficiency in China: What will happen in the world's largest nation?" *Journal of Banking and Finance*, 33, pp. 113-130.
5. Bonin, J.P., Hasan, I., Wachtel, P. (2005a). "Bank performance, efficiency and ownership in transition countries", *Journal of Banking and Finance*, 29, pp. 31-53.
6. Bonin, J.P., Hasan, I., Wachtel, P. (2005b). "Privatization matters: Bank efficiency in transition countries", *Journal of Banking and Finance*, 29, pp. 2155-2178.
7. Drakos, K. (2002). "The efficiency of the banking sector in Central and Eastern Europe", *Russian and East European Finance and Trade*, 38, pp. 31-43.
8. Fries, S., Taci, A. (2005). "Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries", *Journal of Banking and Finance*, 29, pp. 55-81.
9. Grigorian, D., Manole, V. (2002). "Determinants of commercial bank performance in transition: An application of data envelopment analysis", World Bank Policy Research Working Paper 2850, June.
10. Hasan, I., Marton, K. (2003). "Development and efficiency of the banking sector in a transitional economy", *Journal of Banking and Finance*, 27, pp. 2249-2271.
11. Jemric, I., Vujcic, B. (2002). "Efficiency of banks in Croatia: A DEA approach", *Comparative Economic Studies*, 44, pp. 169-193.
12. Kraft, E., Tirtiroglu, D. (1998). "Bank efficiency in Croatia: A stochastic-frontier analysis", *Journal of Comparative Economics*, 26, pp. 282-300.
13. Lin, Ming-Yu (2003). "A Study on the Operating Efficiency of the Privatized State-owned Banks in Taiwan – An Application of DEA Approach", Master Thesis, Business Administration, National Cheng Kung University, Taiwan.
14. Lin, X., Zhang, Y. (2009). "Bank ownership reform and bank performance in China", *Journal of Banking and Finance*, 33, pp. 20-29.
15. Matousek, R., Taci, A. (2002). "Banking efficiency in transition economies: Empirical evidence from the Czech Republic", Discussion Paper No. 02-3, Center for International Capital Markets, London Metropolitan University.
16. Micco, A., Panizza, U., Yañez, M. (2007). "Bank ownership and performance. Does politics matter?" *Journal of Banking and Finance*, 31, pp. 219-241.
17. Nikiel, E.M., Opiela, T.P. (2002). "Customer type and bank efficiency in Poland: Implications for emerging banking market", *Contemporary Economic Policy*, 20, pp. 255-271.
18. Rhoades, S.A. (1998). "The efficiency effects of bank mergers: An overview of case studies of nine mergers", *Journal of Banking and Finance*, 22, pp. 273-291.
19. Weill, L. (2003). "Banking efficiency in transition economies: The role of foreign ownership", *Economics of Transition*, 11, pp. 569-592.
20. Williams, J., Nguyen, N. (2005). "Financial liberalization, crisis, and restructuring: A comparative study of bank performance and bank governance in South Asia", *Journal of Banking and Finance*, 29, pp. 2119-2154.
21. Yeh, Tsai-lien, Chen, Tser-yieth (1998). "A Comparative Study on the Operating Efficiency of the State-Owned and Private Banks in Taiwan – An Application of DEA Approach", *Soochow Journal of Economics and Business*, 22, pp. 77-100.
22. Yildirim, H.S., Philippatos, G.C. (2007). "Bank Efficiency: Evidence from the transition economies of Europe", *European Journal of Finance*, 13, pp. 123-143.