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BANKING DEREGULATION AND MACROECONOMIC IMPACT IN CHINA: A THEORETICAL ANALYSIS AND IMPLICATIONS OF WTO ACCESSION TO THE MAINLAND AND HONG KONG

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Banking Deregulation and Macroeconomic Impact in China: A Theoretical Analysis and Implications of WTO Accession to the Mainland and Hong Kong

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Abstract

Since the beginning of 1990s, the credit balance of the banking system in mainland China has experienced a big swing from negative to positive. The balance has continued to expand up to now. It seems that both negative and positive credit balances are so large that the financial resources have been utilized inefficiently by the banking system. On the eve of China's accession to the World Trade Organization (WTO), challenges from banking competition will increase. In this paper a three-sector equilibrium model of monopolistic banking competition is set up and is applied to analyze the impact of the expanding credit balances and banking reform on the Chinese economy. Through theoretical analysis, reasons for the expanding credit balance are provided and some possible solutions are given. China's accession to the WTO will present many challenges to the state-owned banks. Foreign banks will be allowed to compete directly with Chinese local banks. We found that competition will not only promote China's GDP, investment, consumption and deposits as well as bring benefits to consumers, but also provide the banking sector from Hong Kong with new opportunities.

JEL codes: O11 - Macroeconomic Analyses of Economic Development
O41 - One, Two, and Multisector Growth Models
G21 - Banks; Other Depository Institutions; Mortgages

Keywords: banking competition, WTO, China, Hong Kong.

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1. Introduction

China, as one of the fastest growing economies in the world, is very much dependent on the rapid development of her financial system. Along with the decentralization and market-oriented reforms in other aspects of the economy since 1979, various specialized banks have been created or re-established and then shifted gradually to state-owned commercial banks. Foreign-funded banks, private banks, joint-venture banks, shareholding and non-bank financial institutions have been allowed to operate and compete with state-owned banks for savings and loans, although their business scope was restricted. The central government has, to some extent, already carried out or is considering some deregulations such as the relaxation or elimination of various forms of administrative controls, including credit plan, interest rate control, and restrictions over cross-bank competition.

However, unlike those reforms in the industrial and agricultural sectors, which have basically fulfilled the process of marketization, the reform or liberalization of the banking sector has developed neither a really commercial-oriented state-owned banking sector, nor a non-state-owned banking sector that is strong enough to compete against the state-owned banks.

On the contrary, the deregulations on the banking sector in mainland China created many serious macroeconomic and financial problems in 1992-93. Many banks and their affiliated non-bank financial institutions poured resources into imprudent activities, such as speculations in the real estate and stock markets. As a result, the share of non-performing loans in banks' total outstanding loans has grown rapidly. The increasing share of household deposits in banks' total liabilities created serious pressure on the banking sector. The need to re-consider the quality of their assets and the liquidity risks was urgently presented in the schedule of the central government. The law of the People's Bank of China and the law of the Commercial Bank of China were respectively enacted on March 18 and May 10, in 1995, in which asset-liability ratio and risk management were required to ensure the soundness of the banking system.

However, we find that there is a widening gap between deposits and loans since the implementation of the asset-liability requirement. If we exclude the non-performing loans from the total loans (column (7) in Table 1), the adjusted loan-deposit ratio of all financial institutions in China fell from 102% in 1987 to 64% in 2000, well below the 75% asset-liability management requirement set by the People's Bank of China. This indicates that the inefficiency of financial resources utilization is very serious.

Even though some progress has been made in the financial system of mainland China recently, a wide range of problems, such as excessive non-performing loans, incomplete property rights, abnormal regulation system and bad banking management practice, are far from being resolved. Some mainland economists have tried to solve these problems from different points of view. For example, Wang (2001) and Dai and Wu (2000) put forward their proposals on the reform of the stockholding system of commercial banks. Lin and Li (2001) analyzed the relationship between the enterprises and the financial institutions, both small- and medium-sized, and made suggestions on the development of small- and medium-sized financial institutions. Wang (1998) explained the swings in the credit balance before 1997. From the relationship between consumption and investment, Li (1995) and Zhang (1995) investigated the changes of the credit balance that took place in two local areas.

Recently, on the eve of China's accession to the World Trade Organization (WTO), more attention has been focused on the impact of China's WTO entry on the Chinese banking sector. One of the authoritative works is "The challenges and strategies of China's banking sector in the face of China's accession to the WTO" by Chen (2000). However, most of these publications are of a descriptive and institutional nature and are putting forward policy propositions by using conventional statistical tabulations to detect and explain trends of changes. Theoretical work has been rare. In this paper, we will first build a new equilibrium model to analyze the important phenomenon of the co-existence of the expanding gap between deposits and loans and the difficulties encountered by small- and medium-sized enterprises (SMEs) in financing worthwhile investment projects. Then, we highlight some implications of China's entry to the WTO for the economies of Hong Kong and the mainland. The model-based analysis will also assist us to understand the policy and institutional predicament of the banking reform and to find some possible solutions for the existing problems.

The remainder of the paper is organized as follows. Section 2 develops a three-sector theoretical model that involves consumer, enterprise and banking sectors. This model will assist us to understand the impact of the opening up of China's banking sector to allow foreign banks, such as banks from HK, to compete for both deposits and loans with state-owned commercial banks. With the help of the model, some policy and institutional implications of increasing competition and China's accession to the WTO on the economy can be found.

Section 3 compares behaviors of state-owned firms and banks in transition with their counterparts in the market, with the help of the theoretical model. Various possible reasons that may cause an expanding gap between deposits and loans are analyzed. In addition, some empirical evidence to support our points is presented.

Section 4 puts forward our viewpoints on the challenges and opportunities of the mainland and Hong Kong in the face of China's entry to the WTO. Finally, Section 5 summarizes the findings of this paper.

2. A Three-Sector Equilibrium Model

We study the banking reform in China by modeling the behaviors of three sectors: consumption, production and banking. Existing models in the literature do not seem to be able to serve our purposes. For example, the AS-AD model focuses on the impact of exogenous fiscal and monetary policy or foreign direct investments on domestic income and price through the changes of aggregate supply and aggregate demand. Tsang and Ma (1997) analyze the macroeconomic impact in China of increased FDI intake utilizing an AS-AD model. The IS-LM model focuses on the impact of exogenous fiscal and monetary policy on income and interest given a constant price. Both models are not concerned with the banking sector and cannot meet our demand.

Other models, such as those of Chari, Jones and Manuelli (1995), although including the banking sector, cannot be utilized to study the banking reform in China, since their assumption of perfect competition in the banking sector does not conform to the current situation in mainland China. A recent paper by Freixas and Rochet (1997), which deals with monopolistic competition among banks, can explain the

role of increasing competition in the economy. However, their model is subject to the analysis of the static partial equilibrium. In this paper, we borrow some ideas from Freixas and Rochet (1997) together with Dixit and Stiglitz (1977) to develop a three-sector general equilibrium model.

Our model incorporates the stylized facts of the Chinese economy and distinguishes from other models with the following assumptions: (1) all household savings are deposited in banks and there is no security investment, (2) all loans are issued to enterprises, (3) all of the household income is in the forms of labor wage and deposit interest, (4) all banking profits are paid to the government, and (5) the number of banks represents the extent of banking competition or monopolistic power. As a result, the short-run and the long-run equilibriums in our model can analyze the impact of increasing competition in the Chinese banking sector and that of China's accession to the WTO on the economies of the mainland and Hong Kong.

2.1 The Firm Behavior

Assuming that a representative firm has a production function with neo-classical Cobb-Douglas form:

$$Y_t = (A+u)K_{t-1}^{\alpha} H_t^{1-\alpha} \tag{1}$$

where Y_t, $K_{t-1}$and H_t respectively denote output at time t, capital investment at time t-1, and labor input at time t, $(A+u)$ denotes the technological level of the production function, A is a constant and u is a random shock representing the uncertain knowledge or information about the firm with probability of distribution: $\Pr(u=1)=q$ is the probability that an investment project succeeds, and $\Pr(u=0)=1-q$ is the probability that an investment project fails.

Under normal market economic conditions, a firm and banks decide how much to produce and how much to invest.

$$EY_t = (A+Eu)K_{t-1}^{\alpha} H_t^{1-\alpha} = (A+q)K_{t-1}^{\alpha} H_t^{1-\alpha} \tag{2}$$

In the discussion below, we omit the symbol "E".

It is also assumed that, for simplicity, both consumption goods and capital goods employed in production are completely used up in production, similar to assumptions made in other related papers (see, Hahn and Solow, 1995; and Barro and Sala-i-Martin, 1995). This simplified assumption usually does not change the conclusion derived from more complicated cases in which capital can be used repeatedly (Barro and Sala-i-Martin, 1995). Here, capital investment plays a double role: a) it is intermediate capital goods coming from the product market and used up in one period of production, and b) it is also the debt of the firm in the form of the bank loan.

The price of investment and consumption goods (P_t) is assumed to be the same as that of output, so the investment and the bank loan are linked through the price by $K_t P_t = L_t$.

We further assume that a firm is levied by an output tax with rate τ_t at time t. A profit-maximizing firm solves for the following problem:

$$\begin{aligned} \text{Max}\,\pi_f &= (1-\tau_{t+1})P_{t+1}(A+q)K_t^{\alpha}H_{t+1}^{1-\alpha} - L_t R_{Lt} - H_{t+1}w_{t+1} \\ \text{s.t. } & K_t P_t = L_t \end{aligned} \tag{3}$$

where R_{Lt} is one plus the nominal interest rate of the loan, which means that the firm has to pay back its principal and interest after one period. It is obvious that R_{Lt} is greater than one.
The first order conditions of the problem (3) are

$$\begin{aligned} \frac{\partial \pi_f}{\partial L_t} &= \alpha(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}L_t^{\alpha-1}H_{t+1}^{1-\alpha} - R_{Lt} = 0 \\ \frac{\partial \pi_f}{\partial H_{t+1}} &= (1-\alpha)(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}L_t^{\alpha}H_{t+1}^{-\alpha} - w_{t+1} = 0 \end{aligned} \tag{4}$$

From the equations in (4), the firm's demand function for the loan can be written as:

$$L_t^{d} = \left[\frac{\alpha(1-\tau_{t+1})P_{t+1}(A+q)}{P_t^{\alpha}R_{Lt}}\right]^{\frac{1}{1-\alpha}} H_{t+1} \tag{5}$$

Rolling equation (5) one period backward gives:

$$L_{t-1}^{d} = \left[\frac{\alpha(1-\tau_t)P_t(A+q)}{P_{t-1}^{\alpha}R_{Lt-1}}\right]^{\frac{1}{1-\alpha}} H_t \tag{5}'$$

Rewrite it as the inverse demand for the loan:

$$R_{Lt} = \alpha(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}L_t^{\alpha-1}H_{t+1}^{1-\alpha}$$

From (5), it is easy to see that the current demand for the loan is an increasing function of next period price, labor force and probability of investment success (q), and a decreasing function of current price, loan interest rate and tax rate. Combining (2) and (5), we obtain the goods supply function of a firm as follows:

$$Y_t = (A+q)^{\frac{1}{1-\alpha}}[\alpha(1-\tau_t)]^{\frac{\alpha}{1-\alpha}} R_{Lt-1}^{\frac{-\alpha}{1-\alpha}} \left(P_t / P_{t-1}\right)^{\frac{\alpha}{1-\alpha}} H_t \tag{6}$$

We can see from (6) that the output supply is negatively related to last period interest rate and positively related to current inflation rate and employment. The output reaction to interest rate lags one period behind.

For the traditional Chinese economy, especially before 1998, the government is responsible for supplying every person who has the ability to work with a job. Even in the recent three-year period of state-owned enterprise reform beginning in 1998, the laid-off workers are referred to as 'temporarily leaving the work place' instead of unemployed. Thus, it is plausible to assume that the labor supply is inelastic and hence can be regarded as an exogenous variable. These assumptions imply that labor supply and total wage determine the labor demand. The wages of workers are perfectly flexible and are given as follows:

$$\begin{aligned} H_t w_t &= (1-\alpha)(1-\tau_t)P_t Y_t \\ &= \frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau_t)]^{\frac{1}{1-\alpha}} r_{Lt-1}^{\frac{-\alpha}{1-\alpha}} (P_t / P_{t-1})^{\frac{\alpha}{1-\alpha}} P_t H_t \\ &= \frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau_t)]^{\frac{1}{1-\alpha}} r_{Lt-1}^{\frac{-\alpha}{1-\alpha}} P_{t-1}^{\frac{\alpha}{1-\alpha}} P_t^{\frac{1}{1-\alpha}} H_t \end{aligned} \tag{7}$$

2.2 The Banks' Behavior

The banking sector is a financial intermediary that absorbs deposit D_t from households and issues loan L_t to firms. Although its behavior is far from the market-oriented final objective, it is assumed that the banking sector aims to maximize profits in our model. In mainland China, since the four biggest state-owned banks have monopolistic power and have the most powerful impact on the central bank's monetary policy, it is reasonable to assume that there are a number of banks with monopolistic power competing for taking deposits and issuing loans, and setting lending rate and lending quantity. As a bank must consider the possibility (which is denoted by q) of a loan not being paid back in making its lending decision, the objective function of a bank i can be written as:

$$\pi_{bit} = qL_{it}R_{Lt} - D_{it}(1+r_{Dt}) \tag{8}$$

where R_{Lt} denotes the loan demand function of a firm, L_{it} the loan supply of bank i, and d_t the required reserve ratio.

Given $L_{mt}(m \neq i)$, deposit rate r_{Dt}, and the required reserve ratio d_t, and the constraints $L_t = L_{it} + \sum_{m \neq i} L_{mt}$ and $L_{it} \leq (1-d_t)D_{it}$, we substitute R_{Lt} of (5) into (8) to obtain (assuming the equality of the constraint holds as the optimal choice by the bank):

$$\pi_{bit} = qL_{it}\alpha(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}(L_{it} + \sum_{m \neq i} L_{mt})^{\alpha-1} H_{t+1}^{1-\alpha} - L_{it}(1+r_{Dt})/(1-d_t), \text{ for all } i.$$

The first order condition is

$$\frac{\partial \pi_{bit}}{\partial L_{it}} = qL_{it}\alpha(\alpha-1)(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}(L_{it}+\sum_{m\neq i}L_{mt})^{\alpha-2}H_{t+1}^{1-\alpha}$$
$$+ q\alpha(1-\tau_{t+1})P_{t+1}(A+q)P_t^{-\alpha}(L_{it}+\sum_{m\neq i}L_{mt})^{\alpha-1}H_{t+1}^{1-\alpha} - (1+r_{Dt})/(1-d_t) = 0$$

Let

$$\sum \frac{\partial \pi_{it}}{\partial L_{it}} = 0 \text{ for all } i,$$

we have:

$$R_{Lt} = \frac{N(1+r_{Dt})}{q(1-d_t)(N-1+\alpha)} = \left(1+\frac{1-\alpha}{N-1+\alpha}\right)\left(\frac{1+r_{Dt}}{q(1-d_t)}\right) \tag{9}$$

This is the lending rate for the banks to issue their loans. It can be seen from equation (9) that the lending interest rate determined by the banks will decrease with the number of banks (N). When $N=1$, which represents the case of monopoly, the lending rate is $\frac{1+r_{Dt}}{\alpha q(1-d_t)}$ at which the profit of banks is maximized.

This is the reason that banks always try to seek monopolistic power. Given the deposit interest rate, when N increases from 1 to ∞, the gap between the deposit rate and the lending rate will be narrowed. Equation (9) also indicates that the increase in the reserve requirements will cause the lending rate to rise, and the increase in the possibility of non-performing loans (namely q decreases) causes the interest rate to increase too.

The loan supply function of the banking sector can be expressed as

$$L_t^{\,s} = \left[\frac{(1-d_t)(N-1+\alpha)\alpha(1-\tau_{t+1})P_{t+1}(A+q)}{N(1+r_{Dt})}\right]^{\frac{1}{1-\alpha}} P_t^{-\frac{\alpha}{1-\alpha}} H_{t+1} \tag{10}$$

which is obviously dependent on the number of banks, the current deposit rate and the price, reserve requirements, and expected tax rate and price. Equation (10) tells us not only how many loans that the banks would like to supply, but also how many deposits banks demand are determined. Equation (10) also indicates that the increasing competition among banks may lead to an increase in the loan supply.

The profit in the banking sector is determined by:

$$\pi_b = \left[\frac{(N-1+\alpha)\alpha(1-\tau_{t+1})P_{t+1}(A+q)}{N(1+r_{Dt})/(1-d)}\right]^{\frac{1}{1-\alpha}} P_t^{-\frac{\alpha}{1-\alpha}} H_{t+1} \cdot \left(\frac{1-\alpha}{N-1+\alpha}\right)\left(\frac{1+r_{Dt}}{1-d_t}\right)$$

$$= [\alpha(1-\tau_{t+1})P_{t+1}(A+q)]^{\frac{1}{1-\alpha}} \left[\frac{(1-d_t)(N-1+\alpha)}{N(1+r_{Dt})P_t}\right]^{\frac{\alpha}{1-\alpha}} H_{t+1} \cdot \left(\frac{1-\alpha}{N}\right)$$

$$= (1-d_t)^{\frac{\alpha}{1-\alpha}} \left[\frac{(N-1+\alpha)}{N}\right]^{\frac{\alpha}{1-\alpha}} \left(\frac{1-\alpha}{N}\right) \alpha[(1-\tau_{t+1})P_{t+1}(A+q)]^{\frac{1}{1-\alpha}} \left[\frac{1}{(1+r_{Dt})P_t}\right]^{\frac{\alpha}{1-\alpha}} H_{t+1} \cdot$$

To better understand the effects of the competition among banks on their profits, we assume temporally that banks regard the deposit rate and the price level as given. In this case, we only need to consider how the function of N varies:

$$f(N) = \left[\frac{(N-1+\alpha)}{N}\right]^{\frac{\alpha}{1-\alpha}} \left(\frac{1-\alpha}{N}\right)$$

The function *f (N)* obviously has the same maximum or minimum as function $\ln f(N)$. Through simple derivations we have:

$$\frac{\partial f(N)}{\partial N} = \frac{\partial \ln f(N)}{\partial N} = 0, N = 1$$

$$\frac{\partial^2 \ln f(N)}{\partial N^2} = \frac{-1}{\alpha} < 0, N = 1,$$

Thus, we have the following finding:

Proposition 1: Based on the partial equilibrium that the deposit interest rate and the price are fixed, monopoly is the best choice (solution) for banks. Since increasing banking competition causes the lending rate and profits of the banking sector to go down, any bank tends to obtain monopolistic power in order to earn maximum profit.

2.3 The Behavior of the Representative Household

We assume that a representative household has two generations at time t. Each generation lives for two periods: the young and the old. The generation born at t will be denoted with a subscript t. c_t^1 and c_t^2 respectively represent a household consumption at young (denoted by 1) and old (denoted by 2). All generations have the same utility function:

$$U(c_t^1, c_t^2) = \ln c_t^1 + \beta \ln c_t^2 \tag{11}$$

This utility function is obviously monotone and concave.

The young generation is paid a nominal wage w_t at t, which is then divided into two parts: consumption c_t^1 and savings D_t (also in nominal terms at the deposit interest rate r_{Dt}). Let

$$\frac{P_{t+1}}{P_t} = \pi_{t+1}$$

where P_t is the money price of the good at time t (which is already known) and $P_{t+1}$is expected price in the next period. In addition, each young generation at time t is endowed with H_t unit of labor force, which is assumed to be supplied inelastically as above. We can now write the household budget constraint for t and t+1 for a generation at its young and old separately as

$$P_t c_t^1 + D_t = H_t w_t \tag{12}$$

$$P_{t+1} c_t^2 = D_t (1 + r_{Dt}) \tag{13}$$

To maximize utility function (11) subject to (12), (13), we have

$$c_t^1 = \left(1 - \frac{\beta}{1+\beta+\gamma}\right)\frac{H_t w_t}{P_t} \tag{14}$$

$$c_t^2 = \frac{\beta}{1+\beta}\left[\frac{1+r_D}{\pi_{t+1}}\right]\frac{H_t w_t}{P_t} = \frac{\beta}{1+\beta}(1+r_{Dt})\frac{H_t w_t}{P_{t+1}} \tag{15}$$

$$\frac{D_t}{P_t} = \left[\frac{\beta}{1+\beta}\right]\frac{H_t w_t}{P_t} \tag{16}$$

Let

$$\phi = \frac{\beta}{1+\beta}$$

(14) and (15) can be simplified respectively as

$$c_t^{\,1} = (1-\varphi)\frac{H_t w_t}{P_t} \tag{18}$$

$$c_t^{\,2} = \phi(1+r_{Dt})\frac{H_t w_t}{P_{t+1}} \tag{19}$$

$$\frac{D_t}{P_t} = \phi\frac{H_t w_t}{P_t} \tag{20}$$

Equation (18) indicates the young generation will consume a constant rate of its real wage. Given a constant nominal wage rate, higher price means lower consumption. Given a constant price, consumption will increase with the rise in the nominal wage rate. Equation (19) shows that the old generation will consume more if the current deposit rate rises or wage rate increases, but will consume less if the price in the next period rises. Equation (20) indicates that real deposits in banks by the household only depend on its real wage rate. To see how interest rate and inflation affect the deposits, we substitute (7) into (20) to obtain

$$D_t = \phi\frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau_t)]^{\frac{1}{1-\alpha}} r_{Lt-1}^{\frac{-\alpha}{1-\alpha}} (\pi_t)^{\frac{\alpha}{1-\alpha}} H_t\,. \tag{21}$$

This equation indicates that present deposits depend upon the last period interest rate, and the current inflation rate. The higher the last period interest rate was, the higher present deposits are. The interest rate transmitting mechanism is that the fall in the last period interest rate leads to the increase in corresponding investment demand, then the rise in the investment demand in turn will lead to the increase in the current output as well as current deposits.

2.4 Walras's Law and Model Equilibrium

In the previous sub-section we introduced the goods supply function and investment demand function of a firm, the consumption function, deposits supply, and money demand function of a household, and loan supply and demand functions of banks. In contrast to what we assumed above, however, an economy in the real world is usually not freely operated without government interference. The government needs to collect tax from firms (we assume household tax is negligible for simplicity), and spends its revenues in the forms of government consumption and investment. The government sometimes spends more or less than it taxes. Thus government revenues can be written as the sum of tax collected from firms, profits and reserve requirements from banks:

$$G_t = T_t + \pi_{Bt} + d_t D_t \tag{22}$$

where G_t is government expenditure that comes from three resources: T_t, the tax from firm's output; π_{Bt} the profit from bank, and $d_t D_t$, the reserve requirement.

There are four equilibrium conditions required to meet in our model: markets for goods, labor and deposit, as well as government budget constraint. For simplicity, we assume full employment in the labor market in China and that the wage is equal to the marginal product of labor. Below we apply Walras's law to the model, which sets the sum of the excess demand for goods and deposits equal to zero. We can apply Walras's law to specify the excess-demand functions for goods and deposits. A full equilibrium of the model is completely determined by setting each of these excess demands equal to zero, and keeping full employment. These equilibrium conditions are in terms of difference equations, which determine the equilibrium path for the economy given the initial conditions. The dynamics of the model come from two sources: a) that capital goods must be produced and purchased in one period and be used in the next period, and b) that household decisions on consumption and savings are made within a two-period horizon. Thus expectations about t+1 are an ingredient of decisions in t, and those decisions are an ingredient of outcomes at t.

To discuss the effects of a variety of factors on each market's equilibrium, we begin to apply Walras's law. At time t, the budget constraint of the generation t-1 can be obtained by rolling (13) one period back:

$$P_t {c_{t-1}}^2 = D_{t-1}(1 + r_{Dt-1}) \tag{23}$$

Adding (12) to (23), and then moving all the terms to the left of the equation, we have

$$P_t({c_t}^1 + {c_{t-1}}^2) + D_t - D_{t-1}(1 + r_{Dt-1}) - H_t w_t = 0 \tag{24}$$

by using

$$L_{t-1}R_{t-1} + H_t w_t = P_t y_{dt} = P_t Y_t - T_t \tag{25}$$

where y_{dt} is the after-tax income of the firm, which is equal to $y_{dt} = Y_t - T_t = (1 - \tau_t)Y_t$.

Subtracting and adding loan demand L^d and government expenditure G at time t respectively in (24), we obtain

$$\begin{aligned}&[P_t({c_t}^1 + {c_{t-1}}^2) + {L_t}^d + G_t - P_t Y_t + (D_t - {L_t}^d)] + (T_t - G_t) \\ &+ \left[L_{t-1}R_{Lt-1} - D_{t-1}(1 + r_{Dt-1})\right] = 0\end{aligned} \tag{26}$$

Since $D_t^{\ s} = (1-d_t)D_t$ represents total loans of banks, substituting it into (26) we obtain

$$\begin{aligned}&[P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} + G_t - P_tY_t + (D_t^{\ s} - L_t^{\ d})] + \left[L_{t-1}^d R_{t-1} - D_{t-1}(1+r_D)\right] \\ &+ [dD_t + T_t - G_t] = 0\end{aligned} \tag{27}$$

Since the banking sector that meets the market equilibrium condition at time *t*-1 must gain a profit of $\pi_{Bt} = L_{t-1}^d R_{Lt-1} - D_{t-1}(1+r_{Dt-1})$, then equation (27) can be rewritten as

$$\begin{aligned}&[P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} + G_t - P_tY_t + (D_t^{\ s} - L_t^{\ d})] \\ &+ (\pi_t + d_tD_t + T_t - G_t) = 0\end{aligned} \tag{28}$$

According to Walras's law and (28), the general equilibrium framework requires that the goods market, deposits market and government budget constraint meet following conditions:

$$P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} + G_t = P_tY_t \tag{29}$$

$$D_t^{\ s} = L_t^{\ d} \tag{30}$$

$$\pi_{Bt} + dD_t + T_t = G_t \tag{31}$$

It is obvious that only two of the above three equations are independent at general equilibrium. To arrive at a general equilibrium, only two of them need to be held. Thus we ignore the equilibrium of the government sector (31) and focus on the deposits market and goods market. That is, we solve for the price and the interest rate by (29) and (30).

2.4.1 Short-Run Equilibrium of the Deposit Market

In our model, the "short-run" equilibrium refers to the situation in which current price and interest rates are adjusted to equalize the demand and supply in the goods and deposit markets, given the previous and future variables, including policy variables, fixed at the exogenous levels. The "long-run" situation means that all variables, such as inflation rate and interest rates, have reached their steady-state constant levels that are determined endogenously by the model structure.

To discuss how the short-run equilibrium is determined, we first introduce some symbols. Let

$$z_t = \frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau_t)]^{\frac{1}{1-\alpha}}(1+r_{Dt-1})^{\frac{-\alpha}{1-\alpha}}\left(\frac{N}{(1-d_{t-1})q(N+\alpha-1)}\right)^{\frac{-\alpha}{1-\alpha}} P_{t-1}^{\frac{-\alpha}{1-\alpha}} H_t \tag{32}$$

$$x_t = [\alpha(1-\tau_{t+1})(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{N}{q(1-d_t)(N+\alpha-1)} \right)^{\frac{-1}{1-\alpha}} P_{t+1}^{\frac{1}{1-\alpha}} H_{t+1} \quad (33)$$

From (32) and (33), we can rewrite the deposit market equilibrium condition (30) as

$$(1-d_t)\phi z_t P_t^{\frac{1}{1-\alpha}} = x_t P_t^{\frac{-\alpha}{1-\alpha}} (1+r_{Dt})^{\frac{-1}{1-\alpha}} \quad (34)$$

Or

$$1+r_{Dt} = [(1-d_t)\phi z_t / x_t]^{-(1-\alpha)} P_t^{-(1+\alpha)} \quad (35)$$

From (34) we can easily obtain the relationship between the current deposit rate and the price (Figure 1), which is of negative slope and is called the D-curve (namely, deposit market equilibrium curve). The D-curve represents the condition under which the deposit demand equals its supply.

2.4.2 Short-Run Equilibrium of the Goods Market

Similar to the solution of the deposit market, the goods market equilibrium condition (29) can be rewritten from (32) and (33) as follows:

$$(1-\phi) z_t P_t^{\frac{1}{1-\alpha}} + \phi z_{t-1}(1+r_{Dt-1}) P_{t-1}^{\frac{1}{1-\alpha}} + x_t P_t^{\frac{-\alpha}{1-\alpha}} (1+r_{Dt})^{\frac{-1}{1-\alpha}} + G_t = \frac{1}{(1-\alpha)(1-\tau_t)} z_t P_t^{\frac{1}{1-\alpha}} \quad (36)$$

Multiplying $P_t^{\frac{\alpha}{1-\alpha}}$ on both sides of equation (36) and rearranging terms gives:

$$\left[\frac{1}{(1-\alpha)(1-\tau_t)} - (1-\phi) \right] z_t P_t^{\frac{1+\alpha}{1-\alpha}} - [\phi z_{t-1}(1+r_{Dt-1}) P_{t-1}^{\frac{1}{1-\alpha}} + G_t] P_t^{\frac{\alpha}{1-\alpha}} = x_t (1+r_{Dt})^{\frac{-1}{1-\alpha}} \quad (37)$$

This is the relationship between goods price and the deposit interest rate at the goods market equilibrium. This relationship is depicted in Figure 2 on the (P_t, r_{Dt}) plane, which is called the G-curve (as it represents the goods market equilibrium). Let $F(P_t)$ represent the left-hand-side of equation (37). Setting the derivative $F(P_t)$ with respect to P_t equal to zero gives:

$$F'(P_t) = \frac{1+\alpha}{1-\alpha} \left[\frac{1}{(1-\alpha)(1-\tau_t)} - (1-\phi) \right] z_t P_t^{\frac{2\alpha}{1-\alpha}} - \frac{\alpha}{1-\alpha} [\phi z_{t-1}(1+r_{Dt-1}) P_{t-1}^{\frac{1}{1-\alpha}} + G] P_t^{\frac{2\alpha-1}{1-\alpha}} = 0 \quad (38)$$

The solution of (38) is

$$P_t^0 = \left(\frac{\alpha}{1+\alpha}\right)^{1-\alpha}\left[[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t]/[1/(1-\alpha)(1-\tau_t) - (1-\phi)]z_t\right]^{1-\alpha} \tag{39}$$

Since $1/(1-\alpha)(1-\tau_t) - (1-\phi) > 0$, we have $P_t^0 > 0$. $F(P_t)$ is an increasing function for P_t if $P_t > P_t^0$ and a decreasing function if $P_t < P_t^0$. Hence $F(P_t)$ has maximum at P_t^0. This conclusion implies that r_{Dt} is a decreasing function with P_t if $P_t > P_t^0$, and that r_{Dt} is an increasing function of P_t if $P_t < P_t^0$, since P_t is inversely related to r_{Dt} from (37) (see Figure 2).

However, given that the right-hand-side of equation (37) is greater than zero, (39) implies that the price P_t must satisfy:

$$P_t > \left[[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t]/[1/\alpha(1-\tau_t) - (1-\phi)]z_t\right]^{1-\alpha} > P_t^0 \tag{40}$$

Hence, $F(P_t)$ is only defined in the above-defined domain $P_t < P_t^0$, and must be an increasing function of P_t. As a result, there exists only a negative relationship between the price and the interest rate. The positive relationship between the price and interest rate is excluded from the solution set.

2.4.3 The Intersection and Slope of the D-Curve and the G-Curve

By comparing equation (35) with (36) or (37), we find that the D-curve and the G-curve must intersect at equilibrium (r_{Dt}^e, P_t^e) (see (45) and (46) below) at which both curves have a negative slope. To find out how the two curves intersect, we need first to find out the slope of which curve is larger at the equilibrium.

To answer this question, differentiating both sides of equation (35) and (36) gives

$$\frac{-1}{1-\alpha}x_t(1+r_{Dt})^{\frac{-2+\alpha}{1-\alpha}}\frac{\partial r_{Dt}}{\partial P_t}_{D-curve} = (1-d)\frac{1+\alpha}{1-\alpha}\phi z_t P_t^{\frac{2\alpha}{1-\alpha}} \tag{41}$$

$$\begin{aligned}&\frac{-1}{1-\alpha}x_t(1+r_{Dt})^{\frac{-2+\alpha}{1-\alpha}}\frac{\partial r_{Dt}}{\partial P_t}_{G-curve}\\ &= \frac{1+\alpha}{1-\alpha}\left[\frac{1}{(1-\alpha)(1-\tau)} - (1-\phi)\right]z_t P_t^{\frac{2\alpha}{1-\alpha}} - \frac{\alpha}{1-\alpha}[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G]P_t^{\frac{2\alpha-1}{1-\alpha}}\end{aligned} \tag{42}$$

It is easy to show from the two equations above that $\left.\frac{\partial r_{Dt}}{\partial P_t}\right|_{D-curve} > \left.\frac{\partial r_{Dt}}{\partial P_t}\right|_{G-curve}$. Using this inequality, we can plot two curves in Figure 3.

2.4.4 Short-Run General Equilibrium

To obtain the short run general equilibrium, we solve the two equations (43) and (44):

$$(1-d_t)\phi z_t P_t^{\frac{1+\alpha}{1-\alpha}} = x_t(1+r_{Dt})^{\frac{-1}{1-\alpha}} \tag{43}$$

$$\left[\frac{1}{(1-\alpha)(1-\tau_t)} - (1-\phi)\right] z_t P_t^{\frac{1+\alpha}{1-\alpha}} - [\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t]P_t^{\frac{\alpha}{1-\alpha}} = x_t(1+r_{Dt})^{\frac{-1}{1-\alpha}} \tag{44}$$

Hence

$$\left[\frac{1}{(1-\alpha)(1-\tau_t)} - (1-\phi)\right] z_t P_t^{\frac{1+\alpha}{1-\alpha}} - [\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t]P_t^{\frac{\alpha}{1-\alpha}} = (1-d_t)\phi z_t P_t^{\frac{1+\alpha}{1-\alpha}}$$

The solution of the above equation set (43), (44) is

$$P_t^e = \left[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t\right] \Big/ \left[\frac{1}{(1-\alpha)(1-\tau_t)} + d_t\phi - 1\right] z_t \Bigg]^{1-\alpha} \tag{45}$$

$$r_{Dt}^e = \left[x_t/(1-d_t)\phi z_t\right]^{1-\alpha} \left[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t\right] \Big/ \left[\frac{1}{(1-\alpha)(1-\tau_t)} + d_t\phi - 1\right] z_t \Bigg]^{-(1+\alpha)} - 1 \tag{46}$$

To see clearly how the equilibriums are affected by policy variables, we introduce the following variables:

$$z_t = \frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau_t)]^{\frac{1}{1-\alpha}}(1+r_{Dt-1})^{\frac{-\alpha}{1-\alpha}} \left(\frac{N}{(1-d_{t-1})q(N+\alpha-1)}\right)^{\frac{-\alpha}{1-\alpha}} P_{t-1}^{\frac{-\alpha}{1-\alpha}} H_t \tag{47}$$

$$= (1-\tau_t)^{\frac{1}{1-\alpha}} \bar{z}_t$$

where $\bar{z}_t = \frac{1-\alpha}{\alpha}[(A+q)\alpha]^{\frac{1}{1-\alpha}}(1+r_{Dt-1})^{\frac{-\alpha}{1-\alpha}} \left(\frac{N}{(1-d_{t-1})q(N+\alpha-1)}\right)^{\frac{-\alpha}{1-\alpha}} P_{t-1}^{\frac{-\alpha}{1-\alpha}} H_t$,

and

$$x_t = \left[\alpha(1-\tau_{t+1})(A+q)\right]^{\frac{1}{1-\alpha}} \left(\frac{N}{q(1-d_t)(N+\alpha-1)}\right)^{\frac{-1}{1-\alpha}} P_{t+1}^{\frac{1}{1-\alpha}} H_{t+1} \tag{48}$$

$$= (1-d_t)^{\frac{1}{1-\alpha}} \bar{x}_t$$

where $\bar{x}_t = \left[\alpha(A+q)(1-\tau_{t+1})\right]^{\frac{1}{1-\alpha}} \left(\frac{N}{q(N+\alpha-1)}\right)^{\frac{-1}{1-\alpha}} P_{t+1}^{\frac{1}{1-\alpha}} H_{t+1}$,

Using above definitions, the general equilibrium solutions of (45) and (46) can be rewritten as

$$P_t^e = \left[\left[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t\right] \Big/ \left[\frac{1}{(1-\alpha)(1-\tau_t)} + d_t\phi - 1\right](1-\tau_t)^{\frac{1}{1-\alpha}} \bar{z}_t\right]^{1-\alpha} \tag{49}$$

$$1 + r_{Dt}^e = (1-d_t)^{\alpha}(1-\tau_t)\left[\bar{x}_t / \phi\bar{z}_t\right]^{1-\alpha}$$
$$* \left[\left[\phi z_{t-1}(1+r_{Dt-1})P_{t-1}^{\frac{1}{1-\alpha}} + G_t\right] \Big/ \left[\frac{1}{(1-\alpha)(1-\tau_t)} + d_t\phi - 1\right](1-\tau_t)^{\frac{1}{1-\alpha}} \bar{z}_t\right]^{-(1+\alpha)} \tag{50}$$

From (47), (48), (49) and (50), we obtain the following proposition:

Proposition 2: The goods price and the deposit interest rate are affected not only by the current tax rate, the ratio of reserve requirement and government expenditure, but also by the respective lagged and expected price and interest rate. In the short-run, government expenditure has a positive impact on the goods price and a negative impact on the deposit interest rate, given the price in the past, the expected price in the future, and other exogenous variables and policies. However, the short-run impacts of both the reserve requirement ratio and tax rate on the price and the interest rate are ambiguous due to non-linearity.

Generally speaking, a rise in the tax rate has a negative impact on both total demand and total supply, but the final effect depends on the relative impacts on the demand side and the supply side. There may exist a range of tax rates within which an increase of tax rate will lead to a fall in the price level and a rise in the deposit rate, but outside this range the opposite conclusion may emerge due to the reversal impacts on the demand and the supply. A similar situation may also exist for the reserve requirement ratio.

2.4.5 Long-Run Steady-State Analysis

To understand the impact of banking competition on the real economy of the mainland in the long-run, we focus on the determinants of real interest rates and the impact of the degree of the banking competition on the nominal interest rate, investment, bank's profit, and firm's output.

Define

$$i_{Lt} = \frac{R_{Lt}}{\pi_{t+1}}$$

where i_{Lt} is the real lending interest rate plus 1.
The real investment demand of a firm can be written as

$$K_t = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{\pi_{t+1}}{R_{Lt}} \right)^{\frac{1}{1-\alpha}} H_{t+1}$$

and the output supply is

$$Y_t = \left(\frac{1}{\alpha(1-\tau)} \right) [(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}} \left(\frac{\pi_t}{R_{Lt-1}} \right)^{\frac{\alpha}{1-\alpha}} H_t$$

The real consumption of a representative household is

$$C_t = c_t^1 + c_{t-1}^2$$

where

$$c_t^{\,1} = (1-\phi)\frac{H_t w_t}{p_t} = \left(\frac{1-\alpha}{\alpha} \right) [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{\pi_t}{R_{Lt-1}} \right)^{\frac{\alpha}{1-\alpha}} H_t$$

$$c_t^{\,2} = \phi \left[\frac{1+r_{Dt}}{\pi_{t+1}} \right] \left(\frac{1-\alpha}{\alpha} \right) [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{\pi_t}{R_{Lt-1}} \right)^{\frac{\alpha}{1-\alpha}} H_t$$

Rolling the above equation one period backward, we have

$$c_{t-1}^2 = \phi \left[\frac{1+r_{Dt-1}}{\pi_t} \right] \left(\frac{1-\alpha}{\alpha} \right) [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{\pi_{t-1}}{R_{Lt-2}} \right)^{\frac{\alpha}{1-\alpha}} H_{t-1}$$

The total profit of banks at time t is

$$P_{Bt} = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left[\frac{\pi_t}{R_{Lt-1}}\right]^{\frac{\alpha}{1-\alpha}} H_t \cdot \left(\frac{1-\alpha}{N}\right)$$

Since the optimum behavior of the banks is subject to $D_t^{\ s} = L_t^{\ d}$ and reserve requirements have no effect on the real economy, the real interest rate in the long-run steady-state is adjusted to clear the goods market. According to Walras's law:

$$\begin{aligned}&[P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} + G - P_t Y_t + (D_t^{\ s} - L_t^{\ d})] \\ &+\left\{\left[L_{t-1}^d R_{t-1} - D_{t-1}(1+r_D)\right] + dD_t + T_t - G_t\right\} = 0\end{aligned}$$

we obtain $$[P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} - P_t Y_t] + \left\{\left[L_{t-1}^d R_{t-1} - D_{t-1}(1+r_D)\right] + T_t\right\} = 0$$

or

$$[P_t(c_t^{\ 1} + c_{t-1}^{\ 2}) + L_t^{\ d} - (1-\tau)P_t Y_t] + \left[L_{t-1}^d R_{t-1} - D_{t-1}(1+r_D)\right] = 0$$

An equilibrium is at the steady-state if it is a perfect foresight equilibrium with the property that, for all t, $i_{Lt} = \frac{R_{Lt}}{\pi_{t+1}} = i_L$, $H_{t+1}/H_t = n$. Thus, the equilibrium condition can be written as

$$\begin{aligned}&(1-\phi)\left(\frac{1-\alpha}{\alpha}\right)[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} i_L^{\frac{-\alpha}{1-\alpha}} n \\ &+\phi\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]\left(\frac{1-\alpha}{\alpha}\right)[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} (i_L)^{\frac{1-2\alpha}{1-\alpha}} \\ &+[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} (i_L)^{\frac{-1}{1-\alpha}} n^2 \\ &+[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} i_L^{\frac{-\alpha}{1-\alpha}} \left(1 - q(1-d) + \frac{(1-\alpha)q(1-d)}{N}\right) n \\ &=\left(\frac{1}{\alpha}\right)[(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}} i_L^{\frac{-\alpha}{1-\alpha}} n\end{aligned}$$

Through simple derivations, we obtain the following equation that determines the real interest rate of lending:

$$(1-\phi)\left(\frac{1-\alpha}{\alpha}\right)i_L^{\frac{-\alpha}{1-\alpha}}n+\phi\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]\left(\frac{1-\alpha}{\alpha}\right)i_L^{\frac{1-2\alpha}{1-\alpha}}+i_L^{\frac{-1}{1-\alpha}}n^2$$

$$+i_L^{\frac{-\alpha}{1-\alpha}}\left(1-q(1-d)+\frac{(1-\alpha)q(1-d)}{N}\right)n=\left(\frac{1}{\alpha}\right)i_L^{\frac{-\alpha}{1-\alpha}}n$$

or

$$\phi\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]\left(\frac{1-\alpha}{\alpha}\right)i_L^{\,2}-\left[\phi\left(\frac{1-\alpha}{\alpha}\right)+\frac{(N+\alpha-1)q(1-d)}{N}\right]ni_L+n^2=0$$

From the above equation, we obtain two solutions for the real interest rate:

$$(i_L)_1=\frac{n}{\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]},$$

$$(i_L)_2=\frac{n}{\phi\left(\frac{1-\alpha}{\alpha}\right)}.$$

Next we turn to discuss some economic implications corresponding to the above two equilibrium solutions.

Equilibrium 1

$$(i_L)_1=\frac{n}{\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]}.$$

It is obvious that the real lending rate decreases with the number of banks N and the investment success probability q, but increases with the reserve requirement d.

For the production sector

$$i_L=\frac{N(1+r_{Dt})}{q(1-d)(N-1+\alpha)}=\frac{Ni_D}{q(1-d)(N-1+\alpha)}$$

Per capita investment is given by

$$k = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left[\frac{q(1-d)(N+\alpha-1)}{N}\right]^{\frac{1}{1-\alpha}} n^{\frac{-\alpha}{1-\alpha}}$$

Per capita output is given by

$$y = \left(\frac{1}{\alpha(1-\tau)}\right)[(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}} \left(\frac{q(1-d)(N+\alpha-1)}{Nn}\right)^{\frac{\alpha}{1-\alpha}}$$

For the consumer sector, the real deposit rate is given by

$$i_D = 1 + r_D = n \tag{51}$$

Per capita consumption is given by

$$c = c^1 + c^2 = (1-\phi+\phi n)\left(\frac{1-\alpha}{\alpha}\right)[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left(\frac{q(1-d)(N+\alpha-1)}{Nn}\right)^{\frac{\alpha}{1-\alpha}}$$

Per capita deposit is given by

$$D/H = \phi\frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}} \left(\frac{q(1-d)(N+\alpha-1)}{Nn}\right)^{\frac{\alpha}{1-\alpha}}$$

For the banking sector, profit

$$P_{Bt} = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}} \left[\frac{q(1-d)(N-1+\alpha)}{N}\right]^{\frac{\alpha}{1-\alpha}} H_t \cdot \left(\frac{1-\alpha}{N}\right)$$

is a decreasing function with the degree of banking competition.

Equilibrium 2

$$(i_L)_2 = \frac{n}{\phi\left(\frac{1-\alpha}{\alpha}\right)}.$$

This equation indicates that the real lending rate is independent of N, and is a decreasing function the deposit preference ϕ and an increasing function of α. However, due to

$$i_L = \frac{N(1+r_{Dt})}{q(1-d)(N-1+\alpha)} = \frac{Ni_D}{q(1-d)(N-1+\alpha)},$$

the real deposit rate can be written as

$$i_D = \frac{q(1-d)(N-1+\alpha)}{N}\left(\frac{\alpha n}{\phi(1-\alpha)}\right), \tag{52}$$

which is positively related to the number of banks and the parameter q.

Hence, per capita investment is given by

$$k = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}}\left[\frac{\alpha n}{\phi(1-\alpha)}\right]^{\frac{-1}{1-\alpha}}$$

Per capita output is given by

$$y = \left(\frac{1}{\alpha(1-\tau)}\right)[(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}}\left(\frac{\alpha n}{\phi(1-\alpha)}\right)^{\frac{-\alpha}{1-\alpha}}$$

Per capita consumption is given by

$$c = c^1 + c^2 = (1-\phi)\left(\frac{1-\alpha}{\alpha}\right)[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}}\left(\frac{\alpha n}{\phi(1-\alpha)}\right)^{\frac{\alpha}{1-\alpha}}$$
$$+\phi\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]\left(\frac{1-\alpha}{\alpha}\right)[\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}}\left(\frac{\alpha}{\phi(1-\alpha)}\right)^{\frac{2\alpha-1}{1-\alpha}}\left(\frac{1}{n}\right)^{\frac{2-\alpha}{1-\alpha}}$$

Per capita deposit is given by

$$D/H = \phi\frac{1-\alpha}{\alpha}[(A+q)\alpha(1-\tau)]^{\frac{1}{1-\alpha}}\left(\frac{\alpha n}{\phi(1-\alpha)}\right)^{\frac{\alpha}{1-\alpha}}$$

For the banking sector, profit is

$$P_{Bt} = [\alpha(1-\tau)(A+q)]^{\frac{1}{1-\alpha}}\left[\frac{n\alpha}{\phi(1-\alpha)}\right]^{\frac{-\alpha}{1-\alpha}} H_t \cdot \left(\frac{1-\alpha}{N}\right).$$

Similar to the conclusion of the partial equilibrium analysis, we find that more competition causes the profit of the banking sector to fall in the long-run too.

From the above discussion, we have the following proposition.

Proposition 3: Given that the real return to capital assets is positive and that α and ϕ satisfy $\phi\left(\frac{1-\alpha}{\alpha}\right)<1$, or $\alpha>\frac{\phi}{1+\phi}$, we have following conclusions corresponding to the two equilibriums discussed above:

Equilibrium 1

If the real interest rate of lending is given by $\left(i_L\right)_1=\frac{n}{\left[\frac{q(1-d)(N+\alpha-1)}{N}\right]}$, we have:

(1) Increasing the banking competition will lower the real interest rate of lending and will promote GDP, investment, consumption, and deposits saving.

(2) An increase in the reserve requirement ratio *(d)* will raise the real lending rate, and will decrease GDP, investment, consumption, and deposits.

(3) If the possibility of investment success *(q)* increases, the real lending rate will decrease. As a consequence, the high bad-asset ratio will lead to a rise in the real interest rate of lending but a fall in GDP, investment, consumption, and deposits.

(4) If the tax rate increases, GDP, investment, consumption, and deposits will decrease; the tax rate has no impact on the interest rate. (Note: because total demand for consumer and government remains unchanged.)

(5) An increase in the growth rate of the labor force leads to a decrease in all per capita variables. (Note: because capital becomes relatively scarce, the marginal productivity of capital increases and consequently the interest rate of lending rises too.)

(6) Increasing competition will lead to a fall in the profits of banks.

Equilibrium 2

If the real lending interest rate is given by $\left(i_L\right)_2=\frac{n}{\phi\left(\frac{1-\alpha}{\alpha}\right)}$, we have:

(1) More competition among banks generates more per capita consumption. (Note: deposit rate increases, interest income increases, and deposits increase.)

(2) Enhanced competition among banks raises the real deposit rate, since the demand for deposits increases.

(3) The real interest rate of lending is negatively related to the time preference parameter ϕ. The less patient a consumer (ϕ decreases) is, the higher the real lending rate is, because the supply of deposits falls.

(4) Similar to the first case, increasing competition will cause profit of banks to fall.

The policy implications of the above propositions to the mainland economy are that if the banking sector is monopolized by the state-owned banks, introducing more competition may produce two possible outcomes that benefit the mainland economy in two different ways. One is to lower the real interest rate of lending, and therefore to help to promote investment and GDP growth (equilibrium 1). The other is to raise the real deposit rate, therefore to help to promote consumers' interest income and their consumption (equilibrium 2).

If policymakers pay more attention to the economic and consumption growth than to consumer welfare, they may set the real deposit interest rate according to (51). Then the economy will settle at equilibrium 1. An increase in competition may promote economic growth, consumption, investment and deposits through the income effect.

However, if policymakers pay more attention to consumer welfare than the benefits of firms, they may adjust the real lending rate according to (52). The economy will reach equilibrium 2. Increasing competition may increase consumers' interest income, and hence increase their consumption.

In any case, with the number of banks increasing, their profits will fall. After all, as an intermediate sector, banks aim at providing both firms and consumers with good services. As long as the whole economy grows steadily, redistributions from one individual sector to another are feasible.

Our model can also provide some explanation for the deflation that the Chinese economy has been experiencing in recent years. When the nominal interest rate cannot be changed timely in line with the changes in demand and supply due to the financial control of the central bank, the extent of price adjustments has to be large so that the economy can stay on the path of balanced growth. Thus, financial control has exacerbated deflation in the mainland economy. Table A below shows that the relationship between annual GDP growth *(GDPG)*, real deposit interest rate (r_d) or lending rate (r_L) and inflation rate (denoted by consumer price index π) from 1990-2000 is consistent with the long-run steady-state solution of the model.

Table A: Correlation among Real Interest Rate, GDP Growth and Inflation (based on annual data over 1990-2000)

	GDPG	r_D	r_L	$r_L - r_D$	π
GDPG	1				
r_D	-0.6817	1			
r_L	-0.68033	0.983824	1		
$r_L - r_D$	-0.42201	0.59186	0.725537	1	
π	0.641169	-0.94295	-0.98209	-0.79139	1

Source: China Statistical Yearbooks, 1990 to 2001.

The first equilibrium in our model predicts that both firms and consumers are beneficiaries, but the second equilibrium implies that only consumers are beneficiaries. Hence we argue that the authority concerned should make an effort to achieve the first equilibrium. That is, the Chinese government may aim to adjust the real deposit rate to be as low as the growth rate of labor force, n, according to the first equilibrium condition (51), and allow the real lending rate to be freely determined at a market with more competition.

3. Explanations of the Swings of the Credit Balances

Before 1993, especially during 1988-1993, a negative credit balance in all the Chinese financial institutions was a dominant phenomenon (see column (4) in Table 1). After the reform of the banking system, the situation has changed gradually. By 1994, the gap between deposits and loans in the banking system had almost disappeared. The deposits and loans seemed to have reached their balance path.

However, the opposite phenomenon, namely, the positive credit balances occurred and became increasingly large later on. In 1995, positive credit balances occurred for the first time in the history of China's financial sector. Then they continued to expand (see Table 1). At the end of 1998, the credit balance was over RMB 900 billion. One year later in 1999, the gap between deposits and loans reached RMB 1,504 billion, an increase of about 600 billion or 45% (see column (5) in Table 1). In 2000, it rose to 2,443 billion, an increase of 62%. As a result, the loan-deposit ratio fell from 127% in 1987 to 80% in 2000.

Apparently, these ratios fall within the normal range of the loan-deposit ratio of a commercial bank. However, it is estimated that about 25% of the loans are non-performing loans (NPLs) in Chinese financial institutions (Wang, 2001). Foreign practice indicates that about 10-23% of the NPLs are returned (Wang, 2001). A recent auction of NPLs by Huarong Asset Management, one of the four Chinese companies given the responsibility for disposing of the bad loans, recovered about 9% of the book value sold to a foreign consortium led by Morgan Stanley (Kynge, 2001). Assuming 20% of the NPLs are recoverable, the bad loans are about 25% x 80% = 20%. If we exclude the bad loans from the total loans (column (7) in Table 1), the gap between the adjusted-loan and deposits is even larger. The adjusted loan-deposit ratio fell from 102% in 1987 to 64% in 2000. The adjusted ratios reveal the true picture that the inefficiency of financial resources utilization is very serious.

The changes in the credit balances in state-owned banks (see Table 2) are similar to those in all financial institutions. In 1999, deposit balances in Chinese state-owned banks was RMB 6,932.5 billion, 10.4 times as much as that (RMB 668.6 billion) in 1988, while loan balances issued arrived at RMB 4,252.8 billion, only 4.2 times more than in 1987. The growth rate of deposit balances through 1988-1999 is two times higher than the growth rate of loan balances. The gap between deposit and loan balances increased from -34.7% to 68.2%. A considerable part of the credit balances goes into the central bank in the form of government bonds.

Although there are considerable positive credit balances in the banking system and most of the fund resources (over 80% on average) for enterprises are in the form of banking loan (cf. Table 3), they mostly go into state-owned enterprises (SOEs). Those non-SOEs, especially many small- and medium-sized enterprises (SMEs), utilize financial resources more efficiently (cf. Table 4) and contribute relatively more to GDP (cf. Table 5) than SOEs. However, they have found it difficult to obtain loans for their investments from the state-owned banks (SOBs). Their shares in total loans extended by all financial institutions combined, of which SOBs presently make up some 75%, have been less than 20% (cf. Table 6).

To stimulate the economy, the central government has to adopt an active fiscal policy. However, past experiences indicate that an active fiscal policy is not as effective as expected if the deep-rooted problems are not resolved. To analyze these problems and to understand the importance of financial reforms, we next look at the evolution process of credit balances in the past.

3.1 Credit Balance before 1995

The existence of the negative credit balance before 1995 in Chinese banking institutions can be analyzed in several aspects. Apparently, it was due to the rapid increase in consumption that depressed the growth of deposits (Li, 1995). However, it is rooted deeply in an institutional environment in the following five aspects.

Firstly, in the process of market-oriented reform, the Chinese economy has inevitably experienced a process of monetization. This process needs the issue of a lot of money to relieve the pressure of the depressed price in the old system. That contributes to the excessive negative credit balance.

Secondly, interest rates of both lending and deposits were fixed at a relatively low level by the central bank before the reform of the state-owned banking sector from a planned banking system toward a commercial one. As a result, investment demand of state-owned enterprises (SOEs) grew much more quickly than the household deposits. The deposit supply was relatively inelastic due to the lack of other financial products.

Thirdly, the credit business of state-owned banks (SOBs) was usually guaranteed by the central government. It seemed unimportant for the SOBs to maintain the reserve requirements. Thus there was no urgent need for them to keep credit balances. The only thing the SOBs needed to do was to carry out a credit plan. However, credit plans were often overshot by the soft constraint. Therefore an excessive credit balance occurred.

Fourthly, the lack of an incentive mechanism between responsibility and reward for the management as well as unclear property rights in traditional SOEs often led both SOEs and SOBs to ignore investment risk. Some managers in SOEs did not consider the repayment of the principal of the banking loans let alone interest. Whenever SOBs were forced by local governments to lend to local firms, the phenomenon of lending more than deposits would occur (Li and Ma, 1996; Fan, 1999).

Finally, as a result of the government acting as the lender of last resort, nobody in the old banking system was responsible for losses but everyone gained if they made profits. They could gain not only rewards financially but also promotions politically. So the negative credit balance was inevitable.

Besides the institutional factors, the cyclical effect due to macroeconomic policies was also an important determinant factor contributing to the excessive negative credit balances before 1995.

The industrial deregulation had been accelerated by the evolving contractual responsibility system together with expanded financial autonomy in China since the mid 1980s. As a result, output soared and wages increased. Market demand for bank credits surged and money supply expanded. Both public and private consumption were 'over-heated' ('guore'), which generated *prima facie* a case of 'double expansion' (Fan, 1999). All of these factors created persistent inflationary pressures during the 1980s (Kueh, 1999). Contractionary administrative measures were then applied to control investment, wage bills and credit supply in late 1988 (Naughton, 1990). Interest rates of both loans and savings deposits were raised as well.

However, the large increases in savings deposits were not matched by commensurate increases in the supply of loans, due to government control. That resulted in a huge decline in the negative credit balances. In addition, macroeconomic policies shifted towards re-centralization of both monetary and industrial controls after the 'Tiananmen incident' in June 1989. That resulted in a hard-landing of the Chinese economy. The inflation rate was cut from 18% to a mere 2-3% in 1990 and 1991 (Kueh, 1999).

However, the policy retreat lasted for no more than two years. The expansionary effects of Deng Xiaoping's famous 'southern inspection tour' in early 1992 relaxed controls on bank loans and credits. The confidence of foreign investors was also boosted with a flood of foreign direct investment inflow. Output and wages rose again. Decentralization was accelerated in the domestic economy. In March 1994, there was a massive increase in farm procurement prices and subsequently in retail food prices. As a consequence, inflation accelerated sharply and China experienced a double-digit inflation rate for three consecutive years during 1993-95 (Kueh, 1999).

From our model, the probabilities of investment success (q), inflation, lending rate and wage rate all can affect credit balances. Firstly, since the probability of investment success (q) was exacerbated to be larger than its true value, firms' demand for investment exceeded the deposits supply from consumers and enterprises. Secondly, with a fixed lending interest rate and soft budget constraint, the interest rate mechanism is not responding properly to over-investment. As a result, goods price was forced to react to the excessive demand in the form of inflation. Thirdly, the expected high inflation rates repeatedly pushed investment upward and the gap between loans and deposits expanded. Finally, low real salary

may also contribute to negative credit balances. In the institutional transition process, the wage rate was depressed artificially. The depressed wage rate weakened the deposit supply and widened the gap between loans and deposits.

However, with the development of institutional reforms, proportions of income have been distributed increasingly from the state to individuals. Household deposits grew more quickly than loans. The gap had gradually narrowed down. Actually, although there was still a soft budget constraint, the credit plan was not completely out of control. This is probably because actual investment is still subject to the constraint of total fund available $L_t \leq D_t + B_t$, where B is over supply of money controlled by the central bank. In order to pursue profits given below

$$\pi_B = q(D + B)r_L - Dr_D = D(qr_L - r_D) + Bqr_L$$

at the fixed interest rate, the banking sector must compete for deposits (D) and raise success probability (q) of investment, and lend (B) more than deposits, if the inflation rate is acceptable. The fixed interest regime, however, inevitably led to underground trade in the case of excessive demand for deposits, especially when some households were offered a higher interest rate.

The discussion above indicates that before market-oriented banking reform, the Chinese banking system not only utilized all the deposits, but also met excessive demand by means of issuing paper money, when inflation was acceptable. However, because no mechanism in the traditional financial system could guarantee that loans went to those who utilized them most efficiently, even though the deposits in banks were exhausted, the financial resources were not necessarily utilized efficiently.

3.2 The Expanding Credit Balance after 1995

As indicated above, with the progress of economic reform, the negative gap between the deposits and loans was narrowed and eventually reversed into positive with deposits exceeding loans (cf. Tables 1 and 2). The expanding credits balance after 1995 could also be explained by the cyclical effect of macroeconomic policies and the institutional foundation.

As discussed in the previous sub-section, the expansionary effects of Deng Xiaoping's 'southern inspection tour' in early 1992 accelerated the Chinese inflation rate to a double-digit level during 1993-95 (Kueh, 1999). That unfortunately sent a distorted signal to the decentralized producers and the more-or-less liberalized market for further expansion. Since 1997, there has been over-supply in the domestic markets. As a consequence, demand for loans was weakened. The gradual implementation of the 'modern enterprise system' starting from 1993 resulted in a steady increase in the number of employees being laid off from state-owned enterprises (Chai and Docwra, 1997). As job security and economic perspectives were looming, private consumption was cautious and savings deposits rose. The Chinese economy entered into an unprecedented deflation era.

The enacting of the law of the Commercial Bank of China obviously sped up this process. According to the law, state-owned banks were required to maintain a certain asset-liability ratio and to engage in risk

management. At the beginning of practical operation of the banking law, the credit business in state-owned banks (SOBs) was still seriously controlled by the credit plan. Asset-liability ratio management was only carried out for the non-SOBs. However, it has been widely implemented in the SOBs since 1998. It requires that all financial institutions may not issue loans in proportion to their deposits of more than 75%.

It is worthwhile to indicate that the asset-liability ratio management is also effective to contain overheated investment and high inflation. Although the implementation of the banking law indeed played an important part in curbing inflation, it did not completely change the behaviors of the SOEs at once, which regard banking loan as a fiscal subsidy. The demand for investment was still very large and the budget constraint was still soft for the SOEs. However, the budget constraint for the banking sector has obviously been much more hardened than before. Thus the demand for loans is restrained by its supply. As deposits grew steadily, a positive gap between deposits and loans persisted.

It should be acknowledged that the impact of loan growth slowing down on different sectors is not uniform. The loan demand of non-SOEs bore the brunt of the financial reform at first. As deflation persisted and market demand was weak, some non-SOEs became “reluctant-to-borrow”. At the same time, some bank managers were worried that the loan could not be paid back, and therefore they would be punished, a phenomenon called “reluctant-to-lend” (‘xidai’) came forth in the banking sector. The “reluctant-to-borrow” restrained the demand of non-SOEs for the loan, whilst the “reluctant-to-lend” restrained the loan supply not only to SOEs but also to non-SOEs. As a result, the adjusted loan-deposit ratios in all financial institutions and SOBs are about 65% only (see column (8) of Table 1 and column (6) of Table 2, respectively), well below the 75% asset-liability management requirement set by the People’s Bank of China.

It is worthwhile to indicate that the banking sector should not take the full responsibility for the difficulty of small- and medium-sized enterprises (SMEs) to obtain loans. Half-baked historical financial records of SMEs are also responsible for the expanding credit balance as well. Imperfect information makes it difficult for banks to judge whether an investment project is profitable.

To overcome the deflation problem, the government adopted national debt investment to promote the economy. However, long-term national debt investment usually discourages the banking sector to pursue ideal customers, which in turn may reduce the effectiveness of the fiscal policy. Recent practice has already shown that stimulating fiscal policy hardly drove the non-state-owned investment when market and institutional reforms were far from complete. Hence, it is recommended that national debt investment, as a policy to promote economic growth, should not be adopted for long.

In the aspect of our macroeconomic model, the credit balance can be expressed as a function of the lending interest rate, inflation rate, tax rate and information uncertainty given below:

$$\frac{D_t}{L_t} = \left[\frac{\beta}{1+\beta}\right] H_t w_t \Bigg/ \left\{\left[\frac{\alpha(1-\tau)P_{t+1}(A+q)}{P_t^{\alpha} R_{Lt}}\right]^{\frac{1}{1-\alpha}} H_{t+1}\right\},$$

Obviously, the extent to which deposit over loan is positively related to real wage rate, real lending rate, tax rate and unemployment (negatively related to the growth rate of employment), and negatively related to the expected inflation rate (or positively related to deflation rate) and investment success rate. When information is symmetric and the probability of an investment project succeeding is lower or considered lower than its true level by the state-owned banks, the loan supply may be less than its demand. If information is asymmetric, namely, the knowledge and recognition on the production technology to banks and firms is different: firms regard q as q_1, banks regard it as q_2, and , and $q_1 > q_2$ the credit balance will be relatively lower.

3.3 Changes in the Credit Balance after Lending Rate Liberalization

Our model implies that asset-liability management and a fixed interest rate regime are incompatible. The maximization solution of the banking sector must satisfy the following equation:

$$R_{Lt} = \frac{N(1+r_{Dt})}{q(1-d)(N-1+\alpha)} = \left(1+\frac{1-\alpha}{N-1+\alpha}\right)\left(\frac{1+r_{Dt}}{1-d}\right)\left(\frac{1}{q}\right),$$

in which at least one of the three variables, deposit rate, lending rate or reserve requirement, should be flexible in order to reach market equilibrium. However, if the government simultaneously controls all the three variables, it is difficult to find a solution. Hence, one of the reasons for the credit imbalance is that the interest rate was not liberalized at the time of carrying out asset-liability management.

When the lending rate is determined by the market, whilst the deposit rate is still fixed by the monetary authority, the credit balance is positively related to deposit rate and reserve requirement, but is negatively related to the degree of banking competition and the probability of investment success rate q.

$$D_t / L_t = \left[\frac{\beta}{1+\beta}\right]\frac{w_t}{P_t}\left\{\left(1+\frac{1-\alpha}{N-1+\alpha}\right)\left(\frac{1+r_{Dt}}{1-d}\right)\left(\frac{1}{q}\right)\right\}^{\frac{1}{1-\alpha}} \Bigg/ \left\{(1+n)\left[\alpha(1-\tau)\pi_{t+1}(A+q)\right]^{\frac{1}{1-\alpha}}\right\}$$

To conclude, the possible causes of the expanding credit balance include an increase in investment risk, reserve requirement ratio, degree of monopoly, deposit interest rate, employment rate and tax rate, and a decrease in technological level and expected inflation.

4. Implications of China's Accession to the WTO

4.1 Impacts on the Mainland Economy

With the reform of the banking sector from the planned towards the market-oriented system, state-owned enterprises (SOEs) begin to find it difficult to obtain soft loans from the banks, and thus a downturn in the output of the SOEs was inevitable during 1994-1998. To promote economic growth, the central government has adopted expansionary fiscal policy for several years, but its outcome does not seem to be as effective as expected. The Chinese economy still has a vicious cycle between the state-owned

banks (SOBs) and SOEs, even though it is regarded as a promising economy in the world at present. In reality, the Chinese economy is at a very difficult time. Without further external institutional shocks, it is difficult to get out of low growth (relative to its potential human and financial resources) and low efficiency. Hence, external institutional shocks are welcome to the internal economy.

The agreement of China's entry into the WTO came into effect at the end of 2001. The reform process without doubt will be accelerated with WTO membership. We expect that the Chinese economy including her banking sector, rather than collapsing after entry to the WTO, will be able to overcome the difficulties they face in the future. Similar to the successful story that the Chinese home electrical industry has experienced, China's banking sector will become mature and strong in the process of international competition through learning-by-doing.

Although we have expressed our optimism about China's accession to the WTO in the long run, however, the short run impact is far from clear. The entry to the WTO is also an irreversible decision. This is one of the reasons that China waited for fifteen years before finally joining the WTO in 2001. The waiting is worthwhile and the value of waiting is positive. Ma (2001) applied the financial option theory to investigate the optimal timing and strategy of China's entry to the WTO. This theoretical analysis is consistent with the empirical findings by Tsang and Ma (2000) who found that the Chinese economy is more integrated with the Hong Kong economy than with the rest of the world, especially with the OECD countries.

In order to reduce possible negative impacts after WTO entry, the Chinese government may adopt some practical approaches to adjust the speed of the reform in a flexible manner. In fact, the Chinese government has always adopted an approach that launched a variety of economic reform measures on an experimental basis first, and then expanded steadily. In the banking sector many reform measures have been implemented since 1998. It is urgent to improve them further for preparing for the accession to the WTO. These reform measures include reducing the reserve requirement ratio, injecting equity capital into the state-owned commercial banks (SOBs) and carrying out asset-liability ratio management, setting up asset management companies (AMCs) and the organizational reform of the People's Bank of China (Lardy, 1998). Since September 2000, reform progress has been clearly expedited. For example, lending rates of foreign currencies and the interest rate of large-scale deposits were liberalized.

Benefits brought in by China's accession to the WTO may include the following aspects. Firstly, China's WTO membership is helpful to open up the old financial system, to accelerate the pace of reform, to bring an end to the monopoly by the SOBs, to introduce competition and accelerate the banking business marketization process. Secondly, the competition undoubtedly will become intensified and the efficient use of financial resources will be enhanced. Just as our model indicated, investment, consumption and economic growth are expected to be expedited. Inflation or deflation pressure on the macro-economy is expected to be weakened. Thirdly, at the beginning of China's accession to the WTO, the monopolistic profits of state-owned banks will fall. However, through learning-by-doing and the spillover effect, financial management skills of the Chinese banks will be improved in the long-run. As long as the Chinese banks can utilize their advantages and overcome their disadvantages, they may challenge the foreign banks as well in the future.

There are also possible challenges facing the state-owned banks. Firstly, without government special supports anymore, some local banks may face the risk of collapse. However, there is also the possibility that after reshuffling, a few large banks may emerge.

Secondly, Chinese local banks will face the risk of loss of high quality human resources. Some unskilled employees of the state-owned banks might be laid off. At the same time, skilled staff may move to foreign banks for better remuneration and career development.

Thirdly, a significant amount of individuals' deposits may shift to foreign banks after foreign banks start Renminbi business after the WTO entry. Currently, most local residents have little choice but to deposit their savings in the local banks, although the quality of the service provided by the local banks is low. So far only few foreign banks are permitted to engage in Renminbi business in restricted areas such as Shanghai. Consequently, local banks need not worry about the lack of liquidity. The local banks still have many advantages such as a wide range of branch locations, transportation and communication networks. It seems likely that the supremacy of the local banks will decline, although not to be seriously compromised, by competition from foreign banks (see Kueh, 2001, and Longlois, 2001 for detailed analyses of the relative competitiveness of domestic banks in the wake of possible influx of foreign banks and possible responses of the domestic banks in coping with foreign intrusion into their business sphere).

4.2 Impact on Hong Kong's Economy

The model in this paper tells us that in the process of mainland China opening up her financial market to allow foreign banks to compete for deposits and loans with the Chinese local banks, those banks which go into the mainland market earlier will earn higher profits than those which come later. Therefore it is beneficial for the concerned institutions from Hong Kong to adopt active measures to pursue the possibility of entering the mainland market earlier. In the framework of 'one country, two systems', it may be possible for the Chinese government to give special treatment to the banks from Hong Kong, although this practice may invite complaints from other WTO members. Possible policies may include relaxing the conditions of entry, issuing licenses ahead of other foreign banks, strengthening co-operation with each other and helping to train human resources for the mainland banking sector.

Generally speaking, as a window and starting point of doing business with China, the banking sector of Hong Kong will definitely benefit in the short term from China's accession to the WTO. The advantages of Hong Kong's banking sector over the mainland's and foreign competitor's are embodied in following aspects.

Firstly, it will take a long time for China to improve its own infrastructure to attract more foreign capital than before after the entry to the WTO.[1] It can be expected that the intermediary position of Hong Kong

[1] For the recent development of the theory on the foreign direct investment, see Ma (2002).

will not disappear and the goods and capital movements through Hong Kong will increase in the short-run (Ma, Tsang, and Tang, 1998).

Secondly, Hong Kong's local banks are much more acquainted with the market mechanism and hence are much more efficient than the mainland's state-owned banks. A comparison between some representative banks in the mainland and Hong Kong clearly supports this standpoint (see Table 7).

Thirdly, besides its advantages over the mainland's banking sector, the banks in Hong Kong also enjoy relatively more advantages over other foreign banks in that they have a much closer relationship with China.

Fourthly, whilst it has to face challenges from Shanghai, Hong Kong as an international financial center is much less likely to be replaced by Shanghai or other cities in mainland China before the Renminbi becomes a fully convertible currency.[2] According to the experiences in other countries and the reality of the mainland economy, it is most unlikely for RMB to be fully convertible within ten years (see Liu, Zhao, Ma, Yiu, Kueh, and Tsang, 2002)[3]. By the time the RMB becomes fully convertible in ten years, China's GDP may have doubled. Given the fact that the currently rapidly developing size of economy in China and Southeast Asia can support Hong Kong as the only financial center for China now, there should be no doubt that as the mainland doubles her economy she may be able to support two international financial centers, Hong Kong and Shanghai, in ten years. Each of them is supported by half of the mainland economy on average. Considering the size of China's economy and its integration into the world economy after the accession to the WTO, these two cities might become complementary rather than competitive with each other.

To turn the opportunity into practical interests, the banks from Hong Kong should overcome some disadvantages they face and actively prepare for the coming challenges too. Firstly, the high limits on the asset scope for foreign banks to enter the mainland market may prevent small- and medium-sized banks in Hong Kong from entering the mainland. Of course, this does not mean they have no other ways to enter the mainland markets. If necessary, they may enter through mergers and acquisitions. Secondly, because some business of Hong Kong banks needs to shift to the mainland due to Hong Kong's higher operation cost, more of the labor force currently working in the banking sector in Hong Kong may be laid off.

To sum up, it is unlikely that the position of Hong Kong as an international financial and trade center will change in the foreseeable future. Nevertheless, in the long term, with China's catching up with its infrastructure, competition pressure on Hong Kong will rise. Hong Kong will have to improve her economic structure and development strategy. Thus, China's accession to the WTO is a good opportunity for Hong Kong's banking sector except that there will be some side effects on employment.

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[2] For a review of the recent literature on the relationship between exchange rates and the economic fundamentals, see Ma and Kanas (2000).

[3] For research on Hong Kong's linked exchange rate system, see Ma, Meredith and Yiu (2002) and Tsang and Ma (2002). Ma and Tsang (2002) studied the relationship between the RMB and the Hong Kong dollar.

5. Conclusions

This paper discusses the phenomenon of continuing expanding credit balances of the Chinese banking system during the 1990s, and some important issues faced at present and to arise after China's entry to the WTO. To investigate the impacts of banking reforms on the Chinese economy, a three-sector equilibrium model that includes the behaviors of consumers, enterprises and banks is built incorporating some of the stylized facts in China such as interest rate liberalization and breaking up the monopolistic position of the state-owned banks. Using this model, we can directly carry out analyses of not only the short-run equilibrium but also of the long-run steady-state as done in some neoclassical models.

Similar to the assumptions of the IS-LM model, this paper obtains the short-run equilibrium conditions of the deposits market and goods market, given the price in the past, the expected price in the future, and other exogenous variables and policies. However, unlike the IS-LM model in which price is assumed to be sticky and the banking sector is implicit, our model assumes that both current interest rate and price of goods are adjusted to clear the markets. The model finds that whilst government expenditure has a positive impact on the price of goods, quantity of investment and future output, it has a negative impact on the interest rate in the short-run. However, the short-run impacts of both the reserve requirement ratio and the tax rate are ambiguous.

There are two important theoretical findings from this paper. One is the finding of the so-called D-curve and G-curve, which can be utilized to analyze short-run impacts. The second finding is that the long-run steady-state equilibrium has significant implications for institutional reform as well as long-run economic growth. There are two equilibrium solutions for the long-run steady state. The first solution indicates that introducing competition to the banking sector will benefit both the consumer sector and the production sector. Increasing the banking competition will lower the real interest rate of lending and will boost GDP, investment, consumption, and deposits, but the monopolistic profits of the banking sector will decrease. The second long-run solution indicates that increasing competition will cause the real interest rate of deposits to rise and profits of banks to fall. However, all the benefits from increasing competition among banks will go to the consumer sector instead of the production sector.

Comparing the two long-run equilibriums, the first equilibrium is believed to be more acceptable, because it will benefit both consumers and enterprises. Although the model cannot explain all the stylized facts of the Chinese banking system, it can contrast the differences between the traditional system and the market one, and can explain the swing of the credit balances and provide some solutions to the existing problems in the Chinese banking system.

With regard to the challenges of China's entry to the WTO, the findings of our research project have important implications for both the economies of mainland China and Hong Kong. With respect to the Chinese economy, market-oriented banking reform helps to break up the old financial system and to enhance the efficient use of financial resources, and to boost investment, consumption and economic growth. Opening up the banking sector's competition can reduce both inflation and deflation pressures. The expected fall in monopolistic profits will create pressures on the state-owned banks, although it will also force them to improve their efficiency and skills of financial management through learning-by-

doing. With respect to Hong Kong's banking sector, since those banks who go into the mainland market earlier will earn more profits, it is recommended that the concerned institutions in Hong Kong try to enter into the mainland market as early as they can. Our analyses indicate that the banking sector in Hong Kong will enjoy relatively more opportunities than challenges after China enters the WTO.

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Table 1: Credit Balances in All Financial Institutions in the Mainland

(100 million Yuan)

(1) Year	(2) Deposit (stock)	(3) Loan (stock)	(4) Credit balance	(5) Changes in loan to changes in deposit	(6) Loan-deposit ratio	(7) Adjusted loan*	(8) Adjusted loan-deposit ratio*
1987	8117	10307	-2190		127%	8246	102%
1988	9475	12255	-2780	-43%	129%	9804	103%
1989	10786	14360	-3574	-61%	133%	11488	107%
1990	14013	17681	-3668	-3%	126%	14145	101%
1991	18079	21338	-3259	10%	118%	17070	94%
1992	23468	26323	-2855	7%	112%	21058	90%
1993	29623	32943	-3320	-8%	111%	26354	89%
1994	40473	40810	-337	27%	101%	32648	81%
1995	53862	50538	3324	27%	94%	40430	75%
1996	68571	61153	7418	28%	89%	48922	71%
1997	82390	74914	7476	0%	91%	59931	73%
1998	95698	86524	9174	13%	90%	69219	72%
1999	108778	93734	15044	45%	86%	74987	69%
2000	123804	99371	24433	62%	80%	79497	64%

Sources: China's Financial Statistics, 1952-1996, 1997-1999; and People's Bank of China Quarterly Statistical Bulletin, 2001Q1.

Note: Adjusted loan = Loan x (1 - 25% x 80%), which assumes that 25% of the original loans are non-performing loans (NPLs) and 80% of the NPLs will not be recovered. Foreign practice indicates that about 10-23% of the NPLs are returned (Wang, 2001). A recent auction of NPLs recovered about 9% of the book value sold (Kynge, 2001).

Table 2: Credit Balances in State-Owned Banks

(1) Year	(2) Deposit (stock)	(3) Loan (stock)	(4) Loan-deposit ratio	(5) Adjusted loan*	(6) Adjusted loan-deposit ratio*
1988	6686	10245	153%	8196.0	123%
1989	7982	12064	151%	9651.2	121%
1990	10459	14759	141%	11807.2	113%
1991	13299	17595	132%	14076.0	106%
1992	17484	21082	121%	16865.6	96%
1993	21400	25778	120%	20622.4	96%
1994	26434	27310	103%	21848.0	83%
1995	35036	32279	92%	25823.2	74%
1996	44940	37983	85%	30386.4	68%
1997	51220	44824	88%	35859.2	70%
1998	60379	53611	89%	42888.8	71%
1999	69325	57456	83%	45964.8	66%

Note: (1) Before 1997, state-owned banks include four state-owned commercial banks and the Bank of Communication and the CITIC Industrial Bank; after 1997 it denotes four state-owned commercial banks.
(2) Adjusted loan is defined as in Table 1.

Table 3: Financing Resources of China's Enterprises (%)

Year	Banking loan	Equity share	Bonds	Commercial bill	Total
1995	88	1	2	9	100
1996	83	3	2	12	100
1997	77	9	2	13	100
1998	83	6	1	10	100

Sources: China's Financial Outlook, 1999.

Table 4: Credit-Output Indicator

	1990	1991	1992	1993	1994	1995	1996	1997
Non-SOE	2.70	2.61	2.84	3.06	4.46	4.98	5.51	6.18
SOE	0.66	0.68	0.62	0.57	0.43	0.39	0.33	0.29

Source: Wu (1999).

Note: Credit-output indicator is the ratio of the output-share to the credit-share.

Table 5: Industrial Output Share of SOE and Non-SOE (%)

Year	SOE	Non-SOE		
		Total	Collective	Others
1978	77.63	22.37	22.37	
1979	78.47	21.53	21.53	
1980	75.97	24.03	23.54	0.49
1981	74.78	25.22	24.61	0.61
1982	74.46	25.54	24.82	0.72
1983	73.36	26.64	25.74	0.90
1984	69.08	30.92	29.71	1.21
1985	64.86	35.14	32.08	3.06
1986	62.26	37.74	33.52	4.22
1987	59.73	40.27	34.62	5.65
1988	56.81	43.19	36.14	7.05
1989	56.06	43.94	35.69	8.25
1990	54.60	45.40	35.63	9.77
1991	52.94	47.06	35.70	11.36
1992	48.09	51.91	38.04	13.87
1993	43.13	56.87	38.36	18.51
1994	40.80	59.20	38.80	20.40
1995	33.97	66.03	36.59	29.44
1996	31.00	69.00	35.00	34.00

Source: Zhang (2001).

Table 6: Share of Loans to Non-State-Owned Sectors by Financial Institutions

(100 million Yuan)

Year	Village & township enterprises		Private and individuals		Foreign capital related enterprises		Agriculture		Lending share in total loan
	quantity	ratio	quantity	ratio	quantity	ratio	quantity	ratio	
1989	821	5.7%	33	0.2%			1955	13.6%	19.6%
1990	977	5.5%	40	0.2%			2413	13.6%	19.4%
1991	1136	5.3%	49	0.2%			2976	13.9%	19.5%
1992	1518	5.8%	68	0.3%			3868	14.7%	20.7%
1993	1963	6.0%	109	0.3%			4839	14.7%	21.0%
1994	2071	5.1%	156	0.4%	792	1.9%	4644	11.4%	18.8%
1995	2146	4.2%	196	0.4%	999	2.0%	3019	6.0%	12.6%
1996	2833	4.6%	280	0.5%	1346	2.2%	7123	11.6%	18.9%
1997	5036	6.7%	387	0.5%	1891	2.5%	8350	11.1%	20.9%
1998	5580	6.4%	472	0.5%	2487	2.9%	4444	5.1%	15.0%
1999	6161	6.6%	579	0.6%	2986	3.2%	4792	5.1%	15.5%
2000	6060	6.1%	655	0.7%	3050	3.1%	4889	4.9%	14.7%

Sources: China's Financial Statistics, 1952-1996, 1997-1999; and People's Bank of China Quarterly Statistical Bulletin, 2001Q1.

Table 7: A Comparison of China's Biggest Banks with Two of Hong Kong's Banks (%)

	Industrial and Commercial Bank	Bank of China	Agriculture Bank	Construction Bank	HSBC	HANG SENG
	1998	1998	1998	1998	2000	2000
Return on average shareholder's funds	0.11	0.21	-0.05	0.08	33.30	23.60
Return on average total assets	2.46	4.08	-1.05	1.81	1.77	2.10
Cost-income ratio	75.52	100.68	111.68	64.51	37.20	24.40
			Capital adequacy ratio			
Total capital	5.05	5.17	7.85	4.70	13.20	15.30
Tier-1 capital					9.40	11.90

Sources: Wang (2000), HSBC and Hang Seng Bank web pages.

Figure 1: Deposit Market Equilibrium - The D-Curve

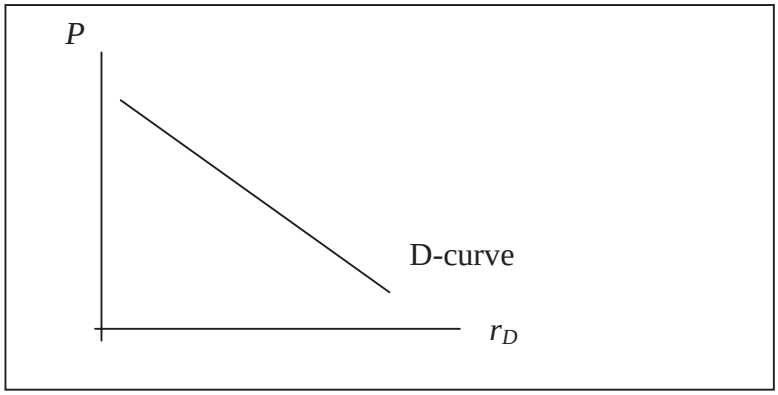

Figure 2: Goods Market Equilibrium - The G-Curve

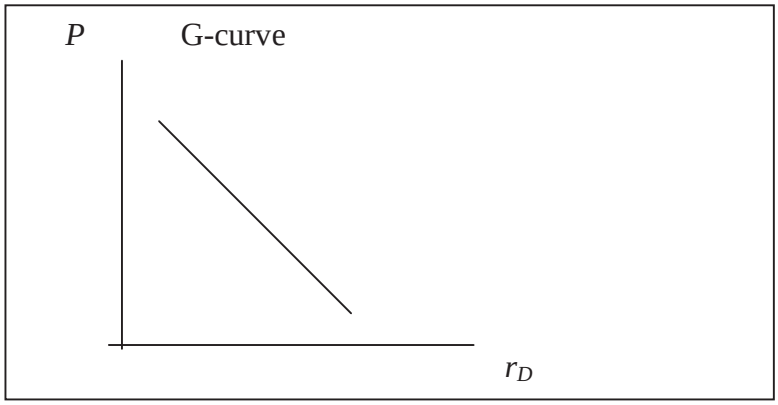

Figure 3: The General Equilibrium