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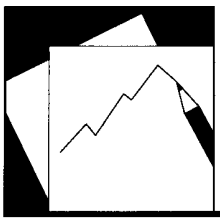

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Interest Rate Liberalization in China

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Abstract

What might interest rate liberalization do to intermediation and the cost of capital in China? China's most binding interest rate control is a ceiling on the deposit rate, although lending rates are also regulated. Through case studies and model-based simulations, we find that liberalization will likely result in higher interest rates, discourage marginal investment, improve the effectiveness of intermediation and monetary transmission, and enhance the financial access of underserved sectors. This can occur without any major disruption. International experience suggests, however, that achieving these benefits without unnecessary instability, requires vigilant supervision, governance, and monetary policy, and a flexible policy toolkit.

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I. INTRODUCTION

Financial liberalization can provide many benefits. By allowing for the better pricing of capital and risk, liberalization improves the allocation and efficiency of investment (Abiad, Oomes, and Ueda, 2004). A larger share of intermediation would be undertaken by more efficient banks and those better at assessing risk. More credit would also flow to sectors previously underserved. The range of financial products should also expand, allowing firms and households to better manage risk, and providing them with portfolio diversification opportunities. However, if attempted prematurely, financial liberalization may also expose weaknesses in the financial sector, inhibiting intermediation and creating economic volatility. In this paper we ask what impact interest rate liberalization, a central part of any broader financial liberalization, will likely have on China's banking system.

China has already made substantial progress in liberalizing its financial markets, and its interest rates in particular. After years of reform, however, there still remains a floor on bank lending rates and a ceiling on deposit rates. The deposit rate ceiling, in particular, appears to bind, as deposit rates have remained clustered at their benchmark, and real deposit rates have on average been zero.

Interest rate controls perpetuate important distortions in the Chinese economy. First, households are not appropriately compensated for their savings, and their financial income as share of total income remains one of the lowest in the world. Second, the large administratively determined interest margin provides little incentive for banks to become more efficient and improve intermediation and risk pricing. Third, credit constraints put in place to limit credit growth (since interest rates do not serve that function) create an environment where banks channel funds to large and well-connected enterprises, away from small- and medium-sized enterprises and households. And fourth, the lack of market-determined interest rates robs the People's Bank of China of critical information on macroeconomic and liquidity conditions.

We investigate the likely impact of reform using two different approaches. First, we develop and calibrate an oligopoly model of the banking system (Section II). Using this model, we study the likely impact of interest rate deregulation (Section III). Similar model based approaches have been applied to the study of deregulation in other markets (see Bushnell, Mansur, and Saravia, 2004; and Kopsangas-Savolainen, 2003, for electricity reform examples).

The model simulations show that liberalization results in a higher cost of capital, a lower volume of lending, and more effective monetary policy transmission. All of this may occur without harming the soundness of the banking sector, and indeed the efficiency of the system as a whole is enhanced. Smaller banks, in particular, benefit from liberalization. By opening a further channel for competition, small banks are able to attract additional deposits and expand their operations. Large banks scale back their deposit bases as funding costs rise. Freer deposit rates also enhance the impact of a given change in targeted interbank rates on deposit and lending rates, as well as on intermediation activity. The banking system remains

sound even in the face of greater competition after liberalization, despite somewhat narrower deposit-loan rate margins.

Our second approach—the discussion of a series of case studies—asks what the experience of interest rate liberalization in other countries may imply for China (Section IV). The experience of other reformers highlight a number of preconditions for successful reform, including macroeconomic stability, sound bank governance and supervision, and appropriate monetary policy in the face of any excessive demand after reform. Liberalization is likely easiest when the controls are relatively less binding, and the private sector's credit demand is unlikely to jump after reform. These preconditions would seem to be broadly in place in China. Nonetheless, both banking supervision and monetary policy will need to remain vigilant particularly in the early stages following liberalization. Following the loss of direct control over deposit (and lending) rates, the PBC will also have to rely more on indirect monetary policy tools.

II. A Model of China's Banking Sector

In this section we develop a model to capture the main characteristics of the banking sector in China. The model allows for banks to have different sizes, across both their deposits and loans. It also allows banks to operate with both increasing and decreasing returns to scale, and have different levels of profitability. These assumptions are consistent with banks having market power despite competing against each other (a finding of Feyzioğlu, 2009). Specifically we model banks as oligopolists, in the sense that each bank chooses lending and deposit taking activity in a way analogous to Cournot competition commonly described in industrial organization (see Freixas and Rochet, 2008, for a broader treatment of banking sector models).

A. Baseline Oligopoly Model

We assume there are n banks in the economy, in which bank i chooses how many deposits (D_i) it needs and how many loans (L_i) to make. Against these deposits banks are required to hold a share α as reserves. The banks face an aggregate supply curve for deposits and demand curve for loans, which depend on the deposit and lending interest rates, respectively. The aggregate supply curve for deposits and demand curve for loans are denoted as $r_D(D)$ and $r_L(L)$, respectively, where:

$$D = \sum_{i=1}^{n} D_i$$

$$L = \sum_{i=1}^{n} L_i \quad .$$

Deposits are either lent to enterprises or households at an interest rate r_L, or lent to other financial institutions through an interbank market at an interest rate r (once reserve requirements are accounted for). We assume, for simplicity, that required reserves and any government bonds that a bank holds are remunerated at the interbank rate, r. Depending on the central bank's operating procedure, the interbank rate may reflect their policy target. In

this case, the central bank absorbs or injects any liquidity required to maintain this rate. On the other hand, the interbank rate may be endogenously determined reflecting the demand for interbank funds (by nonbanks and the central bank) given the level of deposits and loans in the system. In either case, banks take the rate, *r*, as given.

Each bank faces a cost function that depends on its volume of deposits and loans, as well as some fixed cost. We assume additive cost functions across deposits, loans and bank overheads (i.e., we abstract from economies of scope across lending and deposit taking activities). Deposit and loan management costs are denoted by $d_i(D_i)$ and $l_i(L_i)$, respectively, while fixed costs are denoted by F_i.

If lending and deposit rates are unregulated, then each bank, *i*, solves the following profit maximization problem:

$$\max_{D_i, L_i}[r_L(L_i + \sum_{j \neq i} L_j) - r]L_i + [r - r_D(D_i + \sum_{j \neq i} D_j)]D_i - d_i(D_i) - l_i(L_i) - F_i \qquad (1)$$

Subject to

$(1-\alpha) D_i \geq L_i$, with an associated multiplier λ_i.

The solution can be characterized by the following conditions:

$$0 = -r'_D(D_i + \sum_{j \neq i} D_j)D_i + r - r_D(D_i + \sum_{j \neq i} D_j) - d'_i(D_i) + (1-\alpha)\lambda_i \qquad (2a)$$

$$0 = r'_L(L_i + \sum_{j \neq i} L_j)L_i + r_L(L_i + \sum_{j \neq i} L_j) - r - l'_i(L_i) - \lambda_i \qquad (2b)$$

$$0 = \left((1-\alpha) D_i - L_i\right)\lambda_i, \lambda_i \geq 0 \qquad (2c)$$

Without reserve requirements, lending and deposit decisions are independent, given the separable nature of banks' costs across loans and deposits. However, the two can become linked when banks are required to hold reserves. If the reserve requirement is binding (and its shadow price positive, $\lambda_i > 0$), the requirement acts as a tax on lending (of size λ_i), and a subsidy on deposit taking ($(1-\alpha)\lambda_i$), thereby reducing lending and increasing deposit volumes. Nonetheless, deposit and loan volumes primarily depend on the marginal costs of deposit taking and lending, respectively. Therefore, market shares in both the deposit and lending markets are primarily dependent on the relative marginal costs across banks, facts we use in our calibration of the model discussed below. While the banks with lower marginal cost have larger market shares, these banks need not be the most profitable, depending on the extent of the bank's fixed costs.

When banks are subject to *binding* deposit or lending rate regulation, say a regulated deposit rate level or a binding ceiling, then they act as a price taker in that market. In the case of ***deposit rate regulation***, with $\overline{r}_D$ the binding regulated deposit rate, the banks' deposit taking decisions are characterized by the condition:

$$0 = r - \overline{r}_D - d'_i(D_i) + (1-\alpha)\lambda_i, \qquad (3a)$$

replacing equation (2a). The main difference is that the marginal revenue associated with deposits ($r - \overline{r}_D$) no longer varies with the volume of deposits held. However, if this is the only regulation binding then the lending decision is still characterized by equation (2b), and, hence, deposit rate regulation only affects liquidity through deposit volumes. Since lending decisions are relatively unaffected, there will be less "excess" liquidity in the interbank market available for government bond purchase or other nonbank participants if the regulated deposit rate is held at a level below its equilibrium.

In the case of ***lending rate regulation***, with $\overline{r}_L$ the binding lending rate, the banks' lending decisions are characterized by the condition:

$$0 = \overline{r}_L - r - l'_i(L_i) - \lambda_i, \qquad (3b)$$

replacing equation (2b). As with deposit rate regulation, the main difference is that the marginal revenue associated with loans ($\overline{r}_L - r$) no longer varies with the volume of lending, and lending rate regulation only affects liquidity through lending volumes.

If both ***deposit and lending rate regulations bind jointly***, then conditions (3a) and (3b) replace their analogous conditions in equation (2). In this case, it is not clear in how "excess" liquidity in the interbank market is affected.

The model is complete once the interbank market is included. The central bank can target the interbank rate or allow it to be determined endogenously by the liquidity in the market. Regardless of the central bank's operating target, the interbank market clears only if the supply of funds (from deposits) into the banking system equals the call on these funds (from bank lending, the net issue of government and central bank paper, and the net demand for funds by nonbank interbank market participants). Denoting the net bank holdings of government and central bank paper by B, and the net demand for funds by nonbanks by $N(r)$, the interbank market clears if :

$$D = L + B + N(r). \qquad (4)$$

If interest rate regulations do not artificially lower the deposit rate or raise the lending rate, then the level of deposits and loans reflect the decisions of the commercial banks (i.e., $D = \sum_i D_i(r_D, r)$, and $L = \sum_i L_i(r_L, r)$ from equations (2a) and (2b)), and so the volume of deposits and loans in the system partially depend on the interbank rate. If interest regulations are binding, the level of deposits in the system reflects the (fixed) supply at the regulated deposit rate and the level of loans reflects the (fixed) demand at the regulated rate.

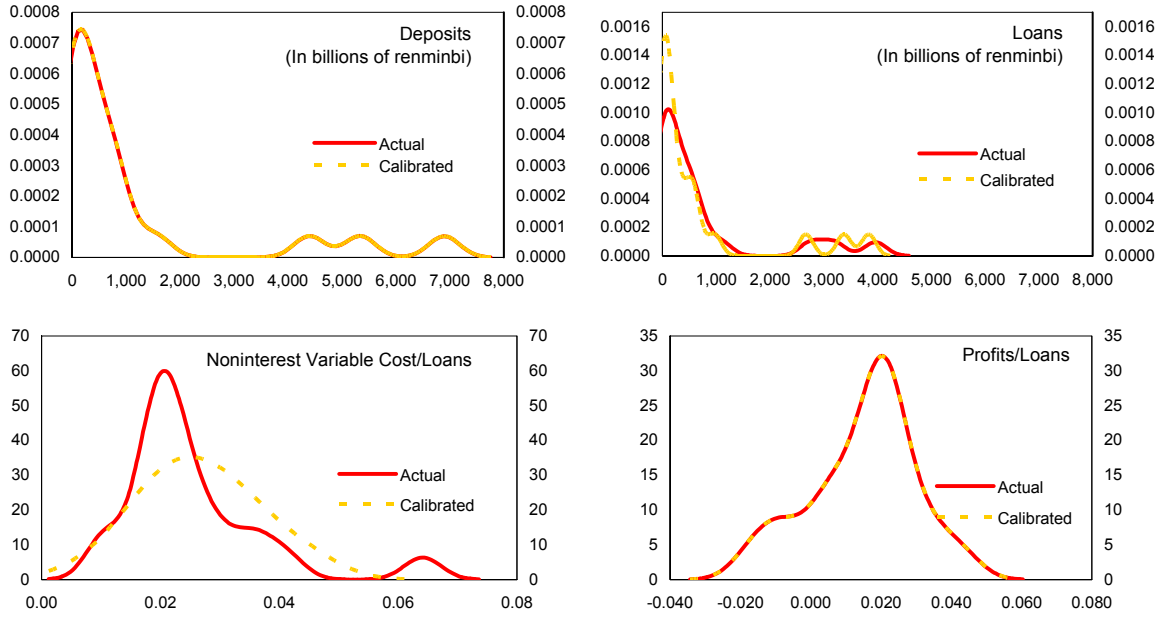
B. Calibration

To draw relevant implications from the model we calibrate it specifically to reflect the behavior of China's banking sector. Parameters are chosen in a way that matches the implied behavior of the banking system in the model as closely as possible with the observed

behavior of the Chinese banks. Key dimensions chosen to calibrate the model along are the loans, deposits, profits, and costs of 20 of China's largest banks (in 2007).[1] The calibration also assumes that while the deposit rate ceiling is binding, the lending rate floor is not. The floor on lending rates is probably no longer binding on many (especially marginal) borrowers (even if it may be on those with near-sovereign risk characteristics), as less than one-third of loans are offered at the lending rate floor. The details of this calibration procedure are described in the technical appendix.

The calibrated model is able to replicate the distribution of loans, deposits, profits and costs across banks fairly well (Figure 1). In particular, bank-by-bank deposits and profits are matched exactly. The broad properties of the distribution of loans—i.e., its multiple mass points and highly skewed nature—is also closely replicated. The model can also capture the variable costs of the majority of banks, but has some difficulty accounting for those of the highest cost banks.

Figure 1. Bank Intermediation and Profitability: Actual and Calibrated Distributions



Sources: Bank reports; and staff estimates.

With this model calibrated, we can then study the impact on the banking sector and intermediation of liberalizing the deposit rate. The model also allows us to study how liberalization changes the way in which monetary policy feeds through to interest rates, and lending and deposit decisions, as well as ask how the impact of reform differs if banks compete more or less aggressively than assumed under oligopoly.

[1] Note that the Agricultural Bank of China was excluded from the exercise given its ongoing restructuring.

III. How May Interest Rate Liberalization Change Chinese Banking?

With the calibrated model capturing the main patterns of intermediation and efficiency in Chinese banking, we can now apply the model to investigate the impact of deposit rate liberalization. Given that the impact of interest rate liberalization may depend on central bank operations, we consider three different assumptions: (i) the central bank operates monetary policy by targeting the interbank (IB) rate (holding it constant); (ii) the central bank targets a spread over the now endogenously determined deposit rate; and (iii) the central bank is relatively passive, and allows the interbank rate to endogenously clear the interbank market given the new lending and deposit rates.

In the rest of the section, we describe the impact of liberalization given these different assumptions for central bank behavior. Specifically, we ask four questions: (1) What is the impact of liberalization on intermediation? (2) Does the central banks' operating target significantly affect the impact of reform? (3) What implications does liberalization have for the effectiveness of monetary policy? (4) How does the impact of liberalization depend on the extent of competition?

A. The Impact of Liberalization

Intermediation and Banking System Soundness

Liberalizing the deposit rate allows banks an additional channel to compete for deposits, and therefore fund their lending operations. The model-based results, as shown in the empirical distributions once the deposit rate cap is eliminated (Figure 2), shows that banks would likely take full advantage of this additional channel, with smaller banks offering higher deposit rates to increase their size. The larger banks shrink their deposit bases to reduce costs as the deposit rate increases, although the ultimate extent to which deposits shrink is limited by the need for liquidity to meet reserve requirements. As a result, concentration in the deposit market falls. The impact on the distribution of lending is smaller than on that of deposits as the lending market had already been largely liberalized, and the migration of deposits away from the largest banks has only modest effects on lending since these banks were highly liquid already. On average, profitability (as a share of loans) changes little (see Table 1), but that disguises lower profits at large banks offsetting higher profits at smaller ones. On net the deposit rate rises sufficiently to bring additional deposits into the system, and loan rates and the cost of capital increase thereby reducing the volume of lending undertaken. Although the share of deposits at banks making losses increases slightly (never above 3¾ percent), this reflects a bank that has high calibrated fixed costs but relatively low marginal costs, as the number of loss making banks falls.

These trends are consistent across central bank operating procedures (Table 1). The resulting interest rates are very similar if the central bank rigidly targets the interbank rate, or is relatively more passive allowing the rate to be endogenously determined given by liquidity demand (including its own). A larger increase in the interest rate occurs if the central bank targets a constant spread of the interbank over the deposit rate, because the bidding up of the deposit rate, directly increases the interbank rate, which further increases the incentive to use deposits as a funding source, resulting in higher deposit and interbank rates.

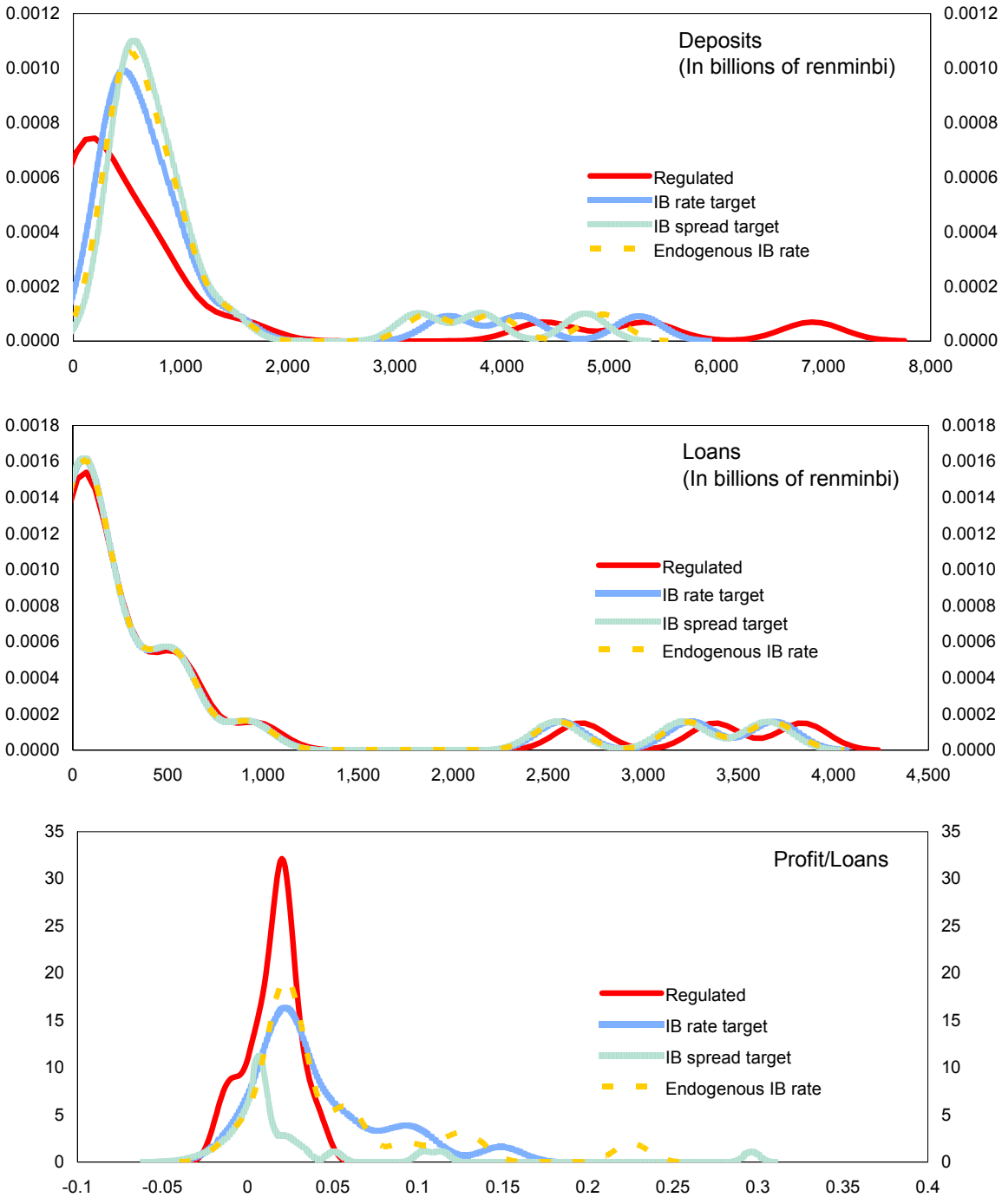
Why don't interest rates rise more after liberalization? The cost of interbank funds places an effective cap on the possible rise in deposit rates after liberalization. As banks also face some cost in managing deposits, the deposit rate should typically be below the interbank rate. Consequently, as the simulated scenario assumes little change in desired monetary conditions (as captured by the interbank rate), there can only be a limited rise in the deposit rate (up to 37 basis points), and therefore the lending rate. Nonetheless, while rates may only increase by a limited amount, liberalization does create a more direct link between the cost of interbank funds (which could be adopted as the central bank's intermediate target), lending and deposit rates, and lending and deposit volumes.

Table 1. The Impact of Liberalization on Market Outcomes

	Lending Rate	Deposit Rate	IB Rate	Profit Rate 1/	Deposit Share of Unprofitable Banks	Market Concentration	
						Lending 2/	Deposit 2/
Calibration	8.31	3.36	3.73	2.28	3.04	0.19	0.19
Target IB rate	8.65	3.62	3.73	2.19	3.53	0.19	0.12
Target IB spread	8.72	3.64	4.00	2.44	3.73	0.19	0.10
Endog. IB rate	8.67	3.61	3.72	2.23	3.66	0.19	0.11

1/ In percent of loans.
2/ As measured by the Herfindahl-Hirschman index. A larger value indicates higher concentration.

Figure 2. What Does Liberalization Do to Intermediation and Bank Profits?



Source: Staff estimates

Monetary Policy

Interest rate liberalization enhances the effectiveness of indirect monetary policy and interest rates as price signals. The effectiveness of monetary policy after reform is a major question, with China's quantity-based monetary policy already effective under regulation. Can policy be as effective after reform? Table 2 compares the impact of monetary policy actions through interbank rate targets and changes in reserve requirement (relative to our baseline case described above) when deposit rates are liberalized and when they are not. Although Table 2 only presents the results for the case where the central bank has a strict interbank rate target, the results are much the same if the interbank rate is endogenously determined (and the central bank's target is less strictly perused).

Monetary policy, especially through indirect monetary policy instruments, would likely be highly effective after interest rate liberalization. A given change in an IB rate target results in a larger feed-through to the lending and deposit rates when the deposit rate is liberalized. For example, the simulations suggest that tighter policy—through a 50 basis point increase in the targeted interbank rate—results in a larger increase in borrowing and lending rates when interest rates are liberalized. This is because when interest rates are liberalized, the increase in the target interbank rate results in additional demand for deposits and therefore a higher deposit rate. With all funds more costly, banks restrict lending and so the lending rates are further forced up. Although banks would like to respond to a higher interbank rate by attracting additional deposits, they cannot do this when the deposit rate is capped, and so the cost of funds, and ultimately the lending rate, is lower. The larger change in interest rates means, however, that the central bank will need to undertake larger intervention in the money market to achieve its target when the deposit rate is free. Consequently, quantity based monetary policy remains more effective in the regulated environment when deposits are unresponsive. Conversely, the impact of indirect monetary policy is greater when policy is loosened, either through a lower target IB rate or lower reserve requirement, if the deposit rate is able to fall.

Table 2. Monetary Policy Impact

(In percentage point deviation from baseline)

	Liberalized Deposit Rate			Regulated Deposit Rate 1/		
Monetary Policy Target	Lending rate	Deposit rate	IB rate	Lending rate	Deposit rate	IB rate
Target IB rate: +50 bps	0.34	0.31	0.50	0.23	0.00	0.50
Target IB rate: −35 bps	-0.34	-0.40	-0.35	-0.26	0.00	-0.35
Target IB rate: −50 bps	-0.48	-0.53	-0.50			
RR reduced (15% to 7.5%)	-0.30	-0.18	0.00	-0.12	0.00	0.00

1/ To show the two sided impact on monetary policy of interest rate regulation, we assume in this table that the level of the deposit rate is regulated (rather than its ceiling). Consequently, the central bank cannot lower its target rate more than 37 bps if the deposit rate is held constant, as it is only 37 bps above the deposit rate in the baseline simulation.

Market Behavior

The nature of underlying market behavior may substantially change the impact of reform. To investigate this, we consider two polar extremes: one where after liberalization banks compete aggressively, and one where they collude. In the first case, margins will be squeezed and intermediation expands, while in the second, margins rise as intermediation is curtailed. The simulated impact on interest rates and other banking system indicators appear in Tables 3 and 4, with the distributional impact on intermediation and profits shown in Figure 3.[2]

As expected, greater **competition** leads to a large expansion in lending and deposit taking. As a consequence, deposit rate is bid substantially higher and, as the cost of funds increases, so does the lending rate. While interest rates are higher, banks margins are lower, profitability falls, and the share of deposits in loss making banks rises slightly. Nonetheless, by far the majority of the banking industry remains profitable. Defining bank failure by cases where costs are too high at prevailing interest rates to support positive lending, only one bank fails in open competition (and it account for less than 1 percent of system deposits). Despite the open competition, measures of market concentration actually rise, however, as the largest banks are the ones that expand their operations the most.

If banks were to **collude**, they find it profitable to scale back their operations to increase margins. As they limit their lending activity, they also reduce their demand for deposits. As deposit supply is highly inelastic, they can force the deposit rate down significantly with a relatively small loss of deposits. If banks collude, "liberalization" leads to lower deposit rates, reflecting the extent of their aggregate market power. This result suggests that current market behavior must be far from collusive as otherwise banks would have already pushed the deposit rate well below its benchmark level. The largest falls in lending and deposit taking occurs at the largest banks (smaller banks increase their deposit share), meaning that measures of market concentration actually fall despite the collusion. Profitability is unsurprisingly much higher, and no banks make losses.

[2] Given that all three experiments have qualitatively similar impacts irrespective of the monetary policy operating rule assumed, Figure 3 only shows the distribution for the case where the central bank strictly targets the interbank rate.

Table 3. The Impact of Liberalization Under Alternate Market Behavior

(In percentage point deviation from baseline)

	Lending Rate	Deposit Rate	Interbank Rate	Margin 1/
Competition				
Target IB rate	0.3	0.9	0.0	-0.6
Target IB spread	0.4	1.3	1.0	-0.9
Endog. IB rate	0.4	1.2	2.6	-0.8
Cooperation (collusion)				
Target IB rate	-0.3	-1.0	0.0	0.7
Target IB spread	-1.7	-1.8	-1.9	0.1
Endog. IB rate	-1.0	-1.4	0.2	0.4

1/ The margin is the difference between the lending and deposit interest rates.

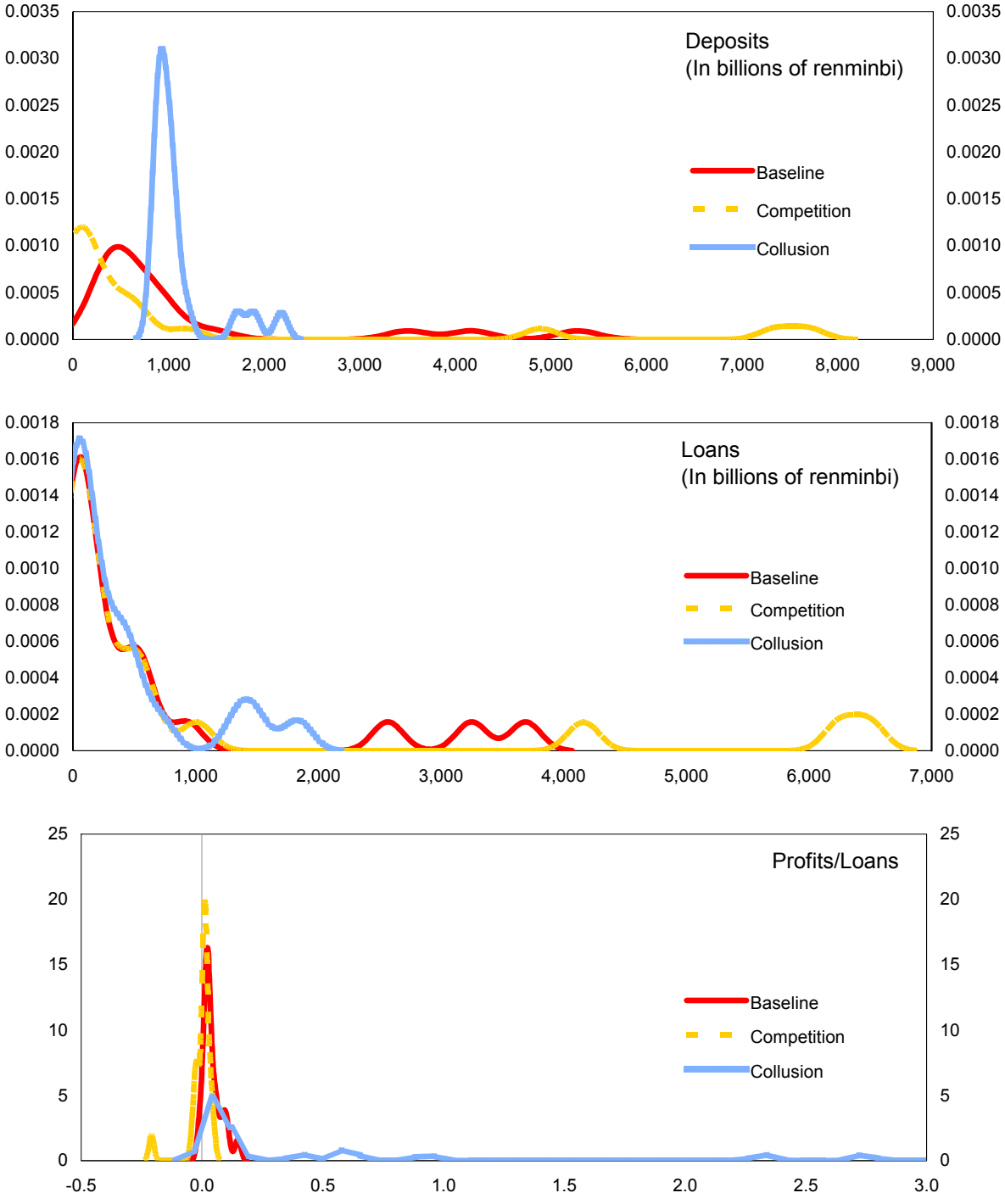
Table 4. The Impact of Liberalization Under Alternate Market Behavior

(In percentage point deviation from baseline)

	Profit/Loans	Unprofitable Banks (Deposit share)	Market Concentration	
			Lending 1/	Deposits 1/
Competition				
Target IB rate	-1.4	0.2	0.05	0.11
Target IB spread	-1.7	0.5	0.05	0.11
Endog. IB rate	-1.7	1.4	0.05	0.11
Cooperation (collusion)				
Target IB Rate	3.8	-3.5	-0.04	-0.06
Target IB Spread	1.4	-3.7	-0.03	-0.03
Endog. IB rate	3.8	-3.7	-0.04	-0.05

1/ As measured by the Herfindahl-Hirschman index. A larger value indicates higher concentration.

Figure 3. How Does Market Behavior Change Intermediaton and Bank Profits?



Source: Staff estimates.

B. Robustness

Underlying these simulations were assumptions on the interest rate elasticity of loan demand and deposit supply. The above simulations assumed that the elasticity of deposit supply was small (0.2) based on estimates in Ho (2008) and the limited investment options individuals have, while the elasticity of loan demand is assumed somewhat larger (-1). The broad picture painted above does not really change even for sizable changes in these elasicities:

- **Deposit Supply**—If the elasticity of deposit supply more than doubles (rises either to 0.5 or 1) then deposit rates increase by less than under deregulation. The larger elasticity means banks have to offer a smaller increase in interest rates to achieve a given change in deposits volumes. The deposit and lending markets end up being less concentrated also, as smaller banks expand their presence by more than in the baseline presented.

- **Loan Demand**—The results are largely unchanged if loan demand becomes more elastic, but do not change if demand is sufficiently less elastic. Banks become significantly more profitable after reform if loan demand becomes less elastic (falling to -0.5), reflecting the greater market power banks would hold. Given this power and their lending decisions, banks would even be able to reduce the deposit rate (meaning that at this elasticity, the deposit cap was not binding). If loan demand becomes more elastic (rising to -2), then this loss of market power translates into a smaller increase in the lending rate (and marginally higher deposit rate) after reform. The share of deposits at loss-making banks is also higher (5.5 percent), although none fail after reform, and measures of market concentration increase.

How does the impact of reform change in the lending rate is initially binding? In this case, the dual liberalization of both markets results in much tighter margins, as reform results in the deposit rate rising and lending rate falling. On balance, both deposit and lending volumes rise above their regulated levels. Simulations of our model (not reported) suggests lower market concentration in both markets, but despite lower profits, banks generally remain sound (and none fail).

IV. What Has Been the Experience with Liberalization Elsewhere?

In this section, we review some country experiences with interest rate liberalization relevant for the challenges that China faces. One key issue that comes up repeatedly in country experiences is the sequencing of interest rate liberalization. However, in China, most of the necessary steps toward liberalization have been already taken (Box 1). Nevertheless, the final step—lifting the ceiling on deposit rates and floor on lending rates—still remains. Another key issue that is of concern during a process of interest rate liberalization is the possibility that aggressive competition for deposits and market share among banks could drive down margins, lead to bankruptcies, and create the conditions for financial instability. In reviewing the country case studies, we pay particular attention to this aspect.

Most governments across the globe have controlled interest rates and credit allocation at one point in their recent history. While these restrictions were put in place to maintain financial

stability and support development, they also reduced governments' borrowing costs by imposing low interest rate ceilings (Caprio, Hanson, and Honohan, 2001). However, this financial repression led to inefficient intermediation and lower growth (Caprio, Atias, and Hanson, 1994). Most countries removed these restrictions, often after experiencing macroeconomic crises.

Box 1. Key Dates in Interest Rate liberalization in China

1996	Abolished the upper limit on interbank lending rates
1997	Liberalized repo rates
1998–2004	Gradually increased the upper limit on lending rates
1999	Begun to gradually allow different institutions to negotiate rates on over Y30 million deposits with above 5-year maturity
2000	Liberalized foreign currency lending rates
2000	Liberalized foreign currency deposit rates for deposits over $3 million
2003	Removed floor on foreign currency deposit rates
2003	Liberalized deposit rates in pound, franc, Swiss Franc, and Canadian Dollar
2004	Liberalized all foreign currency deposit rates with maturity above 1 year
2004	Removed ceiling on all lending rates (except for urban and rural credit cooperatives, which have a cap of 130 percent over reference rates)
2004	Removed floor on all deposit rates

Source: The People's Bank of China (2005).

In most cases, interest rate liberalization led to higher real interest rates, shifted surplus from borrowers to savers, and allowed those who were previously crowded out to have access to credit. In India, for example, medium-sized enterprises gained access to credit as interest rates and credit allocation were liberalized and regulation and supervision was improved significantly (Hanson, 2001). At the same time, the volatility of interest rates increased after liberalization, and so did the likelihood of a banking crisis, unless the institutional environment was strong (Demirguc-Kunt and Detragiache, 2001).

In this paper, we focus on cases where transition to a liberalized financial system was not smooth with a view to learning from the mistakes made during these transitions. We start with the case of financial liberalization in Nordic countries, which culminated in a major banking crisis. Next we look at the savings and loan industry in the United States, which, soon after interest rate liberalization, suffered a major collapse. Third, we look at the case of Turkey, which experienced excessive competition after the liberalization. Finally, we look at the two attempts to liberalize the interest rates in Korea. These case studies are informative not only for the lessons on how to accomplish interest rate liberalization but also in pointing to pitfalls that should be avoided.

A. Nordic Countries[3]

Before deregulation in 1980s, financial sectors of Finland, Norway, and Sweden had a number of important similarities to the current system in China: controls kept interest rates low and stable; credit was rationed, creating an informal market for loans; banks gravitated towards relatively safer credit risks; and competition was limited. Lending rate restrictions led to the growth of a grey market and disintermediation, but often banks supported these informal sector loans with their off-balance sheet activities (Drees and Pazarbasioglu, 1998). The financial system remained dominated by banks with money markets playing an insignificant role.

During 1978–91, these Nordic countries took a number of steps to liberalize their financial markets. They liberalized most of the interest rates during late 1970s–early 1980s. Initially, quantitative controls (including reserve requirements and at times credit quotas) were used to limit credit growth, but soon these restrictions were eased, and most external capital account restrictions were abolished.

Soon after deregulation, lending surged in all three countries (Figure 4). The ratio of loans to GDP increased from 40 percent of GDP to close to 60 percent of GDP within four years in Sweden, and similar changes were observed in Finland and Norway. This reflected the profound change in competition among banks, as well as strong economic growth. Price competition among banks increased, and a number of large banks lost their market dominance. In Norway, within a decade the large state-owned banks saw their market share in loans erode from 40 percent to 18 percent. In Sweden, nonbank financial institutions increased their share substantially from 45 percent to 60 percent. In Finland, the share of savings banks increased from 16 percent to 25 percent in a shorter period of time as they focused on more risky corporate borrowers. The increase in loans was more and more financed through funds raised in the domestic and international interbank markets, the latter facilitated by capital account liberalizations. In Norway and Finland, the loan-to-deposit ratio surged significantly above 1.

Changes in interest margins, on the other hand, were much less dramatic. While real interest rates increased in all countries, net interest margins remained stable in Sweden, but declined 60–80 basis points in Norway and Finland between 1980 and 1990. Part of the reason for lower margins was the more expensive borrowing banks were forced to raise funds abroad and in money markets.

It did not take long for a full-blown banking crisis to emerge. By late 1980s, signs of economy-wide stress became evident and by early 1990s Sweden and Finland entered one of their deepest and most prolonged recessions. Bank lending shrunk rapidly to levels before the deregulation. Private consumption did not pick up for several years, and investment collapsed.

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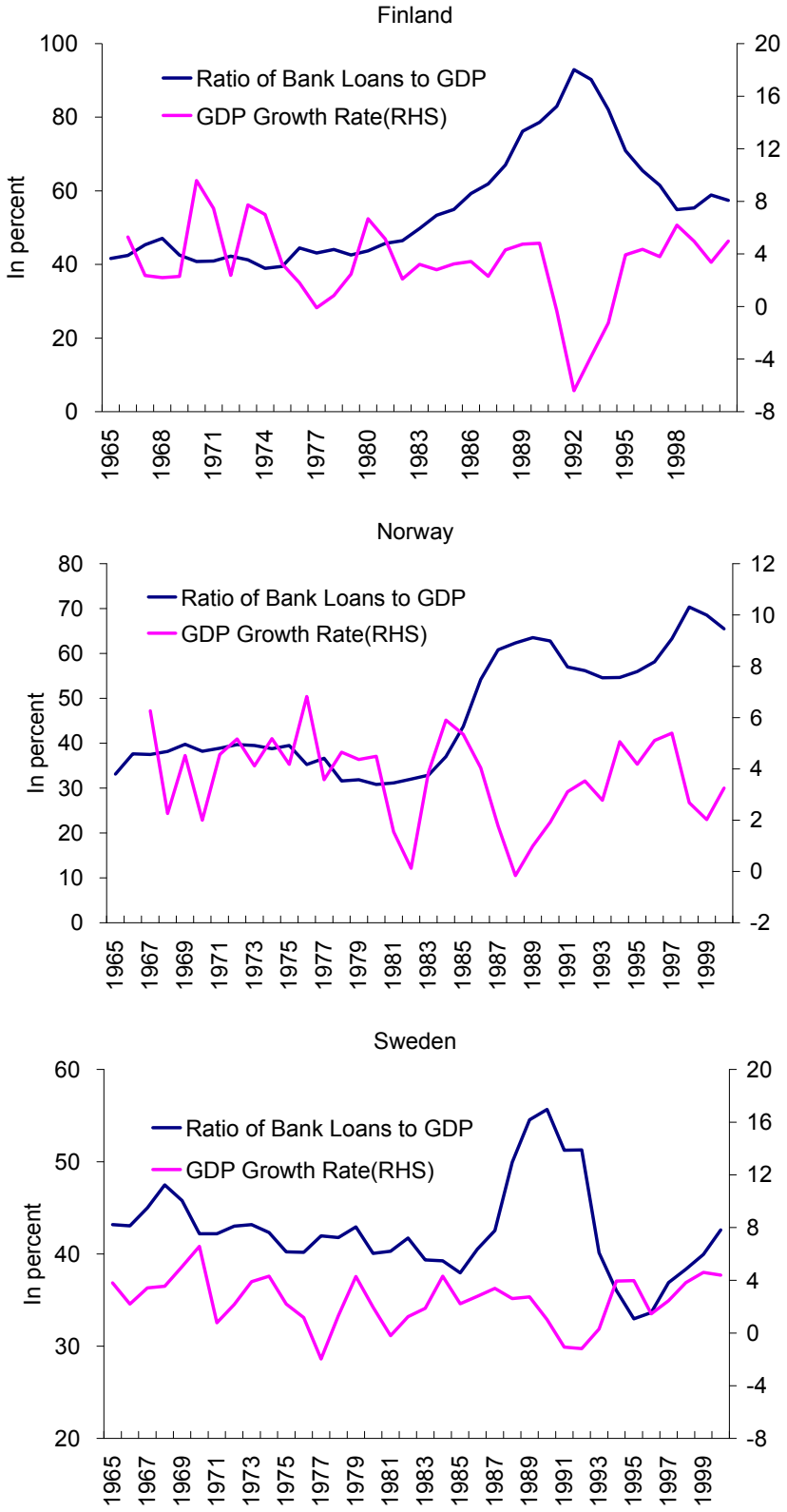
[3] Chen, Jonung, and Unteroberdoerster (2009) also apply the lessons from the Nordic experience with interest rate liberalization, including the smoother experience of Denmark, to the case of China.

Figure 4


Finland
Ratio of Bank Loans to GDP
GDP Growth Rate(RHS)
In percent
100
80
60
40
20
0
20
16
12
8
4
0
-4
-8
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
Norway
Ratio of Bank Loans to GDP
GDP Growth Rate(RHS)
In percent
80
70
60
50
40
30
20
10
0
12
10
8
6
4
2
0
-2
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
Sweden
Ratio of Bank Loans to GDP
GDP Growth Rate(RHS)
In percent
60
50
40
30
20
20
16
12
8
4
0
-4
-8
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
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1995
1997
1999

However, it would be wrong to conclude that financial deregulation led to the banking crisis. Instead, the banking crisis reflected a failure in both macroeconomic and prudential policies. There was excess demand in the economy, which was financed to an increasing extent by borrowing from abroad as capital account restrictions were relaxed. This excess demand boosted GDP growth, as well as demand for housing and housing prices rose. With constraints removed, banks became an integral part of the housing boom and the external financing of domestic demand.

Policies failed in three key areas (Davis, 1995; Berg, 1994; Koskenkyla, 1993; Drees and Pazarbasioglu, 1998; and Chen, Jonung, and Unteroberdoerster, 2009):

- prudential regulations were not strengthened to prevent banks from supporting the housing bubble;
- borrowing was actively encouraged by allowing tax deductibility of interest expenses; and
- monetary policy was not tightened to rain in excess demand, especially when loan growth had increased sharply and household indebtedness surged to unsustainable levels.

This highlights the critical role that active supervision and regulation must play in the immediate aftermath of interest rate liberalization. Bank efforts to rapidly expand their balance sheets should be scrutinized carefully. In addition, strict attention needs to be paid to how banks are financing themselves, particularly if deregulation leads to some banks heavily relying on short-term wholesale funding markets.

B. Savings and Loan in the U.S.

Savings and loan (S&Ls) institutions saw their deposit base shrinking in 1970s as the ceilings on deposit rates prevented them from competing for deposits. In 1980, the U.S. passed a law that gradually liberalized (within 6 years) the deposit rates S&Ls could offer. But a large mismatch begun to emerge as the Fed raised interest rates sharply to disinflate the economy. The S&Ls were increasingly forced to offer higher interest rates to attract deposits but on the asset side of their balance sheets they predominantly held 30-year fixed mortgages at low interest rates that were extended during the course of the 1960s and 1970s. Faced with this mismatch, S&Ls aggressively expanded new lending to real estate developments (both commercial and housing) with insufficient attention paid to the underlying riskiness of the loans (White, 1991). During the following years, more than 1,000 thrift institutions—with total assets more than $500 billion—went bankrupt. The total cost to the government and taxpayers amounted to more than $150 billion (Curry and Shibut, 2000).

As in the Nordic cases, the S&L crisis was created by regulatory forbearance and moral hazard, not by the liberalization of deposit rates. The S&Ls were already in great financial difficulty at the time interest rates were liberalized. The key reason was that they were losing their deposit base, particularly because deposit interest rates were controlled and customers were gravitating to the parts of the banking system that were less regulated. At the same time,

they were accumulating mortgages with long-term maturities at low fixed rates, in part prompted by low and stable funding costs. By the mid-1980s, as it became clear that S&L business structure was not viable, more opportunities were given to S&Ls to expand their businesses into new areas. This was combined with regulatory forbearance and weak supervision (FDIC, 1997). S&Ls were allowed to lend and invest in bonds and securities—areas where they had little expertise, and the S&L regulator did not strictly enforce capital requirements on the grounds that, with these new business opportunities available to them, the S&Ls would prosper and be able to rebuild their capital over time. Backed by deposit insurance, the S&Ls engaged in much more risky businesses, many of which turned out to be unviable, and bid up rates on deposits in order to attract funds to finance these new businesses. The total cost of the S&L debacle could have been substantially lower had there have been no regulatory forbearance and supervision were stronger.

C. Turkey

In 1980, Turkey's financial system was relatively large and had the typical signs of a repressed financial system, with interest rates determined by the government. That year the authorities lifted the restrictions on both the deposit and the lending rates and allowed the interest rates to be determined in the market. Interest rates surged rapidly as banks and brokerage firms engaged in fierce competition to attract deposits. This included large Ponzi games by brokerage firms (Saracoglu, 1996).

The events evolved very rapidly and within two years of the decision to liberalize interest rates, the financial system fell into a crisis and several banks and a number of brokerage houses collapsed. The authorities reinstated interest rate controls, but the damage was already done. There were huge losses, especially on the side of the households who lost significant share of their wealth in the financial system.

The experience with interest rate liberalization revealed the unusually weak financial infrastructure, which was the root cause of bank failures. In fact, bank supervision was so weak that capital adequacy requirement for banks did not even exist. Moreover, classification of loans and provisioning rules were inadequate and certainly not up to international standards. Also, interbank markets were not developed at all—banks did not trust each other or lend to each other because they were an integral part of different, competing large industrial groups.

The government reacted quickly to restore order to the financial system, and made important strides in improving banking supervision. It also established an interbank market. While there was still much room to improve, these changes allowed the government to liberalize the rates successfully during 1984–88. The second attempt to liberalize the interest rates did not lead to excessive bank competition or create bank bankruptcies.

D. Korea

Korea made two attempts to liberalize its interest rates. The first episode was during 1980s, when most lending rates and long-term deposit rate were liberalized, as part of a broader agenda to deregulate the financial sector. However, despite formal deregulation of interest

rates, in effect most rates remained controlled through more informal window guidance (Kim, 1996). Competition among banks increased, but this was the direct result of deliberate measures taken by the government, including lowering regulatory entry barriers, to encourage the establishment of new banks (Oh and Park (1998)). This period of deregulation did not last long, as labor-management disputes and export stagnation led to a sharp increase in interest rates, which then triggered the reinstatement of interest rate controls in 1989.

The second episode of interest rate liberalization begun in 1991 as part of a four-step deregulation program. During the first stage, short-term lending rates were liberalized, and during the second stage, most of the remaining lending rates. During the third stage, long-term deposit rates were freed up, and in the final stage (by 1997), most of the remaining deposit rates were liberalized.

Just as the final stage of the interest rate liberalization was implemented, Korea's economy begun to deteriorate sharply as the Asian crisis took hold in several economies in the region. The reasons for the crisis have been widely discussed (IMF, 1998), but none of the reasons included interest rate liberalization. Instead, inadequate supervision of financial systems and poor enforcement of prudential rules, in addition to inappropriate monetary and exchange rate policies were highlighted as some of the key factors behind the crisis. Moreover, Oh and Park (1998), among others, make the point that insufficient financial liberalization in the domestic markets and too rapid external financial liberalization were the root causes of the crisis in Korea. Lindgren and others (2000) highlight the importance of further banking reforms, rather than the reversal of reforms, as part of key measures to achieve recovery.

E. Lessons

Pace of reform. China started the liberalization process in earnest in 1996, and took gradual steps since then, but over the past five years, progress towards financial regulation has stalled with the deposit rate floors and lending rate ceilings still remaining. It is true that too rapid liberalization could lead to instability and reversal of the reforms, as was seen in Turkey and Korea. However, in those cases it is not the reform itself but rather a failure of regulation and supervision that is the key issue. Even if China takes the final steps in liberalization today, the total time span of the reform would reach 13 years, which is long by any international comparator. It is worth noting that both too rapid and too slow pace of reform could be damaging.

Timing. Macroeconomic and structural imbalances present important challenges. Removing a constraint can expose other problems in the economy, as was the case in Nordic countries, where demand was growing too rapidly and policies allowed for excessive borrowing, facilitated by a rapid liberalization of capital account restrictions. Inadequate regulatory and supervisory frameworks and poor governance in banks also have exacerbated problems in virtually in all the cases covered above. The ideal time to remove a constraint is when the constraint is less binding. An economy that is slowing down could present such an opportunity.

Supporting measures.

- **Bank regulation and supervision.** Proper regulation and supervision is the most important factor in the success or failure of interest rate liberalization. All banking crises after interest rate liberalization could be traced back to inadequate supervision or regulations not keeping up with the changing financial landscape. Removing interest rate constraints has led to more competition in almost all cases; but this competition became destructive rather than constructive when banks were allowed to enter too risky businesses and support excess demand in the economy.

- **Monetary policy.** Monetary policy also needs to be vigilant against excess demand when interest rate constraints are removed from the banking system. Often the loosening of restrictions has led to an expansion of credit (which, ultimately, was not consistent with the macroeconomic stability goals of the government). In most of the cases discussed above, monetary conditions were not tightened enough to stem the demand boom and limit inflationary pressures from an expansion of credit. In China's case, while the current economic slowdown may afford some space for an expansion of credit, such growth should be watched carefully both to ensure risks are controlled and that the resulting monetary expansion is consistent with the government's broader macroeconomic goals.

- **Policy Tools.** As direct controls over interest rates and credit quantity are replaced by indirect controls, countries have benefited from strengthening their indirect policy tools. China has also made major advances in deepening its money markets, and removing the interest rate restrictions will catalyze further development of these markets. Nonetheless, there is a need to strengthen indirect monetary policy instruments, as the use of direct interest rate and credit controls becomes less effective after liberalization, especially as markets and new products develop.

V. CONCLUSION

This paper has sketched the broad preconditions for, and likely impacts of, interest rate liberalization, a central part of broader Chinese financial liberalization. We find that China meets several of the preconditions for successful interest rate liberalization identified by the experience of other countries. Moreover, our modeling results suggest that reform should raise the cost of capital, increase the return on savings, and allow smaller, more efficient, banks to increase their role in intermediation. With capital more costly, and some marginal lending discouraged, there is likely to be an increase in the efficiency of investment. Moreover, with smaller banks expanding, it is possible that the share of lending to sectors that are currently underserved—e.g., SMEs and households—may increase. Importantly, all of these benefits are achieved without banks becoming unprofitable or failing. Even if competition is relatively aggressive, the broad market structure of the banking system is unlikely to change much from that of today. A few large banks will likely remain at the core of the system with high levels of liquidity, and a range of smaller banks will compete for

both deposits and loans, imposing competitive discipline even on the largest banks. Of central importance throughout the process of liberalization is that banking supervision and monetary policy setting remains vigilant to increasing credit risks within the system. In addition, the PBC will likely need to expand its policy toolkit and conduct monetary policy though alternate, more indirect means, rather than through quantity controls or directly setting key loan and deposit rates.

Given the nature of our modeling exercise, its scope was obviously selective. For example, we have not focused particularly on what happens to the quality of lending, or will happen after the development of new financial products. Nonetheless, liberalization would likely improve aggregate loan quality. In the first instance, marginal lending should fall, and by making it easier for banks to compete over deposits, those better at assessing risk (provided their management costs are not excessive) should find it easier to increase their share of intermediation (by offering higher deposit rates). The development of new financial products is also likely to provide both borrowers and depositors with additional options, thereby increasing competition to attract household and corporate savings. This will tend to limit the market power of banks but (based on our robustness exercises) should not result in any major disruption. The development of new products will, however, also reduce the effectiveness of quantity based monetary policy measures as money demand becomes less predictable. This would make the adoption of indirect policy instruments significantly more important.

TECHNICAL APPENDIX

Calibration

Calibration of a model makes it empirically relevant by ensuring it captures some key characteristics of relevant data. It requires a choice of both necessary functional forms and their associated parameter values. We calibrate our model to match the regulated deposit rate equilibrium with the benchmark deposit, but not the lending, rates assumed to be binding.

Functional Forms

Given the stylized structure of the model, we only have to choose the supply of deposits, the demand for loans, and the cost functions associated with lending and deposits taking for each bank. For the demand and supply functions, we choose constant elasticity demand and supply functions:

$$L = A_L^{-\varepsilon_L} r_L^{\varepsilon_L}$$
$$D = A_D^{-\varepsilon_D} r_D^{\varepsilon_D},$$

where $\varepsilon_L \leq 0$ and $\varepsilon_D \geq 0$ are the price elasticity of demand for loans and the price elasticity of supply for deposits, respectively, and A_i for $i = L, D$ are the respective constants. We choose these forms over linear forms as they are more flexible with the resulting equilibrium robust to substantial changes in the structure of banking markets if they result in significant changes in interest rates.

For cost functions we assume a quadratic form, with one bank-level fixed cost representing overheads. This should provide a reasonable approximation for the various actual cost functions. Feyzioglu (2009) finds that the production technology of particular Chinese banks ranges from increasing to decreasing returns to scale, which the quadratic form can capture. In particular, the cost of managing deposits and loans are:

$$d_i\left(D_i\right) = a_{di} D_i + b_{di} D_i^2$$
$$l_i\left(L_i\right) = a_{li} L_i + b_{li} L_i^2$$

When the model is extended to endogenize the interbank rate, we assume a net demand for interbank funds for participants, including the PBC, that are not commercial banks. Their position in equilibrium is simply the difference between deposits and loans, and they are assumed to have a constant elasticity net demand cure: $N\left(r\right) = A_{IB}^{-\varepsilon_{IB}} r^{\varepsilon_{IB}}$.

Parameter Values

Parameters are chosen to reflect the empirical characteristics of China's banking sector in 2007. We use balance sheet and profitability data for 20 of the largest banks for 2007.[4] These banks represent around 60 percent of total loans and deposits in the banking system. In particular, we use data on bank-by-bank deposits and loans, net interest income (interest revenue less interest expenditure), total and "other" non-interest expenditure. We proxy non-interest variable costs by total less "other" non-interest expenditure, and total profits by net interest income less non-interest expenses.

Parameters for the demand and supply curves can be chosen using past elasticity estimates and aggregate market information. Since we know aggregate lending and deposits and average interest rates, we can solve for the constant terms in (1) and (2). In particular, based on Ho (2008) we choose a low elasticity for deposits of 0.2. Loan demand in China are likely to be more elastic, and so we have chosen a larger elasticity of -1. Given these elasticities, we choose the constants in the deposit supply function and loan demand function to be consistent with average implied interest rates from the activities of the 20 banks in our sample during 2007:

$$A_L = r_L L^{-\frac{1}{\varepsilon_L}} \text{ and } A_D = r_D D^{-\frac{1}{\varepsilon_D}}.$$

To choose the cost function parameters, we rely on the fact that lending and deposit market shares are highly dependent on the marginal cost terms. We also use information on the banks' non-interest costs for 2007. In particular, we use our proxies for non-interest variable cost, and total profits to choose the cost parameters. Given that we are using four data series per bank, we can only choose four of the five cost function parameters ($a_{li}, a_{di}, b_{li}, b_{di}$, and F_i), requiring one restrictions to allow the other four to be identified. We choose to set $a_{di} = 0$ for each bank. Given this, the remaining parameters are chosen as follows: as the deposit rate is assumed to bind, equation (3a) implies that b_{di} can be chosen to match the deposit share

$$b_{di} D_D = \frac{r - \bar{r}_D - a_{di}}{2 D_{SHi}},$$

where D_D is a parameter that represents how binding the deposit rate cap is, and D_{SHi} is the share of deposits at bank *i*. The two variable cost terms for lending (a_{li} and b_{li}) are then chosen to minimize the distance between bank-by-bank lending and non-interest variable costs (as a share of loans). These are estimated using a Nelder-Mead Simplex algorithm. With estimates of all these costs parameter, the bank specific fixed cost, F_i, is calculated to equate the total profits of the banks in the model with actual profits in 2007.

[4] We have excluded the Agricultural Bank of China from the sample as its restructuring was ongoing during 2007 and did not end until late-2008. With the restructuring now over, its operating behavior is likely to differ significantly from that observed before restructuring.

Finally, during our reform experiments, we include simulate the impact of reform when the central bank does not have a specific interbank rate target, and the interbank rate is determined endogenously. In this case, there is assumed to be a net demand curve by nonbank participants for interbank funds which includes the central bank. Given that the central bank is included, we assume the demand is more elastic than the demand for aggregate loans (specifically ε_{IB}=2.5). Then using 2007 data on deposit, loan and the average 12 month SHIBOR rate:

$$A_{IB} = r\left(D - L\right)^{-\frac{1}{\varepsilon_{IB}}}.$$

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