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Bank productivity in China 1997–2007: Measurement and convergence

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ABSTRACT

This study examines the productivity growth of the nationwide banks of China and a sample of city commercial, banks for the ten years to 2007. Using a bootstrap method for the Malmquist index, estimates of the total factor productivity growth are constructed. Five different models of inputs and outputs based on variants of the Intermediation and Production approaches and non-performing loans are treated as a bad output, are examined for the purpose of arriving at a robust measure. The productivity growth of the state-owned commercial banks (SOCBs) is compared with the joint-stock banks (JSCBs) and city commercial banks (CCBs). In general, average TFP growth has been neutral over the period for the SOCBs and JSCBs but positive for the CCBs in the second part of the period. Efficiency gains (catch-up) were obtained through cost reduction and technical innovation was associated with greater diversification of revenue away from interest earnings. The opening up of the banking market has not led to a discernible improvement in bank productivity growth.

1. Introduction

Banking sector reform in China has been a gradual and on-going process since 1978. A further stage of reform was announced in 1993 with the objective of creating an efficient commercial banking sector. Following the conditions of the WTO, the Chinese banking market has been open to foreign competition since the end of 2006. Chinese banks have been encouraged to allow foreign banks and investors to take minority shareholding positions. The listing of four of the big five banks on the international exchange during 2006–2007 is supposed to usher in, not only foreign capital but also foreign managerial expertise to improve bank management, performance and productivity. Given the acceptance of larger stakes by foreign banks in the smaller commercial banks (to a specified limit of 25% share); it is no surprise that Chinese bank productivity has become a popular topic of research in recent years.

There have been a number of studies of Chinese banking productivity that have been published in Chinese scholarly journals, but to date only a few studies are available to non-Chinese readers.[1] The gradualist reforms of the banking sector and the potential of foreign competition would be expected to improve efficiency and productivity in the banking sector. Evidence of improved performance has begun to emerge.

This paper is an empirical exercise in measurement and convergence. Its principal aim is to measure the productivity of the commercial banks in China for the period 1997–2007. Three issues are addressed in this paper, namely measurement, modeling strategy, and convergence. First, the measurement of output (and input) of banks is not a simple matter. Numerous studies of bank productivity by Chinese scholars employ a bewildering mix of inputs and outputs. We therefore consider several alternative measures of output as a means of obtaining robust results.

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[1] A recent exception is a study using non-parametric methods by Matthews, Guo, and Zhang (2009) and parametric methods by Khumbhakar and Wang (2007). The first non-Chinese paper using the non-parametric approach to estimating bank efficiency is that of Chen, Skully, and Brown (2005).

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Second, we use the Malmquist index of total factor productivity (TFP) as a means of translating inputs and outputs into a measure of productivity growth. The Malmquist index has the advantage of being able to decompose productivity growth into technological change, which captures a shift in the production frontier from efficiency improvement, which captures the movement towards the frontier. One of the problems associated with this approach is that it is constructed within the framework of Data Envelope Analysis (DEA), which is a non-parametric linear-programming method that applies observed input and output data to create a 'best practice' frontier. The main drawback of the DEA approach is that it assumes the inputs and outputs are measured without error and therefore do not permit statistical evaluation. Accurate reporting of Chinese bank data that meets international norms is a very recent phenomenon. This paper provides an inferential capability to the point-estimates of productivity through the use of non-parametric bootstrapping methods.

Third, we use the concepts of conditional *beta-convergence* and *sigma-convergence* from the growth convergence literature (Barro & Sala-i-Martin, 1991, 1992) to examine the properties of convergence of TFP. This paper poses the following questions. What has been the total factor productivity (TFP) growth of Chinese banks over the period 1998–2007? What have been the driving factors in TFP growth? Has there been a significant improvement in TFP growth in the second half of the period consistent with an increase in the pace of reform prior to the opening up of the banking market according to the WTO treaty. Finally, is there evidence of the convergence of TFP to peer group clusters?

The contribution of this paper is first, to extend the analysis of Matthews et al. (2009) to obtain a more robust statement of bank productivity growth by expanding the data set to include city commercial banks; second, to model non-performing loans in a consistent manner as a separate but undesirable output; third, to extend the range of models considered; and to extend the data sample. By using the results of 5 models, the paper uses 1570 simulated bank-year observations of productivity growth. The results show that the productivity of state-owned banks was neutral over this period and that technical progress was offset by negative catch-up (lead banks widening the gap with laggard banks). Additionally, this paper identifies the main drivers of bank TFP growth convergence and identifies the benchmark banks in each bank category.

The paper is organized on the following lines. The next section provides a brief background to the Chinese banking system. Section 3 discusses the methodology and literature relating to the Malmquist method and the bootstrap technology used in estimating bank productivity. Section 4 presents the banking data. Section 5 discusses the results and Section 6 concludes.

2. Chinese banking

In 2007, the Chinese banking system consisted of 8877 institutions, including 3 policy banks, 5 large state-owned commercial banks (SOCB), 12 joint-stock commercial banks (JSCB), 124 city commercial banks (CCB), 29 locally incorporated foreign bank subsidiaries and the rest made up of urban and rural credit cooperatives and other financial institutions.[2]

Like many economies that have undeveloped financial and capital markets, the banking sector in China plays a pivotal role in financial intermediation. Table 1 below shows that the ratio of total bank assets to GDP has increased from 125%, in 1997, to 213% in 2007. The market is absolutely dominated by the five state-owned banks, although their share of the market has been decreasing steadily through competition from the other commercial banks (JSCB and CCB).

Net interest margins (NIM) and return on average assets (ROAA) of the SOCBs are respectable by western standards but are well below levels that would be consistent with economies in the same stage of development (as for example India where NIM would be in the region of 3.5%). Part of the reason is that interest rates were heavily controlled during this period and the remaining reason is the large amount of non-performing loans on the books of the commercial banks. The non-performing loans (NPL) ratio of the SOCBs has been falling from around 50%[3] in 1997 to around 8% in 2007.

With the encouragement of the regulatory authorities, Chinese banks have in recent years, had to restructure their balance sheet, develop modern risk management methods, improve capitalization, diversify earnings, reduce costs and improve corporate governance and disclosure.[4]

Up until 1995, control of the banking system remained firmly under the government and its agencies.[5] Under state control, the banks in China served the socialist plan of directing credits to specific projects dictated by political preference rather than commercial imperative. Foreign banks and financial institutions were increasingly allowed to take a stake in selected Chinese banks. While control of individual Chinese banks remain out of reach for the foreign institution,[6] the pressure to reform management, consolidate balance sheets, improve risk management and reduce unit costs has increased with greater foreign exposure.

The theory of market contestability (Baumol, 1982) suggests that incumbent banks will restructure weak balance sheets, reduce costs, and improve efficiency in preparation for the threat of entry. In their annual report on foreign banks in China, Pricewaterhouse Coopers[7] refer to the China Bank Regulatory Commission report on the opening up of the banking sector. The CBRC divides the pace of reform and innovation into three stages; 1980–1993, 1993–2002 and 2003–2006. In the third stage, more

[2] CBRC Annual Report 2007.

[3] Estimate based on 1998 values. The 1998 values were obtained by adding back the Asset Management Company operations in 1999 back to the reported figures. This is the basic assumption used by Rodman (2005). An overestimate is likely to be small as Huang (2002) suggests that the mid-2002 official NPL ratio at 23% is underestimated by 12%. Liu (2009) estimates the overall NPL ratio was 40–50% in the late 1990s.

[4] CBRC Annual Report 2006 http://www.cbrc.gov.cn/english/home/jsp/index.jsp.

[5] According to La Porta, Lopez-de-Silanese, and Shleifer (2002), 99% of the 10 largest commercial banks were owned and under the control of the government in 1995.

[6] There is a cap of 25% on total equity held by foreigners and a maximum of 20% for any single investor, except in the case of joint-venture banks.

[7] Pricewaterhouse Coopers (2007).