Philip Molyneux, Hong Liu and
Chunxia Jiang

Bank capital, adjustment and ownership: Evidence from China

Bank of Finland, BOFIT
Institute for Economies in Transition

EUROJÄRJESTELMÄ
EUROSYSTEMET

BOFIT Discussion Papers
Editor-in-Chief Laura Solanko

Philip Molyneux, Hong Liu and Chunxia Jiang: Bank capital, adjustment and ownership: Evidence from China

Contents

Philip Molyneux, Hong Liu and Chunxia Jiang

Bank capital, adjustment and ownership: Evidence from China

Abstract

We investigate ownership effects on capital and adjustments speed to the target capital ratio in China from 2000 to 2012 and find that state-owned banks hold higher levels of capital than banks of other ownership types. Foreign banks are more highly capitalized than local non-state banks but under-capitalized compared with the bigger non-state banks with nationwide presence. Foreign banks adjust risk-weighted capital towards their optimal targets at a slower speed than domestic banks, while foreign minority ownership results in a faster adjustment process. Capital is positively influenced by profitability, asset diversification and liquidity risk, but negatively influenced by bank market power. Capital ratios typically co-move with the business cycle although this relationship is reversed during the crisis period due to active government intervention. Our results are robust to various modelling specifications and have important policy implications.

Key words: banking, capital, adjustment, ownership, China
JEL: G21; G28; C32

Philip Molyneux: Bangor Business School, Bangor University. Email: p.molyneux@bangor.ac.uk.

Hong Liu: Adam Smith Business School, University of Glasgow. Email: hong.liu@glasgow.ac.uk.

Chunxia Jiang: Corresponding author . Middlesex University Business School. Email: c.jiang@mdx.ac.uk.

Introduction

The failure of US investment banking giant Lehman Brothers in September 2008 brought on an episode of financial crisis that resulted in the most severe economic recession since the 1930s Great Depression. Governments had to step-in with a variety of acute measures to stabilise financial systems and to stimulate economic recovery. The crisis triggered policy reforms to resolve the crisis and to prevent a repetition of these events, and bank capital stood at the centre of the debate. In particular, governments sought to boost bank capital, among other things, by introducing new regulatory regimes such as the Dodd Frank Act in the US, the Fourth Capital Requirement Directive (CRD IV) in the EU, and Basel III internationally.[1]

During the crisis period, governments took direct measures to restore financial stability. For instance, a number of banks, such as ABN AMRO and Fortis in the Netherlands and Royal Bank of Scotland and HBOS-Lloyds TSB in the UK, were nationalized, in sharp contrast to the pre-crisis trend of a global retrenchment of state ownership in banking.[2] Regulatory action during the crisis highlighted the positive influence that active state involvement in the financial sector can have, although it is also recognised that there may be longer-term negative consequences of government ownership (Cihak and Demirguc-Kunt, 2013). In the post-crisis era, finding a balanced role for the state in finance has become an important issue which has stimulated increasing academic and policy debate (World Bank, 2013). Against this backdrop, the aim of this study is to contribute to the debate by examining how ownership features affect bank capital and its adjustment speed. We investigate these issues in the context of Chinese banking where state-ownership plays a major role, alongside non-state domestic and foreign banks.

The influence of ownership effects on various dimensions of bank behaviour has been a central concern for both researchers and policy makers. Studies have examined a

---

[1] The Dodd-Frank Wall Street Reform and Consumer Protection (Dodd-Frank), passed in 2010, was the largest financial regulatory overhaul since the 1930s and was a response to the 2007-2009 financial crisis. The aim is "to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end 'too big to fail', to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes" (http://www.federalreserve.gov). The EU Capital Requirements Directive (CRD IV) is a legislative package to implement the Basel III agreement in the EU, covering prudential rules for banks, building societies and investment firms; published in June 2013 with effect from1 January 2014 (www.bankofengland.co.uk).

[2] In 2009, the share of state-owned banks in total banking sector assets in developed economies was less than 10%, while that for the developing world was 22%. For the latter, the average state ownership of banking sector assets was 67% in 1970 (World Bank, 2013).

variety of issues including the link between bank ownership and performance (Bonin, Hasan and Wachtel, 2005; Jiang, Yao, Feng, 2013); economic growth (La Porta, Lopez-de-Silanes, Shleifer, 2002); financial development (Barth, Caprio and Levine, 2001); lending behaviour (Jia, 2009); and loan rates (Sapienza, 2004). In addition, a related literature has also developed, which looks at the features of bank capital. The issue of capital is complex in banking due to the leveraged nature of the business and the potential systemic risk posed by severe under-capitalization. Features of bank capital have received considerable research attention, both theoretically and empirically, leading to a rich body of literature. An array of areas have been investigated covering: the determinants of bank capital structure/buffers (Gropp and Heider. 2010; Fonseca and Gonzalez, 2010); reasons for holding excess capital (Marcus, 1984; Estrella, 2004); the cyclicality of capital requirements (Ayuso, et al., 2004); banks' behaviour in capital management/adjustment (Memmel and Raupach, 2010; De Jonghe and Oztekin, 2013); and the effects of bank capital on bank lending (Francis and Osborne, 2009), stock returns (Demirguc-Kunt, Detragiach, Merrouche, 2010), systemic risk (Acharya, Engle, Richardson, 2012), and liquidity creation (Berger and Bouwman, 2013).

Despite the extensive literature on bank capital and ownership, the links between ownership and capital have not (to our best knowledge) been investigated. We argue that it is important for policy makers and practitioners to understand factors explaining bank capital strength, given the significant externalities capital can have as regards financial stability and economic well-being. This study attempts to bring the two strands of literature together so as to make two contributions to the literature. First, we systematically investigate how bank capital is influenced by bank ownership features, focusing on four mutually exclusive forms: state ownership, nationwide non-state ownership, local non-state ownership, and foreign ownership. Even for non-financial firms, little attention has been paid to the effects of state and/or foreign ownership on firms' capital. The extant literature for non-financial firms mainly focuses on ownership effects on capital structure in terms of managerial and external block ownership (Friend and Lang, 1988); control and cash flow rights of ownership (Johnson et al., 2000; Lin, et al., 2011); and the concentration of ownership (Anderson and Reeb, 2003; Shehzad, De Haan, Scholtens, 2010).

Secondly, we contribute to the debate on post-crisis regulatory reform from the perspective of emerging economies by examining the impact of a wide range of factors on bank capital in China. The existing literature on bank capital predominantly focuses on de-

veloped countries, and there has been little research done on emerging economies. Banking systems in these economies differ significantly from those of the developed world, characterised by under-capitalization, pervasive government intervention, inadequate disclosure and transparency, weak supervision and enforcement power, and so on. Moreover, most emerging economies have adopted the new international capital rules – Basel III.[3] Thus, our paper should provide some insight into how bank capital is determined in a major emerging economy, which we believe will be beneficial on a broader scale.

China, with a rapidly changing ownership landscape and capital regulatory environment, offers a natural laboratory for investigating these issues. Since the late 1970s, the country has commenced market-oriented banking reforms via measures such as recapitalizing the banking system, privatizing state-owned banks, and upgrading the prudential regulatory regime (Berger, Hasan, Zhou, 2009; Jiang, Yao, Feng, 2013). However, the banking system remained dominated by state-owned banks until a radical reform of ownership was launched in 2003. Through attracting foreign minority ownership and increased public flotation, the ownership of the banking industry has diversified rapidly, leading to a mixture of state banks, domestic non-state banks, and foreign institutions. China has also committed to global regulatory reform and tightened its capital regulatory rules.[4] Following the first issuance of capital regulation under Basel rules in 2004, the China Banking Regulatory Commission (CBRC) issued the regulatory proposals *Capital Rules for Commercial Banks* under the Basel III framework in June 2012, which came into force on 1 January 2013. In addition, as the country has become increasingly influential on the world economic and financial stage the stability of its banking system has also become globally more important – China is now home to four of the world's top ten largest banks by market capitalization (www.relbanks.com).

In order to investigate bank capital, adjustment and ownership issues we employ an approach following Berger et al., (2008). This allows us to model variations in bank capital and adjustment speeds with respect to ownership features as well as various bank-specific characteristics and macroeconomic and financial conditions. Using annual panel

---

[3] As of March 2013, the adoption of Basel III completed in China, India and Mexico and was in process in Brazil, Argentina and Russia (BIS, 2013).

[4] Until the late 1990s, Chinese banks were generally under-capitalized by international standards, and most banks, including the four largest dominant state-owned banks, were technically insolvent (authors' own estimates of non-performing loans). Although a minimum capital adequacy ratio of 8% was prescribed in the earlier Commercial Banking Law in 1995, adherence was not enforced since no details were given regarding the calculation or definitions of its components (www.pbc.gov.cn).

data of Chinese commercial banks from 2000 through 2012 we find strong and economically significant evidence that state-owned banks have higher capital ratios than banks of other ownership types, regardless of the capital measures employed. Foreign banks are more highly capitalized than local non-state banks but under-capitalized compared with bigger non-state banks with nationwide presence. Foreign banks adjust risk-weighted capital towards their optimal targets at a slower speed than domestic banks, while foreign minority ownership is associated with a faster adjustment process. Moreover, bank capitalization is positively affected by profitability, the extent of asset diversification, and the level of liquidity risks, but is negatively influenced by bank asset size and market power (as measured using the Lerner index). Bank capital ratios co-move with the business cycle, although this relationship was reversed during the crisis period due to active government interventions. Our results are robust to various modelling specifications and have important policy implications in suggesting that Chinese authorities have an opportunity to reduce the capital ratios of state banks without undermining their stability/competitiveness, and the GAP between target and actual capital ratios is a useful complementary measure for regulators and practitioners in monitoring bank capital.

The paper proceeds as follows. Section 2 reviews the related literature. Section 3 describes the sample and research methodology. Section 4 analyses the empirical results and section 5 concludes.

1   Related literature

1.1   Ownership and bank capital

Although regulators set minimum capital requirements based on the risk profile of banks' assets in order to protect depositors and maintain financial stability, banks can voluntarily hold capital in excess of the regulatory minimum (Ayuso, Pérez, and Saurina, 2004; Estrella, 2004). Banks have an optimal capital ratios (Myers and Rajan, 1998; Allen, Carletti, and Marquez, 2011) which is theoretically determined by the trade-off between various costs. Banks are unable to adjust capital and risk instantaneously, and it is a risky strategy to stay close to the minimum requirements given the high costs of regulatory violation (Marcus, 1984). By holding excess capital, banks can avoid the costs of failure and lower the probability of bankruptcy (Acharya, 1996), and they are better able to take advantage

of unexpected future growth opportunities. On the other hand, equity capital is costly and so banks may be reluctant to hold excess capital. Equity capital is more expensive than alternative bank liabilities such as deposits or debt due to the tax saving benefits of debt (Kraus and Litzenberger, 1973; Graham, 2000), and raising equity capital may be interpreted as a sign of overpriced stock expecting a future fall in price (Myers and Majluf, 1984).

Empirically, the unobservable optimal target capital ratio is estimated using a battery of factors reflecting bank-specific characteristics and the macro-environment. However, empirical evidence is mixed. Fonseca and Gonzalez (2010) find a positive relation between capital buffers and bank market power, in contrast to Schaeck and Cihak (2012) who find that banks with lower market power may hold more capital. Some research argues that large banks may hold more capital because greater complexity heightens asymmetric information problems (Gropp and Heider, 2010), while others find that larger banks have lower capital targets (Brewer, Kaufman, Wall, 2008) due to various factors such as "too big to fail", safety net subsidies and gains from economies of scale (Jokipii and Milne, 2008). Gropp and Heider (2010) highlight the effect of unobserved time-invariant bank fixed-effects as the most important determinants of banks' capital levels, in contrast to Memmel and Raupach (2010) who show that regulatory pressure plays an important role. Research on developed countries generally reports a negative relationship between capital buffers and the economic cycle (Ayuso, Pérez, Saurina, 2004; Lindquist, 2004), while Fonseca and Gonzalez (2010) find that this relationship is negative in some countries but positive in others.

Although ownership is an important dimension of bank-specific characteristics, there is little research examining its impact on bank capital. We argue that different ownership types can affect bank capital through several channels. The first channel is the source of capital. State banks are likely to face soft budget constraints (Shleifer and Vishny, 1994; Desai and Olofsgard, 2006), as they are closer to politicians and more likely to have easy access to government funding. This suggests that government owned institutions are likely to hold more capital than non-state banks facing tougher budget constraints. Moreover, internal sources of funds are generally preferred over external funds when raising capital (Myers and Majluf, 1984), and the availability of retained earnings can vary with different forms of ownership. That said, empirical evidence suggests that state banks generally underperform non-state banks (Bonin et al, 2005; Jiang, Yao, Feng, 2013). Foreign banks

tend to have an advantage over their domestic counterparts in raising capital, as they have access to parent companies and so can use resource transfers (via an internal market).[5] They may also have more ample sources of internal funding, according to the global advantage hypothesis (Berger et al., 2000) whereby foreign banks outperform domestic banks due to advanced technologies and superior managerial skills.

The second channel is corporate governance, which reflects on how well banks of different ownership forms tackle principal-agent problems. Agency cost theory suggests a link between capital and ownership (Jensen and Meckling, 1976; Jensen, 1986). Under private ownership, managers who have non-diversifiable human capital invested in the firm have an incentive to reduce their non-diversifiable employment risks by ensuring the viability of the firm (Amihud and Lev, 1981), which can be accomplished by reducing the firm's debt holdings (Friend and Lang, 1988). Under state ownership, managers (who may be politicians too) have strong incentives not only to secure employment but also to enhance their political standing by boosting bank capital using state funds. Therefore, from the aforementioned perspectives, both private and state banks have incentives to hold high levels of capital, but the pressure may be greater for private firms since potential support in times of trouble – too-big-to-fail and related safety net subsidies – are perceived as less "guaranteed" than in the case of state banks.

The third channel relates to banks' strategic objectives. The capital structure literature is traditionally based on the assumption that the main goal of private firms is to maximize shareholder value. However, banks with different ownership structure may pursue varying goals. The "development" view (Gerschenkron, 1962) argues that state banks could act ''benevolently'' and direct resources toward strategic and socially desirable long-term projects to foster growth. The "political" view (Shleifer and Vishny, 1994) believes that governments may provide incentives to supporters, for example, by financing inefficient but politically (socially) desirable projects, in exchange for their votes, political contributions, and bribes. Empirical evidence (La Porta et al., 2002) confirms that state ownership promotes government's political goals at the expense of other stakeholders. With prioritized social and policy goals, the capital decisions of state banks are likely to depart from those of non-state banks. It could be that state banks hold more capital in order to

---

[5] Note that post-crisis there have been moves in some jurisdictions to force foreign banks to hold more capital in their overseas subsidiaries. The US Foreign Bank rule, which comes into force in mid-2016, requires foreign banks with assets exceeding $50 billion to hold more capital in the US. In the US this mainly impacts big investment banking arms of large European banks such as Deutsche Bank, Credit Suisse and Barclays.

avoid any disruption in fulfilling social and policy goals, However this influence may be mitigated because (as noted above) government safety net benefits may be greater for state banks.

The fourth channel relates to market discipline and regulatory enforcement. The market view argues that the level of bank capital is the outcome of interactive pressures among shareholders, debt holders and depositors (Martinez Peria and Schmukler, 2001; Flannery and Rangan, 2008). State banks with politically powerful owners may face a lower degree of market discipline, external scrutiny and monitoring. Moreover, given the multiple roles of the state as owner, regulator, and overseer, state banks may benefit from regulatory forbearance, especially if they are "too big to fail". Non-state banks are likely to face more stringent external inspections and regulatory enforcement and thus they may hold more capital than state banks.

The final channel relates to the existence of deposit insurance. In most developed countries explicit deposit insurance schemes act as a safety net to prevent banking crisis, whereas many emerging economies have no such an explicit deposit insurance scheme. State banks with implicit government guarantees may hold lower levels of capital, as they are less likely to face depositor runs if they are viewed as quasi deposit insurance schemes backed by the government. In contrast, confronting a higher probability of bank runs, non-state banks and foreign banks are likely to have to maintain higher levels of capital.

1.2   Ownership and capital adjustment speeds

The optimal capital level is dynamic in that it responds to changes in bank-specific characteristics and in the macroeconomic and financial environment. Observed bank capital ratios are likely to deviate from target levels. In theory, banks are assumed to adjust their capital instantly, but in practice the adjustment speed depends on the costs of adjustment. Under minimal adjustment costs, banks should always maintain the optimal target capital level. However, if transaction costs are significant, banks may slow down the capital adjustment process and operate at a sub-optimal level (Flannery and Rangan, 2006). Moreover, even if banks have the ability to adjust capital quickly, they may not choose to do so. Therefore, it is important to understand the factors that affect adjustment speeds and also to obtain unbiased estimates of optimal target capital ratios.

The literature on bank capital structure adjustment is extensive, and the speeds of adjustment depend on bank characteristics, the sign of the deviation from target, and country-level regulatory, supervisory, and macroeconomic features (Rime, 2001; Berger et al., 2008; Memmel and Raupach, 2010; Jokipii and Milne, 2011). Based on a sample of 64 countries for the period 1994–2010, De Jonghe and Oztekin (2013) suggest that capital adjustment speed is heterogeneous across countries. Banks adjust capital faster during crisis periods and in countries with more stringent capital requirements, better supervisory monitoring, more developed capital markets, and high inflation. European banks are found to annually close two-thirds of the gap between current and target levels (Jokipii and Milne, 2008) and German banks have been found to adjust even faster (Memmel and Raupach, 2010).

Research on the relationship between ownership and capital adjustment is scarce. Focusing on the effect of control rights and cash flow rights of ultimate owners in pyramids on capital-ratio adjustment, Lepetit, Tarazi and Zedek (2014) find that banks with ultimate owners holding excess control rights adjust capital toward the optimal targets by reducing lending instead of by issuing equity, especially in countries with weak shareholder protection and as regards family-controlled banks. Memmel and Raupach (2010) examine how state and private ownership affect bank capital structure adjustment and find that private banks adjust their capital ratios more rapidly than state-owned and cooperative banks in Germany.

To sum up, despite the pervasive ownership effect in banking, its impact on bank capital remains under-researched. Moreover, the literature on determinants of bank capital refers mainly to developed countries, and the empirical evidence is inconclusive. Our study focuses on ownership effects on bank capital and adjustment speeds in the context of banking in China. Experiences and lessons from our study should be of particular interest to policy makers in other developing countries that have features similar to that of China, including an important state sector, increasing foreign bank presence, rapid growth, and being in a phase of major economic and financial change.

2   Data, variables, and model specification

2.1   Data and variables

This study focuses on commercial banks operating in mainland China over the period 2000–2012. The sample starts from 2000 due to data availability. In China, although the disclosure of regulatory capital ratios was not an official requirement until 2004, the authorities started internal monitoring in accordance with the Basel Accord from 1998, and the ratios for major banks are available as from 2000. The data are mainly from BankScope – Fitch's International Bank Database and other complementary data sources including the Almanac of China's Finance and Banking (1986–2013) and the China Statistical Yearbook. Data on foreign minority ownership are hand-collected from multiple sources such as press releases and the websites of the central bank, the CBRC and individual banks, and these are all carefully cross-checked. The sample is primarily based on unconsolidated financial reports (although consolidated accounts are used in the absence of unconsolidated data). The final sample is an unbalanced panel for 186 banks with 1,208 observations, comprising the four largest state-owned banks, 13 nationwide joint stock commercial banks, 31 foreign banks, 113 city commercial banks, and 25 rural commercial banks.[6]

The variables are defined in Table I with sample descriptive statistics in Table II. We winsorize all variables except bank size at the 2% and 98% levels to mitigate the impact of outliers. We consider three different capital ratios: EquiyCap is the ratio of equity to total assets; Tier1Cap is the ratio of Tier 1 capital to total risk-weighted assets; and TotalCap is the ratio of total capital (Tier1+Tier 2 capital) to total risk-weighted assets. As shown in Table I, banks' average ratios of equity to total assets are 8.55%, Tier 1 capital ratios 13.36%, and Total capital ratios 14.63%, well above the minimum regulatory capital requirements of 4% for the Tier 1 capital ratio and 8% for the total capital ratio.[7]

---

[6] China Development Bank is excluded from the sample since it was formerly a policy bank and was converted into a state-owned commercial bank in Dec 2008.

[7] The minimum capital requirements under Basel III are 4.5%, 6%, and 10% for the unweighted equity ratio, Tier 1 capital ratio, and Total capital ratio, respectively.

Table I   Definition of variables

Variable	Definition
Capital measures	
EquityCap	The ratio of equity to unweighted total assets.
Tier1Cap	The ratio of tier 1 capital to total risk-weighted assets.
TotalCap	The ratio of total bank capital (tier 1+tier2) to total risk-weighted assets.
Ownership indictors	
State	A dummy variable that equals 1 if the bank is a state-owned commercial bank and 0 otherwise.
Nationwide non-state	A dummy variable that equals 1 if the bank is a joint-stock commercial bank and 0 otherwise.
Local non-state	A dummy variable that equals 1 if the bank is a city commercial bank or rural commercial banks and 0 otherwise.
Foreign	A dummy variable that equals 1 if the bank is a foreign bank and 0 otherwise.
Foreign minority	A dummy variable that equals 1 as from the year a bank has foreign minority ownership and 0 otherwise
LIST	A dummy variable that equals 1 if the bank is publicly listed on a stock exchange and 0 otherwise.
Bank specific characteristics	
Market power	The Lerner index measuring the mark-up of price over marginal costs. The higher the value, the more the bank's market power the bank has.
Size	The natural logarithm of total assets.
Profitability	Return on assets
Cost ratio	The cost to income ratio (overheads as a proportion of operating profits before provisions)
Income diversification	The ratio of non-interest income to total operating income.
Assets diversification	Total loans as a percentage of total assets.
Liquidity	The ratio of the sum of cash and for-sale securities to total assets
Macro environmental variables	
GDP	Real GDP growth – the percentage change of real GDP.
Inflation	Inflation ratio – the percentage change of Consumer Price Index
Crisis	A dummy variable for the 2007-09 global financial crisis that equals 1 for the years 2007 to 2009 and 0 otherwise.
Market capitalization	The total market value of all of the listed company's outstanding shares divided by GDP

Notes: (1) EquityCap: Equity to total asset ratio; Tier1Cap is the ratio of Tier 1 capital to risk-weighted asset; TotalCap is the ratio of total capital (Tier 1+Tier 2 capital) to total risk-weighted assets. (2) State: state-owned banks, Nationwide non-state: nationwide joint-stock commercial banks. Foreign: foreign banks, Local non-state: city commercial bank or rural commercial banks.

Table II   Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
EquityCap	1206	8.19	7.77	1.76	46.76
Tier1Cap	807	13.20	11.40	3.33	75.42
TotalCap	911	14.63	11.18	3.87	76.97
Market power	1206	37.79	11.93	5.52	56.43
Size	1206	10.83	2.06	3.85	19.04
Profitability	1206	0.88	0.51	0.01	2.04
Cost ratio	1206	44.60	16.16	21.68	93.25
Income diversification	1206	15.55	13.81	-1.79	60.86
Assets diversification	1206	50.52	11.32	20.13	74.21
Liquidity	1206	12.36	9.86	0.00	35.04
GDP growth	1206	10.29	1.87	7.80	14.20
Inflation	1206	2.83	2.16	-0.77	5.86
Market capitalization	1206	73.29	42.77	31.85	178.20

Note: This table reports summary statistics for commercial banks operating in China over the period 2000–2012. The detailed definition of the variables can be found in Table I.

The ownership effect on bank capital and adjustment speed is examined in terms of the different types of owners, separated into four mutually exclusive and collectively exhaustive groups. In particular, ownership features are proxied by a set of dummy variables: *State* is a dummy variable that equals 1 if the bank is a state-owned commercial bank and 0 otherwise; *Nationwide non-state* is a dummy variable that equals 1 if the bank is a nationwide joint-stock commercial bank and 0 otherwise; *Local non-state* is a dummy variable that equals 1 if the bank is a city commercial bank or a rural commercial bank and 0 otherwise; and *Foreign* is a dummy variable that equals 1 if the bank is a wholly foreign-owned bank and 0 otherwise.[8] We also include two additional indicators of ownership features: listing

---

[8] One might argue that joint-stock banks and city/rural commercial banks are not private banks because the key shareholders of most of them are local governments and/or the state-owned/controlled enterprises. We define these banks as non-state owned banks and separate them from state-owned banks for two main reasons. First, although all of these banks are subject to government influence, the influence is indirect and the degree of intervention is much less compared with state-owned banks. As the mainstay of the Chinese banking system, state-owned banks assume much more responsibility for promoting macroeconomic/social stability and maintaining economic growth. Secondly, the remuneration system and personnel management of the nationwide joint-stock banks and city/rural commercial banks is significantly different from those of state-owned banks, which resemble those of central government organizations. Moreover, nationwide non-state banks are joint-stock commercial banks and were established as such. Local non-state banks refer to city and rural commercial banks that have been set up as joint-stock commercial banks since the mid-1990s by restructuring and consolidating the former urban and rural credit cooperatives. They are restricted to operate

status and foreign minority ownership. A bank's listing status to an extent reflects its own-ership concentration (Iannotta, Nocera, and Sironi, 2007) and listed banks, under public scrutiny and monitoring, are expected to hold more capital to signify soundness. *List* is a dummy variable that equals 1 if the bank is publicly listed on a stock exchange and 0 oth-erwise. *For-Minority* is a dummy variable that equals 1 for the years before foreign minori-ty ownership, regardless of its original ownership nature and 0 otherwise.[9]

In order to examine the determinants of bank capital and adjustment, we follow the literature and include a set of variables to capture both bank and country level charac-teristics. Banks with market power have an incentive to preserve their higher charter value by holding more capital to reduce the risk of failure (Fonseca and Gonzalez, 2010); we measure bank *Market power* by the Lerner index: the mark-up of price over marginal cost (the higher the value, the greater market power).[10] Bank *Size* is measured by the natural logarithm of total assets, and its effect on bank capitalization is ambiguous (Gropp and Heider, 2010; Brewer, Kaufman, Wall, 2008). *Profitability,* measured by return on assets (ROA), is closely linked to retained earnings as a major internal source of capital, and the literature suggests it has a positive impact on bank capital (Flannery and Rangan, 2008; Fonseca and Gonzalez, 2010). Banks with well-diversified income sources have a lower probability of experiencing a large decline in their capital ratios (Jokipii and Milne, 2008) and we define *Income diversification* by the ratio of non-interest income to total operating income. *Liquidity* also matters, as bank capital levels may be driven by the extent to which customers rely on liquidity and credit (Diamond and Rajan, 2000), and borrowers may de-mand banks to commit some of their own capital when extending credit (Allen, Carletti, Marquez, 2011). We define *Liquidity* as the ratio of the sum of cash and securities for sale to total assets (banks with higher ratios have more liquidity and lower levels of liquidity risk). Asset risk has been found to be positively associated with capital levels (Gropp and

---

within their municipalities' localities and subject to certain local government intervention, although recently a few of them have been allowed to operate across regions. Statistics show that local non-state banks grant about 70 percent of loans to state-owned and private small and medium enterprises that operate within the local boundaries (KPMG, 2007).We separate nationwide non-state banks from local non-state banks to re-flect these differences.

[9] The Chinese government sets upper limits on foreign ownership in domestic banks: 25% for all foreign in-vestors and 20% for a single foreign investor. Therefore, foreign investors can only hold a minority interest in a domestic bank.

[10] The Lerner index is calculated as $Lerner_{it} = (P_{it} - MC_{it})/P_{it}$, where P_{it} is the price of total assets (proxied by the ratio of total revenue to total assets for bank i at time t) and MC_{it} is the marginal cost of bank i at time t derived from a translog cost function. For more details on estimation of the Lerner index see Turk-Arsis (2010) and Liu, Molyneux, Wilson (2013), particularly Fungacova et al. (2013) that estimate Lerner index for Chinese banks using the same method.

Heider, 2010; Memmel and Raupach, 2010). We focus on the influence of asset structure on bank capital and define *Assets diversification* as the ratio of total loan to total assets (banks with lower ratios are more diversified). In addition, we include *Cost ratio,* the cost-to-income ratio, which captures the impact of managerial inefficiency. The sample statistics (Table II) show that Chinese commercial banks on average lend 50% of their assets as loans, hold 12.3% of total assets as liquid assets, obtain slightly less than 16% of total income from non-traditional banking business, and earn an average of 0.87% of ROA.

A set of country level control variables are defined as follows: *GDP growth* is measured by the percentage change in real GDP, included to capture any pro-cyclical effects (Ayuso, Pérez, Saurina, 2004; Fonseca and Gonzalez, 2010); *Inflation* by the percentage change in the consumer price index; and *Crisis* by a dummy for the 2007–2009 global financial crisis that takes a value of 1 for the years 2007 to 2009 and 0 otherwise. Brewer, Kaufman and Wall (2008) suggest that the equilibrium capital ratio is higher in countries where the banking sector is small. We include an indicator of the importance of the stock market (an inverse indicator of the importance of the banking sector) in the economy: *Market capitalization* measured as the ratio of total market value of all listed company's outstanding shares to GDP.

Table III presents the mean of the bank-specific variables by ownership type. These data generally confirm that ownership matters for capital structure. Foreign banks have higher levels of capital than domestic banks (by all measures). Their equity to total assets ratios, tier 1 and total capital ratios are 17%, 29% and 29.58%, respectively – triple those of the least capitalized nationwide non-state banks with corresponding capital ratios of 4.56%, 7.51% and 10.31%, respectively. The variation in capital ratios among banks of different ownership, however, may be due to bank-specific characteristics, as we observe below (the empirical analysis in section 4 aims to unveil the effects of bank-specific characteristics from ownership features). All state banks and 75% of nationwide non-state banks have obtained public listings while only 5% of local non-state banks have been listed, perhaps because of their relative small size and other constraints on local financial institutions. State banks are much larger in size, and foreign banks are at the other end of the spectrum. Local non-state banks appear to be more profitable largely due to lower costs. Foreign banks also appear to have more diversified income sources than domestic banks, which rely on net interest income by more than 80%. State banks have the highest level of market power as indicated by the Lerner index followed by nationwide non-state

banks and local non-state banks, while foreign banks have the lowest level of market power. All in all, state banks appear dominant in terms of assets size and market power; local non-state banks are the most profitable; and foreign banks seem to have higher costs and lower market power.

Table III   Mean values of the bank-specifipc variables by ownershi

	State	Nationwide non-state	Foreign	Local non-state
EquityCap	5.21	4.56	17.00	7.93
Tier1Cap	9.06	7.51	29.00	12.34
TotalCap	10.85	10.31	29.58	13.43
Foreign minority	0.44	0.51	1.00	0.09
LIST	1.00	0.75	0.00	0.05
Market power	45.59	38.63	27.59	39.06
Size	15.62	13.11	9.53	10.08
Profitability	0.77	0.69	0.72	0.94
Cost ratio	43.41	44.16	58.21	42.83
Income diversification	16.32	11.62	22.60	15.38
Assets diversification	52.39	53.90	50.32	49.68
Liquidity	13.92	9.63	6.96	13.58

Note: This table reports the mean values of the variables across different ownership structures. The detailed definition of the variables can be found in Table I. State: state-owned banks, Nationwide non-state: nationwide joint-stock commercial banks, Foreign: foreign banks, Local non-state: city commercial bank or rural commercial banks.

2.2   Model specification

Banks operate in a dynamic world with constantly changing bank-specific characteristics and macro-environments and so we are also interested in optimal target capital levels and how banks adjust to reach these targets. Following the literature (Berger et al., 2008; Öztekin and Flannery, 2012; De Jonghe and Oztekin, 2013), we apply a "variable speed partial adjustment" model to examine how ownership affects bank capital. The target capital ratio ($k_{i,t}^{*}$) is modelled as a function of the firm's characteristics as in equation 1:

$$k_{i,t}^{*} = \frac{K_{i,t}^{*}}{A_{i,t}} = \beta X_{i,t-1} \tag{1}$$

where $K_{i,t}^{*}$ is the target book value capital ratio; $A_{i,t}$ the book value of either simple assets or risk-weighted assets; β a vector of coefficients, and $X_{i,t-1}$ the set of ownership variables and bank-specific characteristics and macro-environment variables.

Banks may not always remain at target capital levels but may hold capital cushions due to potentially high adjustment costs. In a partial adjustment model, a bank's current capital ratio ($k_{i,t}$) is a weighted average of its target capital ratio ($k_{i,t}^{*}$) and the previous period's capital ratio ($k_{i,t-1}$) with a random shock ($\tilde{\delta}_{i,t}$):

$$k_{i,t} = \lambda k_{i,t}^{*} + (1-\lambda)k_{i,t-1} + \gamma D\_YR_{t} + \tilde{\delta}_{i,t} \tag{2}$$

Substituting the equation 1 for the target capital ratio into equation 2 yields the following specification for equation 3:

$$k_{i,t} = \lambda\beta X_{i,t-1} + (1-\lambda)k_{i,t-1} + \gamma D\_YR_{t} + \tilde{\delta}_{i,t} \tag{3}$$

Equation 4 further allows for a firm-specific adjustment speed ($\lambda = \Lambda Z_{i,t-1}$), which varies with annual bank characteristics.[11]

$$k_{i,t} - k_{i,t-1} = (\Lambda Z_{i,t-1})(\beta X_{i,t-1} - k_{i,t-1}) + \gamma D\_YR_{t} + \tilde{\delta}_{i,t} \tag{4}$$

where $k_{i,t}$ is the observed bank capital ratio, λ a scalar for adjustment speed, $D\_YR_{i,t}$ a vector of year dummies to absorb the effects of unspecified macroeconomic and financial market conditions on observed capital, Λ is a vector of coefficients for the adjustment speed function, $Z_{i,t-1}$ the set of bank characteristics that affect adjustment speed λ, $X_{i,t-1}$ the set of ownership variables and bank-specific characteristics and macro-environment variables that affect target capital ratios, and $\tilde{\delta}_{i,t}$ is a random error.[12]

---

[11] Unlike Berger et al. (2008) who use an estimate of a bank's *pro forma* capital ratio to measure changes in the capital ratio and capital gap, we use the previous year's capital ratio, because the data required to estimate the *pro forma* capital ratio are not available for all commercial banks in China.

[12] Empirically, we assume the adjustment speed and the target capital ratio are affected by the same set of bank-specific and macro-environment variables.

The model is estimated using a three-step procedure. First, we assume a constant adjustment speed λ for all sample banks and estimate a standard partial adjustment model (equation 3) using the System GMM estimator (Blundell and Bond, 1998) with Windmeijer correction (Windmeijer, 2005). The main purpose is to obtain an initial set of estimated $\hat{\beta}s$ that are then used to calculate an initial set of target capital ratios $\hat{k}^*_{i,t} = \hat{\beta}X_{i,t-1}$ for each bank each year. These estimates, however, may be biased because the adjustment speed (λ) is assumed to be constant.

In the second step, the gap ($\hat{G}_{i,t}$) between estimated target capital ratio and observed actual capital ratio in the previous year is calculated as in equation 5, which is then substituted into equation 3.

$$\hat{G}_{i,t} = \hat{\beta}X_{i,t-1} - k_{i,t-1} \tag{5}$$

$$k_{i,t} - k_{i,t-1} = (\Lambda Z_{i,t-1})\hat{G}_{i,t} + \gamma D\_YR_t + \tilde{\delta}_{i,t} \tag{6}$$

Equation 6 is a linear model regressing the changes in capital ratio against the product of $\hat{G}_{i,t}$ and the exogenous variables affecting the adjustment speed. Equation 6 uses pooled OLS to estimate $\hat{\Lambda}$, which are required to calculate the varying adjustment speed $\lambda_{i,t}$ for each bank in each year. Because the literature shows that banks adjust their capital towards desired targets at different speeds (Memmel and Raupach, 2010), this step allows us to derive the bank-specific varying adjustment speeds, which are then used in the third step. It also allows us to examine the ownership effect on adjustment speeds towards their optimal level.

In the third step, target capital ratios are re-estimated by substituting the varying adjustment speeds $\hat{\Lambda}Z_{i,t-1}$ obtained from the second step into equation 3. After rearranging the equation, we have the following model in equation 7, which is estimated using a fixed effects estimator:

$$k_{i,t} - k_{i,t-1}(1 - \hat{\Lambda}Z_{i,t-1}) = \beta[(\hat{\Lambda}Z_{i,t-1})X_{i,t-1}] + \gamma D\_YR_t + \tilde{\delta}_{i,t} \tag{7}$$

This step enables bank-specific adjustment speed and estimates of the optimal capital ratio that are unbiased. The estimates of β in equation 7 capture the effects on bank capital of ownership as well as other bank-specific and macro-environment conditions.

3   Empirical results

The ownership effects on bank capital ratios are examined using the three-step analysis described in section 3. Bank capital is measured by three different capital ratios: unweighted equity to assets ratio (EquiyCap), tier 1 capital ratio (Tier1Cap) and total capital ratio (TotalCap). In each step, we estimate three regressions sequentially for each capital ratio, which allows us to examine how target capital ratios vary with different ownership structures. In the first regression we start with the whole sample and treat state banks as the default group; thus we measure the effect of ownership on bank capital ratios relative to state banks. In the second regression, we drop state banks from the sample and treat nationwide non-state banks as the default group, and in the third regression we drop the nationwide non-state banks from the sample and use the foreign banks as the default group.

3.1   Step 1: Target capital ratios under constant adjustment speed

Table IV reports the results from the first step estimation of equation 3 assuming a constant adjustment speed across banks and over time. The results show that the constant adjustment speed of the equity ratio is 0.428 per year (=1–0.572, where 0.572 is the coefficient of the lagged capital ratio reported in the first specification), similar to that of large U.S. banks (0.40, Berger et al., 2008), and a sample of banks in the U.S. and 15 European countries (0.47, Gropp and Heider, 2010). An adjustment speed of 0.428 implies that a bank will close 89% of the distance to its target in 4 years $(1–(1–0.428)^{4}=0.8930)$. Overall, our results indicate that state banks tend to have higher capital ratios than domestic non-state banks in terms of their equity capital ratio, but not in terms of risk-weighted Tier1Cap or TotalCap. However, the assumption of a constant adjustment speed means these findings are somewhat limited and so we turn to the more realistic assumption of bank-specific variable adjustment speeds.

Table IV   Step 1: Determinants of bank capital under constant adjustment speed

	EquityCap			Tier1Cap			TotalCap		
	1	2	3	1	2	3	1	2	3
Capital ratio$_{t-1}$	0.572***	0.557***	0.581***	0.538***	0.629***	0.740***	0.651***	0.621***	0.702***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nationwide non-state	–3.091**			–4.634			–1.887		
	(0.014)			(0.217)			(0.625)		
Foreign	–1.665	0.841		5.577	17.641		5.782	8.347	
	(0.374)	(0.436)		(0.704)	(0.441)		(0.730)	(0.707)	
Local non-state	–3.510*	–0.934	–1.667**	–0.860	7.134	–5.701	1.965	3.102	–9.174
	(0.060)	(0.272)	(0.019)	(0.938)	(0.570)	(0.513)	(0.875)	(0.750)	(0.429)
Foreign Minority	0.298	0.286	0.239	–8.287	–17.023	–9.089	–8.179	–7.491	–10.020
	(0.365)	(0.426)	(0.475)	(0.667)	(0.578)	(0.761)	(0.685)	(0.759)	(0.721)
LIST	1.855*	1.907*	1.134	13.224	19.535	3.665	12.642	10.133	0.900
	(0.082)	(0.055)	(0.207)	(0.569)	(0.534)	(0.615)	(0.605)	(0.646)	(0.904)
Market Power$_{t-1}$	–0.060***	–0.075***	–0.087***	–0.732	–1.424	–0.820	–0.641	–0.609	–1.027
	(0.004)	(0.001)	(0.001)	(0.628)	(0.579)	(0.745)	(0.683)	(0.774)	(0.670)
Size$_{t-1}$	–1.037**	–1.088***	–0.928**	–1.824**	–0.727	–0.796	–1.316	–0.943	–0.244
	(0.032)	(0.009)	(0.020)	(0.044)	(0.272)	(0.423)	(0.189)	(0.674)	(0.858)
Profitability$_{t-1}$	0.948***	0.910***	0.898**	–4.556	–7.205	–3.828	–4.876	–3.198	–3.682
	(0.002)	(0.004)	(0.014)	(0.688)	(0.608)	(0.766)	(0.680)	(0.749)	(0.759)
Cost ratio$_{t-1}$	–0.024	–0.026	–0.030	–0.558	–1.040	–0.542	–0.487	–0.414	–0.689
	(0.223)	(0.188)	(0.165)	(0.657)	(0.598)	(0.760)	(0.710)	(0.797)	(0.684)
Income diversification$_{t-1}$	–0.000	0.003	0.003	–0.124	–0.199	–0.118	–0.122	–0.119	–0.094
	(0.985)	(0.678)	(0.740)	(0.594)	(0.570)	(0.752)	(0.616)	(0.640)	(0.791)
Assets diversification$_{t-1}$	–0.015	–0.017	–0.023	–0.071	–0.055	–0.033	–0.021	–0.066	0.085
	(0.420)	(0.345)	(0.238)	(0.135)	(0.478)	(0.816)	(0.767)	(0.659)	(0.701)
Liquidity$_{t-1}$	–0.026**	–0.018	–0.016	–0.069	–0.042	0.007	–0.044	–0.021	0.018
	(0.034)	(0.138)	(0.205)	(0.414)	(0.100)	(0.910)	(0.573)	(0.383)	(0.807)
GDP growth$_{t-1}$	1.742***	1.704***	1.607***	7.279	9.816	8.395	5.666	5.329	6.686
	(0.002)	(0.000)	(0.000)	(0.481)	(0.533)	(0.707)	(0.594)	(0.645)	(0.687)

Inflation$_{t-1}$	1.465**	0.998***	1.375***	3.708	4.090	−3.417	2.889	2.642	2.349
	(0.016)	(0.001)	(0.001)	(0.386)	(0.476)	(0.720)	(0.514)	(0.505)	(0.660)
CRISIS	−0.704	1.242**	−0.653	7.537	8.470	−24.181	7.051	3.091	4.604
	(0.322)	(0.013)	(0.321)	(0.480)	(0.461)	(0.685)	(0.522)	(0.737)	(0.765)
Market capitalization$_{t-1}$	−0.057***	−0.060***	−0.051***	−0.275	−0.365	−0.048	−0.216	−0.201	−0.203
	(0.002)	(0.000)	(0.000)	(0.494)	(0.524)	(0.724)	(0.607)	(0.622)	(0.722)
Number of observations	1003	943	809	615	576	474	622	582	480
AR(2)	0.158	0.145	0.145	0.472	0.801	0.801	0.533	0.851	0.851
Hansen (p-value)	0.291	0.258	0.258	1	0.999	0.999	0.999	0.991	0.991

Note: (1) This table provides the first step partial adjustment model estimates of the determinants of bank capital ratios with constant adjustment speed using a sample of commercial banks in China from 2000 to 2012. Three different definitions of capital ratios are considered in our regression analysis, namely, equity ratio, tier 1 capital ratio and total capital ratio. We use the System GMM estimator with Windmeijer correction by applying equation 3 ($k_{i,t} = \lambda\beta X_{i,t-1} + (1-\lambda)k_{i,t-1} + \gamma D\_YR_t + \tilde{\delta}_{i,t}$) to all the regressions with the second to the fourth lags of levels and the differences of the dependent variables as instruments. The number of lags varies to ensure the models to pass both Hansen and second order autocorrelation tests. In the first regression, we use the state-owned banks (State) as the default bank; in the second regression, we drop the state banks and use nationwide non-state banks as the default; while in the third regression, we drop nationwide non-state banks and use the foreign banks as the default. (2) All explanatory variables except dummy variables enter the regressions with one-year lag to address any potential endogeneity problems. (3) Year dummies are included in the model but not reported in the table. (4) "Hansen" is the Hansen test statistic of over-identifying restrictions, while AR (2) is the second order autocorrelation test statistic. (5) Detailed variable definitions are in Table I. *, **, *** represents significance at the 10%, 5% and 1% level, respectively. (6) *State*: state-owned banks; *Nationwide non-state*: nationwide joint-stock commercial banks; *Foreign*: foreign banks; *Local non-state*: city commercial banks or rural commercial banks.

3.2   Step 2: Determinants of bank capital adjustment speed

We conjecture that the speed at which a bank adjusts its capital ratio depends on bank-specific characteristics and macro-environment factors. The results from estimating equation 6, reported in Table V, show how ownership features affect adjustment speeds toward target capital ratios along with other important determinants.

In terms of EquityCap, all coefficients of ownership features are insignificant across the regressions, suggesting that banks with different owners do not significantly differ in the speed at which they adjust non-risk-weighted capital towards target levels. This contrasts with Memmel and Raupach (2010) who find that private commercial banks adjust their capital ratios more rapidly than state-owned banks in Germany. In terms of the risk-weighted capital ratio, we find that foreign banks adjust their capital more slowly than domestic banks. Our explanation is that foreign banks hold substantially higher capital buffers (as discussed in Section 4.4) and the risk of falling below minimum requirements is small.

The coefficients of *foreign minority* are positive and significant in most regressions, indicating that foreign minority ownership accelerates the speed of capital adjustment toward target levels. This could be due to foreign investors' better access to international capital markets and a selection effect. Evidence shows that foreign investors chose outperforming banks as investment targets (Jiang, Yao, Zhang, 2009), and these banks are more likely to have effective corporate governance in place and easy access to domestic capital markets. Under the monitoring of foreign investors, these banks (compared with others) have a greater incentive to maintain capital at target levels. Listed banks adjust equity ratios (EquitCap) more slowly than their non-listed counterparts, on average, by 37%. Although listed banks may be able to adjust capital quickly via easier access to capital markets, they face additional adjustment costs as new equity capital can have a diluting effect on the interests of existing shareholders. Therefore they may be reluctant to adjust capital towards target ratios too quickly. Moreover, listed banks generally hold more capital than non-listed banks (as shown in Table VI) and their relatively abundant capital buffer reduces the urgency to adjust capital toward targets quickly.

Table V   Step 2: Determinants of bank capital adjustment speed

	EquityCap			Tier1Cap			TotalCap		
	1	2	3	1	2	3	1	2	3
Nationwide non-state	–0.051			–0.083			0.015		
	(0.750)			(0.463)			(0.890)		
Foreign	–0.260	–0.259		–0.644**	–0.512*		–0.422	–0.585*	
	(0.411)	(0.386)		(0.041)	(0.051)		(0.177)	(0.089)	
Local non-state	–0.205	–0.146	0.094	–0.002	–0.015	0.345	0.040	0.011	0.364*
	(0.360)	(0.414)	(0.641)	(0.992)	(0.933)	(0.113)	(0.846)	(0.959)	(0.090)
Foreign Minority	0.304**	0.340**	0.330**	0.367***	0.153	0.073	0.222**	0.313**	0.156
	(0.018)	(0.013)	(0.012)	(0.000)	(0.177)	(0.583)	(0.020)	(0.014)	(0.325)
LIST	–0.366**	–0.350*	–0.082	–0.008	0.190	0.216	0.097	0.101	0.073
	(0.031)	(0.052)	(0.589)	(0.959)	(0.189)	(0.160)	(0.532)	(0.609)	(0.739)
Market Power$_{t-1}$	0.024***	0.029**	0.028**	0.015	0.020	0.015	0.010	0.021	0.020
	(0.005)	(0.014)	(0.011)	(0.244)	(0.159)	(0.275)	(0.361)	(0.121)	(0.111)
Size$_{t-1}$	0.006	–0.005	0.011	–0.090*	–0.105**	–0.056	–0.063	–0.088	–0.049
	(0.802)	(0.879)	(0.710)	(0.050)	(0.029)	(0.275)	(0.154)	(0.106)	(0.269)
Profitability$_{t-1}$	0.178	0.157	0.143	0.005	–0.072	–0.027	0.051	–0.018	0.003
	(0.205)	(0.278)	(0.317)	(0.975)	(0.625)	(0.834)	(0.653)	(0.867)	(0.981)
Cost ratio$_{t-1}$	0.020***	0.022**	0.020**	0.014	0.015	0.011	0.009	0.014	0.013
	(0.004)	(0.011)	(0.015)	(0.199)	(0.167)	(0.256)	(0.295)	(0.167)	(0.176)
Income diversification$_{t-1}$	0.004	0.004	0.004	0.000	–0.001	–0.002	0.001	0.001	–0.000
	(0.291)	(0.285)	(0.224)	(0.970)	(0.875)	(0.666)	(0.789)	(0.896)	(0.957)
Assets diversification$_{t-1}$	–0.000	0.001	0.002	–0.008	–0.009	–0.010*	–0.009	–0.009	–0.006
	(0.930)	(0.894)	(0.700)	(0.187)	(0.169)	(0.078)	(0.117)	(0.126)	(0.210)
Liquidity$_{t-1}$	0.001	0.000	–0.001	0.002	–0.000	–0.001	0.001	–0.001	–0.000
	(0.810)	(0.951)	(0.901)	(0.792)	(0.997)	(0.883)	(0.821)	(0.933)	(0.968)
GDP growth$_{t-1}$	0.018	0.005	–0.001	–0.104**	–0.115**	–0.094*	–0.071*	–0.086**	–0.082*
	(0.636)	(0.909)	(0.979)	(0.024)	(0.021)	(0.068)	(0.058)	(0.048)	(0.072)

Inflation$_{t-1}$	0.020	0.024	0.034	0.024	0.032	0.013	0.021	0.045	0.036
	(0.437)	(0.397)	(0.221)	(0.391)	(0.305)	(0.698)	(0.354)	(0.127)	(0.199)
CRISIS	−0.061	−0.022	−0.071	0.098	0.146	0.175	0.117	0.099	0.146
	(0.629)	(0.857)	(0.576)	(0.632)	(0.502)	(0.428)	(0.493)	(0.616)	(0.457)
Market capitalization$_{t-1}$	0.000	0.000	0.000	0.002	0.001	0.000	0.001	0.000	−0.001
	(0.955)	(0.964)	(0.982)	(0.272)	(0.463)	(0.905)	(0.501)	(0.951)	(0.598)
Constant	−1.860**	−1.997*	−2.197**	1.285	1.532	0.990	1.116	1.015	0.246
	(0.038)	(0.061)	(0.041)	(0.170)	(0.131)	(0.394)	(0.149)	(0.231)	(0.804)
Number of observations	1003	943	809	615	576	474	622	582	480
Adjusted R-squared	0.178	0.216	0.236	0.184	0.233	0.247	0.191	0.240	0.245

Note: (1) This table provides estimates of the determinants of the adjustment speeds of bank capital using a sample of commercial banks in China from 2000 to 2012. Three different definitions of capital ratios are considered in our regression analysis, namely equity ratio, tier 1 capital ratio and total capital ratio. We use pooled OLS by applying equation 6 ($k_{i,t} - k_{i,t-1} = (\Lambda Z_{i,t-1})\hat{G}_{i,t} + \gamma D\_YR_t + \tilde{\delta}_{i,t}$) to all regressions. In the first regression, we use the state-owned banks (State) as the default bank; in the second regression, we drop state-owned banks and use the nationwide non-state banks as the default; while in the third regression, we drop the nationwide non-state banks and use the foreign banks as the default. (2) All explanatory variables except dummy variables enter the regressions with one-year lag to address any potential endogeneity problems. (3) Year dummies are included in the model but not reported in the table. (4) Detailed variable definitions are in Table I. *, **, *** indicates significance level at the 10%, 5% and 1% level, respectively. (5) *State*: state-owned banks; *Nationwide non-state*: nationwide joint-stock commercial banks; *Foreign*: foreign banks; *Local non-state*: city commercial bank or rural commercial banks.

As to the effects of bank-specific characteristics and macro-environment on adjustment speeds, we find that market power (proxied by the Lerner index) and operational cost efficiency (measured by the cost-to-income ratio) accelerate adjustment speeds for equity capital, whereas bank assets size and GDP growth appear to slow down adjustment speeds for risk-weighted capital. Banks with greater market power appear to have better access to external sources of funding, as a one standard deviation increase in the Lerner index increases the speed of adjustment by 28% (11.93*0.024). Banks with higher costs (and resultant lower profitability) need to adjust capital quickly to avoid falling below the minimum capital requirements. A one standard deviation increase in the cost-to-income ratio increases the speed of adjustment by 33% (16.34*0.02). We find that larger banks adjust Tier1Cap more slowly than smaller banks, which contrasts with De Jonghe and Oztekin's (2013) findings. Banks tend to adjust risk-weighted Tier1Cap and TotalCap to target levels slowly during economic booms but faster in downturns. This may be because banks underestimate the risk of their assets and it may be harder to adjust capital quickly when facing rapid asset expansion during economic upturns.

3.3   Step 3: Determinants of bank capital ratios under bank-specific variable adjustment speed

In the final step, we re-estimate the target capital ratios using equation 7 based on bank-specific variable adjustment speeds derived from the second step. Results from this step, reported in Table VI, are of particular interest to us for gauging how bank capital is affected by ownership features along with other bank- and country-level factors.

The first set of regressions applies to the full sample. We find that state banks hold significantly higher levels of capital than banks of other ownership types, and this effect is strongest for the risk-weighted capital ratios. For state-owned banks, soft budget constraints and skewed managers' incentives are likely to explain higher levels of capital. The second set of regressions is based on the sample excluding state-owned banks. The differences in capital ratios between foreign banks and nationwide non-state banks are insignificant for all capital metrics. Moreover, local non-state banks have significantly lower risk-weighted capital ratios than nationwide non-state banks. This justifies our separation of local non-state banks from nationwide non-state banks and highlights the importance (in addition to ownership features) of other bank-specific and macro-environment factors in determining banks' capital ratios.

Table VI   Step 3: Determinants of bank capital ratios under bank-specific variable adjustment speeds

	EquityCap			Tier1Cap			TotalCap		
	1	2	3	1	2	3	1	2	3
Nationwide non-state	−6.471***			−14.782**			−16.085***		
	(0.000)			(0.011)			(0.001)		
Foreign	−4.304*	1.540		−11.528	3.840		−16.358**	1.482	
	(0.085)	(0.351)		(0.113)	(0.400)		(0.013)	(0.715)	
Local non-state	−8.386***	−2.355	−3.820***	−21.795***	−7.316**	−11.436***	−24.320***	−7.070***	−7.799**
	(0.000)	(0.105)	(0.004)	(0.000)	(0.018)	(0.007)	(0.000)	(0.010)	(0.037)
Foreign Minority	0.476	0.693	0.576	0.539	−0.086	0.195	0.511	0.719	0.750
	(0.662)	(0.482)	(0.575)	(0.796)	(0.967)	(0.939)	(0.819)	(0.700)	(0.747)
LIST	4.021**	4.165***	1.662	8.514***	8.526***	5.473	9.816***	7.747***	3.159
	(0.018)	(0.006)	(0.297)	(0.006)	(0.004)	(0.112)	(0.001)	(0.003)	(0.363)
Market Power$_{t-1}$	−0.095	−0.150**	−0.166***	−0.119	−0.173	−0.157	−0.071	−0.120	−0.245*
	(0.162)	(0.014)	(0.008)	(0.330)	(0.165)	(0.269)	(0.583)	(0.306)	(0.084)
Size$_{t-1}$	−2.288***	−2.194***	−1.892***	−6.159***	−6.059***	−4.968***	−6.774***	−5.604***	−4.388***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Profitability$_{t-1}$	2.026**	2.284***	1.974**	1.302	1.267	1.148	−0.304	0.935	0.675
	(0.045)	(0.009)	(0.028)	(0.355)	(0.401)	(0.507)	(0.860)	(0.528)	(0.698)
Cost ratio$_{t-1}$	−0.022	−0.049	−0.066	−0.035	−0.063	−0.053	−0.122	−0.063	−0.093
	(0.632)	(0.234)	(0.127)	(0.675)	(0.463)	(0.587)	(0.176)	(0.442)	(0.334)
Income diversification$_{t-1}$	−0.023	−0.016	−0.002	−0.013	−0.017	−0.023	−0.020	−0.008	−0.011
	(0.289)	(0.432)	(0.909)	(0.782)	(0.735)	(0.692)	(0.690)	(0.862)	(0.837)
Assets diversification$_{t-1}$	−0.104***	−0.083***	−0.089***	−0.367***	−0.357***	−0.353***	−0.348***	−0.344***	−0.346***
	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity$_{t-1}$	−0.032	−0.025	−0.021	−0.128**	−0.142***	−0.114*	−0.161***	−0.119**	−0.126**
	(0.321)	(0.406)	(0.468)	(0.011)	(0.008)	(0.057)	(0.005)	(0.020)	(0.031)
GDP growth$_{t-1}$	4.067***	3.626***	3.674***	10.363***	9.346***	8.682***	11.689***	10.572***	8.372***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation$_{t-1}$	2.297***	1.874***	1.812***	5.697***	4.709***	4.434***	6.293***	4.985***	3.880***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CRISIS	4.630***	4.295***	4.511***	10.041***	11.322***	7.374*	11.536***	–5.555	7.977*
	(0.004)	(0.003)	(0.004)	(0.001)	(0.003)	(0.089)	(0.003)	(0.774)	(0.079)
Market capitalization$_{t-1}$	–0.147***	–0.126***	–0.128***	–0.340***	–0.301***	–0.240***	–0.406***	–0.339***	–0.181***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Constant	0.626***	0.614***	0.732***	0.487	0.496	0.491	0.987*	0.486	0.394
	(0.002)	(0.002)	(0.001)	(0.266)	(0.299)	(0.416)	(0.078)	(0.338)	(0.432)
Number of observations	1003	943	809	615	576	474	622	582	480
R-within	0.236	0.226	0.227	0.232	0.244	0.279	0.345	0.397	0.387
R-between	0.236	0.226	0.227	0.232	0.244	0.279	0.345	0.397	0.387
R-overall	0.499	0.509	0.537	0.609	0.600	0.537	0.605	0.606	0.566

Note: (1) This table provides the estimates of the determinants of bank capital ratios using a sample of commercial banks in China from 2000 to 2012. In this step, we relax the constraint on a constant adjustment speed and allow it to vary across banks and over time. Three different definitions of capital ratios are considered in our regression analysis, namely, equity ratio, tier 1 capital ratio and total capital ratio. We use random effects estimator by applying equation 7 ($k_{i,t} - k_{i,t-1}(1 - \hat{\Lambda} Z_{i,t-1}) = \beta[(\hat{\Lambda} Z_{i,t-1}) X_{i,t-1}] + \gamma D\_YR_t + \tilde{\delta}_{i,t}$) to all regressions. In the first regression, we use the state-owned banks as the default bank; in the second regression, we drop state-owned banks and use the nationwide non-state banks as the default; while in the third regression, we drop nationwide non-state banks and use the foreign banks as the default. (2) All explanatory variables except dummy variables enter the regressions with a year period lag to address any potential endogeneity problems. (3) Year dummies are included in the model but not reported in the table. (4) Detailed variable definitions are in Table I. *, **, *** indicates significance at the 10%, 5% and 1% level, respectively. (5) *State*: state-owned banks; *Nationwide non-state*: nationwide joint-stock commercial banks; *Foreign*: foreign banks; *Local non-state*: city commercial bank or rural commercial banks.

The third set of regressions compares three capital ratios between foreign and local non-state banks. Foreign banks hold significantly higher levels of capital than local non-state banks by all capital measures employed, providing tentative evidence that they have better access to international capital markets and internal transfers and they may generate higher retained earnings through better performance under the global advantage hypothesis.

As to the two additional indicators of bank-ownership structure, foreign minority ownership in a domestic bank has little influence on capital; all the coefficients are insignificant. As expected, listed banks are better capitalized than unlisted ones due to their greater access to capital markets as well as internal sources of funding, and presumably closer monitoring and public scrutiny.

The results for bank-specific factors are generally consistent across different capital measures. The impact of *market power* is significant for the equity capital ratio but not for the risk-weighted capital ratios. Banks with greater market power hold less capital, consistent with Schaeck and Cihak (2012). Similar to Brewer, Kaufman and Wall (2008), we find that larger banks hold less capital, and the magnitude of the *size* effect is substantial. For instance, a one standard deviation increase in the logarithm of total assets leads to a fall in the equity ratio by 4.71% (2.06*2.288), tier 1 capital by 12.68% (2.06*6.159), and total capital by 13.95% (2.06*6.774). Evidence indicates that risk-weighted capital ratios are sensitive to *liquidity risk* and banks with more liquidity risk hold more capital. *Profitability* has a significant impact on the unweighted equity ratio but not on risk-weighted capital ratios, which is generally consistent with the literature (Flannery and Rangan, 2008; Fonseca and Gonzalez, 2010). A one standard deviation increase in ROA will boost the equity ratio by 1.03% (0.51*2.026). Banks with more diversified asset portfolios have higher levels of capital, suggesting that these banks tend to engage in more risky businesses demanding more capital. A one standard deviation increase in the ratio of loans to total assets (a decrease in the degree of asset diversification) will reduce the equity ratio by 1.33% (11.32*0.104) and risk-weighted capital ratios by about 4%.

All country level macroeconomic and financial environment factors significantly influence bank capital adjustment and the effect is much stronger on risk-weighted capital ratios. Banks are found to hold higher capital ratios in an expansionary economic environment, with increasing *GDP growth* and *inflation,* by all capital measures. We find the procyclical co-movement between bank capital ratios and the business cycle over the sample period, consistent with Fonseca and Gonzalez (2010) who report a positive relation be-

tween capital buffers and the economic cycle in Brazil, Hong Kong, India, Italy, and Romania. However, we also observe that banks have higher capital ratios over the 2007–2009 crisis period. We argue this is a consequence of more prudential/tightened lending policy and various government interventions aimed at bolstering financial stability. *Market capitalization* has a negative coefficient implying that when firms rely more on the capital market for funding the banking sector becomes relatively less important and banks tend to hold less capital.

3.4   Target capital ratios, gap, and adjustment speeds under various ownership types

Panel A of Table VII presents the banks' target capital ratios and GAPs between target and actual capital ratios under both a constant adjustment speed (estimated from step 1) and bank-specific variable adjustment speeds (estimated from step 3) for all banks. The estimated target capital ratios and GAPs under bank-specific variable adjustment speeds are generally lower than those under a constant adjustment speed. The differences, especially for the risk-weighted capital ratios, are substantial for all banks, justifying our choice of the bank-specific variable adjustment speeds.

Allowing for variable adjustment speeds, the estimated target capital ratios are well above regulatory minimum requirements for all bank ownership types. Consistent with the actual capital ratios as reported in Table III, foreign banks have the highest capital targets of 13.9%, 24.7% and 27.3% for unweighted equity ratio, tier 1 and total capital ratio, respectively – more than triple those of the least capitalized nationwide non-state banks at corresponding figures of 4.8%, 5.2% and 7.8%.

All GAPs are negative, implying that banks in China hold more capital in excess of target levels, with two exceptions: nationwide non-state banks for the equity capital ratio and local non-state banks for the risk-weighted total capital ratio. The GAPs in the unweighted equity ratio are smaller compared to the risk-weighted counterparts, meaning that banks tend to stay close to their desired equity targets. One exception is foreign banks, which on average have more equity capital than target levels by 3.56 percentage points. The GAPs in risk-weighted capital ratios are also substantial and banks tend to hold Tier 1 and total capital ratios exceeding their desired targets by 1.5 to 3 percentage points, except for local non-state banks, which stay close to target levels.

Table VII　　　Target capital ratio, GAP and adjustment speed under various ownership features

Panel A		Target capital ratio				GAP = Target capital ratio - capital ratio$_{t-1}$			
		State	Nationwide non-state	Foreign	Local non-state	State	Nationwide non-state	Foreign	Local non-state
	EquityCap	5.51	4.45	15.22	7.01	0.40	0.02	–1.28	0.20
	Tier1Cap	12.66	7.82	26.81	11.80	3.43	0.29	0.69	0.78
Constant adjustment speed	TotalCap	13.15	9.85	27.82	14.17	1.89	–0.33	1.22	1.65
	EquityCap	4.91	4.84	13.90	6.42	–0.20	0.33	–3.56	–0.72
	Tier1Cap	6.55	5.28	24.73	11.47	–2.35	–2.09	–3.19	–0.13
Variable adjustment speed	TotalCap	9.19	7.81	27.30	13.39	–1.48	–2.26	–1.48	0.32

Panel B		Adjustment speed (lambda)			
		State	Nationwide non-state	Foreign	Local non-state
	EquityCap	0.43	0.29	0.51	0.28
	Tier1Cap	0.10	0.25	0.10	0.39
	TotalCap	0.25	0.23	0.16	0.38

Note: (1) Panel A presents the target capital ratio and GAP for banks with different ownership structures calculated from step 1 when the adjustment speed is constrained constant across different banks and step 3 when bank-specific variable adjustment speeds are considered. (2) Panel B reports the average of variable adjustment speed across different ownership calculated from step 2. (3) *State*: state-owned banks; *Nationwide non-state*: nationwide joint-stock commercial banks; *Foreign*: foreign banks; *Local non-state*: city commercial bank or rural commercial banks.

The academic literature has advanced a number of reasons to explain why banks hold capital buffers in excess of the regulatory requirements (Marcus, 1984; Estrella, 2004). Banks hold excess capital because they anticipate that they may need capital but may be unable to raise it in the future and to ensure they do not violate regulatory requirements. Our results suggest that banks in China, regardless of ownership structure, hold capital in excess of their targets, although the GAP between actual and target capital levels varies among different ownership groups. Banks may hold excess capital to signal soundness to the market and satisfy the expectations of rating agencies. Growth oriented banks may also hold capital buffers to take advantage of future unexpected profitable investment opportunities.

Panel B reports the average of variable adjustment speeds calculated from step 2. We do not find evidence of a significant ownership effect on bank's adjustment speed of capital, consistent with results shown in Table V. Nevertheless, banks generally adjust non-risk-weighted equity capital faster than risk-weighted capital, and non-state banks adjust risk-weighted capital ratios faster than state banks and foreign banks.

Figure 1 plots the trend analysis of the actual and target equity ratio, tier 1 capital ratio, and total capital ratio by ownership features, confirming that banks in general hold more equity than their desired levels over the sample period, while the GAP changes over time. As shown in panel A of Figure 1, state banks and nationwide non-state banks tend to operate close to their target equity capital levels, while foreign banks and local non-state banks operate well above their target ratios. Over the sample period, the equity ratios of state banks and nationwide non-state banks have been relatively stable, while that of foreign banks has been decreasing, and the trend for local non-state banks is U-shaped. As shown in panels B and C, the risk-weighted tier 1 and total capital ratios increase over the sample period, in contrast to the equity capital ratios.

Figure 1   Target and actual capital ratios of Chinese commercial banks by ownership, 2000 – 2012

A: Equity capital ratio
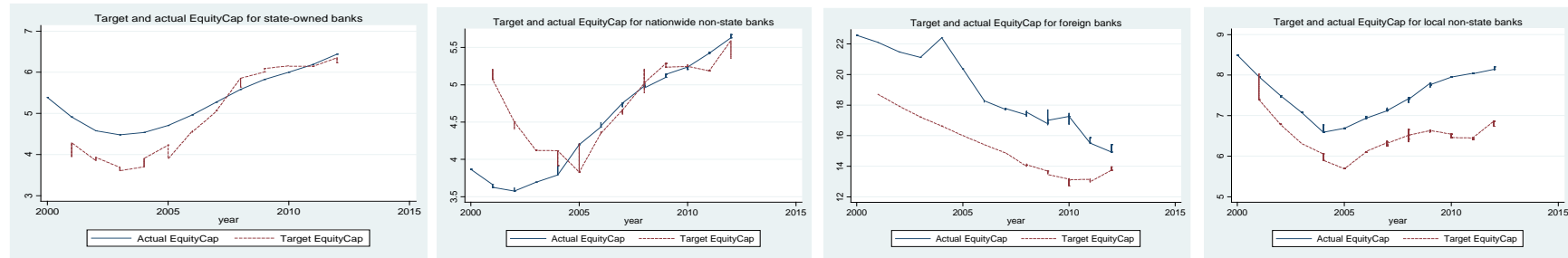
B: Tier 1 capital ratio
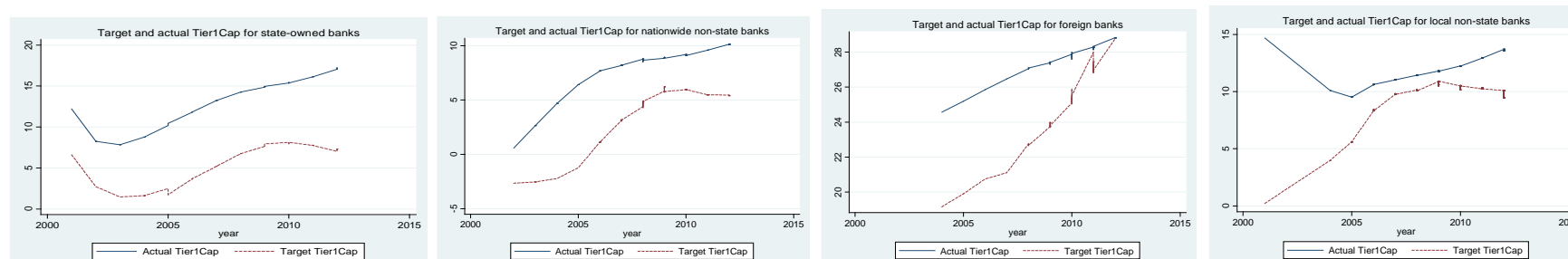
C: Total capital ratio
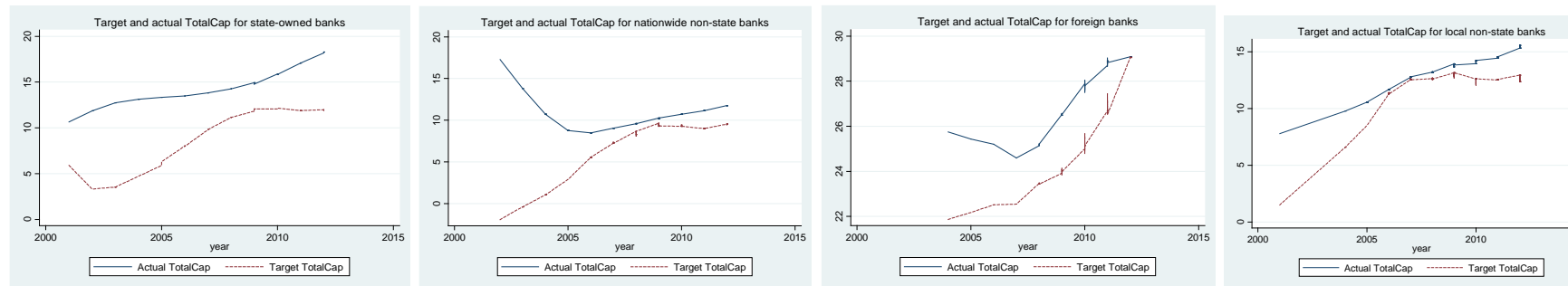
4   Conclusion

This study investigates the relationship between bank ownership and bank capital using annual panel data on Chinese commercial banks from 2000 through 2012. Applying a three-step partial adjustment model, we arrive at the following findings. *First*, we find significant ownership effects on bank capital. Banks with majority state ownership have the highest capital ratios of all banks, regardless of the capital measure employed. Foreign banks hold higher capital levels than domestic local non-state banks except for those non-state banks with nationwide presence. Listed banks with more dispersed ownership are better capitalized than non-listed ones. *Second*, bank-specific characteristics and the macroeconomic, financial, and regulatory environment also exert a significant influence on bank capital. In particular, we find that target capital ratios are negatively associated with market power, bank size, and stock market capitalization; and positively linked to profitability, liquidity risk, and the degree of asset diversification. Bank capital co-moves with the business cycle, whereas this relation is reversed during the crisis period most, likely due to various government interventions. *Third*, we find that banks with different ownership features vary in adjusting risk-weighted capital ratios, but they are not significantly different in adjusting the equity capital ratios towards targets. Foreign banks tend to adjust risk-weighted capital more slowly than domestic banks, but interestingly foreign minority ownership in domestic banks speeds up the adjustment process. Moreover, market power and bank operational cost efficiency (measured by cost-income ratio) accelerates the adjustment speed for equity capital, while total bank assets and GDP growth tend to slow the adjustment of risk-weighted capital. *Finally*, banks on average hold capital buffers in excess of the regulatory minimum, suggesting that capital requirements are not binding in China. The GAPs between target and actual capital ratios vary with ownership features and capital measures, in particular, foreign banks have much larger GAPs than domestic banks.

Our results provide notable insights into the features of bank capital and its adjustment from the perspective of emerging economies and have important implications for policy makers/regulators, practitioners, and researchers. *First*, when assessing and monitoring bank capital adequacy, policy makers/regulators should focus more on GAPs between target and actual capital ratios. We recommend GAP as an important complementary measure for monitoring bank capital, as it measures the distance to optimal target capital ratios, taking into account various bank-specific and macro environmental factors. The

level of actual capital ratios may be misleading. For instance, as shown in Table III, the actual risk-weighted Tier 1 and total capital ratios of local non-state are 12.3% and 13.4%, respectively, higher than those of state banks by about 3 percentage points. However, looking at the GAPs, as shown in Table VII, reveals that state banks operate at much larger margins, while local non-state banks stay near their targets. *Second*, when deriving target capital ratios researchers should allow for variable adjustment speeds that take into account various bank-specific and macro environment factors. The assumption of a constant adjustment speed yields biased estimates of target capital ratios. *Finally*, government should consider using target capital ratios to examine whether state banks are over-capitalized since this is an indirect cost to taxpayers. We have shown that state banks hold excessive capital buffers beyond the equilibrium target capital levels, especially in terms of risk-weighted capital ratios. The negative GAPs of state banks are generally, in absolute value, larger than those of other domestic banks. Our results suggest there is room for capital reduction in Chinese state banks that will still allow them to be more solvent than other competitors in the domestic market.

Reference

Acharya, V., Engle, R. and Richardson, M. (2012) Capital shortfall: A new approach to ranking and regulating systemic risks, The American Economic Review 102 (3), 59–64.

Acharya, S. (1996) Charter Value, Minimum Bank Capital Requirements and Deposit Insurance Pricing Equilibrium, Journal of Banking and Finance 20, 351–375.

Allen, F., Carletti, E. and Marquez, R. (2011) Credit market competition and capital regulation, Review of Financial Studies 24, 983–1018.

Amihud, Y., Lev, B. (1981) Risk reduction as a managerial motive for conglomerate mergers, Bell Journal of Economics 12(2), 605–617.

Anderson, R.C. and Reeb, D. M. (2003) Founding family ownership and firm performance: Evidence from the S&P 500, Journal of Finance 58 (3), 1301–1328.

Ayuso, J., Pérez, D. and Saurina, J. (2004) Are capital buffers pro-cyclical? Evidence from Spanish panel data, Journal of Financial Intermediation13, 249–264.

Barth, J.R., Caprio, Jr., G. and Levine, R. (2001) Banking systems around the globe: Do regulation and ownership affect performance and stability? in: F.S. Mishkin (eds.), Prudential Supervision: What Works and What Doesn't University of Chicago Press, Chicago, pp31–88.

Berger, A.N. and Bouwman, C. H. S. (2013) Bank liquidity creation, Review of Financial Studies 22 (9), 3779–3837.

Berger, A., DeYoung, R., Flannery, M., Lee, D. and Oztekin, O. (2008) How do large banking organizations manage their capital ratios? Journal of Financial Services Research 34, 123–149.

Berger, A.N., De Young, R. Genay, H. and Udell, G.F. (2000) Globalization of financial institutions: Evidence from cross-border banking performance, Brookings-Wharton Papers on Financial Service 3, 23–158.

Berger, A.N., Hasan, I. and Zhou, M. (2009) Bank ownership and efficiency in China: What will happen in the world's largest nation? Journal of Banking and Finance 33, 113–130.

BIS (2013) Progress report on implementation of the Basel regulatory framework, Basel Committee on Banking Supervision.

Blundell, R and Bond S. (1998) Initial conditions and moment restrictions in dynamic panel data models, Journal of Econometrics 87, 115–144,

Bonin, J.P., Hasan, I. and Wachtel, P. (2005) Bank performance, efficiency and ownership in transition countries, Journal of Banking and Finance 29, 31–53.

Brewer, E., Kaufman, G. and Wall, L. (2008) Bank capital ratios across countries: Why do they vary? Journal of Financial Services Research 34, 177–201.

Cihak, M. and Demirguc-Kunt A. (2013) Rethinking the state's role in finance, Policy Research Working Paper, The World Bank, Washington, DC.

De Jonghe, O. and Öztekin, Ö. (2013) Bank Capital Management: International Evidence. unpublished working paper, Available at SSRN: http://ssrn.com/abstract=2270606.

Demirguc-Kunt, A., Detragiach, E. and Merrouche, O. (2010) Bank Capital: Lessons from the Financial Crisis, IMF Working paper No.286.

Desai, R.M. and Olofsgard, A. (2006) The political advantage of soft budget constraints, European Journal of Political Economy 22, 370–387.

Diamond, D.W. and Rajan, R.G. (2000) A theory of bank capital, Journal of Finance 55, 2431–2465.

Estrella, A. (2004) The cyclical behaviour of optimal bank capital, Journal of Banking and Finance 28 (6), 1469–1498.

Flannery, M.J. and Rangan, K.P. (2008) What caused the bank capital build-up of the 1990s? Review of Finance 12, 391–429.

Flannery, M.J. and Rangan, K.P. (2006) Partial adjustment toward target capital structures, Journal of Financial Economics 79, 469–506.

Fonseca A. R. and Gonzalez, F. (2010) How bank capital buffers vary across countries: The influence of cost of deposits, market power and bank regulation, Journal of Banking and Finance 34, 892–902.

Francis, W. and Obsorne, M. (2009) Bank Regulation, Capital and Credit Supply: Measuring the Impact of Prudential Standards, Occasional Paper No.36, UK Financial Services Authority, London, UK.

Friend, I. and Lang, L. (1988) An empirical test of the impact of managerial self-interest on corporate capital structure, Journal of Finance 43(2), 271–281.

Fungacova, Z., Pessarossi, P. and Weill, L. (2013) Is bank competition detrimental to efficiency? Evidence from China, China Economic Review 27, 121–134.

Gerschenkron, A. (1962) Economic Backwardness in Historical Perspective, Harvard University Press, Cambridge, MA.

Graham, J.R. (2000) How bit are the tax benefits of debt? The Journal of Finance 55 (5) 1901–1941.

Gropp, R. and Heider, F. (2010) The determinants of bank capital structure, Review of Finance 14, 587–622.

Iannotta, G. Nocera, G. and Sironi, A. (2007), Ownership structure, risk and performance in the European banking industry, Journal Banking and Finance 31, 2127–2149.

Jensen, M. and Meckling, M. (1976) Theory of the firm: Managerial behavior, agency costs and ownership structure, Journal of Financial Economics 3, 305–60.

Jensen, M. (1986) Agency costs of free cash flow, corporate finance, and takeovers, American Economic Review 76, 323–339.

Jia, C. (2009) The effect of ownership on the prudential behaviour of banks – The case of China, Journal of Banking and Finance 33, 77–87.

Jiang, C., Yao, S. and Feng, G. (2013) Bank ownership, privatization, and performance: Evidence from a transition country, Journal of Banking and Finance 37, 3364–3372.

Jiang, C., Yao, S. and Zhang, Z. (2009) The effects of governance changes on bank efficiency in China: A stochastic distance function approach, China Economic Review 20, 717.731.

Johnson, S., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2000) Tunnelling, American Economic Review 90 (2), 22–27.

Jokipii, T. and Milne, A. (2008) The cyclical behaviour of European bank capital buffers, Journal of Banking and Finance 32, 1440–1451

Jokipii, T. and Milne, A. (2011) Bank capital buffer and risk adjustment decisions, Journal of Financial Stability 7, 165–178.

Kraus, A. and Litzenberger, R.H. (1973) A state preference model of optimal financial leverage, Journal of Finance 28, 911–922.

KPMG (2007) China's City Commercial Banks: Opportunity Knocks? KPMG report, Hong Kong.

La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2002) Government ownership of banks, Journal of Finance 57 (1), 256–301.

Lepetit, L., Tarazi, A. and Zedek, N. (2014) Excess Control Rights, Bank Capital Structure Adjustment and Lending, unpublished working paper, available at SSRN: http://ssrn.com/abstract=2418023.

Liu, H., Molyneux, P. and Wilson, J.O.S. (2013) Competition and stability in European banking: A regional analysis, The Manchester School 81(2), 176–201.

Lin, C., Ma, Y., Malatesta, P. and Xuan, Y. (2011) Ownership structure and the cost of corporate borrowing, Journal of Financial Economics 100, 1–23.

Lindquist, K.-G. (2004) Banks' buffer capital: How important is risk, Journal of International Money and Finance 23, 493–513.

Marcus, A. (1984) Deregulation and bank financial policy, Journal of Banking and Finance 8, 557–565.

Martinez Peria, M. and Schmukler, S. (2001) Do depositors punish banks for bad behaviour? Market discipline, deposit insurance and banking crises, Journal of Finance 56, 1029–1051.

Memmel, C., Raupach P. (2010) How Do Banks Adjust Their Capital Ratios? Journal of Financial Intermediation 19(4), 509–528.

Myers, S.C. and Majluf, N.S. (1984) Corporate financing and investment decisions when firms have information that investors do not have, Journal of Finance 39, 575–592.

Myers, S. C. and Rajan, R. G. (1998) The paradox of liquidity, Quarterly Journal of Economics 113, 733–771.

Öztekin, O. and Flannery, M.J. (2012) Institutional determinants of capital structure adjustment speeds, Journal of Financial Economics 103, 88–112

Rime, B. (2001) Capital requirements and bank behaviour: Empirical evidence for Switzer-land, Journal of Banking and Finance 25, 789–805.

Sapienza, P. (2004) The effects of government ownership on bank lending, Journal of Financial Economics 72, 357–384.

Shehzad, C. T., De Haan, J. and Scholtens, B. (2010) The impact of bank ownership concentration on impaired loans and capital adequacy, Journal of Banking and Finance 34, 399–408.

Shleifer, A. and Vishny, R.W. (1994) Politicians and firms, Quarterly Journal of Economics 109, 995–1025.

Schaeck, K. and Cihak, M. (2012) Banking competition and capital ratios, European financial Management 18 (5), 836–866.

Turk-Ariss, R. (2010) On the Implications of Market Power in Banking: Evidence from Developing Countries, Journal of Banking and Finance 34, 765–775.

Windmeijer, F. (2005) A Finite Sample Correction for the variance of Linear Efficient Two-Step GMM Estimators, Journal of Econometrics 126, 25–517.

World Bank (2013) Global Financial Development Report 2013: Rethinking the Role of the State in Finance, World Bank, Washington, DC.

BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.