China's State-Owned Banks' Lending Practices, 1994-2005: Empirical Tests and Policy Implications

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Abstract: More than half of the assets in China's banking system are accounted for by four huge state-owned commercial banks. This paper examines the changing factors influencing these banks' lending behavior over the post-1994 period on a province-by-province basis. Determinants include the concentration of state-owned enterprises, the level of provincial prosperity, deposit levels, and macroeconomic control variables. We confirm a downward trend in the banks' loan-to-deposit ratio combined with some (mixed) evidence of more lending to richer provinces over time. SOE lending remained important for at least one of the four banks.

Keywords: Chinese banks, lending, state-owned enterprises, provincial income, privatization, World Trade Organization.

INTRODUCTION

Despite facing increasing domestic and foreign competition, China's four largest state-owned commercial banks (SOCBs) remain dominant players in China's banking industry and still accounted for over half of the total assets in China's banking system in 2006[1]. Three of the four, Bank of China (BOC), China Construction Bank (CCB) and the Industrial and Commercial Bank of China (ICBC), had initial public offerings in Hong Kong. All three quickly ranked amongst the world's top ten commercial banks in terms of market value and, as of July 23, 2007, ICBC's rising share price made it the biggest lender in the world by market capitalization [2]. As recently as 1998, however, these institutions, like the other SOCB, the Agricultural Bank of China (ABC), were not only entirely government-owned but also forced to conform to a national credit plan that largely allocated funds based on perceived needs – and essentially regardless of creditworthiness. There has been much discussion, but little empirical evidence, regarding how much actual SOCB lending practices have changed in recent years. This paper considers a range of potential influences on their lending behavior. We look at variations in bank behavior by province, as well as over time, using over a decade of data starting in 1994. Determinants include the concentration of state-owned enterprises and the level of provincial prosperity as well as the banks' overall intake of deposits. We allow for changing lending patterns as the gradual relaxation of the constraints imposed by the government's credit plan after 1998 potentially gave the SOCBs more opportunity to pursue profit maximization.

EVOLUTION OF CHINA'S STATE OWNED COMMERCIAL BANKS[2]

Even after China's economic reforms began in 1978, the People's Bank of China continued to operate as a 'mono-bank' and controlled essentially all lending and deposit-taking activities. Its reformulation as a true central bank was approved by China's State Council in September 1983, and its former responsibility of lending to state-owned commercial and industrial enterprises was transferred to the newly-formed ICBC in 1984. ABC and CCB then took over lending activities in their own specialized domestic areas while BOC focused on international transactions. Three new policy banks were created in 1994 (the State Development Bank of China, the Import-Export Bank of China and the Agricultural Development Bank of China) and policy loans were transferred to these new institutions, leaving the four SOCBs, in theory, now accountable for their own profits and losses[3]. The central government incorporated the SOCBs into its credit plan to finance its state-owned enterprises (SOEs) and formal funding requirements were not lifted until 1998, however. Even after 1998, the historical burden of prior bad loans plus ongoing protection of many SOEs continued to hamper full commercialization of the SOCBs. State-owned banks were still allocating 75% of their short-term loans to SOEs in 2003 [5] while, still more recently, Barth and Ca-

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[1] A fifth bank, Bank of Communications, was reclassified as a "large state-owned bank" in April 2007 but remained at only approximately a quarter the size of the others in terms of total assets (see Tucker, Anderlini) [1]. The analysis below focuses exclusively on the original four SOCBs.

[2] For more details on the successive banking reforms, and new challenges posed by World Trade Organization membership, see Burdekin, Kochanowicz [3].

[3] The actual assistance rendered by the new policy banks remained in question, however. Most of their bond issues aimed at supporting lending were actually being purchased by other banks, with the four SOCBs in the lead (Barth, Koepp, Zhou) [4].

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prio [6] point to SOEs and collective enterprises receiving nearly half of total corporate loans despite contributing little more than a quarter of GDP[4]. Meanwhile, private companies, especially those of small to medium size, were often shut out of the formal lending market entirely [9].

Under the credit plan, the big four banks had no real say in the creditworthiness of borrowers and were forced to make loans to politically-motivated projects. Moreover, SOE managers were not made accountable for the non repayment of old loans and, even if an SOE had previously defaulted on loans, the banks still lacked the authority to independently cut off new lending to that SOE. This essentially forced the banks to make new loans to cover defaulted interest payments, reporting phantom interest profits in the process. And, until 1998, banks were not allowed to classify more than one percent of their portfolio as a NPL. Thus, the government not only forced the banks to make bad loans, but also would not let them write them off. The practice of assigning loan quotas to every region under each year's credit plan further prevented the allocation of credit from being determined by market forces. Indeed, regions with low growth potential tended to be highly dependent on SOEs and, as such, garnered relatively large amounts of loans. Park, Sehrt [10] find empirical support for a strong inverse relationship between financial intermediation and the level of provincial economic development over the 1991-1997 period, suggesting that "factors other than economic fundamentals play an important role in lending decisions." Forced emphasis on the weaker economic areas clearly compromised banks' ability to determine loans on the basis of standard risk and return criteria – especially with policy lending quotas being set without any reference to the banks' ability to meet these targets [3].

The 1998 lifting of the credit plan, and the formal elimination of minimum loan quotas for each region, was intended to increase the independence of the loan portfolios of the SOCBs. The positive liberalizing effects of the policy changes were, at first, offset by large increases in lending due to the Asian financial crisis and the start of the Fixed Asset Investment Program, however. This latter program substantially raised the allocation of funds to SOEs through the SOCBs and the 1998 loan targets were set 25% above 1997 levels at RMB 1 trillion [11]. Nevertheless, policy changes did start to give the banks more operational freedom. Bank managers were permitted to cut costs by laying off excess employees and closing redundant branches. And, in 1998, the NPL classification changed from the old four-level Chinese standard to a five-level accrual basis, similar to the international standard and allowing for greater transparency. The government also laid down ambitious new targets for the SOCBs that were to achieve 8% risk-adjusted capital standards by 2000 (consistent with international standards), a maximum loan-to-deposit ratio of 75%, and a liquid asset ratio of 25% [5].

The Ministry of Finance issued RMB 270 billion ($US 32.5 billion) in special bonds to recapitalize the SOCBs in 1998, bringing the SOCBs closer to the 8% standard for capital adequacy. Further substantial recapitalizations were needed in 2003 and 2005, however. The 1998 bond recapitalization itself raised total bank capital from RMB 208 billion to RMB 478 billion, and the next 2003 infusion added another RMB 370 billion. At that time, $US 45 billion of China's official foreign exchange reserves were drawn upon to further recapitalize BOC and CCB in preparation for their IPOs. Yet another $US 15 billion in foreign exchange reserves was employed in recapitalizing ICBC in 2005. NPLs totaling RMB 705 billion were transferred to Asset Management Companies (AMCs) in May-June 2005 and, with essentially the full book value of the NPLs being replaced by new cash or by claims on the AMCs or the government itself, the total cost of the latest bailout likely exceeded $US 80 billion [12]. Taking into account not only the losses on the NPL transfers but also SOCB equity writedowns and carving out of doubtful loans by the People's Bank, other costs born by bank customers and foreign investors, RMB 500 billion for city commercial banks and RMB 35 billion for the Bank of Communications in 2004, Ma [13] estimates that total restructuring costs actually amounted to as much as RMB 4047 billion by the end of 2005.

Central government rhetoric did, at last, begin to outwardly encourage bank profitability and NPL reduction as this restructuring took place. The 2003 recapitalization of BOC and CCB was accompanied by strengthened corporate governance and provisions for qualified external auditing and oversight. The targeted NPL to total loan ratio of 3-5% for 2004 was met by the CCB and essentially achieved by BOC[5]. Both banks also became joint-stock companies with independent directors. Table **1** shows that the overall progress achieved in NPL levels between 1999 and 2005 was not shared by ABC, however[6]. Its cost-to-income ratio remained more than 20 percentage points above those of BOC, CCB and ICBC in 2005 [12]. Even as a possible $US 40 billion injection of funds into ABC from China's foreign exchange reserves came under discussion in August 2007, it was estimated that a further infusion of $US 76 billion would be required to reduce ABC's non-performing loan ratio to 5% from the 2006 ratio of 23.4% [16]. This 23.4% figure contrasts sharply with the NPL ratios below 5% realized by BOC, CCB and ICBC in the aftermath of their 2003 and 2005 recapitalizations[7].

[4] An ongoing concentration of bank lending to provinces where SOEs are dominant is suggested in the 2003 data analyzed by Dobson, Kashyap (pp. 125-126) [7]. The benefits of such SOE funding certainly seem highly questionable given that provinces with greater SOE shares in industrial production have, on average, consistently experienced lower growth rates in the past (Phillips, Kunrong) [8].

[5] There was also improved return on equity, especially for CCB – previously none of the SOCBs had managed to record a return on equity of even 5% over the 2001-2003 period (Thomas, Ji) [14].

[6] ABC's NPL ratio was still 23.4% in 2006. A further area of concern is the question of just how many additional dubious "special mention" loans may turn into future NPLs not only for ABC but also for the other three SOCBs. For example, 12.7% of BOC's loans were classified as special mention in 2005 – more than double the level of acknowledged NPLs (Financial Times) [15].

[7] The three SOCBs still lagged well behind foreign commercial banks operating in China in terms of their balance sheet strength, however – and their loan loss reserves covered substantially less than 100% of NPL levels in

Table 1. Nonperforming Loan Levels of the Big Four State-Owned Banks

NPL %	2005	2004	2003	2002	2001	2000
BOC	4.6	5.1	15.9	22.4	27.5	26.5
CCB	3.8	3.7	9.1	15.4	19.4	19.9
ICBC	4.7	19.1	21.3	25.5	29.8	34.4
ABC	26.3	26.8	30.7	36.7	41.4	
SOCB aggregate	**10.5**	**15.6**	**17.8**	**23.1**	**25.4**	

Note: the NPL figures reflect the five-level reporting standard adopted in 1998.
Source: 2001-2005 data are as listed in Barth and Caprio [6] and the China Banking Regulatory Commission website (http://www.cbrc.gov.cn); and 2000 figures are *Bankscope* data given by García-Herrero, Gavilá and Santabárbara [24].

The newfound strength of CCB's balance sheet made possible its successful IPO on the Hong Kong market in October 2005. ICBC's own NPL ratio improvement from 34.4% in 2000 to 19.1% in 2004 (Table **1**) was accompanied by a five-fold profit increase over 2000-2004 while the number of branches was halved and the employee head count cut by around one third. A more dramatic drop in ICBC's NPL ratio followed during 2005 thanks to the $US 80 billion government support package in the first half of that year. ICBC then became a shareholding company with Goldman Sachs, Allianz and American Express attaining a 10% stake [17][8]. The potential benefits of such minority foreign ownership in China's banks themselves remain subject to debate. Although Berger, Hasan, Zhou [18] suggest that significant efficiency gains have been realized, Leigh, Podpiera [19] question foreign investors' actual involvement in core operations – implying that their investments in non-core areas could remain profitable even if the banks' overall performance failed to improve[9].

THEORETICAL FRAMEWORK

Standard equilibrium bank profit-maximizing models [25, 26] treat banks as profit-maximizing firms that choose interest rates to determine their optimal pricing strategy and thereby determine their optimal lending. Given that interest rates in China have generally not been determined by the market, while commercial banks' lending remained heavily influenced by the central government, such models are unlikely to capture the historical behavior of Chinese banks. The 1998 reforms and other market deregulation moves have arguably allowed China's banks to focus more on profit maximization in recent years, however. In this section we first apply the static equilibrium model of bank profit-maximization to model banks' optimal lending in a world where there is no government regulation and the banks are profit-maximizing firms. We then impose regulatory constraints to capture government influence on bank lending behavior. By comparing the results with and without these constraints, we can make some simple predictions as to how bank behavior might be impacted by their imposition (or removal). This yields hypotheses that can be tested in the subsequent empirical analysis as we examine whether recent Chinese bank reforms have, in fact, succeeded in giving birth to more market-based lending practices[10].

The industrial organization approach to banking models commercial banks as independent entities that optimally react to their environment and provides a rich set of models for tackling such questions as bank regulation and market structure. The Klein-Monti prototype static equilibrium bank profit-maximizing model was further developed by Freixas and Rochet [28], who examine banks' optimal strategies and equilibrium conditions under alternative specifications for the intensity of competition in this sector. The authors then use this framework to analyze specific issues such as regulation of branch banking, measurement of the market power of California banks, and measurement of banks' efficiency. This standard equilibrium bank profit-maximizing model has been widely applied in the literature with Hannan [29], for example, employing such a model to assess the relationship between market structure and various aspects of bank conduct and performance. Pinho [30] extends the model by including non-price instruments so as to analyze innovations in price and non-price competition in the Portuguese deposits market during the 1986-1992 deregulation phase. The further extension by Chang [27] allows for both lending maximization and profit maximization strategies in the Korean case and incorporates the role of NPLs.

In the framework laid out below, a monopolist bank chooses D (volume of deposits) and L (volume of loans) to maximize profits. The bank faces a deposit supply curve of positive slope $D(r_D)$ and a loan demand curve of negative slope $L(r_L)$. For simplicity's sake the level of capital is assumed to be given. The bank is assumed to be a price taker in the inter-bank market (r_i), so that the objective function of profits to be maximized is as follows:

$$\begin{aligned}\pi &= \pi(L, D) \\ &= (r_L(L) - r_i)L + (r_i - r_D(D))D - C(L, D)\end{aligned} \quad (1)$$

Based on this model, the bank is assumed to hold deposits, D. It can either lend to SOEs (L^S) or the private sector (L^P) (L^S and L^P can also represent loans made to poor and richer economic regions, respectively). The bank charges r_L^S for the loans made to SOEs, charges r_L^P for the loans made to the private sector, and pays r_D on deposits. Furthermore, the marginal costs of managing loans (C_L) and managing deposits (C_D) are assumed to be exogenous and constant.

2005 in contrast to Citibank's 158.7% coverage, for example (Barth, Caprio) [6].

[8] ICBC's 2006 IPO garnered a record $21.9 billion and, combined with the earlier IPO's of BOC and CCB, a total of $42.3 billion was raised from selling shares in these three SOCBs.

[9] The SOCBs certainly seem to offer considerable room for improvement in this regard based upon the latest estimates of their efficiency levels and prudential ratios. And the more recently-established joint-stock banks, with more limited government ownership and control, appear to have significantly outperformed the SOCBs (Fu, Heffernan) [20] (Shih, Zhang, Liu) [21] (Ariff and Can) [22] (Jia) [23].

[10] Chang [27] points to such a shift towards profit maximization following the relaxation of government regulation, and protection, under the Korean banking sector deregulation that began in the 1980s.

The bank can borrow from the central bank at a rate of r_i. The bank maximizes its profits by choosing the optimal interest rates – r_L^S, r_L^P, and r_D. Therefore, the bank's objective function is now:

$$\max_{r_L, r_d} \pi(r_L^S, r_L^P, r_D) = r_L^S L^S + r_L^P L^P + r_R res D - r_D D - r_i \max(L^S + L^P - D, 0) - C_L(L^S + L^P) - C_D D - FC \quad (2)$$

where, L^S, L^P and D are functions of interest rates, i.e., $L^S(r_L^S)$, $L^P(r_L^P)$, and $D(r_D)$, r_R is the interest rate on reserves, *res* is the required reserve ratio, and FC is fixed cost.

Assuming the bank always borrows from the central bank, first order conditions with respect to the interest rates yield the following equations:

$$\frac{\partial \pi}{\partial r_L^S} = L^S(r_L^S) + r_L^S L'^S(r_L^S) - r_i\,(L'^S(r_L^S)) - C_L L'^S(r_L^S) = 0 \quad (3)$$

$$\frac{\partial \pi}{\partial r_L^P} = L^P(r_L^P) + r_L^P L'^P(r_L^P) - r_i\,(L'^P(r_L^P)) - C_L L'^P(r_L^P) = 0 \quad (4)$$

$$\frac{\partial \pi}{\partial r_D} = r_R res D'(r_D) - D(r_D) - r_D D'(r_D) + r_i D'(r_D) - C_D D'(r_D) = 0 \quad (5)$$

The solution (r_L^{*S}, r_L^{*P} r_D^*) can be obtained by solving the equations above. Moreover, optimal lending to SOEs and to the private sector can be derived as follows:

$$L^S(r_L^{*S}) = (r_L^{*S} - r_i - C_L) \mid L'^S(r_L^{*S}) \mid$$

(notice that $L'^S(r_L^S)$ is negative) (6)

$$L^P(r_L^{*P}) = (r_L^{*P} - r_i - C_L) \mid L'^P(r_L^{*P}) \mid$$

(notice that $L'^P(r_L^P)$ is negative) (7)

$$D(r_D^*) = (r_R res - r_D^* + r_i - C_D) D'(r_D^*)$$

(notice that $D'(r_D)$ is positive) (8)

The bank's loan to deposit ratio is:

$$\frac{L^S(r_L^{*S}) + L^P(r_L^{*P})}{D(r_D^*)} = \frac{(r_L^{*S} - r_i - C_L) \mid L'^S(r_L^{*S}) \mid + (r_L^{*P} - r_i - C_L) \mid L'^P(r_L^{*P}) \mid}{(r_R res - r_D^* + r_i - C_D) D'(r_D^*)} \quad (9)$$

Given total deposits, the bank's optimal percentage of lending to SOEs is:

$$\frac{L^S(r_L^{*S})}{D(r_D^*)} = \frac{(r_L^{*S} - r_i - C_L) \mid L'^S(r_L^{*S}) \mid}{(r_R res - r_D^* + r_i - C_D) D'(r_D^*)} \quad (10)$$

And the bank's optimal percentage of lending to the private sector is:

$$\frac{L^P(r_L^{*P})}{D(r_D^*)} = \frac{(r_L^{*P} - r_i - C_L) \mid L'^P(r_L^{*P}) \mid}{(r_R res - r_D^* + r_i - C_D) D'(r_D^*)} \quad (11)$$

Equations (10) and (11), in turn, suggest the following testable hypotheses:

Hypothesis 1: The bank's percentage lending to SOEs is increasing in the interest rate on the loans, *ceteris paribus*.

Hypothesis 2: The bank's percentage lending to private sector is increasing in the interest rate on the loans, *ceteris paribus*.

Hypothesis 3: If the expected return on loans to private sector is higher than the expected return on loans to the SOEs (i.e., $r_L^{*P} > r_L^{*S}$), the bank should lend more to the private sector, and vice versa, *ceteris paribus*

In China there has typically been little or no discretion in setting interest rates, with the same below-market-clearing rates being charged on both SOE and private sector loans. After imposing the constraint $r_L^S = r_L^P = \overline{r_L} < r_L^{*S}, r_L^{*P}$ to equations (10) and (11), we see that such lending rate limits should make it optimal for the bank to reduce the percentage of lending to SOEs relative to the private sector. This conflicts with the fact that the Chinese SOCBs were essentially forced to make loans to politically motivate projects, however, and thereby act contrary to the dictates of profit maximization.

The elasticity of the supply of deposits is defined as:

$$\varepsilon_D = \frac{r_d D'(r_d)}{D(r_d)} > 0 \quad (12)$$

Therefore, (10) and (11) can be written as:

$$\frac{L^S(r_L^{*S})}{D(r_D^*)} = \frac{(r_L^{*S} - r_i - C_L) \mid L'^S(r_L^{*S}) \mid r_D^*}{(r_R res - r_D^* + r_i - C_D) \varepsilon_D D(r_D^*)} \quad (13)$$

$$\frac{L^P(r_L^{*P})}{D(r_D^*)} = \frac{(r_L^{*P} - r_i - C_L) \mid L'^P(r_L^{*P}) \mid r_D^*}{(r_R res - r_D^* + r_i - C_D) \varepsilon_D D(r_D^*)} \quad (14)$$

Equations (13) and (14) suggest the following testable hypotheses:

Hypothesis 4: If total deposits rise, the loan-to-deposit ratio should be lower, *ceteris paribus*.

Hypothesis 5: If total deposits rise, the percentage of loans to the SOEs and to the private sector over the deposits should be lower, *ceteris paribus*.

In this respect, the model implies a very intuitive corollary. With the SOCBs being forced by the government to lend to SOEs and weak economic regions, sub-optimal levels of funding would be left for the private sector – consistent with the high reliance upon trade credits and informal finance observed in practice (see Burdekin, Kochanowicz, and the references provided therein) [3]. At the same time, we would expect any relaxation of the government restrictions to improve the flow of funds to the private sector. To the extent that the SOCBs have been taking advantage of in-

creased freedom to pursue profit maximization in recent years, this should be evidenced in reduced emphasis on lending to SOEs (as the counterpart to increased lending to the private sector) and less emphasis on the weaker economic regions.

Hypothesis 6: The elimination of the credit plan would cause the percentage of loans to the SOEs to decrease and the percentage of loans to the private sector to increase.

CHANGES IN BANK LENDING PATTERNS OVER THE 1994-2005 PERIOD

In this section, we begin by considering whether there is, in fact, any broad tendency for banks to reduce their allocation of funds to the weaker economic regions. Table **2** depicts the historical loan distributions of the big four state-owned banks based on a grouping that divides China's 31 provinces, municipalities, and administrative regions into top, middle and bottom tiers according to each year's annual per capita GDP of each region. The loan allocation pattern appears to undergo substantial change for CCB and ICBC but not for ABC and BOC. ABC continued to allocate close to 50% of its lending to the richest provinces over the 1994-2005 period while BOC's share remained around 65% over the sample period[11]. Meanwhile, ABC, not surprisingly given its rural base, consistently allocated the largest share of loans to the poorest provinces – typically providing more than 22% to this group. CCB and ICBC do both evince an increase in lending to the richest provinces, and decrease in lending to the poorest provinces, over the sample, however. CCB features the most pronounced change in behavior, with its loan allocation to the wealthiest regions rising from 45.9% in 1994 to 57.9% in 2005 while the allocation to the poorest regions fell from 24.9% to 19.1% over that same period. Overall changes in lending patterns have remained quite mild, however, and the possibility that SOCB lending may still not be line with the opportunities available in the richer regions is supported by Podpiera's [12] finding that the big four banks lost market share to other financial institutions in those provinces featuring more profitable SOEs.

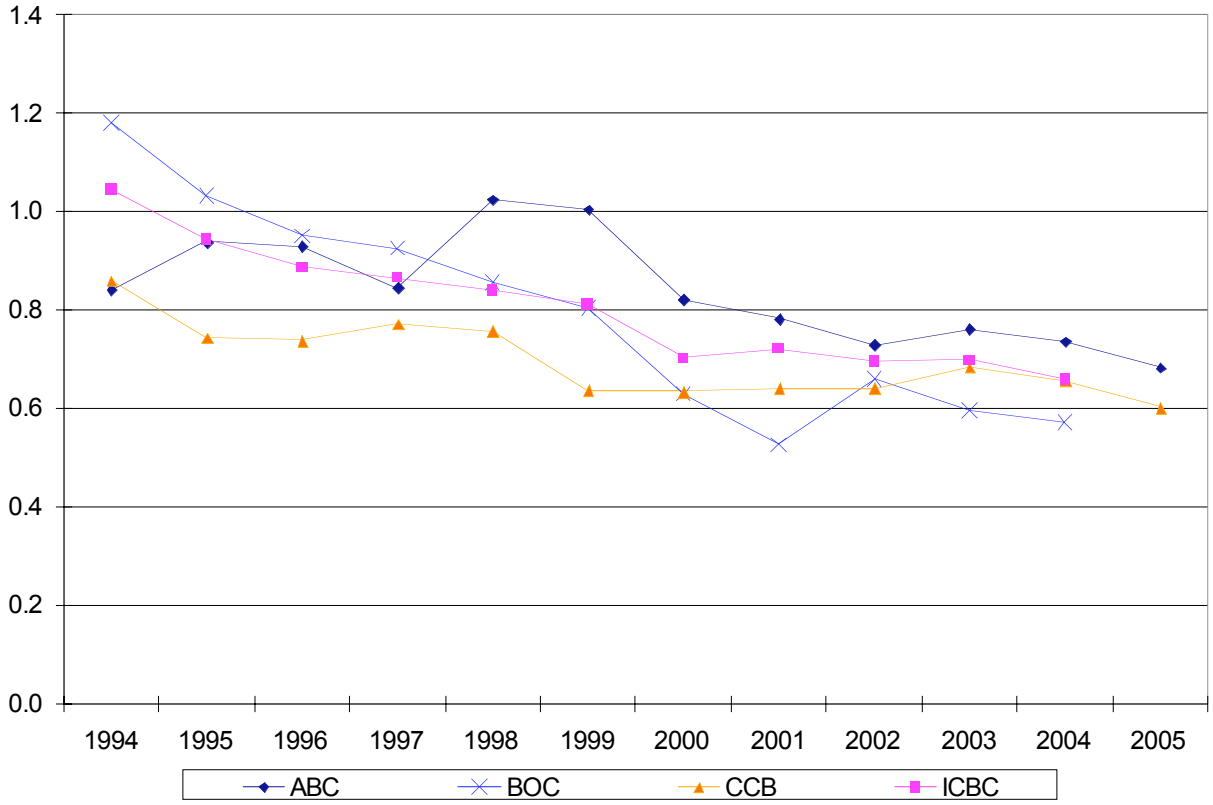
Table 2. Loan Allocation of the Big Four State-Owned Banks

ABC	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994
High Tier	52.3%	52.4%	52.2%	52.8%	50.9%	50.2%	48.2%	47.2%	53.4%	49.1%	47.5%	47.3%
Mid Tier	24.1%	24.7%	24.0%	21.0%	25.1%	27.0%	29.1%	29.7%	26.3%	31.1%	26.6%	28.7%
Low Tier	23.6%	22.9%	23.8%	26.2%	24.0%	22.8%	22.7%	23.1%	20.3%	19.8%	25.9%	24.0%
BOC	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**
High Tier	--	66.5%	64.3%	64.2%	64.8%	67.4%	62.8%	63.0%	63.0%	63.0%	63.8%	62.2%
Mid Tier	--	19.5%	21.2%	20.8%	18.8%	20.6%	23.3%	23.3%	23.2%	23.3%	20.2%	22.2%
Low Tier	--	14.0%	14.5%	15.0%	16.4%	12.1%	13.9%	13.7%	13.8%	13.7%	16.0%	15.6%
CCB	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**
High Tier	57.9%	61.4%	57.8%	58.4%	59.6%	58.8%	56.5%	54.0%	53.1%	50.9%	49.3%	45.9%
Mid Tier	23.0%	21.0%	21.4%	21.8%	20.4%	22.5%	23.9%	26.3%	26.8%	29.7%	25.9%	29.2%
Low Tier	19.1%	17.5%	20.8%	19.8%	20.0%	18.7%	19.6%	19.8%	20.0%	19.4%	24.8%	24.9%
ICBC	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**	**1995**	**1994**
High Tier	--	57.8%	58.1%	56.3%	57.9%	57.6%	54.9%	54.0%	53.8%	51.9%	51.9%	47.7%
Mid Tier	--	23.3%	22.6%	23.2%	22.5%	24.6%	26.0%	26.8%	27.0%	28.3%	25.1%	29.4%
Low Tier	--	18.9%	19.3%	20.5%	19.6%	17.8%	19.1%	19.1%	19.2%	19.8%	23.0%	22.9%

Notes:
China's 31 provinces, municipalities, and administrative regions are divided into 3 tiers according to their relative rankings based on each year's provincial nominal per capita GDP. Foreign currency loans and deposits are included from 2000 with the $US amounts converted into RMB using the 8.28 fixed exchange rate that applied through 2004. The annual average exchange rate value was applied for 2005.
Source: Almanac of China's Finance and Banking [31].

A more general perspective on lending practices is provided through the loan-to-deposit ratio shown in Fig. (**1**). The credit plan era was marked by loan-to-deposit ratios that ranged between 0.8 and 1.2 for ABC, BOC and ICBC, and between 0.7 and 0.9 for CCB. The substantial reduction in these loan-to-deposit ratios since 1998 appears to be consistent with the banks' scope, and incentive, to be more selective in their lending after the lifting of the credit plan. The most dramatic drop was enjoyed by BOC, with an overall halving of its loan-to-deposit ratio between 1994 and 2004, whereas ABC showed the smallest reduction over the 1994-2005 period. The loan-to-deposit ratios for the four SOCBs typically remained between 0.8 and 0.6 during 2000-2005. These data suggest that, even though changes in loan alloca-

[11] BOC and ICBC provincial lending data were no longer reported in the Almanac of China's Finance and Banking [31] after 2004 and also could not be obtained from the individual bank websites.



Note: Foreign currency loans and deposits are included from 2000 with the $US amounts converted into RMB using the 8.28 fixed exchange rate that applied through 2004. The annual average exchange rate was applied in 2005.
Source: Almanac of China's Finance and Banking [31].

Fig. (1). Loan-to-deposit ratios for the big four state-owned banks.

tion across regions seem to have been more incremental in nature for most of the SOCBs, a meaningful change in total lending rates has occurred since the mid-1990s and the ending of the credit plan in 1998 (see also ref. [23]). From 2000 on, all the SOCBs but ABC consistently attained the 75% maximum loan-to-deposit ratio targeted as part of the 1998 reforms – and even ABC reached this goal in 2005.

EMPIRICAL TESTING

Our econometric analysis seeks to quantify the extent to which the overall decline in loan-to-deposit ratios over the 1994-2005 period may be related to provincial factors, macroeconomic factors and/or bank-specific factors. At the provincial level, we assess the relative prosperity of each province by taking the ratio of provincial per capita GDP to national per capita GDP. If bank lending is redistributive in nature, as propounded under the old national credit plan, banks should lend more to poorer provinces, *ceteris paribus*, as observed by Park and Sehrt [10] for the pre-1998 period. A more market-based approach likely implies lending more to the stronger provinces over time, however. We also take into account the importance of SOEs to each province, given that government pressure for loans to loss-making SOEs likely fueled additional lending to provinces where SOEs account for a larger share of provincial GDP. While the past importance of SOE ties receives empirical support from Park and Sehrt [10], our theoretical analysis implies that greater freedom to pursue profit maximization should be associated with reduced emphasis on SOE lending. Additional macroeconomic control variables allow for bank responses to inflation, as represented by the consumer price index, and overall liquidity as reflected in broad money (M2) growth[12]. Finally, we take into account the level of deposits available to each bank to serve as a base for lending – with our theoretical analysis implying that the loan-to-deposit ratio should fall as the total amount of available deposits increases[13].

Summary statistics on each data series, together with variable definitions, are provided in Tables **3** and Tables **4a**,**b** give sample correlation coefficients[14]. Table **4a** suggests that the bank's loan-to-deposit ratio has a positive correlation with the SOE output share in three cases out of four while the correlation with the GDP ratio is negative in three cases out of four, implying proportionately less lending to richer provinces. There is an overall tendency for higher SOE output shares to be associated with higher NPL ratios – and all four banks feature small but positive correlations between these two variables. In keeping with hypotheses 4

[12] We also considered the rate of growth of national real GDP but found its inclusion to often lead to singularity problems owing to multicollinearity with other variables. National GDP is, in any event, already included in the specification *via* the ratio to provincial GDP.

[13] The importance of deposit financing for loans is also likely influenced by banks' access to the interbank market, which was reintroduced after 1995 (Park, Sehrt) [10].

[14] These data are drawn from the Almanac of China's Finance and Banking [31], the China Statistical Yearbook [32] and the Great China database (http://www.finasia.biz/tejonline/tejonline.htm).

Table 3. Summary Statistics for the Panel Data Set

		Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Loans (in constant value units of 1 billion RMB)	ABC	369	48.59	41.46	0.00	249.25
	BOC	338	26.66	35.38	0.20	280.19
	CCB	372	40.74	38.85	0.00	206.00
	ICBC	341	71.39	58.16	0.00	347.58
Deposits (in constant value units of 1 billion RMB)	ABC	369	60.79	63.10	0.00	443.66
	BOC	338	39.63	62.66	0.32	481.59
	CCB	372	60.94	63.27	0.73	396.36
	ICBC	341	93.74	107.08	0.00	765.91
Loan/Deposit Ratio	ABC	368	0.93	0.26	0.10	1.98
	BOC	338	0.85	0.39	0.08	4.62
	CCB	372	0.75	0.31	0.00	4.76
	ICBC	330	0.91	0.23	0.26	1.58
NPL Ratio*	ABC	155	0.32	0.06	0.26	0.41
	BOC	186	0.17	0.09	0.05	0.28
	CCB	186	0.12	0.07	0.04	0.20
	ICBC	186	0.22	0.09	0.05	0.34
SOE Output Share		369	0.40	0.19	0.05	0.94
GDP Ratio		369	1.20	0.86	0.36	5.24
Inflation Rate		372	0.05	0.08	-0.01	0.24
M2 Growth Rate		372	0.19	0.07	0.12	0.35

Notes:
*NPL data are available only from 2000 to 2005, *SOE Output Share* is the share of provincial GDP accounted for by state-owned enterprises, *GDP Ratio* is the ratio of provincial per capita GDP to national per capita GDP, *Inflation Rate* is the growth rate of China's consumer price index, and *M2 Growth Rate* is the rate of growth of China's broad money supply measure.

and 5 from the theoretical section, there is a negative correlation between the loan-to-deposit ratio and total deposits for all four banks. Loans and deposits are themselves highly correlated, with the correlation coefficient exceeding 0.85 for each bank. Meanwhile, Table **4b** offers some confirmation that provinces more reliant on SOEs also tend to be poorer, on average, based on the negative correlation with the GDP ratio. We also see that inflation and money growth were, not surprisingly, very closely related over our sample period.

In order to assess the actual significance of the different factors for bank lending behavior, we initially consider a regression including each of the variables from Table **4** that is available over our full 1994-2005 sample period[15]. The panel regression covers 31 provinces over 12 years, yielding a total of over 300 observations and is estimated using a fixed effects model with heteroskedasticity-consistent robust standard errors. Consistent with other work in this area, we use the loan-to-deposit ratio, rather than total loans, as our dependent variable[16]. We also allow for a constant and a time trend in the variable array and find the latter to often be negative and significant. This is consistent with the overall downtrend in the loan-to-deposit ratio during 1994-2005 seen in Fig. (**1**) above. Table **5** provides regression results together with diagnostic statistics for all four banks. In each case, the Hausman test statistics support the applicability of our fixed effects model. There is evidence of significant serial correlation for ABC and ICBC, however, based on the Wooldridge test for autocorrelation in panel models. Accordingly, we re-estimate the ABC and ICBC equations with the dependent variable specified in first difference form, i.e., as the first difference of the bank's loan-to-deposit ratio. This re-estimation in first differences (column 2 in Table **5**) naturally lowers the overall goodness of fit compared to the original results in levels (column 1) but has only limited effects on the inferences derived from the results[17].

While ABC always features a significant positive reaction to the SOE variable, it is insignificant for BOC, CCB and ICBC. Meanwhile, the response to the GDP ratio is actually positive and significant at the 5% level for both CCB and ICBC. The GDP ratio is also significant and positive at

[15] The NPL ratio is necessarily excluded from our regression analysis as data are available only from 2000.

[16] Given that total deposits form one of our right-hand-side variables, the high correlation between loans and deposits shown in Table 4a would be highly problematic if total loans were serving as the dependent variable.

[17] The Wooldridge test confirms that no significant serial correlation is present in the re-estimated equations.

Table 4a. Correlation Coefficients for the Bank-Specific Variables

		Deposits	Loan/Deposit Ratio	NPL Ratio	SOE Share	GDP Ratio	Inflation Rate	M2 Growth Rate
Loans	ABC	0.97	-0.31	-0.24	-0.63	0.43	0.18	0.05
	BOC	0.90	0.00	-0.20	-0.50	0.45	0.13	0.08
	CCB	0.95	0.11	-0.24	-0.50	0.67	0.19	0.12
	ICBC	0.85	-0.33	-0.15	-0.45	0.63	0.10	0.09
Deposits	ABC	-	-0.43	-0.24	-0.59	0.44	0.17	0.06
	BOC	-	-0.15	-0.20	-0.42	0.52	0.16	0.07
	CCB	-	-0.10	-0.24	-0.46	0.59	0.18	0.11
	ICBC	-	-0.64	-0.13	-0.23	0.67	0.10	0.06
Loan/Deposit Ratio	ABC	-	-	0.25	0.20	-0.28	-0.11	-0.09
	BOC	-	-	-0.18	0.14	-0.12	0.14	-0.05
	CCB	-	-	0.03	-0.22	0.26	-0.01	0.03
	ICBC	-	-	0.08	0.05	-0.40	-0.08	-0.01
NPL Ratio	ABC	-	-	-	0.11	0.00	-0.66	-0.31
	BOC	-	-	-	0.08	-0.04	-0.81	-0.26
	CCB	-	-	-	0.13	-0.01	-0.75	-0.50
	ICBC	-	-	-	0.12	-0.04	-0.60	-0.62

Table 4b. Correlation Coefficients for the Region-Specific and Macroeconomic Variables

	SOE Share	GDP Ratio	Inflation Rate	M2 Growth Rate
SOE Share	1	-	-	-
GDP Ratio	-0.22	1	-	-
Inflation Rate	0.17	-0.04	1	-
M2 Growth Rate	0.16	-0.04	0.94	1

the 10% for ABC in the differenced regression but insignificant in the original regression. With only BOC evincing a significantly negative reaction to this variable, there seems to be an overall tendency for banks to lend more to richer provinces. There are significant positive responses to M2 growth for three of the four banks (only BOC revealing no significant response at all) and the only significant responses to inflation are negative – uniformly so in the case of ABC and also in the differenced regression for ICBC. Finally, higher levels of funds on deposit are associated with significantly higher loan-to-deposit ratios for CCB – but similar initial results for ABC and ICBC did not prove to be robust to the re-estimation with the dependent variable in first difference form.

The above results do not allow responses to the individual right-hand-side variables to change over time, however. Given that the raw data depicted in Fig. (**1**) suggest a sustained downtrend in the loan-to-deposit ratio over our post-1994 sample period, we wish to allow for ongoing effects of such events as the 1998 freedom from the government's credit plan and the additional policy moves that paved the way for the public listings of BOC, CCB and ICBC discussed above. Significant time trend effects have previously been observed by Jia [23], who finds evidence of improving SOCB loan/asset and deposit/loan ratios over the course of his 1994-2004 sample period. We allow for generalized parameter "drift" over our sample period by adding a full set of time trend interactions to our model. Each of these extra terms represents the original right-hand-side variable multiplied by the time trend. This procedure was suggested by Farley, Hinich [33] as an alternative way of testing for shifting slope coefficients over time and, unlike standard dummy variable and Chow tests, provides for a change that occurs gradually over the sample period (see also ref. [34]). The results of adding the set of time trend interactions to the model are presented in Table **6** and the overall significance of these extra variables is confirmed by the F-test statistics reported at the bottom of the table. As before, the ABC and ICBC equations were re-estimated with the dependent variable in first difference form.

In Table **6**, we see that the baseline response to the SOE output share remains positive and significant for ABC while insignificant (but generally positive in sign) for BOC, CCB and ICBC. There is evidence of a significantly declining

Table 5. Factors Influencing the Big Four Banks' Lending Behavior, 1994-2005

	ABC		BOC	CCB	ICBC	
	(1)	(2)	(1)	(1)	(1)	(2)
SOE Share	0.38**	0.49***	1.14	-0.16	0.08	-0.27**
GDP Ratio	0.04	0.06*	-0.60***	0.15**	0.10**	0.07**
Deposits	0.0007***	0.0003	-0.0008	0.002***	0.0003***	-0.0002*
Inflation Rate	-1.30***	-0.88**	1.52	0.21	-0.10	-0.53***
M2 Growth Rate	-0.05	1.40***	-0.22	0.66**	0.36*	0.558***
Trend	-0.05***	-0.01	0.004	-0.04***	-0.04***	0.003
Constant	1.07***	-0.49***	1.08*	0.67**	0.89***	-0.11
R-Squared	0.44	0.13	0.31	0.26	0.73	0.16
Hausman Test	11.01*	--	25.69**	43.62***	17.13***	28.57***
Test for Serial Correlation	20.88***	1.13	0.74	0.69	123.0***	0.72
Number of Observations	368	337	338	369	327	298

Notes:
*, **, and *** denote significance at the 10%, 5%, and 1% critical levels, respectively, based on robust standard errors; The Hausman test is for the applicability of fixed effects *vs* random effects, with significant values supporting the selected fixed effects model (in the one case where the test statistic is not reported this reflects the data failing to meet its asymptotic assumptions); and serial correlation is tested based on the Wooldridge test procedure designed for panel data.
Dependent Variable = loan/deposit ratio in (1) and first difference of this ratio in (2).
Estimation Method = panel with fixed effects.
Sample Period = 1994-2005.

response to the SOE share over time in the case of CCB. Positive and significant baseline responses to the GDP ratio are seen in the first difference specifications for ABC and ICBC. Although BOC features a negative and significant baseline reaction to the GDP ratio, the significant positive time trend interaction effect remains consistent with more lending to richer provinces over time. In contrast, the negative time trend interaction for ICBC (in the differenced regression) actually suggests a movement in the other direction. Meanwhile, the baseline response to deposit levels is negative for ABC and ICBC but then tends to increase over time in each case. There is also a positive baseline response to deposits in the case of CCB that is significant at the 10% level. Finally, the results suggest that ICBC's response to both inflation and money growth may have increased over time – and ABC also shows some evidence of this in the case of the time trend interaction with inflation.

The Table **6** results yield some evidence that lending by BOC may have become less redistributive over time as the constraints of the old credit plan were relaxed. While the apparent overall tendency for ABC and ICBC to lend more to richer provinces in the Table **5** results also receives some support in the baseline responses in Table **6**, the suggested trend in ICBC's case actually suggests more redistributive lending over time. With regard to CCB, the significant positive response to the GDP ratio in Table **5** is not maintained in any way after the addition of the time trend interactions. Both sets of results consistently point to a continued role for SOEs in influencing ABC's provincial loan allocations. There is therefore only limited empirical support for a broad-based change in strategy over our sample period. Our ability to pick up such a change is, of course, restricted by the limitations on the available data and the aggregation required by our panel data approach. Another difficulty is posed by the sheer number of regulatory changes and policy interventions over our relatively short sample period that, while making the application of individual dummy variables impractical, may also interfere with our ability to identify their effects *via* the simple generalized parameter drift posited in our Table **6** results.

CONCLUSIONS

The reallocation of funds to richer provinces seemed, based on the raw data presented earlier in Table **2**, to be most dramatic for CCB over the post-1994 period. Although our econometric analysis offers some support for ABC, CCB and ICBC, on average, allocating proportionately more loans to richer provinces, the indicated effects for CCB, and to some extent ICBC, are called into question by the results of adding time trend interaction terms to the model. Only in the single case of BOC is there any support for lending becoming less redistributive over time. Moreover, in ABC's case, evidence of continued SOE lending implies that any evolution in bank business practices remained, at best, incomplete over our 1994-2005 sample period. When time trend interactions are included, CCB alone evinces a declining degree of SOE lending over time – which is, in turn, consistent with this SOCB lending more to richer provinces (given the negative correlation between provincial GDP and the SOE share of provincial industrial production). We also find some mixed evidence of significant effects on the loan-to-deposit ratio associated with the level of available deposits and some indications that the importance of money growth and inflation increased over time for ICBC and, to a lesser extent, ABC.

The absence of more clear-cut, consistent evidence supporting broad-based changes in SOCB behavior over our

Table 6. Estimation Allowing for Time Trend Interactions

	ABC		BOC	CCB	ICBC	
	(1)	(2)	(1)	(1)	(1)	(2)
SOE Share	0.35**	0.70***	0.71	0.39	0.14	-0.006
GDP Ratio	-0.04	0.12*	-0.56***	-0.04	0.11	0.24***
Deposits	-0.006***	-0.002**	-0.004	0.005*	-0.0012***	-0.0005
Inflation Rate	-2.75***	-1.83*	-2.06	1.96	0.42	-0.55
M2 Growth Rate	1.52	1.53	4.10**	-2.07	-0.88	-0.73
SOE x Trend	-0.01	-0.02	0.01	-0.10**	0.01	-0.006
GDP Ratio x Trend	0.01***	-0.002	0.66*	0.01	-0.0004	-0.008**
Deposits x Trend	0.0004***	0.0002**	0.0002	-0.0003	0.0001***	0.00003
Inflation x Trend	0.10	0.18*	0.50	0.01	-0.04	0.17**
M2 Growth x Trend	-0.25	0.01	-0.48	0.37	0.18*	0.22***
Trend	-0.02	-0.004	0.02	-0.07*	-0.08***	-0.03**
Constant	1.14***	-0.54**	0.54	1.00*	1.20***	-0.13
R-Squared	0.50	0.15	0.34	0.32	0.75	0.25
Number of Observations	368	337	338	369	327	298
Joint Significance of Time Trend Interactions (F-tests)	9.86***	1.96*	2.39**	2.40**	3.46***	7.05***

Notes:
*, **, and *** denote significance at the 10%, 5%, and 1% critical levels, respectively, based on robust standard errors.
Dependent Variable = loan/deposit ratio in (1) and first difference of this ratio in (2).
Estimation Method = panel with fixed effects.
Sample Period = 1994-2005.

sample period apparently supports the rather pessimistic view that little has changed in practice [7, 12]. We must bear in mind, however, that our sample period largely predates the transition of three of the four SOCBs to joint-stock companies. There would, of course, be no way for our empirical work to identify any more recent shifts in behavior associated with these major organizational changes and nascent competition from the foreign banks now operating in China. Further moves toward commercial banking structures are in the offing. Not only did China Development Bank become the first of the three policy banks to initiate commercialization reform and restructuring in 2008 but also ABC's governor Xiang Junbo announced a plan to offer shares to the public by 2010 [35]. Meanwhile, overall NPL ratios among the SOCBs have continued to decline, falling from 10.5% at the end of 2005 to 9.22% at year end 2006 and 8.05% at year end 2007. When more data are available, it will be interesting to see whether the latest reforms are associated with a clearer shift in SOCB behavior than that evident after 1998.

ACKNOWLEDGEMENTS

An earlier version of this paper was presented at the Asia-Pacific Economic Association annual conference in Kowloon, Hong Kong, July 25-26, 2007. The authors thank session participants and an anonymous referee for helpful comments.

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Received: March 20, 2008 Revised: April 8, 2008 Accepted: May 5, 2008