

A Comparative Study of Banking in China and India, Nonperforming Loans and the Level Playing Field

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Abstract

It has become common in the literature to compare India and China, two remarkably growing economies, but these comparisons often do not take into account the institutional differences between these two countries. We have in this paper done a comparative analysis of banking institutions in China and India taking into accounts the contentious issue of nonperforming loans along with the issue of use of banks to provide countervailable subsidies to exporting organizations. Our research shows that the efficiency differences between banks in these two countries can be directly related to institutional difference and any comparative study between these countries not taking into consideration these institutional differences may lead to misleading results.

Keywords: Banks, Financial Markets, Non-performing loans

JEL Classification: G1, G28, D53

Introduction

Because of the rapid economic growth and significant contribution to international economy by China and India, comparative analyses of these two countries have become commonplace nowadays. Starting from management consultants such as McKinsey (Farrell, Khanna, Sinha, Woetzel 2004, Farrell, Lund, Greenberg, Doshi, Rosenfeld, Morin 2006) and Ernst and Young (2006) to Banks (Deutsch Bank 2005) and a number of scholars from different countries (Ahya & Xie 2004, Saez 2004, Tseng & Cowen 2007, Roland 2007) tend to compare these two countries as if they are similar in all respects concerning their institutional and regulatory set up and their developments. In the case of

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financial institutions, such observations are difficult to justify because the underlying institutional differences between India and China can be quite wide. For example, Roland (2007) on the basis of ratio analysis concluded that the Indian banking sector outperforms the Chinese banks with the exception of cost-income ratio. He attributed this performance difference to faster banking sector reform in India. Similarly, Gamble (2005) tried to compare China's Construction Bank and India's ICICI although he did suggest that these two banks cannot be compared.

Access to finance is the most critical component of any firm's operations and a lopsided access has a potential to distort the level playing field of industries operating in international business. NPLs are normal products of any banking institutions in market economies but whether Chinese NPLs can be compared to any other NPLs needs a close examination. Although loan defaults have been called non-performing loans (NPLs), those loans which are not returned or are allowed to be recycled provide the banks not only with extra profit on their balance sheet but also help firms with such access to fund an extra advantage particularly in the international market.

There is a number of aspects of banking in these two countries which need a closer examination. These include nonperforming loans, under capitalization, directed loans, underlending, overlending, loans at favourable terms, loan write offs, debt equity swaps and a number of other credit arrangements with a potential for distorting the level playing field. Banking institutions can also act as significant facilitators of exports and thus banking practices occupy a very important place in the Agreement on Subsidies and Countervailing Duties (ASCM) because of their sensitivity in providing direct financial subsidies. In every action taken by or against Members of the WTO such as the USA, EU, Japan, India etc. involving countervailing duties, benefits provided by banks through favourable loans have been the most contentious issue. Banking institutions are critical financial intermediaries for economic growth but they are also prone to legal and political intervention leading to distortion in international economy.

In this article, we have used a nonparametric technique for comparative analysis of the banking institutions of China and India to look for a comparison into productivity and efficiency of their banks taking into consideration the contentious issues of non-performing loans and use of banks as instruments of governmental subsidies. This analysis is an attempt to use the comparative productivity

of banking sector of these two countries to identify the institutional aspects of their development and look for similarities and differences between world's two large economies with high potential for growth. A general productivity analysis may elicit certain objective information but a comparative analysis can lead to a significant insight into not only their comparative efficiency but also of other factors affecting vital financial intermediation and the impact of these factorial differences on national and international economies.

International banking is passing through a critical phase. The banks provide one of the basic institutional functions for national growth and as such play a critical role in a country's development. However, the non-transparent nature of banking, government sponsored deposit insurance and lender of last resort facilities were held to be reasons for the origin of the Accord on the International Convergence of Capital Measures and Capital Standards (hereinafter called Basel I) which was apparently an initial attempt to create a level playing field among different jurisdictions (King and Sinclair 2003). However, Basel I did not appear to be very successful in curtailing the distortion in level playing field resulting in the introduction of Basel II.²

In the first part, we will be dealing with the issue of level playing field and introduction of Basel I and Basel II along with the issue of banks acting as instruments of export subsidies. In the second part we discuss the concept of nonperforming loans and bailing out of banks in China and India along with the treatment of China as a nonmarket economy and consequent non-application of countervailing duties by Members of the WTO to goods exported from China. In part III, we analyse efficiency of these banks separately and together over four years to see the changes that have taken place in the last four years. In the last part i.e. part IV, we discuss the results of our analysis and end the article with conclusion.

Part I

Level Playing Field and Basel I and Basel II Accord

The nonregulatory lending by banks can give unilateral advantage to banks in the promotion of industries from their own countries and provide extensive subsidy to the national firms in international business (Helleiner 1992). The Basel I and Basel II accords are essentially based on the

² Basel Committee on Banking supervision (2006)

premise of level playing field although it was couched in various other terms of stability and transparency (Bernauer and Koubi 2003, Chakraborty and Linda 2007). The Basel I accord required reserve capital of at least 8 percent or more of the risk-weighted assets of a bank and banks having capital asset ratio of less than 8 percent were required to raise equity or shed assets.

The logic behind compulsory reserve capital is that banks under a less austere regulatory regime can provide services at more competitive prices. International banking market was regarded as a distorted one because of the influence of the political decision makers on the banking operations. Basel II is trying to add an important refinement to Basel I by proposing new internal ratings-based (IRB) capital requirements (Jokivuolle and Vesala 2007) although the aim to achieve a level playing field stayed (Caruana 2004)

Banks as Instruments of Subsidy

One of the reasons for banks' adverse role in fair play is that excessive support from banks can provide unequal benefits to the firms in international trade. While in the domestic context, banks role can at worst add to the deficit financing, in the international context, banks can provide support through loans on favourable terms and when the loans are not returned or when they are converted into equity through debt-equity swaps on favourable terms, they become outright cash grants. In these situations, bank loans can act as direct cash subsidies to the exporting organizations. In the Agreement on Subsidy and Countervailing Measures (ASCM Agreement), even favourable interest rates on loans and loan credit guarantee schemes have been specifically recognized as export subsidies.

The adverse effect of banking as an instrument of export subsidy can be seen from the recent US countervailing actions against China, Korea, and Indonesia in the case of import of coated free sheet paper to the USA where the USA for the first time agreed to take action against export subsidies provided by the Chinese government (USDOC 2007a). The USA has also used any type of banking loans not commensurate with open market practices as countervailable benefits against Taiwan, Canada, India and the European Union. Countervailing actions by the European Union against

countries such as India and Korea also involves extensive analysis of banking practices followed in these countries.³

The most important example of use of banking as providing subsidy has been in the case of Dynamic Random Access Memories (DRAMS) manufactured by Hynix from Korea where the USA, the EU and Japan all imposed countervailing duties on imports of DRAMS from Korea exclusively on the basis of Korean banks alleged favourable treatment to Hynix. Korea took each and every decision of these governments before the WTO's Dispute Settlement Body (WTO 2005a, 2005b, 2005c, 2007a, 2007b).⁴

In contrast to the extremely restrictive interpretation of banks providing countervailable benefits to exports from India, Korea, Malaysia, Indonesia, the USA and the EU have not been taking countervailing action against Chinese goods for any subsidy including those provided by Chinese banks on the plea that China is a nonmarket economy and the USA and the EU cannot estimate the amount of subsidy extended to exporters from China by the Chinese government and its agencies.

As will be later discussed, the Chinese practice of self-raised funds for investment in Chinese industries which account for nearly 60 percent of the Chinese fixed asset investment and financing add another dimension to the issue of government subsidy. The origin of such self raised funds is difficult to determine.

Part II

Nonperforming Loans and Theoretical discussion of Bailout of Banking

The generation of nonperforming loans and their bailouts have been an extremely contentious issue. In the case of S&L Crisis in the USA, Akerlof et al (1993) called it a looting. Similar sentiments were expressed by Naik (2002) in the case of Indian banks. Nonperforming loans and policy banking involve bailout policy by the government which brings the issue of governmental intervention and moral hazard. Bailouts create moral hazard encouraging banks to take excessive risks and set their

³ Commission of the European Communities (2005) Proposal for a Council Regulation Amending Council Regulation (EC) No. 2603 Imposing a Definitive Countervailing duty on Imports of Certain Polyethylene Terephthalate originating, inter alia, in India, 8.9.2005, Com/2005/0416 final/ The import of Polyethylene Terephthalate to European Union from India also invited action for Export Credit Scheme based on Sections 21 and 35 A of the Indian Banking Regulations Act which permit RBI to direct commercial banks in the field of export credits. Under this scheme, the interest rate for credits to eligible exporters is based on internationally competitive rates;

⁴ While at the WTO Panel Stage, all decisions were in favour of Korea, at the Appellate stage, the decisions were mixed.

efforts at suboptimal level. However, a bailout also increases survival and growth of a bank (Goodhart and Huang 1999). Bailout has also been suggested by Freixas (1999) as an optimal policy to avoid social cost of bank failure which he called ‘constructive ambiguity doctrine.’ While Freixas (1999) was advocating a tougher line on bailout policy, Aghion et al (1999) suggested a softer approach which could prompt the entrepreneur reveal the financial distress at an early stage which would permit less expensive rescue effort. However, sometimes bailouts particularly in nonmarket economies may involve movement of enormous fund. According to Ma (2006) the cost of restructuring of banks assuming that there are no further problems with the banks would come to staggering 30 percent of the China’s GDP. While discussing bailout policy of Chinese banks, Mundaca and Quifeng (2005) were critical of Chinese banking and observed that “What is then at risk is the insolvency of virtually the entire banking system. Risk, return, effort and capital adequacy have meant nothing for Chinese banking industry.” (p.).

NPLs in Chinese Banks and Infusion of funds by the Chinese Government⁵

Infusion of fund in the bank can take a number of forms. In recent years whether infusion of funds in Morgan Stanley (Giannone 2007) and in City Bank (Giannone 2007) is any different from what the Government of China or any other government is doing is an interesting question for discussion (Table 1)

Table 1

Investment by Sovereign Wealth Funds in Western Banks

Foreigners buying Stakes in Major US Securities suffering subprime losses			
Company	Investment (US\$ in billions)	Investor	Share (%)
Morgan Stanley	China Investment Corp.	5.0	9.9
City group	Abu Dhabi Investment Authority	7.5	4.9
Blaskstone	China Investment Corp.	3.0	9.4
UBS	Singapore Investment Corp.	9.5	9.0
UBS	Unidentified Middle East Investor	1.7	n/a
Bear Stearns	Citics Securities	1.0	6.0
Merrill Lynch	Temasek	6.2	n/a

Source: Giannone (2007), p. 20

⁵ Figures pertaining to China have been given in RMB with 8 RMB= 1 US Dollar. Figures pertaining to India have been given in Rupees with 40 Rupees = 1 US Dollar. Indian figures have been given in crore which is equal to 10 million.

China's six major banks have raised more than US\$ 50 billion through international public offerings since mid-2005 (Reuters 2007). In the case of China, banks and the stock markets provide limited finance at present and the percentage of self-raised funds play a very significant proportion of the investment but the banking practices may have provided Chinese industries and Chinese banks with unusual advantages. China essentially has four major banks, three of which have become public limited banks with the issue of shares. These three are Industrial and Commercial Banks of China (ICBC), Construction Bank of China (CBC), and Bank of China (BOC), whereas Agricultural Bank of China (ABC) still stays at its old format. Other Chinese government owned banks such as China Construction Bank (CCB) and CITIC bank have raised funds from the Hong Kong and Shanghai Market in recent times. The Chinese loans have increased at a compound annual growth rate of 15.6% and the deposit at the rate of 18.1 percent for the last five years (CITIC 2007).

The restructuring of Chinese banks started with the issue of RMB 270 billion in Special Government Bonds in August 1998. The banks could buy the bonds after the Chinese government reduced statutory reserve requirement from 13 to 9 percent. The government then injected all the bond proceeds in their four major banks thereby virtually doubling their capital base. The issue of equity itself is a little difficult to understand as there is no record of these banks approaching any Stock exchange either in China or in any other part of the world. The issue of these bonds have left scholars perplexed as till now there is no sign of payment of any interest on these bonds.

This was followed in 1999 by the establishment of four Asset Management Companies (AMCs) to which NPLs worth RMB 1.4 trillion (US\$173 billion) or 20 percent of the total loan balance at that time were transferred at par value (Ma 2006). These NPL transfers in 1999 were claimed to be restricted to those loans incurred before the end of 1995 (Ma and Fung 2002). To complete this transaction, AMCs issued bonds to the four banks. Although rate of interest is mentioned, but so far, it appears that no interest has been paid.

Moreover, the 20 percent cash recovery rate claimed by the AMCs would not be able cover the interest payment on these bonds and PBC loans assumed by AMCs (Ma 2006, p. 23). The transfer to AMCs was followed by endorsement of US\$ 60 billion of Chinese government's reserve invested in the USA to China Construction Bank (CCB)(US\$22.5 billion), Bank of China (BOC)(US\$ 22.5

billion) and to Industrial and Commercial Bank of China (ICBC) (US\$ 15 billion). This arrangement whether involves any interest is not known. In a recent case, China's newly created sovereign wealth fund the China Investment Corporation (CIC) which had invested in Blackstone Group LP and Morgan Stanley, has also invested US\$ 20 billion in China's policy lender China Development Bank (Carey and Areddy 2008). A close examination reveals that each and every restructuring of the Chinese banks by the Chinese government is different.

In 2004 another RMB 780 billion (US\$ 96 billion) was transferred by CCB, BOC and ICBC to AMC's through a number of transactions involving People's Bank of China (PBC). First RMB 320 billion in NPAs was bought by PBC from CCB and BOC at half their book value and then transferred to AMC's for 30-40 cents to a dollar. In 2005, PBC bought another RMB 460 billion from ICBC at par value and then transferred to AMC's for an average of 26 cents for a dollar. The PBC has apparently made a loss of RMB 400 billion (US\$ 50 billion) or as Ma (2006) put it, some 20 times more than its own capital. PBC also provided capital to AMC's to buy these two NPAs.

A number of foreign banks entered into the Chinese recapitalization process through the purchase of privately placed shares. Resolution of NPAs appears to be quite dramatic in the case of China (Barboza 2006). However, such dramatic reduction in nonperforming loan portfolio such as from 17 percent to 3.5 percent in 2004 of Constructing Bank of China does create doubt about the integrity of the figures (Ma 2006).

NPLs in India and Infusion of Funds by the Indian Government

Banking in India provides quite a varied field with banking landscape consisting of nationalised banks, old private banks, new private banks and foreign banks (Banerjee et al 2005). The importance of public sector banks has been coming down in recent years but they still command major share of banking activities (Bhide et al 2001). The Reserve Bank of India is the central bank responsible for control of and operations of others banks including managing the money supply.

The percentage of bank loans to GDP in India is less than 50 percent and suggests low credit penetration (Nitsure 2007). The credit deposit ratio is hovering around 50 percent for quite some time whereas it should have been around 70 percent (Naik 2001). The underlending is also evidenced by

the Banks investment in government securities. The bank's investment in government securities was more than Rs. 1,000,00 crore (Rs. 1,000 billion) in the year 2000. (Naik 2001).

Loans of Indian banking sector has grown seven times between 1995 and 2007 (from Rs. 5984 billion to Rs. 45,372 billion). Unsecured consumer loans, capital market exposure and real estate lending comprise less than 10 percent of total loans (Nitusure 2007). Banks in India are required to lend at least 40 percent of their to priority sector such as agriculture, small scale Industries (SSI) etc. at an interest rate no more than 4 percentage points above their prime lending rates.

As usual, it is difficult to arrive at a correct figure of nonperforming loans (Topalova 2004) but the figure shown in Tarapore Committee report suggests an acceptable figure of around 13.7 percent in 1997 which it recommended to be brought down to 5 percent by the year 2000. Narasimhan Committee (RBI 1998) suggested transfer of NPAs to Asset Reconstruction Company (ARCs) on the realizable value of NPLs and issue of "NPA Swap Bonds" (Bhaumik et al 2004). The government was supposed to guarantee these bonds issued by the ARCs. Another committee was formed to suggest how to improve weak public sector banks called Verma Committee which prepared guidelines for restructuring of ARCs (RBI 1999).

The Indian government has always been supportive of banks possibly to enhance the depositor's confidence in banks and has been injecting funds time and again to support the system. These infusions are mostly merger of failed banks with larger banks although there have been certain liquidations since 1969. Banerjee et al (2005) identified 21 cases of such bank failure.

Under the Bank Nationalisation Act of 1980 named as the Banking Companies (Acquisition and Transfer of Undertaking) Act, 1980, the Indian government's equity in nationalized banks cannot fall below 51 percent which also restricted holding of foreign financial institutions at 24 percent. This governmental control apparently brought the banks under constant vigilance scrutiny and led to a high underlending.

To improve the performance of public sector banks, the Indian government wanted to go for gradual privatization of these banks which needed improvement in the balance sheet of these banks. The first thing that was required to improve these banks' balance sheet was capital infusion. The Indian

government had already provided Rs. 40 billion for recapitalization of 19 nationalized banks from 1991-92 to 1992-93.

The capital injection was made through the issue of bonds directly to recapitalized banks, with fixed coupon rates which was initially at 7.7 % per annum and in subsequent issues is at 10%. Certain performance obligations were introduced on these banks which has availed themselves of these infusions, which included deposit mobilization, improvement of investment yield, expansion and diversification of credit, reduction of NPLs, cost reduction, voluntary retirement etc.

Over the period 1993-2004, the Indian government infused around Rs. 22516 crore (Rs. 225.16 billion) for strengthening the capital base of nationalised banks (Trend in Banking 2007). As a part of recapitalisation, the Indian government is also investing Rs. 10,000 crore (US\$2.5 billion) in State Bank of India which would keep its 59.73 percent of original stake (David 2007). State Bank of India is expected to raise about Rs. 16,000 crore (US\$ 4 billion) from investors by March 2008.

Some of banks have returned capital to the government to the total amount of Rs. 1303 crore (Rs.13.03 billion) by March 2004 although most of these banks are still paying interest on their recapitalised fund (Trend in Banking 2007).

The health of development financial institutions (DFI) is quite worrisome with their declared NPAs reaching a figure of nearly Rs. 20000 crore (Naik 2002). The Indian government has also worked out huge bail out packages for Unit Trust of India (UTI) and the Industrial Finance Corporation of India (IFCI). The involvement in share market speculation by Indian banks also led to the generation of NPLs.

China as a Nonmarket Economy and Export Subsidy

The discriminatory non-application of countervailing duties to goods coming from China has been discussed by Shanker (2001). For the last twenty years or so, US Department of Commerce (USDOC) did not impose any countervailing duty in spite of a number of arguments advanced by its steel, paper and other industries. In fact the USDOC approached the then newly created Court of Appeals for Federal circuits (CAFC) to overturn the decision of the US Court of International Trade (USCIT)

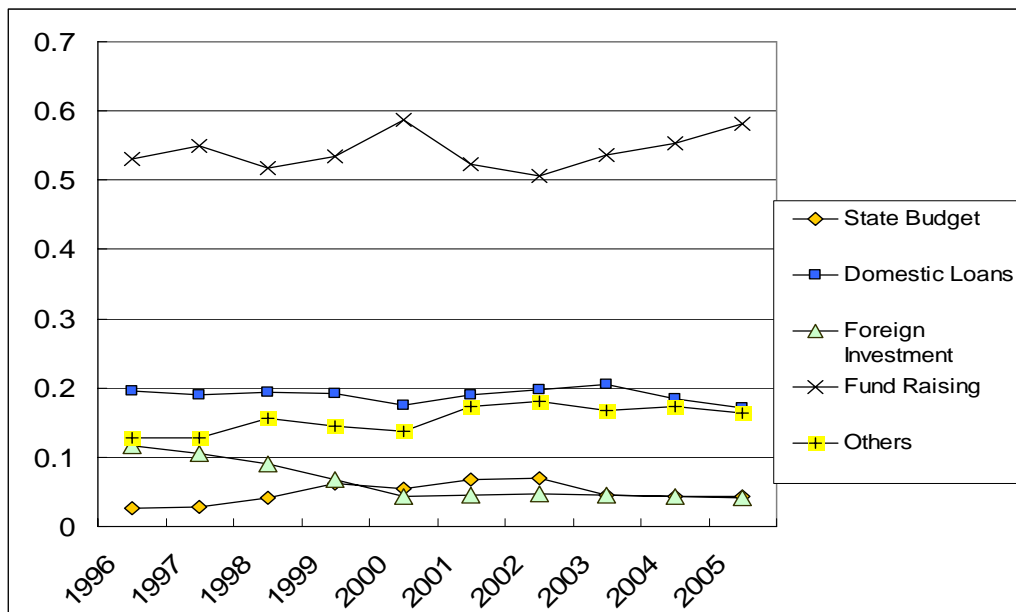
which had earlier directed the USDOC to use countervailing duties against these countries.⁶ Before the USCIT, the USDOC opposed the imposition of countervailing duty on the plea that since subsidy can be applied only when there is market distortion and in the case of nonmarket economies such as that of old Czechoslovakia and China there could not be any distortion of market since there was no market. On and off the USDOC developed a different way to deal with imports from China under “bubbles of capitalism test” (Meszaros, 1996) but the goods from China were exempted from countervailing duty actions till the end of 2007 when under the constant pressure of US Congress, US local industries and the US labour unions, the USDOC changed its position (Jones 2007).

Investment and Financing Pattern in China

The investment pattern in China is a little unusual. The Chinese government in its dispute with the USA regarding countervailing action against import of coated paper from China argued that the Chinese financing environment is highly liquid because of the ample amount of credit available in the Chinese market, there is no need for the Chinese government to direct lending in a particular direction (USDOC 2007, p. 43). However, the source of this liquidity is not known. Allen et al (2007) have done some extensive work on China’s financial system and they have identified bank loans, firm’s self fundraising, the state budget and the FDI as major sources. While others are self evident, in respect of self raised funds Allen et al (2007) observed that a self raised funds include “proceeds from capital raised from local governments (beyond the state budget), communities and other investors, internal financial channels such as retained earnings and all other funds raised domestically by the firms.” It is not mentioned how did they come to this conclusion as the source of their data i.e. China Statistical Yearbooks does not provides any such information. Jehangir and Li Cui (2007) have concluded that more than half of China’s investment comes from self raised funds while domestic loans finance less than 20 percent. It is difficult to believe that the Chinese enterprises particularly State Owned enterprises (SOEs) which were known to be suffering from tremendous losses resulting in non return of bank loans have been consistently profitable to use these profits in investment which would be approximately 6 times the GDP of China assuming that Chinese banks loans constitute twice the GDP of China (Fung et al 2004).

⁶ Continental Steel Corp. v. United States, US Court of International Trade, 614 F. Supp. 548

Figure 1
Fixed Asset Investment in China



Source: Li-Gang Liu (2006). The table and the graph are based on information from China's National Statistical Bureau, via CEIC. The self raised funds are apparently from the firms own profits released by NSB. (personal communication)

According to Allen et al (2007) the self raised funds are increasing at an average rate of 17.8 per cent over the period from 1994-2006. Total self fund raising (for fixed asset investment) at the end of 2006 was US\$665.5 billion whereas the domestic bank loans for the same period was US\$364.8 billion. Private owned companies raise almost 90 percent of total financing as self-fundraising whereas state or quasi state owned companies raise between 45 to 65 percent of their financing as self raised funds. (Allen et al 2007, p. 9). This concept of self raised funds of this extent is rarely seen in other economies. This analysis suggests that the investment pattern of China is quite different from the investment pattern of market economies.

Methodology

Banking efficiency has been an area of discussions by a number of economists (Ally et al 1999, Berger et al 2000, Sathye 2001, Drake And Hall 2003). Efficiency can be measured in two ways. One is by nonparametric mathematical methods such as Data Envelopment Analysis (DEA) and the other is the parametric function method using Cobb-Douglas or other forms i.e. econometric approach

which is basically a stochastic frontier approach. Since these two methods use two different approaches to envelop the data, they provide for different accommodations for random noise.

DEA methodology operates on the principle of linear programming and thus provides relative measures of efficiency with the best practice firm staying at the frontier. DEA thus indexes in-sample performance dispersion between firms. The nonstochastic aspect i.e. all deviations are because of inefficiency is applicable in the case of DEA. In all these approaches fixed sets of input and output parameters are specified to compute efficiency dispersion score.

The DEA model has been used in a wide range of applications including measurement of efficiency of banks (Yeh 1996, Drake 2004). DEA has been used extensively in the analysis of banking either in one country or region or for a comparative analysis around the world (Berg et al 1993, Angelidis and Lyroudi 2006, Casu, Girardone and Molyneux 2003, Molyneux and Iqbal 2006). Using regressions and other methodologies in our view may not correctly display the institutional complexity of these two major economies.

We have attempted to do a comparative analysis of banking taking into consideration the contentious issue of nonperforming loans and the possibility of such non-returnable loans providing extensive subsidy to the goods exported from China and India. For the comparative analysis, we have used DEA in a very broad manner because the wide institutional differences between India and China. In our view DEA provides a credible means for this broad analysis. So far, wherever the comparative studies between these two countries have been made, they have neglected to take into account the related institutional developments which may have diminished the contribution of those research.

DEA: Theoretical Discussions

Farrell (1957) is viewed as the originator of microeconomic efficiency measurement who proposed that the productive efficiency of any firm consists of two components, technical efficiency and allocative efficiency. The technical efficiency is the firm's ability to maximise output from a given set of inputs while the allocative efficiency is the use of inputs in optimal proportion if the prices are given. Farrell (1957) suggested that production or cost efficiency can be measured empirically against the idealised frontier isoquant.

Decision Making Units (DMUs) are operating on the flat portion of the long run average cost curve. Banker et al (1984) modified the CCR model to account for scale effects by estimating the most productive scale size for individual firm while determining its technical efficiency which amounts to further decomposition of technical efficiency into pure technical efficiency (PTE) and scale efficiency (SE) following Avkiran (1999) that if the efficiency score measured by *crse* and *vrse* differ significantly, then the banks are expected to show variable return to scale, we have used *vrse* in our analysis.

Let there be N firms and let x_i represents the input matrix of the i th firm and y_i represents the output matrix of the same firm. Let X represent K x N input matrix and Y represent M x N output matrix for all the firms.

The relative efficiency of each bank is specified as

$$\max_{u,v} (u' y_i / v' x_i)$$

s.t.

$$u' y_j / v' x_j \leq 1$$

$$u, v \geq 0$$

where y_i is the vector of output produced by the i th bank, and x_i is the vector of inputs used by the i th bank, u and v are M x 1 and K x 1 vectors of output and input weights (the prime denotes a transposed vector). The first condition ensures that efficiency scores for all banks cannot score more than 1 and the second condition ensures that weights are nonnegative. To limit the number of solutions, another constraint $v' x_i = 1$ is imposed. The transformed program assumes the following equivalent linear programming problem:

$$\max_{\mu,v} (\mu', y_i)$$

s.t.

$$v' x_i = 1$$

$$\mu' y_j - v' x_j \leq 0$$

$$\mu, v \geq 0$$

DEA searches for the ratio of all weighted outputs over all weighted inputs. The weights are selected from the dual of the original linear programming and are specified as

$$\begin{aligned}
& \min_{\theta, \lambda} \theta \\
& \text{s.t.} \quad -y_1 + Y\lambda \geq 0 \\
& \quad \quad \theta x_1 - X\lambda \geq 0 \\
& \quad \quad \lambda \geq 0
\end{aligned}$$

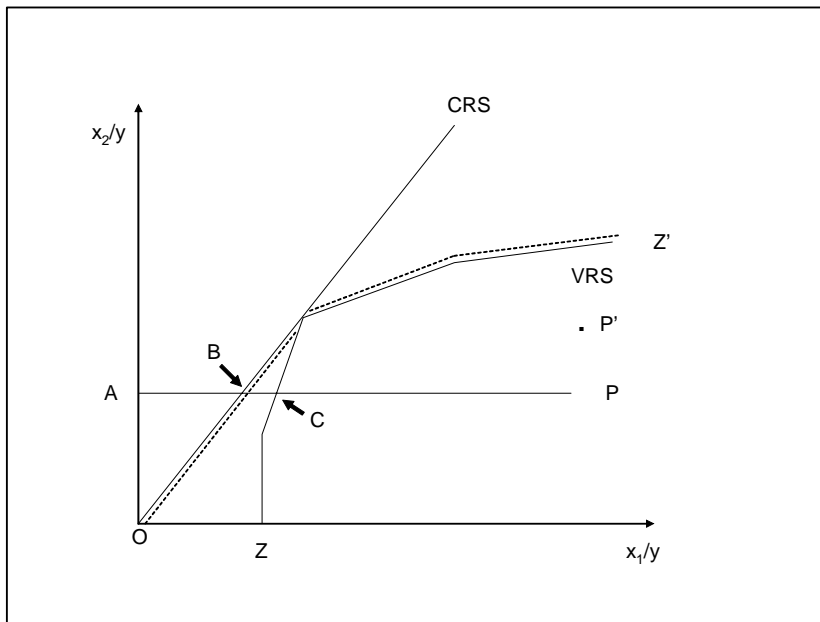
where λ is an $N \times 1$ vector of constants, θ is a scalar and denotes overall economic efficiency score for the i th firm.

The model specified above is based on the assumption of constant return to scale (CRS) and is based on the assumption that all the firms are operating at optimal efficiency. Regulatory, instructional and geographical constraints normally would not let these banks operate at optimal efficiency and scale effects would confuse the measures of technical efficiency. Banker et al (1984) modified the linear programming problem to account for variable return to scale (VRS) i.e. technical efficiency without any effect of scale efficiency) by adding convexity constraints $N1'\lambda = 1$ to the above equation where $N1$ is an $N \times 1$ vector of ones. The next step is to solve the following linear program which includes the convexity constraints:

$$\begin{aligned}
& \min_{\lambda, x_i^*} w_i' x_i^* \\
& \text{s.t.} \\
& -y_i + Y\lambda \geq 0 \\
& x_i^* - X\lambda \geq 0 \\
& N1'\lambda = 1 \\
& \lambda \geq 0
\end{aligned}$$

where w_i is a vector of input prices for the i th bank and x_i^* is the cost minimizing vectors of input quantities for the i th bank given the input price vector and the output vector y_i (Coelli et al 1998). The ratio $w_i' x_i^* / w_i' x_i$ measures the cost efficiency and $[(w_i' x_i^* / w_i' x_i)^{-1} - 1]$ measures the extent of both technical and allocative inefficiency.

Figure 3



Source: Neal (2004)

When the assumption in the case of linear programming is constant return to scale, the ray from the origin bounds the production possibility set to the right of the ray (fig. 3). The addition of variable returns to scale moves convex production possibility set to the right of and bounded by solid line ZZ' . If the firm is producing at point P in figure 3, then under the assumption of CRS, the technical efficiency equals the ratio AB/AP . In the case of VRS, the technical efficiency is defined by AC/AP . If these two terms are not equal, then the firm is operating at variable return to scale. The determination whether the firm is operating at increasing return to scale or decreasing return to scale is then determined by substituting convexity constraint $\sum \lambda_i = 1$ by $\sum \lambda_i \leq 1$ in the LP problem. If the efficiency ratio is not equal to the result based on VRS, then increasing return to scale exists and if they are equal then decreasing return to scale exists.

We have used Charnes et al (1978) extension of Data Envelopment Analysis (DEA) of multiple input-output generalisations. However, the CRS assumption is valid when all DMUs are operating at an

optimal scale (Banker et al 1984) and in our opinion, the banks particularly those in India and China cannot be said to be operating at their optimal scales (Chen et al 2006).

The sample size has been the matter of discussion in the case of DEA. DEA has normally been regarded as appropriate for the small sample size although with our sample of more than 30 banks, DEA should be able to discriminate between efficiencies of different banks (Drake 2001). VRS models do require caution where there is diversity in size as small and large units will tend to be overrated in the efficiency measurement (Dyson et al 2001).

Data

The data on outputs and inputs have been obtained from Bankscope which are based on Fitch Ratings, Factiva, Capital Intelligence, Economic Intelligence Unit, Moody's, Standard and Poor's and FinInfo. We have also used data from the Annual Reports of these banks, RBI in the case of Indian banks and in the case of China from prospectuses of their banks used for raising funds on Hong Kong Stock Exchange. We have confined our study for the period from 2002 to 2005 as banks before that have undergone dramatic changes. To incorporate the role of NPAs in the productivity calculations, we have used the combined data with loans as outputs reduced by certain percentages to reflect presence of NPLs as projected by a number of economists and their effects on efficiency of banks. Nonperforming loans are essentially total loss except the recovery of certain percentages by banks and AMCs. In that case, large number of banks would have been bankrupt. The data of percentage recovery is also not clear because it involves a large amount of debt-equity swap. In the case of China, the percentage of NPLs taken for analysis has been fixed at 0 percent i.e. without making any change to 30 percent. The intermediate percentages of NPLs have been taken at 20 and 25 percent. The figures for NPLs in the case of Chinese banks varies dramatically depending upon the scholars with Ernst and Young's latest study on May 2, 2006 claiming that the NPL percentage in the contemporary Chinese loans would be more than 46 percent of total loans (Ernst and Young 2006). Garcia-Herrero et al (2006) and Pei and Shirai (2004) have done their own calculations. Other scholars such as Setser (2006) have also provided their figures on NPLs in China. Setser's (2006) figures start from the percentage of NPLs from 37 percent in 2002 to 24 percent in 2005 if there is no new addition to NPLs. In the case of Indian NPLs, we have started from without any change to 13 percent as claimed by

Tarapore Committee. There is normally very little dispute regarding percentage of NPLs in Reserve Bank of India's figure with the exception of Tarapore Committee. The process of generation of NPLs is very important to understand different aspects of banking productivity in China and India and whether this can ever be compared. We have not used Stochastic Frontier model or the regression model to determine the comparative productivity because of wide institutional differences between these two countries. We think that the DEA provides the most simple and reliable way of comparison if the underlying analysis is objectively done. We have used DEA to help in getting an additional insight in our comparative analysis of Chinese and Indian banking.

We have done DEA analysis of combined data of Indian and Chinese banks over the last four years year wise. It is not only to identify productivity differences between banks from two different countries but also to look at the changes in productivity these banks have undergone in the last four years.

TABLE 2
DEA Analysis of Combined Chinese and Indian Banks over four years

NPL ADJUSTED
NPL ADJUSTED INDIAN BANKS= 13 PERCENT
NPL ADJUSTED CHINESE BANKS= 30 PERCENT

Bank	2002 vrste	Bank	2003 vrste	Bank	2004 vrste	Bank	2005 vrste
AGR.BANK.CHINA	1	AGR.BANK.CHINA	1	AGR.BANK.CHINA	1	SBI	1
AGR.DEV.BANK	1	CHINA DEV. BANK	1	CHINA DEV. BANK	1	ICICI	1
BANK OF CHINA	1	CHINA CITIC GR.	1	CHINA CITIC GR.	1	DONGGUAN CITY COMMERCIAL BANK CO LTD	1
CHINA DEV. BANK	1	NINGBO COMMERCIAL BANK	1	DONGGUAN CITY COMMERCIAL BANK CO LTD	1	CHINA DEV. BANK	1
CHINA CITIC GR.	1	DONGGUAN CITY COMMERCIAL BANK CO LTD	1	ICICI	1	CHINA CITIC GR.	1
ICBC	1	Bharat Overseas	1	SBI	1	Bharat Overseas	1
NINGBO COMMERCIAL BANK	1	ICICI	1	State Bank of Patiala	1	AGR.BANK.CHINA	1
DONGGUAN CITY COMMERCIAL BANK CO LTD	1	SBI	1	Bharat Overseas	0.998	CHINA MINSHENG BANK CORP	0.99
ICICI	1	CHINA CONS BANK CORP.	0.871	NINGBO COMMERCIAL BANK	0.983	NINGBO COMMERCIAL BANK	0.902
SBI	1	ICBC	0.827	AGR.DEV.BANK	0.77	AGR.DEV.BANK	0.621
CHINA CONS BANK CORP.	0.856	AGR.DEV.BANK	0.761	ICBC	0.748	State Bank of Patiala	0.575
Bharat Overseas	0.831	HDFC	0.582	SHENZHEN COMMERC. BANK	0.525	SHENZHEN COMMERC. BANK	0.546
SHENZHEN COMMERC. BANK	0.525	SHENZHEN COMMERC. BANK	0.565	BANK OF CHINA	0.472	ICBC	0.516
State bank of Hyderabad	0.519	State Bank of Patiala	0.55	HDFC	0.395	HDFC	0.479
HDFC	0.508	BANK OF CHINA	0.538	State Bank of Bikaner	0.369	State Bank of Bikaner	0.367
State Bank of Patiala	0.383	State bank of Hyderabad	0.469	CHINA CONS BANK CORP.	0.357	State bank of Hyderabad	0.345
State Bank of Travancore	0.368	State Bank of Bikaner	0.449	State bank of Hyderabad	0.354	CHIN.MERCHA.BANK	0.326
Andhra	0.346	Canara Bank	0.421	Canara Bank	0.322	Canara Bank	0.318
OBC	0.291	State Bank of Travancore	0.38	Andhra	0.314	Andhra	0.315
Indian Overseas	0.253	BOB	0.354	BANK OF SHANGHAI	0.283	State Bank of Travancore	0.305
Union Bank of India	0.241	Andhra	0.331	State Bank of Travancore	0.278	BANK OF CHINA	0.294
PSB	0.207	CHIN.MERCHA.BANK	0.299	CHIN.MERCHA.BANK	0.274	BANK OF SHANGHAI	0.286
Central bank of India	0.205	Indian Overseas	0.259	PSB	0.259	CHINA CONS BANK CORP.	0.279
CHIN.MERCHA.BANK	0.186	Union Bank of India	0.257	BOB	0.256	PSB	0.271
Syndicate Bank	0.177	OBC	0.256	Indian Overseas	0.213	BOB	0.242
BANK OF BEIJING CORP LTD	0.176	PSB	0.254	OBC	0.208	Indian Overseas	0.238
SHANGHAI PUDONG DEV BANK	0.162	BANK OF SHANGHAI	0.236	Union Bank of India	0.202	Union Bank of India	0.232
UCO Bank	0.159	Central bank of India	0.204	SHANGHAI PUDONG DEV BANK	0.198	OBC	0.23
United Bank of India	0.147	SHANGHAI PUDONG DEV BANK	0.198	UCO Bank	0.198	UCO Bank	0.22
BANK OF SHANGHAI	0.143	United Bank of India	0.192	United Bank of India	0.187	United Bank of India	0.218
CHINA MINSHENG BANK CORP	0.126	BANK OF BEIJING CORP LTD	0.189	BANK OF BEIJING CORP LTD	0.176	SHANGHAI PUDONG DEV BANK	0.207
BOB		Syndicate Bank	0.187	Central bank of India	0.173	Syndicate Bank	0.198
Canara Bank		UCO Bank	0.173	Syndicate Bank	0.163	BANK OF BEIJING CORP LTD	0.165
State Bank of Bikaner		CHINA MINSHENG BANK CORP	0.137	CHINA MINSHENG BANK CORP	0.129	Central bank of India	0.155

Results Analysis

The most surprising result has come from the Chinese banks that the banks that have undergone extensive restructurings and other reforms apparently became less productive. Alternatively, it can be explained that the Chinese banks have been extending loans without any constraint but the introduction of IPOs has brought certain responsibility and transparency which has prevented these restructured banks to extend credits without any criteria or restrictions. While Agriculture Bank of

China has stayed at the top of the Chinese banks for the four years i.e. 2002 to 2005 even when the loan amount has been reduced by 30 percent to reflect a high percentage of NPLs based on various studies discussed above, restructured and recapitalized banks have been showing continuing decline in their productivity.

It is difficult to believe that Agricultural Bank of China is the most productive of all the banks under consideration including those Chinese banks which have undergone extensive restructuring and recapitalization. Agricultural Bank of China is regarded as one with the maximum amount of nonperforming loans and it has not been restructured in the Chinese structuring system but it is showing the highest productivity. The most glaring aspect of restructuring is that three of the highly restructured banks such as Construction Bank, ICBC and Bank of China have been becoming less productive over the last four years. These three banks had the maximum input of funds both from the Chinese government and its agencies as well as from foreign investors. The conclusion here is that Agricultural Bank of China is freely disbursing loans and is maintaining one of the highest portfolios of loans. This aspect has two implications. One is that the DEA analysis based on higher percentage of loans particularly in the case of China may not reflect highest form of efficiency. In a non-market restructuring, such banks can be easily made to look profitable by transferring non returned loans to any Asset Management Firms. One such instance we are witnessing in the case of China Development Bank which has apparently received 20 billion US dollars from the Chinese Investment Fund. In the case of Indian Bank, performance of SBI and ICICI has been continuously moving upwards even when NPLs are taken either at 13 percent or at 3 percent with corresponding reduction in in the loan amount.

Discussions

A major part of our discussion is again based on the Basel I and Basel II. What led Western Central Banks and their banking associations to introduce transparency and level playing field by banks. There is one obvious argument that by keeping the Capital Asset Ratio (CAR) at a low percentage, banks in Japan could operate at a higher profit. We have extended that argument that banks can extend credit without any limit at a concessional rate of interest or without insisting on the return of the credit. This would provide a direct subsidy to the concerned institutions and if these institutions

are geared towards providing export, they would constitute direct subsidy to the exporters. In a nonmarket economy, the extent of government subsidy is different but it is not impossible to determine as has been projected by the USDOC. In the case of China the extent of subsidy provided by the Chinese government is difficult to estimate because of the acceptance of non-transparency in the Chinese business environment by major trading nations. One example we have discussed in this article is that of self raised funds. It is not rational to accept that 6 times the value of the Chinese GDP has been raised by SOEs, local bodies and private citizens without any accounting. This points towards the difficulty in estimating amount of subsidy provided to goods exported from China but permitting such export from China and restricting them from other market economies may amount to giving undue advantage to exporters from China and that is definitely having an effect on international export structure.

Then, there is the related argument of creation of wealth. Wealth is not a zero sum game i.e. it is limited and if the wealth is provided to one group, others cannot have access to it. In our view, wealth is the purchasing capacity of an economy and this purchasing capacity is reflected by money and credit generated by the social, economic and legal institutions of the society (Shubik 1999). This wealth can expand or shrink. Sometimes issue of shares is basically a creation of wealth. The institutions can help in the creation of wealth. Productivity alone does not create wealth. If in the case of China, the subsidy provided by government through nonperforming loans has created wealth but the wealth has mostly gone to the middle men or exporters or sellers outside China. The subsidy has also led to the creation of one of the largest foreign exchange fund in China but such subsidy has contributed to the distortion of the international market.

We have not used Ernst and Young's (2006) analysis in citing our data because of its involvement in the issue of IPOs of Bank of China and its attempt to politicise its study by withdrawing its report after the protest by the Chinese Government. In our view, institutional differences are so wide that banking in India and China cannot be compared. The banks in China are being used for entirely different purposes i.e. to provide subsidized finance through creation of wealth in a totalitarian country and it cannot be compared to banking in India which is although not working under total

commercial and market freedom because of its stipulated priority sector advances, is still market oriented with accountability to its shareholders including to the government.

Conclusion

The above analysis leads to a direct conclusion that there is a very wide institutional difference between these two countries. The financing in the case of China has moved away from their banking institutions to self raised funds the source of which is nearly impossible to identify. Even though self raised funds constitute a large part of financing, the Chinese banking institutions are still contributing nearly 20 percent of investments in fixed assets in China. Historically, the banking does not constitute a major source of financing in India as banking finance is still less than 50 percent of Indian GDP compared to nearly 200 percent of Chinese GDP and the recapitalization and restructurings resorted to by these countries are entirely different. The process of generation of NPLs is also quite different. Whereas NPLs in the case of China, NPLs have mostly come from loans not returned by State owned enterprises, in the case of India, State owned enterprises play a very small role in the generation of NPLs. In fact, a large part of NPLs has come from stock market operations as is the case in State Bank of India.

The use of DEA basically suggests that the Chinese restructured and recapitalized banks such as CCB, BOC, and ICBC which have raised billions of dollars worth of investments on the share market are becoming less productive. This can only be interpreted as application of greater constraints on these restructured banks in extending credits because of greater oversight having raised investment from the market whereas banks which are still to be recapitalized and restructured are merely going ahead with the distribution of loans. The Indian banks have shown two trends. One is that State owned banks such as State Bank of India have maintained high rate of loan advancement. Private banks such as ICICI have grown in recent times dramatically and have become more productive.

The study has certain limitations as it is based on vrse and the banks vary in their sizes which may have effect on their efficiency dispersion but we stayed with broad comparison and did find that the use of DEA has helped in identifying the comparative strengths and weaknesses of banks in China and India.

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