Financial reforms and technical efficiency in Indian commercial banking: A generalized stochastic frontier analysis

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ABSTRACT

In this study we estimate technical efficiency of Indian commercial banks from 1989 to 2009, using a multiple-output generalized stochastic production frontier and analyze the effects of financial reforms on estimated efficiency. The generalized method estimates technical efficiency in the presence of multiple outputs, filling a gap in the existing literature. Our results show that Indian commercial banks were operating with 64% efficiency on average during the sample period. The initial phase of reform had a positive impact on while the later phase adversely affected technical efficiency of banks. Public sector banks show higher efficiency levels compared to private and foreign banks.

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1. Introduction

The goal of this study is to estimate technical efficiency of Indian commercial banks and examine the effects of financial sector reforms on the measured efficiency.

The financial sector in post-independence India had all the characteristics of financial repression. Banks were nationalized and there was strong government control over the financial market. "The sector was characterized, inter alia, by administered interest rates, large pre-emption of resources by the authorities and extensive micro-regulations directing the major portion of the flow of funds to and from financial intermediaries" (Mohan, 2005). The outcome was lack of competition, high intermediation costs and hence under-lending, corruption and bureaucratic lethargy (e.g., Banerjee, Cole, & Duflo, 2004; Mohan, 2005; Thomas, 2005). In 1991 the Indian government launched widespread economic liberalization policies which also pervaded the financial sector. Entry barriers were loosened making way for private and foreign banks, reforms were initiated to improve "financial soundness" and bank efficiency targeting capital adequacy requirements, stronger vigilance of the banking sector and several

other legal and institutional factors (Ahluwalia, 2002; Mohan, 2005). The banking sector reforms in India were implemented in two phases, first in 1991–92 followed by a second phase in 1998.

India presents an interesting case in the study of bank efficiency owing to the co-existence of a large number of government-owned, private and foreign banks in the economy. India's rapid economic growth also makes examination of the performance of the banking sector an attractive subject for research, especially, after the implementation of widespread economic reforms.

A bank is said to be technically inefficient if the actual output is lower than the maximum possible output level, given available resources. Common causes of such inefficiency include managerial error or coordination failure (O'Donnell & Griffiths, 2006). The existing literature in this field uses mainly two types of methods to measure technical efficiency of banks — Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA).

The DEA method uses linear programming techniques to measure efficiency of production units that produce multiple outputs. Several studies use this approach to measure efficiency of Indian banks (see Bhattacharyya, Lovell, & Sahay, 1997; Das & Ghosh, 2006; Das, Nag, & Ray, 2005; Kumar & Gulati, 2009; Sathye, 2003). However, this method fails to capture the effect of random shocks to the production system. On the other hand, the SFA method posits two main causes for the deviation of actual output from the maximum possible output, given the inputs. A part of this deviation is attributed to the symmetric random shocks to a production system that are not under the

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control of a producer (e.g., uncertainty about the environment, or input market conditions). The other part is attributed to factors such as managerial error and coordination failures. The existing studies that use SFA to measure different types of efficiency of Indian banks either focus on measuring cost and profit efficiency in monetary terms to avoid the problem of considering multiple output (see Sensarma, 2006; Zhao, Casu, & Ferrari, 2010), or measure technical efficiency using a simple production model with one type of output only (see Shanmugam & Das, 2004). In reality, banks produce many financial services (outputs) using a given set of inputs, and none of the existing studies uses the stochastic frontier approach to measure technical efficiency of banks in such a framework.

In this paper, we use the Generalized Stochastic Frontier Production Model that allows for the possibility of multiple outputs in a production system, as introduced by Löthgren (1997), and measure time-varying technical efficiency of Indian banks. Further, we analyze the effects of financial reforms and other bank specific characteristics on the measured efficiency scores using a panel data spanning the period from 1989 to 2009.

Our study finds that the average technical efficiency of both public and private sector commercial banks in India is low and declined during most parts of the period under consideration, showing an improvement only towards the end of the sample period. Capital adequacy ratio negatively influenced technical efficiency of Indian commercial banks, particularly, the private banks. Although the gradual process of financial reforms, as experienced by the country for the last two decades, shows some positive impact on the technical efficiency of banks in the beginning, the effect seems to die down thereafter.[2]

Our finding of a declining trend in efficiency levels of Indian banks over time is in accordance with a study by Das and Ghosh (2006), which uses DEA to measure technical efficiency of Indian banks over the period 1992–2002. The DEA method fails to capture random shocks to the production process. We adopt the stochastic frontier approach (SFA) accounting for such random shocks as well as the presence of multiple outputs. Another study by Zhao et al. (2010) also finds declining cost-efficiency in Indian banking over the period from 1992 to 2004. Our study encompasses a longer period of time, 1989–2009, than Das and Ghosh (2006) and Zhao et al. (2010), and uses a more general technique of efficiency measurements as compared to DEA and the traditional single-output SFA. Also, the use of longer time period in our paper captures both pre- and post-reform years and shows that technical efficiency starts to show an upward trend in 2006.

In a very recent paper, Das and Kumbhakar (2012) analyze efficiency in Indian banking. However, they focus on the quality differences within a variable and aggregate each variable accordingly to measure input oriented technical efficiency. We propose a model to combine quantities of different outputs, so that the generated output mix can be used as a single dependent variable in the stochastic frontier analysis. To our knowledge, our paper is the first and only one to apply this method in measuring bank efficiency.

The following section briefly outlines the general structure of the Indian commercial banks and the reform programs that were initiated from the early 1990s. Section 3 presents details about the data used in this study and the empirical model specifications. The empirical findings are discussed in Section 4, and Section 5 concludes.

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[2] A recent article in a leading newspaper in India states the following about Indian banks: "…they are extremely inefficient. That they can remain so has much to do with the fact that the Reserve Bank of India has protected them from competition…" The RBI hindered competition by not licensing any bank in the last ten years, thereby adding to their inefficiency. *Source: The Telegraph, Nov. 15, 2011* (http://www.telegraphindia.com/1111115/jsp/opinion/story_14747436.jsp).

2. A brief overview of the Indian banking sector

India's banking sector is characterized by public sector banks, private sector banks and foreign banks. In the 1950s the financial sector in India had limited government control on interest rates and low statutory pre-emption of funds resulting in unequal distribution and misallocation of credit. This was not only defying the free market mechanism of credit allocation but also depriving sectors that were in true need of credit (Das & Kumbhakar, 2012). In order to ensure more equitable distribution of credit, the government tightened its control over banks' credit allocation procedures and nationalized 20 major commercial banks between 1969 and 1980 (Das et al., 2005). Consequently, administered interest rates, large pre-emption of resources by the authorities and extensive micro-regulations directing the major portion of the flow of funds to and from financial intermediaries, inter alia, characterized the Indian financial sector in the 1980s. Government controls and regulations also created strong entry barriers. In the absence of competition, India's financial sector was rendered inefficient and non-competitive creating severe credit constraints for other sectors of the economy (Mohan, 2005; Thomas, 2005). Banking sector reforms in India that were initiated in the early 1990s were a gradual and steady process. One can identify two distinct phases of these reforms. The first phase began with the formation of the Committee on the Financial System (The Narasimhan Committee) in 1991 and the second phase of reforms initiated with the formation of the Banking Sector Reforms Committee (Narasimhan Committee II) in 1998. Both committees recommended widespread reforms for the banking system, capital markets and the insurance sector. Banking sector reforms included various liberalization policies, such as relaxing controls on interest rates and the sanction of large loans by the Reserve Bank of India, and policies that promote competition, such as designing liberal norms for entry of private and foreign banks and insurance companies, and allowing inflow of foreign direct investment in the financial sector. The reforms also included measures to improve "financial soundness", like capital adequacy requirements, stronger vigilance of the banking sector and several institutional and legal measures to improve bank efficiency (Ahluwalia, 2002; Mohan, 2005).

These reforms resulted in the expansion of private and foreign banks in India while lowering the share of public sector banks' assets in total bank assets. The share of public sector banks' assets in total assets declined from 92% in 1990–91 to 75% in 2003–04; at the same time the share of private sector banks went up from 4% in 1990–91 to 19% in 2003–04. The fact that the banking sector became more competitive following the reforms is shown by the reduction in the ten-firm concentration ratios of 92.86 in 1991–92 to 62.99 in 2004–05 (Thomas, 2005).

3. Data and econometric model specification

3.1. Data

Technical efficiency is measured using bank level data from the Prowess database obtained from Center for Monitoring the Indian Economy (CMIE). Prowess has audited financial data on financial sector companies of which we consider companies providing commercial banking services only. The data also provides information on bank ownership, namely, public and private and further categories such as Indian private banks and foreign private banks. Our data consists of an unbalanced panel of up to 103 commercial banks from 1989–2009.

The common practice is to adopt either an intermediary approach or a production approach to define inputs and outputs of banks, in order to measure technical efficiency. Based on data availability we follow the intermediary approach, under which banks produce intermediation services like investments, loans and advances through the collection of liabilities like deposits. This approach also includes