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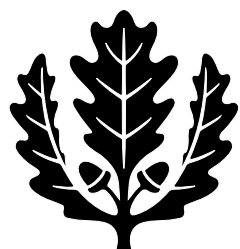
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Abstract

The paper develops a short-run model of a small open financially repressed economy characterized by unorganized money markets, capital good imports, capital mobility, wage indexation, and flexible exchange rates. The analysis shows that financial liberalization, in the form of an increased rate of interest on deposits and tight monetary policy, unambiguously and unconditionally causes deflation. Moreover, the results do not depend on the degree of capital mobility and structure of wage setting. The paper recommends that a small open developing economy should deregulate interest rates and tighten monetary policy if reducing inflation is a priority. The pre-requisite for such a policy, however, requires the establishment of a flexible exchange rate regime.

I. INTRODUCTION

Using a modified Mundell-Fleming model that accounts for financial repression, the paper analyzes the effects of financial liberalization on inflation. Specifically, financial restriction consists of three elements. First, the banking system receives favorable treatment and protection because the government can finance the budget deficit at a low or zero cost. The government does so forcing the banks to hold government bonds and money through the imposition of "high" multiple reserve requirements. Second, since government cannot easily extract revenue from private securities, it does not promote the development of private bond and equity markets. Finally, interest rate ceilings exist in the banking system to encourage low-cost investment and curtail competition with public sector fund raising from the private sector. In this context, financial liberalization means a relaxation of the interest rate ceiling and lowering of reserve requirements.

The paper receives motivation from a recent theoretical contribution by Nag and Mukhopadhyay (1998). The authors show that the new-structuralist claim, propagated by Wijnbergen (1982, 1983, 1985, and 1986), of a tight monetary policy and interest rate deregulation, does not hold with import penetration and a flexible exchange rate. The stagflationary outcome of the new-structuralist thesis does not prove obvious. Our paper builds on Nag and Mukhopadhyay (1998), by incorporating capital account mobility along with perfect wage indexation and

capital good imports, to show that a higher interest rate on deposits and tighter monetary policy will always prove unconditionally deflationary. Moreover, this result holds irrespective of the degree of capital mobility and whether the real product wage is fixed or not. Our paper compliments and extends Nag and Mukhopadhyay (1998).

The paper is structured as follows. Section 2 lays out the economic environment and Section 3 solves the model and discusses the effects of financial liberalization on the rate of inflation. Section 4 concludes.

II. THE MODEL

We consider a small open economy, operating under a floating exchange rate regime, with one domestically produced good and two different types of imported goods -- a consumption good and a capital good. The imported capital good combineswith the domestic component to produce the final capital good. We assume that the shares of the domestically produced component and the imported capital good in investment are exogenous. The imported consumption good also account for a fixed share of total consumption expenditure and depends solely on income. The price of the domestic good is endogenous, whilst the prices of the imported goods, both consumption and capital, are exogenous. We assume a perfectly elastic supply function of the importable goods at a foreign currency price of P^*. Since P^* is parametrically given to the economy, we set it to unity for

simplicity. Note that we implicitly assume a linear the production transformation schedule for the imported consumption good and the capital good. Thus, the same technology applies to both capital formation and the production of consumption goods in the world market and, hence, both investment and consumption goods sell for the same price of P^*.

"Financial repression" proves severe enough to give rise to an Unofficial Money Market (UMM), or the "curb" markets. The curb market establishes an informal credit market, where moneylenders and indigenous banks intermediate between savers and borrowers, beyond the regulation of the monetary authority. Because of no reserve requirements, the curb market resembles a competitive and agile credit market, providing more efficient intermediation than the official banking system. Moreover, since the banking system operates under interest rate regulations and high reserve requirements, the curb market emerges as a residual market that absorbs the excess demand for credit from the official banking system.

Firms unable to obtain low cost funds from the banking system at the regulated lending rate turn to the UMM to satisfy their borrowing needs to finance working and physical capital (the domestic and imported component) requirements. The freely determined rate in the curb market significantly exceeds the deposit and loan rates in the official banking system, and reflects the true marginal cost of

production. Hence, the UMM rate of interest appears as an argument in both the aggregate demand and supply sides of the model.

Our model of the small open financially repressed economy modifies the standard Mundell-Fleming model as outlined in Argy (1994). The basic structure of the economy involves four interrelated markets, labor, commodity, money, and foreign exchange markets. We start off with the labor market. Unlike the standard Mundell-Fleming model, the aggregate supply curve slopes upward under reasonable assumptions about wage-price flexibility.

As a short-run model, the aggregate supply depends solely on conditions in the labor market. That is,

$$\ln Q^S = -\beta_1 [(\ln W - \ln P_d) + r_c].$$ (1)

Equation (1) states that the quantity supplied negatively relates to the marginal cost of hiring one additional unit of labor. Note that labor represents the working capital requirements of the firm, which requires loan financing. Hence, besides the real wage ($\ln W$-$\ln P$), the real interest rate of the curb market (r_c) also appears in the equation. We assume that the nominal wage (W) gets fully indexed to the consumer price index (P) (i.e., $W=P$), where the consumer price index (CPI) equals the weighted average of the price of home good (P_d) and the price of imported good (eP^*). Since P^* equals unity, the movements in the price of the imported good

completely reflect variations in the nominal exchange rate, *e*. So the following relationship holds:

$$\ln P = \beta_2 \ln P_d + (1 - \beta_2) \ln e. \tag{2}$$

Substituting equation (2) into equation (1) and introducing time generates the aggregate supply equation as follows:

$$\ln Q_t^s = -\beta_1 [(1 - \beta_2)(\ln e_t - \ln P_{dt})] - \beta_1 \, r_{ct}, \tag{3}$$

where β_i's > 0, i = 1, 2.

Next, we turn our attention to the commodity market. The aggregate demand positively relates to the level of government expenditure G, exogenous foreign output Y_f, and the real exchange rate ($\ln e$-$\ln P_d$). While the real interest rate in the curb market (r_c) negatively influences the domestic investment demand and, hence, the aggregate demand. We postulate an IS curve of the following nature:

$$\ln Q_t^d = \alpha_1 (\ln e_t - \ln P_{dt}) + \alpha_2 \ln G_t - \alpha_3 r_{ct} + \alpha_4 \ln Y_{ft}, \tag{4}$$

where α_i's > 0, i = 1, 2, 3, 4.

To incorporate the role of reserve requirements, we endogenize the supply of money. The money demand equation follows the standard liquidity-preference theory. Given this, the nominal demand for money function is defined as follows:

$$\ln M_t^d = \ln P_{dt} + \delta_1 \ln Y_t + \delta_2 \bar{i}_{dt} - \delta_3 i_{ct},\tag{5}$$

where $M_t^d, Y_t, \bar{i}_{dt}, \text{ and } i_{ct}$ equal, respectively, the nominal money demand, the real gross domestic product, the nominal interest rate on deposits, and the nominal interest rate on curb market loans. Note that δ_i's > 0, $i=1,2,3$. Following the new-structuralist argument, we assume that a rise in the bank deposit (UMM rate of interest) rate causes a reallocation in households' portfolios toward bank deposits (UMM securities) at the expense of UMM securities (bank deposits) and not cash, thus, causing money demand to increase (decrease). This assumption makes good sense for a developing world, especially where most goods require cash payment and, hence, the demand for currency remains relatively inelastic in relation to changes in the opportunity cost variables.

Money supply equals the sum of currency in circulation (C) and supply of bank deposits (D). We can write, *(M^s)/R= (C/D)(D/R)+D/R*, where *R* equals required reserves and *M^s* equals the nominal supply of money. Alternatively, *M^s=((1+cu)/q)R*, where *cu* equals the currency-deposit ratio and *q* equals the required-reserve ratio. We assume that banks hold no excess reserves.

Simple intuition suggests that the currency-deposit ratio depends negatively on *Y*, and $\bar{i}_d$, and positively on i_c. The rationale for the sign of the currency-deposit ratio with respect to the interest rates reflects the fact that currency demand responds

inelasticly to interest rate movements. As Y increases, however, both C and D rise. But, assuming that the growth of banking habits means more payments through banks, deposits increase more quickly than currency. Hence, the currency-deposit ratio negatively correlates with the level of income. Using these arguments and given that $M^s=((1+cu)/q)R$, the money supply function in log-terms conforms to the following relation:

$$\ln M_t^s = -\eta_1 \ln Y_t - \eta_2 \bar{i}_{dt} + \eta_3 i_{ct} + \ln R_t - q_t, \qquad (6)$$

where η_i's >0, $i= 1, 2, 3$. Combining equations (5) and (6) and realizing that the nominal interest rate equals the sum of the real component and the expected rate of inflation, treated as exogenous, we generate the following equation from the money market equilibrium:

$$\ln R_t = \ln P_{dt} + \ln q_t - \alpha_5 \pi^e + \alpha_6 \ln Y_t - \alpha_7 r_{ct} + \alpha_8 \bar{i}_{dt}, \qquad (7)$$

where α_i's > 0, $i= 5, 6, 7, 8$. Note that $\alpha_5 = \alpha_7, \alpha_6 = \eta_1 + \delta_1, \alpha_7 = \eta_3 + \delta_3, \alpha_8 = \eta_2 + \delta_2$.

Nag and Mukhopadhyay (1998) and Nag (2000) argue that with significant dependence of developing countries on imports of intermediate inputs and lack of growth of exports due to structural bottlenecks, it proves difficult to maintain a fixed exchange rate regime. The tremendous pressure on the balance of payments in an open economic environment inevitably leads to the adoption of flexible exchange rates. In this paper, we assume that the monetary authority allows the

exchange rate to float freely. Accordingly, the equilibrium in the foreign exchange market equals the following:

$$B_t / X_0 = \alpha_9 (\ln e_t - \ln P_{dt}) - \ln Y_t + \ln Y_{ft} + \alpha_{10} r_{ct} + \alpha_{11} (r_{ct} - r_t^*), \qquad (8)$$

where α_i's > 0, $i = 9, 10, 11$, with $\alpha_9 > \alpha_1$ and r_t^* equals the world rate of interest. Note that α_{11} captures the degree of capital mobility, which can range between zero to infinity of from no to perfect capital mobility, respectively. Any positive intermediate value reflects imperfect capital mobility. Equation (8) defines the overall balance of payments given initial exports (X_0), where the first four terms determines the current account balance. The current account depends on the interest rate in the curb market, because of the import of capital goods. The last term captures the capital account balance. Equilibrium in the foreign exchange market implies that the balance of payments *(BP) = 0.*

III. SOLUTION AND FINANCIAL LIBERALIZATION

The section solves the model and then analyzes the effects of interest rate deregulation and lower reserve requirements on inflation and output. Equations (4), (7), and (8) constitute the IS, LM, and BP curves, and along with (3) can solve for Y, r_c, P_d, and e, realizing that $Q^d = Q^s = Y$.

Using equations (4), (7), and (8), we derive the following equation for the aggregate demand (AD) curve:

$$\ln Q_t^d = \Omega_1 \ln P_{dt} + \Omega_2 \ln Y_{ft} + \Omega_3 \bar{i}_{dt} + \Omega_4 r_t^* + \Omega_5 \pi_t^e$$
$$+ \Omega_6 q_t + \Omega_7 \ln R_t + \Omega_8 \ln G_t \quad , \tag{9}$$

where

$$\Omega_1 = -[\alpha_3\alpha_9 + \alpha_1(\alpha_{10} + \alpha_{11})]/\Theta < 0,$$
$$\Omega_2 = [\alpha_7(\alpha_4\alpha_9 - \alpha_1)]/\Theta?,$$
$$\Omega_3 = -\alpha_8[\alpha_3\alpha_9 + \alpha_1(\alpha_{10} + \alpha_{11})]/\Theta < 0,$$
$$\Omega_4 = [\alpha_1\alpha_7\alpha_{11}]/\Theta > 0,$$
$$\Omega_5 = \alpha_5[\alpha_3\alpha_9 + \alpha_1(\alpha_{10} + \alpha_{11})]/\Theta > 0,$$
$$\Omega_6 = -[\alpha_3\alpha_9 + \alpha_1(\alpha_{10} + \alpha_{11})]/\Theta < 0,$$
$$\Omega_7 = [\alpha_3\alpha_9 + \alpha_1(\alpha_{10} + \alpha_{11})]/\Theta > 0,$$
$$\Omega_8 = \alpha_7\alpha_2\alpha_9/\Theta > 0, \quad and$$
$$\Theta = [\alpha_3\alpha_6\alpha_9 + \alpha_7(\alpha_9 - \alpha_1) + \alpha_1\alpha_6(\alpha_{10} + \alpha_{11})] > 0.$$

Given that $\alpha_9 > \alpha_1$, the signs of the coefficient indicate that the slope and the shifts

of the aggregate demand curve conform to intuition.

Using equations (7) and (8), we solve for $\ln e_t$ and substitute the resulting solution

into equation (3). Thus, the aggregate supply (AS) curve emerges as follows:

$$\ln Q_t^s = \Psi_1 \ln P_{dt} + \Psi_2 \ln Y_{ft} + \Psi_3 \bar{i}_{dt} + \Psi_4 r_t^* + \Psi_5 \pi_t^e$$
$$+ \Psi_6 q_t + \Psi_7 \ln R_t + \Psi_8 \ln G_t \quad , \tag{10}$$

where

$$\Psi_1 = \beta_1[(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1)]/\Theta > 0,$$
$$\Psi_2 = -\beta_1[\alpha_6(\alpha_1 - \alpha_4\alpha_9) + (1-\beta_2)\{\alpha_6(\alpha_3 + \alpha_4(\alpha_{11} + \alpha_{10})) + \alpha_7(1-\alpha_4)\}]/\Theta?,$$
$$\Psi_3 = \beta_1\alpha_8[(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1)]/\Theta > 0,$$
$$\Psi_4 = -\beta_1\alpha_{11}[(1-\beta_2)(\alpha_3\alpha_6 + \alpha_7) + \alpha_1\alpha_6)]/\Theta < 0,$$
$$\Psi_5 = -\beta_1\alpha_5[(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1)]/\Theta < 0,$$
$$\Psi_6 = \beta_1[(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1)]/\Theta > 0,$$
$$\Psi_7 = -\beta_1[(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1)]/\Theta < 0, \text{ and}$$
$$\Psi_8 = \beta_1[(1-\beta_2)[\alpha_2\{\alpha_6(\alpha_{11} + \alpha_{10}) - \alpha_7\}]) - \alpha_2\alpha_6\alpha_9]/\Theta?.$$

To ensure that the aggregate supply curve slopes positively (the standard case), we impose the condition that $(1-\beta_2)(\alpha_3 + \alpha_{11} + \alpha_{10}) - (\alpha_9 - \alpha_1) > 0$, which also helps to sign Ψ_i, $i= 3, 5, 6$ and 7. This condition likely holds for a higher degree of capital mobility, given by α_{11}, and is obvious when α_{11} tends to infinity. Lower capital mobility can imply that the aggregate supply curve slopes negatively (the non-standard case). To maintain stability in such a case, however, we must ensure that the aggregate supply curve though negatively sloped must exhibit a steeper slope than the aggregate demand curve (i.e., $|\Omega_1| > |\Psi_1|$). In the non-standard case, except for Ψ_i, $i= 3, 5, 6$ and 7, the signs of all the other coefficients of the aggregate supply curve do not change from the standard case. Understandably, Ψ_i, $i= 3, 6,$ and 7, in the non-standard case possess signs opposite to that in the standard case.

Using equations (9) and (10), we derive the solutions for output and the price level as follows:

$$\ln Y_t = \Xi_1 \ln Y_{ft} + \Xi_2 r_t^* + \Xi_3 \ln G_t \text{ and} \tag{11}$$

$$\ln P_{dt} = \Lambda_1 \ln Y_{ft} + \Lambda_2 \bar{i}_{dt} + \Lambda_3 r_t^* + \Lambda_4 \pi_t^e + \Lambda_5 q_t + \Lambda_6 \ln R_t + \Lambda_7 \ln G_t, \tag{12}$$

where in the standard (non-standard) case,

$$\Xi_1 = (\Omega_2 \Psi_1 - \Psi_2 \Omega_1)/(\Psi_1 - \Omega_1)?(?), \Xi_2 = (\Omega_4 \Psi_1 - \Psi_4 \Omega_1)/(\Psi_1 - \Omega_1)?(<0),$$
$$\Xi_3 = (\Omega_8 \Psi_1 - \Psi_8 \Omega_1)/(\Psi_1 - \Omega_1)?(?),$$

and, in both the standard and the non-standard (given, $|\Omega_1| > |\Psi_1|$) cases,:

$$\Lambda_1 = (\Omega_2 - \Psi_2)/(\Psi_1 - \Omega_1)?, \Lambda_2 = (\Omega_3 - \Psi_3)/(\Psi_1 - \Omega_1) = -\alpha_8 < 0,$$
$$\Lambda_3 = (\Omega_4 - \Psi_4)/(\Psi_1 - \Omega_1) > 0, \Lambda_4 = (\Omega_5 - \Psi_5)/(\Psi_1 - \Omega_1) = \alpha_5 > 0,$$
$$\Lambda_5 = (\Omega_6 - \Psi_6)/(\Psi_1 - \Omega_1) = -1 < 0, \Lambda_6 = (\Omega_7 - \Psi_7)/(\Psi_1 - \Omega_1) = 1 > 0, \text{ and}$$
$$\Lambda_7 = (\Omega_8 - \Psi_8)/(\Psi_1 - \Omega_1)?.$$

Interestingly, the solution for output does not depend on the monetary policy parameter and inflation expectations. Moreover, effect on output corresponding to a fiscal policy change proves ambiguous, since the effect on the aggregate supply curve is uncertain. Besides, we observe that the coefficients on the monetary policy parameters and inflation expectations do not depend on the degree of capital mobility, import elasticities, and aggregate supply curve parameters.

Next, we investigate the effects of deregulation of the interest rate ceiling on deposits (i.e., an increase in $\bar{i}_{dt}$) and also lower reserve requirements (q_t) on rate of

inflation (gP_{dt}), for both the standard and the non-standard case. A '*g*' before a variable indicates the growth rate, while a Δ preceding the variable, indicates a change in the variable concerned. To derive the reduced-form equation for the rate of inflation we first difference equation (12).

$$(gP_{dt}) = \Lambda_1(gY_{ft}) + \Lambda_2\Delta\bar{i}_{dt} + \Lambda_3\Delta r_t^* + \Lambda_4\Delta\pi_t^e + \Lambda_5\Delta q_t + \Lambda_6(gR_t) + \Lambda_7(gG_t). \quad (13)$$

From equation (12), we can make the following observations:

(a) Interest rate deregulation unambiguously reduces inflation, and

(b) A lower reserve requirement policy generates inflation.

An increase in the controlled rate of interest on deposit increases the demand for money and, hence, the rate of interest in the curb market must increase to clear the money market. This enhances the cost of the domestic investment and shifts the IS curve to the left and reduces real gross domestic product and, hence, the import of the consumption good. At the same time, the increase in the UMM rate of interest reduces the import of the capital good and causes a capital inflow. The resulting surplus causes the nominal exchange rate to fall and shifts the IS curve further to the left and the BP curve up, reducing output further. This causes the aggregate demand curve to shift to the left, at a given price level.

On the supply side, the increase in the UMM rate of interest shifts the AS curve up due to the cost-push effect, but the decline in the nominal exchange rate reduces

the marginal cost of production. The positive effect on the aggregate supply curve due to the exchange rate appreciation outweighs the negative effect due to the increase in the UMM rate of interest, causing the aggregate supply curve to shift to the right. The leftward shift of the AD curve and the rightward shift of the AS curve ensures a deflation.

Such a policy change, however, fails to exert any real effect on output. Intuitively, the following sequence of events neutralizes the effects of any monetary policy on output: As the price level falls, the real exchange rate increases and shifts the IS, BP, and LM curves to the right, such that in the end all the curves return to their original positions. With real exchange rate and real interest rate unchanged, none of the schedules move any further.

A reduction in the reserve requirement implies a loose monetary policy and the curb market rate of interest must fall to ensure the money market equilibrium. Henceforth, the analysis follows exactly the opposite path to the one discussed above corresponding to an increase in the controlled interest rate on deposits. The aggregate demand curve shifts to the right while the aggregate supply curve shifts to the left causing inflation but, as before, no real effects.

For the non-standard case, given that $|\Omega_1|>|\Psi_1|$, all coefficients in equation (13) exhibit the same sign as the standard case. The effect on the aggregate demand curve, corresponding to changes in the policy variable, matches the standard case.

The aggregate supply curve, however, moves in the opposite direction to that discussed above. The cost-push effect of the interest rate dominates the employment and output effects corresponding to exchange rate changes.

The increase in the controlled rate of interest causes the AS curve to shift to the left. With the aggregate demand curve shifting left as well, the price level falls, as the latter shift tends to outweigh the former. Moreover, just as in the standard case, relaxation of the reserve requirement causes inflation with no real effects. The results occur because the coefficients of the monetary policy variables do not depend on the slope parameters of the AS and AD curves.

 In summary, the following results emerge: (i) Deregulation of interest rate on deposits and a tight monetary policy (i.e., a rise in q or a fall in R) unambiguously and unconditionally cause deflation; (ii) The effect on the GDP is, however, neutral.

As a corollary, suppose that real product wage is fixed (i.e., $\beta_2 =1$). Then, the aggregate supply curve slopes negatively. For stability, we assume that $|\Omega_1| > |\Psi_1|$ holds. Exactly the same results on the price level and output occur – a deflation with no real effect from interest rate deregulation and tight monetary policy. The coefficient of the monetary policy parameters in the reduced-form solution of the rate of inflation do not depend on the supply curve elasticities with respect to real wage and the curb market interest rate. As before, monetary policy is neutral. This

corollary proves important, especially in the light of the new-structuralist thesis of stagflation. In Wijnbergen (1983), the real wage is fixed and the contractionary effect of credit generates stagflation. Here, we show that even with a fixed real wage, stagflation cannot occur.

IV. CONCLUSION AND AREAS OF FURTHER RESEARCH

The paper modifies the standard Mundell-Fleming model and analyzes the effects of financial liberalization on domestic inflation and GDP. Considering a small open financially repressed economy characterized by an unofficial money market, perfect wage indexation, capital good imports, and capital mobility, we show that interest rate deregulation reduces inflation with no effect on the output. The result sharply contrasts with the new-structuralist claim of stagflation following interest rate deregulation, once we allow for exchange rate flexibility. Tight monetary policy produces similar effects on inflation and real GDP. The results do not depend on whether high or low capital mobility and whether a fixed or variable real wage exist. The critical requirement is a flexible exchange rate regime.

The model makes the following recommendations. A small open developing economy should deregulate interest rates and tighten monetary policy, if reducing inflation is a priority. To achieve this goal, however, the economy must establish a flexible exchange rate regime. The degree of capital mobility and the wage-structure do not matter.

To extend the current analysis, we could endogenize the process of expectation formulation along the lines of rational expectation, and analyze whether such a change affects our existing results. Further, since the current model does not include any microfoundations, it could prove interesting to analyze the long-run effects of financial liberalization on growth and inflation in a dynamic general equilibrium model.

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