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GOVERNMENT CREDITS, DEMAND AND SUPPLY OF DEPOSITS AND THE DEVELOPMENT OF BANKING: A THEORY AND TEST

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I. Introduction

One of the important features of banking in LDCs is the heavy dependence on sources of funds other than private deposits such as government credits, foreign borrowings, and bank equity. In other words, deposit banking is still underdeveloped in many LDCs. Government credits to banking (hereafter called G) consist of government deposits, government and central bank loans to commercial banks and bank notes issued by commercial banks; bank note issue was particularly important for banking in early modern Japan. While an initial supply of sizable amount of G is undoubtedly effective in promoting the initiation of banking business through providing initial loanable funds, making the new business of banking profitable and, possibly, enhancing the reliability of banks, the continuing supply of G after the establishment of banks is detrimental to the development of banking since G retards the effort of banks to extend private deposits. The purpose of this paper is to show that an effective way of bringing about deposit banking is to decrease the government credits to the banking sector under the condition of free interest rates on deposits.

The average share of private deposits in total bank liabilities

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of 42[1] LDCs is 67.4%, and

the shares of government credits, foreign liabilities and bank equity are 14.1%, 8.3% and 9.9% respectively. While the distribution of shares of bank equity is concentrated around the 10% level (ranging from 4.3% to 17.6%), that of government credit is widely dispersed from zero to 50.7%, with banking systems in 12 countries having ratios greater than 20% and 20 countries less than 10%. A similar wide dispersion exists for the shares of foreign liabilities. Consequently, the shares of private deposits in total bank liabilities are also widely dispersed, from 31.7% to 95.2%. It is interesting to note that a similar low dependence on private deposits characterized early banking in Japan.[2] The shares of private deposits, government credits and bank equity were respectively 12.1%, 41.4% and 46.5% in 1878-82, 27.2%, 28.5% and 44.3% in 1888-92 and 67.9%, 5.6%, 26.5% in 1908-12.

The importance of deposit banking is well-known. There are good reasons why an expansion of banking operations with low dependence on private deposits does not necessarily have very favorable effects on economic development. One possible reasoning is as follows.

Assume a simple world of currency, deposits, bank equity, government credit to banking, and industrial capital equity. With a constant currency supply, an expansion of banking operations lowers the required

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[1] In IMF International Financial Statistics, data on capital accounts of the commercial banking systems are available for 55 developing countries, among which 42 countries are selected which have such data as GNP and GDCF for the sake of convenience of future study. Data are for 1971. Extended data covering a wider range of years are under preparation.

[2] See Teranishi and Patrick [1978].

rate of return on investment activity, and thereby encourages economic development, whenever it causes a shift of the aggregate demand function of capital equity against currency.[1] The shift depends both on the allocation of borrowed funds by the debtors of banks and on the method of financing by the creditors of banks.[2] For the sake of simplicity, let us assume that the debtors do not hold currency and allocate all their bank borrowings into real investment. Then, the shift of the aggregate capital demand function depends solely on the method of financing bank liabilities. If bank expansion is financed by an increase in bank equity, it is more likely that bank equity holders have bought bank equity by selling their holdings of equity capital of other industries rather than by reducing currency holdings because bank equity is a closer substitute to industrial equities than to currency. In this case, there would be no shift of the aggregate capital demand function, and bank expansion would not have any (favorable) effects on economic activity.

When bank expansion is financed by government credits, the situation would be more or less the same because government would be holding the least amount of idle balances, and would finance its credit to banking by reducing investment in other areas unless it creates additional

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[1] For this type of theorizing, see Tobin and Brainard [1963]. In this paragraph, all capital equities other than bank equity are assumed to be homogeneous, and the possibility of higher efficiency in fund allocation by banks relative to individual asset holders (such as scale economy in management etc.) is neglected.

[2] This ignores reserve currency at banks.

currency.[1] If, however, the expansion of banking is financed by an increase in private deposits, the deposit increase would most likely be financed by a decrease in currency holding; i.e. from the closest substitute to deposits. In this case, bank expansion would cause a definite increase in the aggregate demand for capital and encourage economic development.

Thus, an expansion of banking has a net favorite effect on capital accumulation only when it is financed through an increase in the share of private deposits. In other words, only through deposit growth can banks play an expansionary role in financial intermediation. How, then, can the share of deposits in bank liabilities be increased? Since this question is related to broad questions of the modernization of economy as well as various banking and monetary policies, one can conceive of a wide range of interrelated policy measures. Indeed, it is quite true that a monetary reform as a banking policy should be specified for each specific phase of development (Ranis [1977])and for each specific country (Cameron [1967]).

In this paper, however, we confine ourselves to the more basic questions concerning the equilibrium of the deposit market. Concretely, two formal questions are investigated: (1) the effect of an autonomous shift of the demand function or supply function for deposits and (2) the effect of a policy-induced shift of the supply function for deposits.

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[1]The currency supply has been assumed to be fixed, however. And any expansion of currency could alternatively be used to finance direct government investment. The monetary policy effect of government credits is analyzed in the next section.

The autonomous shift of the demand or supply functions of deposits corresponds to the so-called promotion of the banking habit and the increase in the efficiency of banking operations. While these shifts can be brought about by a number of measures such as education, advertising, changes in availability of banks and branch offices, inspection and guidance of banking operations, and improvement in the communications and transportation systems, we will not consider these in detail, and shall take the shifts as exogenously given, focussing our analysis on the effects of these shifts.

On the other hand, some government policies such as taxes and subsidies, regulation of bank equity, and manipulation of government credits to banks have more direct and definite effects. In view of the high reliance on government credits by banks in many LDCs, the control of G is very important and, as will be shown below, has definite effects on deposit market equilibrium.

In the next section, we present a simple static theoretical analysis of these two questions. Results of comparative statics are evaluated by two criteria: effects on the private deposits-net worth ratio and on the required rate of return on investment. The first criterion is adopted on the premise that deposit banking per se is desirable in providing an efficient payment system as well as in enabling a more ample supply of short-term credit. The second criterion is necessary because even if some policy is effective in encouraging deposit banking, its desirability should be discounted if it is incompatible with real development. The main conclusions reached are as follows. (1) An autonomous increase in the efficiency of bank operations as represented by a reduction in the cost of banking is effective in bringing about deposit banking and also lowers the

required rate of return on investment, encouraging capital accumulation. (2) An autonomous development of the banking habit as represented by a shift from currency to deposits in assets holders portfolio lowers the required rate of return on investment, but the effect on deposit banking is indefinite, and it is theoretically possible that the equilibrium deposit is reduced as a result of an increase in the banking habit. (3) The policy of reducing G supply accompanied by government open-market purchase of securities is effective both in promoting deposit banking and in lowering the required rate of return on investment. (4) The policy of reducing G supply accompanied by a decrease in currency supply raises the required rate of return on investment, but promote deposit banking insofar as the substitution effect of deposit and G in the subjective equilibrium of banks is sufficiently large.

Section III presents an empirical analysis of G policy with respect to the assets market in early modern Japan. Demand and supply functions of deposits as well as the demand function for currency are successfully estimated, and the coefficient of G is shown to be significant with the correct sign. This is strong support for our recommendation of G reduction policy. Finally, section IV provides some discussion of the policy issues regarding deposit banking in LDCs with particular attention to the relevance of G policy.

II. Theory

1. Model

Our model is in the mode of the general equilibrium model of assets markets developed in Tobin and Brainard [1963] and Tobin [1969]. It consists of four sectors--government (including the central bank), (commercial) banks, individual asset holders and corporate (non-bank) firms--and the following four financial instruments.

(i) Currency, comprised of government currency $\bar{C}$ and bank notes issued by commercial banks G_1.

(ii) Securities issued by firms, banks and the government and held by asset holders, banks and the government. The amounts of securities issued by firms, banks and the government are E, βE and αE respectively. E, α and β are positive constants and αE represents the net issue of securities. All the securities are assumed to be perfect substitutes with each other.

(iii) Deposits supplied by banks and held by asset holders. Supply is denoted by $\bar{D}^s$ and demand by $\bar{D}^d$.

(iv) G, consisting of G_1 and G_2. G_1, as defined above, comprises one part of currency; its share in total G was important in banking in early Meiji Japan. G_2 represents central bank credits to banks plus government deposits in banks.

Rates of interest on G are assumed to be zero.[1]

The balance sheet of each sector is shown in Table 1. K is the capital stock, and p and pq represent the commodity price and the market price of existing capital goods respectively. Both K and p are constant. The rate of interest on securities is defined by the following formula:

$$r = \frac{p\rho K}{QE} \tag{1}$$

where Q denotes the price of securities and ρ represents the physical marginal product of capital, so that r is equal to the marginal value product divided by the market value of securities issued by firms. This interest rate is the required rate of return of investment in our model. A fall (rise) in r encourages (discourages) capital accumulation.

Demand functions for assets of asset holders are assumed to be linear homogeneous in net worth, and also the gross substitutability among assets is assumed.

$$QE^h = H(r, i, \lambda)\, W;\ H_r > 0,\ H_i < 0,\ H_\lambda \gtrless 0 \tag{2}$$

$$\bar{D}^d = D^d(r, i, \lambda)\, W;\ D^d_r < 0,\ D^d_i > 0,\ D^d_\lambda > 0 \tag{3}$$

$$\bar{C}^d = C^d(r, i, \lambda)\, W;\ C^d_r < 0,\ C^d_i < 0,\ C^d_\lambda \gtrless 0 \tag{4}$$

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[1] Analytically, commercial bank note issue is nothing more than government credit with a zero interest rate. Typically, interest is not paid on government deposits. Central bank credits are usually supplied at a relatively low rate which can be regarded as zero for the sake of simplicity since its supply is determined through rationing.

TABLE 1

Government

Net deficit	$\bar{C}$ (government currency)
G_2 (government deposits and central bank credits)	αQE (net outstanding securities)

Commercial Banks

QE^b (demand for securities)	G_1 (bank note issue)
	G_2 (government deposits and central bank credits)
	$\bar{D}^s$ (supply of deposits)
	βQE (bank equity)

Asset Holders

QE^h (demand for securities)	W (net worth)
$\bar{D}^d$ (demand for deposits)	
$\bar{C}^d$ (demand for currency)	

Firms

pqK (capital stock)	QE (outstanding securities)

and

$$\begin{aligned} H_r + D_r^d + C_r^d &= 0 \\ H_i + D_i^d + C_i^d &= 0 \\ D_\lambda^d + C_\lambda^d + H_\lambda &= 0 \\ H + D^d + C^d &= 1 \end{aligned} \tag{5}$$

i is the rate of interest on deposits. An increase in shift parameter λ means the autonomous development of the banking habit.[1] Since the concept of the banking habit is usually concerned with the substitution between currency and deposits, a more specific assumption about the sign of partial derivatives can be used where necessary.

$$H_\lambda = 0,\ D_\lambda^d = -C_\lambda^d > 0 \tag{6}$$

It is assumed that the deposit market and assets investments market faced by banks are imperfect, so that marginal costs of deposits rises as the amount of deposits increases for a given size of the economy increases and likewise for the marginal return on assets investments. Thus the maximization problem for banks can be written as

$$\text{maximize } \Pi = rQE^b - iD^s - \bar{C}^1\ (QE^b,\ pK,\ \theta) - \bar{C}^2\ (\bar{D}^s,\ pK,\ \theta)$$

$$\text{subject to } QE^b = G_1 + G_2 + D^s + \beta QE$$

where Π is profit, and $\bar{C}^1$ and $\bar{C}^2$ denote the administrative costs of assets investments and the deposits respectively. θ is a shift para-

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[1] In his careful and extensive discussion, Porter [1966] uses a broader definition of the banking habit which is close to the concept of deposit banking in our terminology.

meter of the cost functions which represents the efficiency of banking operations. Dividing by pK, the problem is rewritten as

$$\text{maximize } \Pi/pK = rm - id - C^1(1, \theta) - C^2(d, \theta)$$

$$\text{subject to } m = g_1 + g_2 + d + \frac{\rho}{r}\beta$$

where

$$m = QE^b/pK, \quad d = \bar{D}^s/pK, \quad g_1 = G_1/pK, \quad g_2 = G_2/pK,$$

$$C' = \bar{C}^1/pK, \quad C^2 = \bar{C}^2/pK$$

and $\bar{C}^1$ and $\bar{C}^2$ are assumed to be linear homogeneous in QE^b and pK, and D^s and pK respectively. It is also assumed that

$$C^1_m > 0, \; C^1_{mm} \gtrless 0, \; C^2_d > 0, \; C^2_{dd} \gtrless 0, \; C^1_{m\theta} < 0, \; C^2_{d\theta} < 0$$

and that g_1 and g_2 are constant.

Two comments should be added on the role of pK (the current value of capital stock) in this formulation. In the first place, pK works as a scale index of the economy in the cost functions. While it is undeniable that costs should be dependent on some scale index, the choice of the index is an empirical question and there is not particularly firm ground for using pK as the index. Net worth is another possible choice, and the empirical analysis in Section 3 yields good results by using net worth instead of pK. In the second place, the policy variables G_1 and G_2 are assumed to be proportional to pK. This is also a question to be examined empirically. Total bank assets QE^b

or bank equity QE are other candidates.[1]

The first order condition for the maximization is given as

$$r - i - C^1_m - C^2_d = 0$$

Differentiating this and the balance sheet constraint, we have

$$\frac{\partial d}{\partial r} = \frac{\partial m}{\partial r} = (1 + C^1_{mm}\frac{1}{r^2}) / J > 0$$

$$\frac{\partial d}{\partial i} = \frac{\partial m}{\partial i} = -1/J < 0$$

$$-1 \leq \frac{\partial d}{\partial (g_1 + g_2)} = -C^1_{mm} / J \leq 0, \quad 1 \geq \frac{\partial l}{\partial (g_1+g_2)} = C^2_{dd}/J \geq 0$$

$$-\frac{1}{r} \leq \frac{\partial d}{\partial \beta} = -C^1_{mm}\frac{1}{r} / J \leq 0, \quad \frac{1}{r} \geq \frac{\partial l}{\partial \beta} = \frac{1}{r} C^2_{dd} / J > 0$$

$$\frac{\partial d}{\partial \theta} = \frac{\partial m}{\partial \theta} = (-C^1_{m\theta} - C^2_{d\theta}) / J > 0$$

where $J = C^1_{mm} + C^2_{dd}$.

Therefore, we can write the deposit supply function[2] as

$$d = \frac{\bar{D}^s}{pK} = D^s (r, i, g_1 + g_2, \theta, \beta) \qquad (7)$$

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[1] While such a G variable as government deposits is sometimes supplied preferentially to large banks, this does not necessarily mean that QE^b or βQE is used as the policy index for the aggregate supply of government deposits.

[2] In most modern economies, the deposit rate is set by regulation at a lower rate than the competitive equilibrium level, so that the equilibrium amount of deposits is simply equal to the demand for deposits at the regulated rate. In such a situation, there is no use for the notion of the deposit supply function. However, when private banks can set the deposit rate, the concept of the deposit supply function is very important. A few examples which explicitly introduce the deposit supply function are J. Tobin [1969], D. H. Pyle [1971] and M.A. Klein [1971]. Incidentally, in Tobin's model there is no scale factor for the deposit supply function (the total deposit supply is simply a function of interest rates), which means any two economies with the same interest rates have the same deposit supplies irrespective of the size of the economies.

$$D^s_r > 0,\ D^s_i < 0,\ -1 \leq D^s_g = \frac{\partial D^s}{\partial(g_1+g_2)} \leq 0,\ D^2_\theta > 0$$

$$-\frac{1}{r} \leq D^s_\beta \leq 0$$

and the bank demand function for securities as

$$m = \frac{QE^b}{pK} = D^s\ (r,\ i,\ g_1 + g_2,\ \theta,\ \beta) + g_1 + g_2 + \frac{\rho}{r}\beta \qquad (8)$$

One important feature of these derived functions is the substitution of g_1 and g_2 with deposit supply.[1] When g_1 or g_2 is increased it is partly offset by a decrease in deposit supply; consequently the demand for security investments increases less than proportionately. It is also important to note that this substitution effect depends on the relative degree of imperfection of the deposit and asset investments market. If $C^2_{dd} = 0$, that is if the deposit market is perfect,[2] then

$$\frac{\partial d}{\partial(g_1+g_2)} = -1 \quad \text{and} \quad \frac{\partial m}{\partial(g_1+g_2)} = 0$$

and as C^2_{dd} increases, $\partial d/\partial(g_1+g_2)$ decreases and $\partial m/\partial(g_1+g_2)$ increases in the absolute value. If, on the other hand, the assets investments market is perfect ($C^1_{mm} = 0$), then the entire adjustment to a change in G occurs in bank securities holdings, since

$$\frac{\partial d}{\partial(g_1+g_2)} = 0 \quad \text{and} \quad \frac{\partial m}{\partial(g_1+g_2)} = 1.$$

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[1] There is also substitutability between deposit supply and bank equity, for which the analysis is similar.

[2] The intuitive meaning of this is simple. Because banks can obtain as much funds as they want at constant marginal cost if the deposit market is perfect, a decrease in G is simply substituted for an increase in deposit supply.

In other words, the substitution effect is larger the more perfect the deposit market (holding the degree of imperfection in the asset investment market constant).

Let us describe the market equilibrium. The equilibrium condition for the currency market is given by

$$\bar{C} + G_1 = C^d (r, i, \lambda) W \tag{9}$$

That for the deposit market is

$$D^s (r, i, g_1 + g_2, \theta, \beta) pK = D^d (r, i, \lambda) W \tag{10}$$

and for the security market

$$\begin{aligned} (1 + \alpha + \beta) QE &= H (r, i, \lambda) W \\ &+ D^s (r, i, g_1 + g_2, \theta, \beta) pK \\ &+ G_1 + G_2 + \beta QE \end{aligned} \tag{11}$$

By using (9) $\sim$ (11) and the balance sheet constraint of the banking sector, net worth is written as

$$W = QE^h + C^d + D^d = (1 + \alpha) QE + \bar{C} - G_2 \tag{12}$$

Dividing by pK, our model becomes the following two equations

$$c + g_1 = C^d(r, i, \lambda) \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} \tag{13}$$

$$\begin{aligned} &D^s(r, i, g_1 + g_2, \theta, \beta) \\ &= D^d(r, i, \lambda) \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} \end{aligned} \tag{14}$$

where $c = \frac{\bar{C}}{pK}$. The equation for the security market is excluded by

Walras' Law, and the commodity market is neglected following the convention of Tobin-type assets market analysis.

2. Effects of Autonomous Changes in Banking Efficiency and the Banking Habit

Let us examine the effects of an increase in θ. This can be regarded as a formal representation of the autonomous improvement in the efficiency of banking operations. We have

$$\frac{\partial r^*}{\partial \theta} = \frac{1}{A} \begin{vmatrix} 0 & A_{12} \\ D^s_\theta & A_{22} \end{vmatrix} < 0$$

$$\frac{\partial i^*}{\partial \theta} = \frac{1}{A} \begin{vmatrix} A_{11} & 0 \\ A_{21} & D^s_\theta \end{vmatrix} > 0$$

and, with respect to the ratio of private deposits to net worth,

$$\frac{dD^{*d}}{d\theta} = D^{*d}_r \frac{\partial r^*}{\partial \theta} + D^{*d}_i \frac{\partial i^*}{\partial \theta} > 0$$

where

$$A_{11} = C^d_r \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} - C^d (1 + \alpha) \frac{\rho}{r^2} < 0$$

$$A_{12} = C^d_i \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} < 0$$

$$A_{21} = D^d_r \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} - D^d (1 + \alpha) \frac{\rho}{r^2} - D^s_r < 0$$

$$A_{22} = D^d_i \{(1 + \alpha) \frac{\rho}{r} + c - g_2\} - D^s_i > 0$$

and

$$A = \begin{vmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{vmatrix} < 0$$

The implications of these results are obvious. An increase in θ causes a rightward shift of the deposit supply function, yielding a higher interest rate on deposits. Demand for securities by banks is also increased. Although demand for securities by asset holders is decreased by the higher deposit interest rate, this decrease is numerically smaller than the increase in the demand by banks. Thus, the required rate of return on investment r is lowered. A rise in i and a fall in r causes the equilibrium deposits to increase.

An improvement of the banking habit is formally represented by an increase in λ. The results are

$$\frac{\partial r^*}{\partial \lambda} = \frac{1}{A} \begin{vmatrix} +C^d_\lambda \{(1+\alpha)\frac{\rho}{r} + c - g_2\} & A_{12} \\ -D^d_\lambda \{(1+\alpha)\frac{\rho}{r} + c - g_2\} & A_{22} \end{vmatrix}$$

$$\frac{\partial i^*}{\partial \lambda} = \frac{1}{A} \begin{vmatrix} A_{11} & -C^d_\lambda \{(1+\alpha)\frac{\rho}{r} + c - g_2\} \\ A_{21} & -D^d_\lambda \{(1+\alpha)\frac{\rho}{r} + c - g_2\} \end{vmatrix}$$

By applying assumption (6), these become[1]

$$\frac{\partial r^*}{\partial \lambda} = \frac{-C^d_\lambda}{A} \{(1+\alpha)\frac{\rho}{r} + c - g_2\} \quad (A_{12} + A_{22}) < 0$$

$$\frac{\partial i^*}{\partial \lambda} = \frac{-C^d_\lambda}{A} (1+\alpha)\frac{\rho}{r} + c - g_2\} \quad (A_{11} + A_{21}) < 0$$

and also

$$\frac{\alpha D^{*d}}{\alpha \lambda} = D^{*d}_r \frac{\partial r^*}{\partial \lambda} + D^{*d}_i \frac{\partial i^*}{\partial \lambda} \gtrless 0$$

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[1] $A_{12} + A_{22} = (C^d_i + D^d_i)\{(1+\alpha)\frac{\rho}{r} + c - g_2\} - D^s_i$

$= -H_i \{(1+\alpha)\frac{\rho}{r} + c - g_2\} - D^s_i > 0$

The second term on the right hand side of this equation is negative. Thus, in this case, an increase in the banking habit does not necessarily assure an increase in the equilibrium share of deposits. In terms of Figure 1, both the CC curve representing currency market equilibrium and the DD curve representing deposit market equilibrium shift leftward. By the property given in footnote 7 and assumption 6, the shift of the CC curve is greater than that of the DD curve, so that both r and i decrease. In the deposit market equilibrium depicted in Figure 2, the deposit demand function shifts rightward directly due to an increase in λ and indirectly due to a fall in r, while the deposit supply curve shifts leftward due to a fall in r. Therefore, when the interest elasticity of the deposit function is large or deposit supply is highly elastic to a change in r, it is possible that the equilibrium amount of deposits is decreased as a result of an increase in the deposit habit as stipulated in (6).

However, it must be noted that the reality of this paradoxical result is somewhat questionable. In a financially underdeveloped economy where a mere increase in knowledge of the availability of deposits induces a shift from currency to deposits in people's portfolio, the interest elasticity of holding deposits is considered to be small. In other words, the degree of portfolio shift of this kind does not change with the level of deposit interest rates. It can be said that in an economy where λ can be significantly changed, the interest elasticity of deposit demand is usually small, so that a policy of increasing λ will be effective in promoting deposit banking.

Figure 1

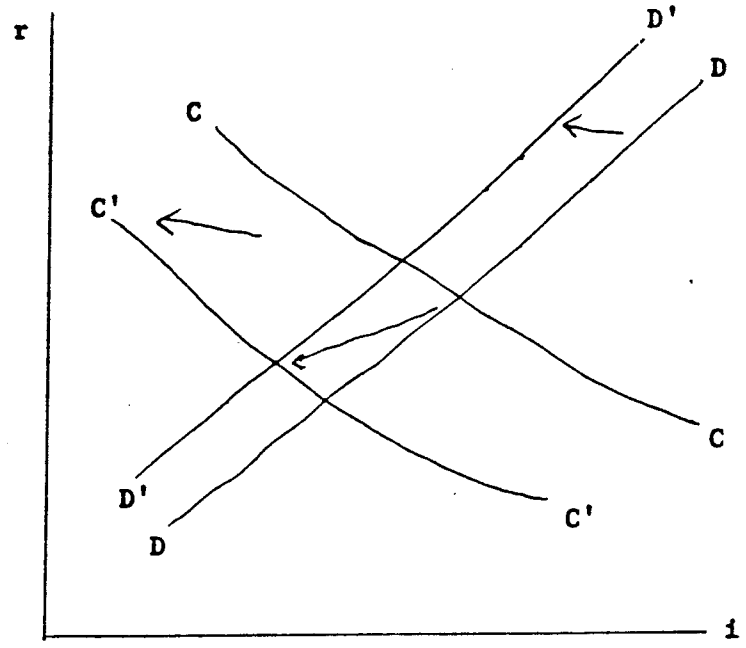
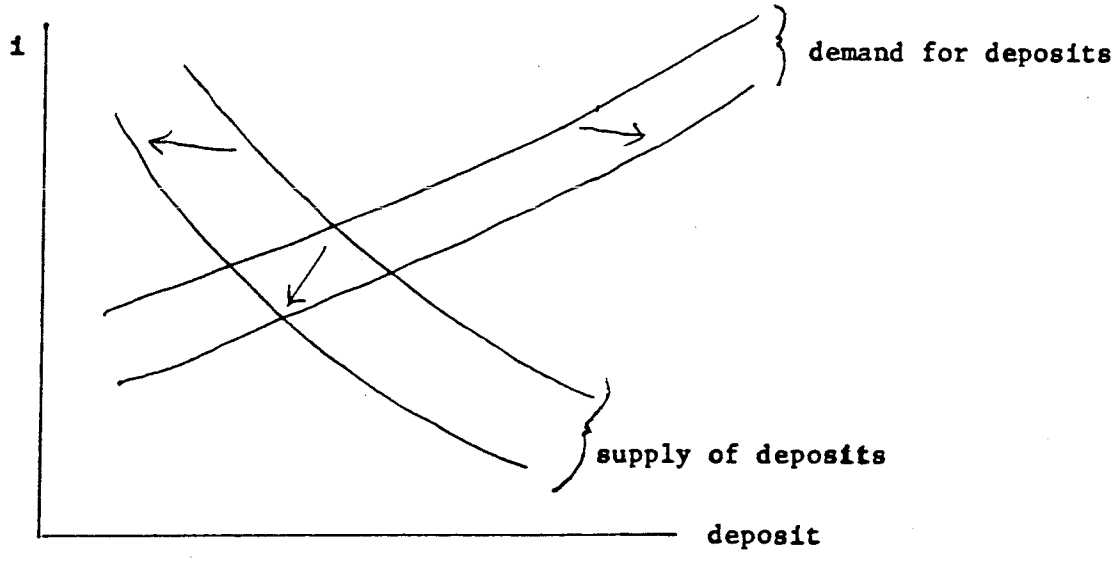


Figure 2



3. Effects of G Policy

In our model, there are two kinds of G, of which G_1 is itself a part of currency and the value of G_2 is constrained by the balance sheet of the government. Therefore, in the analysis of G policy, it is necessary to stipulate the way by which G is changed. We will examine the following two cases: (1) G policy with variable currency supply and (2) G policy with variable security supply.[1] Although there are two components of G, the policy of changing G_2 and, at the same time, changing $\bar{C}$ in the same amount and direction.[2] Therefore, it is sufficient to analyse only the effect of G_1 manipulation.

(1) dG_1 (or equivalently $dG_2 = d\bar{C}$)

This policy assumes a change in currency supply accompanied by G policy. By setting dg_1 in equations (13) and (14), we obtain

$$\frac{\partial r^*}{\partial g_1} = \frac{1}{A}\{(D_i^d - D_g^s C_i^d)((1 + \alpha)\frac{\rho}{r} + c - g_2) - D_i^s\} < 0 \quad [3]$$

$$\frac{\partial i^*}{\partial g_1} = < 0$$

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[1] Changing G with variable government expenditure is another possibility. To deal with this case, we must reformulate the model into that of period analysis, a task left to the future.

[2] In equations (9) ~ (11), all the changes in net worth, currency supply, and central bank and government credits to banking are the same under these two configurations.

[3] The sign of $D_i^d - D_g^s C_i^d$ follows from $-1 \leq D_g^s \leq 0$ and the gross substitution assumption; i.e. $D_i^d - D_g^s C_i^d > D_i^d + C_i^d = -H_i^d > 0$

$$\frac{dD^{*d}}{dg} = \frac{1}{A}\left[D_g^s\left(A_{11}D_i^d - A_{12}D_r^d\right) + A_{22}D_r^d - A_{21}D_i^d\right] \gtrless 0$$

A decrease in G causes a rightward shift of the deposit supply function, causing a rise in the deposit rate. However, since the currency supply is decreased in this case, the security interest rate (required rate of return on investment is increased,[1] and the final effect on capital accumulation is unfavorable. Although the sign of the equilibrium amount of deposits is ambiguous in general, it is definitely increased by the G reduction policy if the substitution effect is numerically large enough; that is

$$\frac{\partial D^{*d}}{\partial g_1} < 0$$

if and only if

$$\frac{A_{21}D_i^d - A_{22}D_r^d}{A_{11}D_i^d - A_{12}D_r^d} > D_g^s$$

Although r is raised by a reduction of G in this case, this is simply because of the decreased currency supply in this policy configuration. It is important to note that the deposit substitution effect of G itself has a favorable effect on capital accumulation, although its numerical value is smaller than the effect of the currency reduction (see footnote 3, page 19).

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[1] A rise in i causes a decrease in the demand for currency. However, this decrease is not as large as the decrease in the currency supply. This is because the gross substitution assumption requires a decrease in security demand as i rises.

(2) $dG_1 = -d\bar{C} = d(\alpha QE)$ (or equivalently, $dG_2 = d\bar{C}$ and $d(\alpha QE) = -d\bar{C}$)

In this policy, the supply of securities by the government is changed by the G policy. The currency supply is kept constant. By setting $dc = -dg_1$ and[1] $d\alpha = \frac{r}{\rho} dg_1 + \frac{\alpha}{r} dr$ in equations (13) and (14), we obtain

$$\frac{\partial r^*}{\partial g_1} = \frac{A_{12}}{A'} D_g^s > 0$$

$$\frac{\partial i^*}{\partial g_1}$$

$$= \frac{1}{A'} \{ C_r^d (1+\alpha) \frac{\rho}{r} + c - g_2 \} - c^d \frac{\rho}{r^2} \} D_g^s < 0$$

$$\frac{dD^{*d}}{dg_1} = < 0$$

where

$$A' = \begin{vmatrix} A_{11} + c^d \frac{\rho\alpha}{r^2} & A_{12} \\ A_{21} + D^d \frac{\rho\alpha}{r^2} & A_{22} \end{vmatrix} < 0$$

A decrease in G raises i by shifting the deposit supply function (with the demand function constant), and in the currency market, the higher i causes a fall in r since the currency supply is constant. In this case, the G reduction policy not only decreases the required rate

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[1] $dg_1 = d(\alpha \frac{QE}{pK}) = d(\alpha \frac{\rho}{r}) = -\frac{\rho}{r^2} \alpha dr + \frac{\rho}{r} d\alpha$

of return on investment, but also increases the equilibrium deposit level. It is also interesting to note that all the effects are strictly proportional to the value of D_g^s (substitution effect). Therefore, if $D_g^s = \theta$

$$\frac{\partial r^*}{\partial g_1} = \frac{\partial i^*}{\partial g_1} = \frac{dD^{*s}}{dg_1} = 0$$

This is because the decrease in the security supply is exactly equal to the decrease in the security demand by banks in the absence of any substitution effect.

III. Empirical Analysis of G Policy

The policy of reducing G is shown to be quite effective in bringing about deposit banking by inducing a substitution for G of private deposits. It is important to note that the condition of a market-determined deposit interest rate is crucial to this analysis. If the deposit rate paid is regulated so as to be below its competitive equilibrium level, the equilibrium amount of deposits would be determined irrespective of the deposit supply condition. In other words, banks would simply supply deposits up to the amount demanded at the ceiling interest rates on deposits. In that situation there would be no substitutability between deposit supply and G, and G could not be manipulated to affect bank deposit supply; all G would simply be reflected in changes in bank loans (and other invested assets).

The experience of banking in early Japan presents a typical example of this kind of G policy. In Japan, the modern banking system was

established by supplying a huge amount of G initially, thereby making it more profitable to enter the banking business. After most of the private banks were set up, however, the government deliberately tried to reduce the supply of G with the more or less explicit purpose of promoting deposit banking. Moreover, this G policy was done under almost completely free market conditions; in particular, there was virtually no regulation of interest rates.[1]

Therefore, by estimating the asset demand and supply functions for this period of Japan, we can obtain empirical counterparts of equations (13) and (14). Estimation is done for the period[2] 1888-1913, and the method of estimation of two-stage least squares developed by Fair [1970] is utilized because of the strong possibility of serial correlation in disturbance terms on account of the lagged endogenous variables.

Our model is summarized in Table 2. The results are generally in line with our expectations. In the demand for currency equation, the signs of the coefficients for interest rates are correct and that for deposit rate significant;[3] the wealth effect as measured is not significant, while the explanatory power of the income term is strong. In almost all forms of estimation experimented with, we obtained better results by using the square root of income rather than income itself. This suggests the

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[1] These points are explained in detail in Teranishi and Patrick [1978].

[2] Data are not adequate prior to 1888, and after 1913 or so the value of G became insignificantly small.

[3] The deposit rate used here is for six-month time deposits; it should be noted that interest was paid on most forms of demand deposits as well, and that changes in various deposit rates moved together.

Table 2

(1) Supply of Currency

$$\frac{C}{W} = \frac{\bar{C}}{W}$$

(2) Demand for currency

$$\frac{C}{W} = \underset{}{-0.0823} \underset{(2.93)}{} - \underset{(-2.86)}{0.0113i} - \underset{(-0.35)}{0.0001r} + \underset{(4.38)}{12.6689}\ \frac{Y^{\frac{1}{2}}}{W} + \underset{(0.33)}{0.0137}\ \frac{\Delta W}{W}$$

$$+ \underset{(0.65)}{0.1316}\ \left(\frac{C}{W}\right)_{-1} - \underset{(-0.16)}{0.0092}\ \left(\frac{D}{W}\right)_{-1}$$

$$R^2 = 0.990,\ \rho = -0.326$$

(3) Demand for Deposits

$$\frac{D}{W} = \underset{(0.76)}{0.0867} + \underset{(1.19)}{0.0188i} + \underset{(1.39)}{0.0014\ r} - \underset{(-0.52)}{4.5972}\ \frac{Y^{\frac{1}{2}}}{W} - \underset{(-1.74)}{0.2096}\ \frac{\Delta W}{W}$$

$$+ \underset{(2.82)}{0.6649}\ \left(\frac{D}{W}\right)_{-1} \underset{(-0.76)}{-0.0041}\ \left(\frac{C}{W}\right)_{-1}$$

$$R^2 = 0.903,\ \rho = 0.210$$

(4) Supply of Deposits

$$\frac{D'}{W} = \underset{(1.02)}{0.1947} - \underset{(-1.47)}{0.0407i} + \underset{(3.02)}{0.0026\ r} - \underset{(-1.68)}{0.8819}\ \frac{G}{L}$$

$$+ \underset{(1.72)}{0.0209}\ \frac{PK}{W} + \underset{(3.71)}{0.1965}\ \left(\frac{D'}{W}\right)_{-1}$$

$$R^2 = 0.658,\ \rho = 0.559$$

(5) Equilibrium Condition of Deposit Market

$$\frac{D'}{W} = \frac{D'}{D}\ \frac{D}{W}$$

Table 2 (continued)

Notations:

Endogenous

C/W : currency (outside banks) - wealth ratio

D/W : private deposits plus postal savings - wealth ratio

D'/W: private deposits - wealth ratio

i : rate of interest on deposits

r : rate of yield on securities (including capital gains and losses)

Exogenous

$\bar{C}/W$: currency (outside banks) - wealth ratio

$Y^{1/2}/W$: (square root of) gross national expenditure (at current prices) - wealth ratio

G/L : government credit to banking - total bank funds ratio

D'/D: private deposits - private deposits plus postal savings ratio

$\Delta W/W$: rate of change of wealth

PK/W: gross capital stock (at current prices) - wealth ratio

Note: Figures in parenthesis are t values. R^2 is adjusted for degrees of freedom. ρ denotes the coefficient of serial correlation of disturbance terms.

Sources: The numbers of parentheses indicate the corresponding columns in Statistical Table II of Teranishi and Patrick [1978].

C($\bar{C}$) = (19) - (20), W = (2) + (3) + (19) - (7), D = (6), D' = (5) + (18), L = (6) + (7) + (8), Y = (16), PK = (1), G = (7), i = (11), r_c = {(2) x (13) + (3) x (15) } ÷ ((2) + (3)).

existence of scale economy in currency use during this period, reflecting probably the fact the monetization of the economy had already been virtually completed by 1888 or so. In the demand for deposits equation, the deposit interest rate coefficient is of correct sign and significant but for the yield on securities is not correct, while the income effect is not significant. The negative sign for the wealth effect, together with its insignificance in the currency equation, suggests a positive wealth effect on security holding. The speed of adjustment in the holding of deposits is slower than for currency demand.[1]

In the deposit supply equation, the signs of coefficients of both interest rates are correct although the R^2 is not particularly high. The sign of pK/W implies that an increase in W (relative to pK), due to the increased supply of government bonds and currency as well as to the accelerated incorporation of firms, induced banks to shift leftward their deposit supply schedule with the objective of lowering the deposit interest rate paid. This suggests some increase in market power of banks related to an increase in W. The coefficient of G/L (L = total bank liabilities) is significant and its value -0.88 suggests a strong substitution effect between G and D as hypothesized. This coefficient roughly corresponds to D_g^s in the theory.[2]

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[1] Our model in its final form does not include shift parameters for changes in the banking habit or banking efficiency. One reason for this is we could not find good measures for these effects. For example, an experiment with the ratio of the number of banks to population did not improve the results.

[2] The long-run equilibrium value is -1.098. Estimations using G/pK or G/W instead of G/L did not yield good results, so that exact comparison with the theoretical analysis is not possible.

Due to the inadequacy[1] of data for this early period, the results of estimation, although fairly satisfactory, are not robust enough to allow conditional simulation experiments of G policy. However, since Japan was quite successful in promoting deposit banking in this period (the ratio of private deposits to corporate net worth rose from 0.17 in 1888 to 0.46 in 1913) and G was reduced drastically (the ratio of G to total bank liabilities was 0.17 in 1888 and 0.03 in 1913), it can be conjectured there occurred a significant substitution between G and private deposits.

IV. Concluding Remarks

With regard to the problem of how to develop deposit banking, we have analysed two broad questions. Both the development of the banking habit and of efficiency of bank operations as formally represented by autonomous shifts of assets demand and supply functions are theoretically effective[2] in fostering deposit banking. While these shifts are basically desirable, it is not easy to specify policy

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[1] One most important difficulty lies in the definition of net worth. Since this period is characterized not only by rapid development of deposit banking but also by the accelerated incorporation of business firms, corporate net worth (paid-in equity and reserves, increased much faster than the real capital stock. Since our data on net worth of assets holders does not include the equity capital of unincorporated firms (since data are not available), there is a possibility of significant bias in our estimation. As Silber [1975] emphasizes, much work needs to be done on the interaction of the development of direct financing and indirect financing, theoretically as well as empirically.

[2] Except for one paradoxical case for shifts in the demand functions of deposits and currency.

measures for this purpose and it is likely to take a long time for the effects of policy measures to be realized. Perhaps these shifts should be pursued in a broader policy framework of overall modernization of the economy.

The policy of reducing G under free interest rates, on the other hand, has a more definite result and at least is more operational for policy. In view of the substantial dependence on G of LDC banking, the possibility of G policy should be considered seriously. However, it must be noted that there are many significant differences between the actual financial circumstances of LDCs and those which prevailed in Meiji Japan and assumed in our theory. First, for many LDCs interest rates are far from free and put under strong regulations. Second, there are many kinds of regulations on the allocation of bank portfolios, which make it necessary to treat both assets and liabilities sides of bank activity in evaluating G policy. Third, foreign liabilities are additional important sources of funds for LDC banking, and their relationship with G and private deposits poses another problem to be considered. Fourth, the degree of development of a market economy should be taken into consideration. As we have shown, G policy is relatively more efficient in a relatively more developed market economy because the substitution of G by deposits by banks is positively related to the degree of perfection of the deposit market.

With all these qualifications, we believe that the relevance of G policy should be considered for each specific phase of a specific economy's development. In our assertion for G policy, we agree with

McKinnon [1973] in his advocacy of the utilization of market interest rates and with Chandler [1962] in his following assault on continuing heavy dependence on G in LDCs.[1]

> 'It is one thing for a central bank to promote the establishment of new financial institutions to supervise and examine them, to help them developing efficiency and trustworthiness. It is quite another to place on the central bank heavy continuing responsibility for financing these institutions. And this is the situation in country after country' (p. 17).

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[1] Johnson's policy recommendation concerning the establishment of new institutions is also similar to our G policy ([1974] p. 96). See also Brimmer [1971], p. 785.

BIBLIOGRAPHY

Brimmer, Andrew F., "Central Banking and Economic Development: The Record of Innovation," Journal of Money, Credit and Banking, Nov. 1971, pp. 780-792.

Cameron, Rondo, ed., Banking in the Early Stages of Industrialization--A Study in Comparative Economic History, ch. 9, Oxford University Press, 1967.

Chandler, Lester V., Central Banking and Economic Development, Series of Monetary and International Economics, No. 3, University of Bombay, 1962.

Fair, Ray C., "The Estimation of Simultaneous Equation Models with Lagged Endogenous Variables and First Order Serially Correlated Errors," Econometrica, May, 1970.

Johnson, Omotunde E. G.,"Credit Controls as Instruments of Development Policy in the Light of Economic Policy," Journal of Money Credit and Banking, February 1974.

Klein, Michael A., "A Theory of the Banking Firm," Journal of Money, Credit and Banking, May 1971.

McKinnon, Ronald I. Money and Finance in Economic Development, The Brookings Institution, 1973.

Porter, Richard C., "The Promotion of 'Banking Habit' and Economic Development," Journal of Development Studies, July 1966, pp. 346-367.

Pyle, David H., "On the Theory of Financial Intermediation," Journal of Finance, June 1971.

Ranis, Gustav, "Economic Development and Financial Institutions" in B. Balassa and R. N. Nelson (eds.) Economic Progress, Private Values and Public Policy: Essays in Honor of William Fellner, North Holland, 1977, pp. 27-55.

Silber, William L., "Toward a Theory of Financial Innovation" in Financial Innovation, ed. by W. L. Silber (Massachusetts, Lexington Books, 1975.

Teranishi, Juro and Hugh Patrick, "The Early Establishment and Development of Banking in Japan: Phases and Policies Prior to World War I" (mimeographed), Yale University, 1978.

Tobin, James, "A General Equilibrium Approach to Monetary Theory," Journal of Money, Credit and Banking, Feb. 1969, pp. 15-29.

_____ and William Brainard, "Financial Intermediaries and the Effectiveness of Monetary Policy," American Economic Review (Papers and Proceedings), 53, May 1963, 383-400.

_____, Essays in Economics, Vol. 1--Macroeconomics, Ch. 17, North Holland, 1971.