



Do capital requirements affect cost efficiency? Evidence from China[☆]



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ABSTRACT

This paper contributes to the debate on the effect of capital requirements on cost efficiency. We study the relation between capital ratio and cost efficiency for Chinese banks over the period 2004–2009, taking advantage of the profound regulatory changes in capital requirements that occurred during this period to measure the exogenous impact of an increase in the capital ratio on banks' cost efficiency. We find that such an increase has a positive effect on cost efficiency, the size of which depends to an extent on the bank's ownership type. Our results therefore suggest that capital requirements can improve cost efficiency.

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1. Introduction

The recent financial crisis served to remind us that a well-performing banking system is essential to certain fundamental aspects of the economy, such as credit supply, and plays an important role in contributing to economic stability. To promote a sound financial system, regulators require banks to hold sufficient amounts of capital to absorb losses and to limit moral hazard behavior.

This prudential regulation could also have downsides, which raises a concern as to its implementation. Higher capital ratios might impose tradeoffs in terms of liquidity creation (Berger and Bouwman, 2009), lending, and output growth (Angelini et al., 2011; BCBS, 2009).

A primary impact of a capital adequacy requirement is its influence on bank efficiency, which has proven to be one of the most direct contributors to financial stability via its effects on bank failures, future problem loans, and risk-taking (Berger and DeYoung, 1997; Podpiera and Weill, 2008; Podpiera and Podpiera, 2008; Fiordelisi et al., 2011).

Theory offers opposing views on the effect of capital ratios on bank performance, based on the agency costs hypothesis. On the one hand, agency costs emerge from the conflicts of interest between shareholders and debtholders, as shareholders have incentives to take actions that benefit themselves at the expense of debtholders and thus do not necessarily maximize bank performance. They have notably incentives to invest in riskier projects than those preferred by debtholders, as suggested by Jensen and Meckling (1976), or to proceed to underinvestment, as observed by Myers (1977). The excessive risk-taking behavior is reinforced by explicit or implicit government guarantees of deposits. As these agency costs are related to the importance of debtholders, they are associated with lower capital ratio. In other words, greater capital ratio would reduce these agency costs and would then be positively related to efficiency.²

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² See Vollmer and Wiese (2013) and Cubillas and Gonzalez (2014) for recent contributions on the impact of capital ratios to reduce risk in the banking industry.

On the other hand, agency costs can come from the conflicts of interest between shareholders and managers. The main problem is the moral hazard behavior of managers that can minimize their effort or waste resources instead of increasing bank performance. A greater debt financing and therefore a lower capital ratio raises the pressure on managers to perform as it reduces “free cashflow” at the disposal of managers (Jensen, 1986) as debt implies interest payment obligations, and as managers have incentives to avoid the personal costs of bankruptcy (Grossman and Hart, 1982); Thus greater capital ratio should have a negative impact on efficiency.

Determining which effect dominates thus remains an empirical question. The literature has however presented us with mixed evidence. In a seminal paper, Berger and Bonaccorsi di Patti (2006) analyzed the relation between bank capital and efficiency in the US banking industry from 1990 to 1995. Fiordelisi et al. (2011) tested the relationship between capital ratio and bank efficiency in the European banking industry over the period 1995–2007. These studies report contradictory findings: Berger and Bonaccorsi di Patti (2006) find that lower capital ratios are associated with higher efficiency; Fiordelisi et al. (2011) find the opposite.

This study contributes to the literature by analyzing the effect of higher capital ratios on cost-efficiency in the Chinese banking industry. The Chinese case provides a unique framework to measure the direct effect of capital adequacy regulation on banks' behavior, due to the extensive transformation of the banking system in the last decade.

In 2004, the first regulation on capital adequacy requirements was implemented. From 2004 to 2008, the industry changed from one in which less than 10% of the banks met the new capital adequacy requirements to one in which nearly all of them comply with the regulatory requirements (CBRC, 2010). This adjustment of bank capital adequacy ratios under pressure from the regulator enables us to measure precisely how banks' performance was affected by the transformation of the period.

This paper thus provides two contributions to the literature on the efficiency-impact of bank capital. First, we note that a common problem with these former studies is the difficulty of assessing the role of prudential regulations since the majority of banks in the periods studied had capital in excess of the required amounts (Berlin, 2011). As stated by Berger and Bonaccorsi di Patti (2006, p. 1068): ‘Most banks are well above the regulatory capital minimums, and [the] results are based primarily on differences at the margin, rather than the effects of regulation.’ Gropp and Heider (2010) indeed show, for a sample of U.S. and European banks over the period 1991–2004, that capital regulation was a second-order determinant of banks' capital structures. Another problem with the studies of the efficiency-impact of capital ratios is the potential reverse causality, from efficiency level to capital, that has been observed.

By studying the effect of capital regulation in China, we are able to resolve to some extent both problems. China provides a natural experiment to test the effect of capital adequacy regulation, as banks have been pressured by the state to cope with totally new prudential regulation since 2004. This provides a unique opportunity to directly measure the effect of new capital regulation on bank efficiency. Moreover, as the banks were obliged to adapt to the new regulation in a very short space of time, the changes in capital ratios can be assumed to be exogenous³ (i.e. the direct effect of change in prudential regulation).

To investigate this issue, we measure cost efficiency on a sample of Chinese banks, including all major commercial banks, using data

from Bankscope supplemented by hand-collected information. We analyze the relation between capital and cost efficiency via the one-step stochastic frontier model proposed by Battese and Coelli (1995).

The rest of the paper is organized as follows. Section 2 presents the related literature, Section 3 reviews capital adequacy regulation in China, and Section 4 describes the data and methodology. Section 5 presents the main results, and robustness checks are performed in Section 6. Section 7 concludes.

2. Related literature

In this section, we review empirical papers dealing with the effect of capital regulation on bank performance and summarize the literature on efficiency of the Chinese banking sector.

2.1. Capital adequacy requirements and bank performance

Capital adequacy requirements are one of the main regulatory tools for the banking system. They are expected to perform two main duties. First, their ‘risk sharing function’ acts as a buffer against losses, which protects depositors and limits the recourse to deposit insurance. Second, they limit the moral hazard issue of shareholders incentive to take on excessive risk. As explained in the introduction, this latter duty is related to the agency costs between shareholders and debtholders (Jensen and Meckling, 1976). It is based on the agency costs hypothesis which also considers the agency costs between shareholders and managers, according to which higher capital ratios can enhance incentives for managers to perform well (Grossman and Hart, 1982; Jensen, 1986). A few studies measure the impact of capital ratio levels on bank efficiency. Berger and Bonaccorsi di Patti (2006) study the relation between capital ratios and profit efficiency in the US banking industry over the period 1990–1995. Using the parametric distribution-free approach, they find that higher capital ratios have a negative effect on efficiency.

Fiordelisi et al. (2011) study the relation between bank efficiency, risk and capital ratios. Their paper is thus broader than an assessment of the efficiency-impact of capital ratios. They use Granger-causality tests in a GMM dynamic panel framework to examine three dimensions of efficiency – cost efficiency, revenue efficiency, and profit efficiency – and notably examine reverse causality, both from efficiency to capital and from capital to efficiency. They find that the less efficient banks tend to take on more risk and that better capitalized banks perform better in terms of efficiency.

Our paper employs the unique case of China banking regulation to directly measure the effect of regulation on bank performance. Since the previous literature has concentrated on the US and European banking systems, they work with samples in which most of the banks' capital ratios exceed the regulatory requirement. The situation is the reverse for China in the period studied here. The exogenous change in Chinese banks' capital ratios due to new capital adequacy regulations eliminates the concern about reverse causality from efficiency to capital ratio and allows us to directly estimate the efficiency-effect of capital regulation.

Some other studies analyze the relationship between capital ratios and other performance metrics. A notable one is the recent paper by Berger and Bouwman (2013), which looks at the impact of capital adequacy requirements on bank performance during financial crises by focusing on three dimensions of performance: survival, market share and profitability. Their sample is composed of all US banks from 1984 to 2009. They find that higher capital

³ The validity of this assumption is tested in Section 6 devoted to robustness checks.

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