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African and Fiscal Affairs Departments

Balance of Payments Stabilization Policies in the
Dependent Economy and Their Short-Run Impact on Economic Activity

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Abstract

This paper reviews financial programming in "dependent economies" with unemployed resources and nonmarket clearing conditions regarding domestic bank credit. Devaluation may increase domestic activity, even if the immediate export supply response is limited and devaluation tends directly to increase savings. When domestic credit markets are rationed, interest rate policy has nonstandard implications. An increase in interest rates becomes potentially expansionary to prevent a worsening of the external disequilibrium. Policy mixes to stabilize the balance of payments without inducing a domestic contraction are derived. There may also be room to accommodate the domestic counterpart of additional external project financing.

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Summary

This paper reviews the macroeconomics of financial programming in "dependent economies." It focuses on the case in which unemployed resources exist, financial intermediation operates entirely through the banking system, and nonmarket conditions may prevail for clearing domestic bank credit to the nongovernment sector. A standard demand-management policy aimed at reducing an external disequilibrium exerts a contractionary effect on the production of nontraded goods and on the level of domestic credit to the nongovernment sector.

The above result contrasts with the short-run potential of a devaluation to accelerate domestic activity even if the immediate supply response of the export sector is limited and monetary savings increase. The paper stresses the role of an accommodating domestic credit policy in supporting growth. When domestic credit markets are rationed, interest rate policy has nonstandard implications. Raising interest rates is potentially expansionary, but in this case expansion of economic activity is necessary to prevent further external disequilibrium.

The remainder of the paper focuses on devising fiscal and monetary policy mixes aimed at stabilizing the balance of payments without inducing a domestic contraction. Regarding fiscal policies, it emphasizes the need to devise appropriate expenditure/revenue policy mixes that take into account the relative nontraded goods content of government and nongovernment expenditures, as well as parameters characterizing monetary demand and supply. Similar considerations apply to a mix of fiscal and monetary policies.

The analysis also illustrates the extent to which there may be room to accommodate the domestic counterpart of additional external project financing, as long as those aspects of additional foreign financing that promote short-run domestic growth take precedence and sufficient resources in the economy are idle.

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I. Introduction

The purpose of this paper is threefold. First, it is to review the macroeconomic structure of the financial programming model that underpins many Fund programs in so-called dependent economies, particularly on the African continent. 1/ Second, it is to review the model's predictions regarding the short-run impact that domestic or external policies aimed at stabilizing the balance of payments are likely to have on economic activity. Third, it is to reassess within the dependent economy model developed in the paper the scope for policy mixes to reduce external disequilibria without perverse short-run effects on economic activity, and its implications for program design. 2/ Implications of the model for ways in which the fiscal targets in financial programs could be modified under the changing availability of foreign financing are also discussed.

The fixed-price disequilibrium macroeconomic model detailed in Section II stresses the budget, financing, and balance sheet constraints, in addition to the pivotal role played by monetary and credit relationships. 3/ Financial intermediation operates entirely through the banking system, and the demands and supplies of financial instruments (mainly domestic owing to the lack of capital mobility) are specified as end-of-period stock targets. This allows a clear interaction between the implied flow demands and supplies of financial assets and the saving/investment relationships.

The following central observation of the so-called monetary approach to the balance of payments is derived from Walras's Law, which holds in the end-of-period model considered here: As long as the nontraded goods market and the banks' deposit and credit markets clear, any excess demand for foreign exchange must be a reflection of (and be matched by) an excess supply of base money. What makes this observation, however, of only limited use as a guide to policy prescription is the fact that any policy action targeted at reducing the excess supply of base money with the aim of correcting the external disequilibrium will also affect the nontraded goods and the banks' deposit and credit markets, with feedbacks on the excess supply and

1/ The broad theoretical aspects of the design of Fund-supported adjustment programs have been reviewed in International Monetary Fund (1987). See, in particular, Khan and Knight (1981, 1982). Early seminal treatments of the dependent economy model were provided by Salter (1959) and Swan (1960). For a restatement, see Dornbusch (1980), Chapter 6.

2/ Such a policy assignment issue was originally discussed by Mundell and Flemming; see, in particular, Mundell (1968), Chapters 16-18.

3/ A thorough synthesis of disequilibrium macroeconomics along the lines of Barro and Grossman (1976) and Malinvaud (1977) in the open-economy context can be found in Cuddington, Johansson, and Löfgren (1984).

demand for base money and foreign exchange themselves. ^{1/} Understanding the nature of these feedbacks is essential in distinguishing between recessionary and growth-promoting balance of payments stabilization policies. A careful treatment of valuation of the banking system's net foreign assets is necessary to derive Walras's Law, and its implications for the formulation of domestic credit targets are highlighted.

Novel features of the model studied in this paper include an explicit account of the implications for the macroeconomic outcome of non-market-clearing conditions regarding domestic bank credit to the nongovernment sector. Two types of short-run quasi-equilibria are envisaged and compared: one is defined in terms of quantity adjustments on the nontraded goods market and interest rate adjustment on the market for domestic credit to the nongovernment sector; the other, which appears more realistic for the kind of economy considered here, is defined in terms of quantity adjustments on both the nontraded goods and the credit markets. ^{2/} The workings of the model are illustrated for external and domestic shocks.

Any standard demand management policy aimed at reducing an external disequilibrium exerts a contractionary effect on nontraded goods production and tends to be associated with a contraction of domestic credit to the nongovernment sector, which also coincides with a decline in savings of the nongovernment sector. The greater the contraction of nontraded goods output, the less efficient is the balance of payments stabilization policy, reflecting the leakages onto the domestic market of a reduction of aggregate demand targeted at reducing the excess demand for foreign exchange. Section III first contrasts these results with the short-run impact on domestic activity of a devaluation aimed at reducing the external imbalance. Even if the short-run supply response of the export sector is negligible, and devaluation tends to raise directly the end-of-period demand for money and thus for savings, it need not be contractionary in the dependent-economy model considered here. The first reason is, of course, that a devaluation could increase total nominal income (and its purchasing power) if the positive effect of that devaluation on the nominal income of the export sector (assuming full pass-through in the case of administratively set domestic export prices) dominates its negative effect on the value added of the nontraded goods sector. The second reason is that the higher savings are being mobilized in the banking system and should relieve the financing constraint faced by the firms, which allows an expansion of (investment) expenditures, including those on nontraded goods.

^{1/} Some of the main academic contributions to the formulation of the monetary approach to the balance of payments are found in Frenkel and Johnson (1976); early work at the Fund in this area was reviewed in Rhomberg and Heller (1977). Recent extensions of the monetary model that underlies the monetary approach are discussed in Chand (1987).

^{2/} See McKinnon (1973) and International Monetary Fund (1983) for a thorough discussion of the implications of financial repression on capital formation and growth.

The monetary side of the model puts things to rest; there is no reason to fear the impact of the above developments on the balance of payments. In fact, the larger the expansion of domestic output, increasing base-money demand, the more efficient the devaluation will be in reducing the external disequilibrium. The role of an accommodating domestic credit policy for the nongovernment sector to support growth is particularly stressed, in sharp contrast with the contraction of credit in standard demand management policies.

When domestic credit markets are rationed, a situation that, it is argued, is likely to occur whether or not capital mobility exists, interest rate policy has nonstandard macroeconomic implications. An increase in interest rates becomes potentially expansionary because it reduces the financing constraint faced by the enterprise sector. In fact, unless output expands sufficiently to offset the negative effect of higher interest rates on the demand for base money, the external disequilibrium will worsen. This is in sharp contrast to the deflationary and balance of payments-improving effect of an increase in interest rates induced by a contractionary monetary policy in the context of a clearing credit market.

In the remainder of Section III some simple rules are derived for the design of fiscal and monetary policy mixes aimed at stabilizing the balance of payments in a dependent economy without inducing a domestic contraction. Concentrating for instance on fiscal policies, a combination of expenditure cuts and tax rate cuts or expenditure increases and tax rate increases might be an optimal policy depending on their relative effectiveness in affecting the aggregate demand for nontraded goods versus the excess supply of base money. This relative effectiveness in turn is shown to depend significantly on the relative nontraded goods content of government versus nongovernment (cash or domestic credit financed) expenditures. Similar considerations apply in a mix of fiscal and monetary policies, for instance, choosing government expenditure increases and tightening reserve requirements rather than the opposite mix of policy directions.

The effectiveness referred to above determines, in particular, whether fiscal or monetary policy should be used to reduce the external disequilibrium, with the other targeted at counteracting that policy's deflationary effect. These results are contrasted with Mundell's unambiguous policy prescription (in the simplest case), and linked to the different structure of the model. It is also confirmed that purely fiscal optimal policy mixes imply a reduction of the government deficit; the sole possible exception concerns tax cuts (or a government wage bill increase) accompanied by reductions in other expenditures, for which the government deficit and its domestic bank financing could increase.

The short-run impact of the availability of greater foreign financing is also discussed. It is suggested that if the short-run domestic growth-promoting aspect of additional foreign financing is overriding, there is ground to accommodate, at least up to a point, the

domestic counterpart of external assistance project loans to the government, through a widening of the deficit beyond the additional foreign financing received. Covering that extra deficit through domestic bank financing would not make the initial balance of payments situation worse.

II. The General Macroeconomic Framework

This section sketches the macroeconomic structure of a typical developing country's dependent economy and subsequently sets up specific behavioral equations that will be used in Section III to discuss policy issues related to stabilization program design. Some of the most technical aspects of the model presented here are developed in the appendices. While the macroeconomic framework is familiar, it does differ from many open-economy formulations of the so-called IS-LM framework. An important distinction is in the treatment of economic agents' budget, financing, and balance sheet constraints, and in the specification of demand and supply for financial assets and related financial market equilibrium conditions as end-of-period relations. Such an approach is of more than academic interest; it allows an understanding of how the short-run macroeconomic outcome can be affected by the financial flows associated with savings, investment, and government deficits and their financing. It also facilitates a rigorous integration of the so-called monetary approach to the balance of payments, emphasizing disequilibrium between flow demand and supply of domestic money, with mainstream macroeconomics.

The model features three commodities: an export good, which is not used domestically and has no imported inputs, indexed x ; 1/ a nontraded good, which is an imperfect substitute for imports in consumption, indexed h ; and an import good, indexed m , which serves both as a consumption good and an input in the production of nontraded goods. Domestic money, M , either in the form of currency, C_u , or deposits in banks, D , is the only means of payment and financial asset accumulation. 2/ There are five aggregate economic agents: the household and enterprise sectors, indexed p , making up the nongovernment sector; the government sector, indexed g ; the central bank; and the deposit money banks. Explicit account is taken of the fact that the

1/ This assumption is not exceptional for many developing countries. Its relaxation would of course allow reduced domestic absorption to affect export performance directly. However, this channel to balance of payments adjustment is notoriously weak for developing countries specializing in a few internationally traded primary commodities.

2/ Hence, portfolio diversification between domestic and foreign financial assets is excluded. While this assumption appears reasonable when strong restrictions on capital flows prevail (as they generally do in many developing countries), its validity could be seriously weakened by the existence of well-developed parallel markets.

decisions of each economic agent must satisfy their budget, financing, or balance sheet constraints, that is,

$$p_h c_{hp} + p_m c_{mp} + (Cu^d - Cu(t-1)) + (D^d - D(t-1)) = Y_d \quad (1.a)$$

$$p_h i_{hp} + p_m i_{mp} = (DC_p^d - DC_p(t-1)) \quad (1.b)$$

$$\begin{aligned} W_g + p_h c_{hg} + p_m c_{mg} + p_h i_{hg} + p_m i_{mg} + r DC_g(t-1) + e r^* B^*(t-1) \\ = tY + NTR + eG^* + e(B^* - B^*(t-1)) + (DC_g - DC_g(t-1)) \end{aligned} \quad (1.c)$$

$$e(t) \overline{NFA}^* + DC_g + A + Rev = Cu + Re \quad (1.d)$$

$$DC_p^s + Re = A + D^s \quad (1.e)$$

where the stock variables are end-of-period stocks (such as the stock of domestic credit demand DC_p^d or supply DC_p^s), except when identified by the script $t-1$ (for beginning of period). Equation (1.a) is the households' budget constraint stating that the sum of consumption on nontraded and import goods (c_{hp} and c_{mp} , respectively) and the desired accumulation of domestic money either in the form of currency or deposits is constrained by disposable income Y_d (variables p_h and p_m are the price of nontraded and import goods, respectively, in local currency terms). Equation (1.b) reflects the firms' financing constraint stating that investment expenditure on nontraded and import goods (i_{hp} and i_{mp} , respectively) are financed by planned borrowing from the deposit money banks. 1/ Equation (1.c) is the government budget constraint stating that the government wage bill W_g , consumption and investment expenditures on nontraded and import goods, and interest payments on domestic (central bank) debt $DC_g(t-1)$ and external debt $B^*(t-1)$ must be financed by revenues from taxation tY , nontax revenue NTR , external grants G^* , foreign borrowing ($B^* - B^*(t-1)$), or domestic borrowing from the central bank ($DC_g - DC_g(t-1)$). In equation (1.c), r and r^* are the domestic and foreign interest rates, respectively, and e is the period average

1/ It is assumed that foreign borrowing is essentially undertaken by government; the implications of the contrary assumption are, however, discussed below. The specification of the firms' financing constraint can also be easily generalized to include capital transfers from government. Note also that domestic bank financing by firms is only to finance investment and not, for instance, to finance imported inputs. As a result, there is no short-run real supply effect from domestic credit availability. A discussion of the impact of credit policy on circulating capital, and its macroeconomic implications, is provided in Gylfason (1987).

exchange rate (units of domestic currency per unit of foreign currency). Equation (1.d) is the central bank's end-of-period balance sheet assuming valuation of (target) net foreign assets NFA^* at end-of-period exchange rate $e(t)$; DC_g represents central bank credit to the government; A , advances to the deposit money banks; Rev , the revaluation account; Cu , currency outside banks; and Re , reserves of the deposit money banks at the central bank. Equation (1.e) is the deposit money banks' end-of-period balance sheet, where DC_p^s is the supply of net credit to the nongovernment sector, D^s is the supply of bank deposits to households, and Re are both planned and actual reserves.

To complete the description of the macroeconomic framework, it remains to specify disposable income Y_d , as follows:

$$Y_d = (1-t) [e p_x^* y_x + p_h y_h - p_m n + W_g] + r DC_g(t-1) + e r^* NFA^*(t-1) - NTR \quad (2)$$

where the term in brackets represents the nominal domestic product (where y_x and y_h stand, respectively, for output of the export and nontraded goods sectors; p_x^* , for international export price in foreign currency terms; n , for imported inputs in the production of nontraded goods) and t is the average tax rate. 1/ It will, furthermore, be assumed that nontax revenue, NTR , exclusively coincides with the central bank's profits (or losses) defined as $e r^* NFA^*(t-1) + r DC_g(t-1)$. 2/ Accordingly, equation (2) is reduced to

$$Y_d = (1-t) [e p_x^* y_x + p_h y_h - p_m n + W_g] = (1-t) Y \quad (3) \quad (3)$$

and the government budget constraint (equation (1.c)) can be rewritten as

$$\begin{aligned} W_g + p_h c_{hg} + p_m c_{mg} + p_h i_{hg} + p_m i_{mg} + e^* r^* B^*(t-1) - e r^* NFA^*(t-1) \\ = tY + eG^* + e(B^* - B^*(t-1)) + (DC_g - DC_g(t-1)) . \end{aligned} \quad (1.c')$$

Using expressions (1) through (3) and making critical use of the following theoretical specification of the change in the central bank's revaluation account

1/ A more detailed specification of a tax structure that goes beyond this simple proportional income tax to include indirect taxes on nontraded and import goods should have priority when considering possible extensions of this model.

2/ The interest earned by the consumers on their bank deposits plus the deposit money banks' profits will coincide with the firm's interest payments on bank loans; hence, these flows cancel out in equation (2). The banks do not earn interest on their reserves, nor do they pay charges on the central bank's advances.

$$\text{Rev} - \text{Rev}(t-1) = \text{NFA}^*(t-1)(e(t-1) - e(t)) + (\overline{\text{NFA}}^* - \text{NFA}^*(t-1))(e - e(t)) \quad (4)$$

the basic macroeconomic condition (5) can be derived (see Appendix I).

$$\begin{aligned} & [(C_u^d + \text{Re}) - (e(t) \overline{\text{NFA}}^* + \text{DC}_g + A + \text{Rev})] + [D^d - D^s] - [\text{DC}_p^d - \text{DC}_p^s] \quad (5) \\ & + p_h[(c_{hp} + i_{hp} + c_{hg} + i_{hg}) - y_h] + e[-CA^* - (B^* - B^*(t-1)) + (\overline{\text{NFA}}^* - \text{NFA}^*(t-1))] = 0. \end{aligned}$$

It will be recognized as the so-called Walras' Law identity establishing that the sum of the values of excess demands for end-of-period base money, bank deposits, bank claims on the nongovernment sector, and for nontraded goods and foreign exchange must be equal to zero. In a competitive market environment, one expects four prices to be determined: the rate of interest on bank deposits, r , and bank loans, r_1 , the price of nontraded goods, p_h , and the average exchange rate, e , given the (target) change in net foreign assets, or the ex post change in net foreign assets given $e(t-1)$ under a fixed exchange rate regime. Note that while expression (5) is, of course, familiar, it does confirm the validity of an approach to domestic credit target formulation that is sometimes disputed. Domestic credit targets, in this case mainly $\text{DC}_g + A$, that are aimed at supporting a particular balance of payments objective (in foreign currency terms) must fully take into account the anticipated (average) exchange rate movement in the period. This follows from the observation that $e(t) \overline{\text{NFA}}^* + \text{Rev}$ in equation (5) equals $e(t-1) \text{NFA}^*(t-1) + \text{Rev}(t-1) + e(\overline{\text{NFA}}^* - \text{NFA}^*(t-1))$; if, for instance, $e(t-1) < e$ rather than e is used in this expression to value the target change in net foreign assets and derive the accompanying domestic credit targets, an overshooting (undershooting) of the balance of payments objective would inadvertently be built into the financial program whenever $[\overline{\text{NFA}}^* - \text{NFA}^*(t-1)]$ is negative (positive).

Having specified the general structure of the model, specific behavioral assumptions can be introduced. Turning first to the monetary side, it is assumed that the deposit money banks are price takers paying a rate of interest r on the households' deposits while earning a rate r_1 on their loans; in addition, they have to hold a fraction v of their deposits in the form of reserves Re at the central bank. Ignoring the real costs of financial intermediation, profit maximization and long-run market equilibrium require: (1) that the deposit money banks are fully "loaned up"; and (2) that $r = r_1(1-v)$. The banks' willingness to accept (i.e., supply) deposits is then infinitely elastic, implying that the actual level of deposits in the banks will be determined by the households' demand. In terms of the general framework presented above, one market (the bank deposits market) has been eliminated, and one relative price relationship (between the lending and deposit interest rates) has been fixed. Note that advances from the central bank are

assumed to reflect entirely the central bank's willingness to provide additional resources to the banking system.

It is postulated that the households' overall demand for end-of-period money M^d (to be more fully specified below) can be decomposed in

$$D^d = \frac{1}{1+u} M^d \quad (6.a)$$

$$C_u^d = \frac{u}{1+u} M^d \quad (6.b)$$

where u is the desired currency/deposit ratio and is generally a function of the nominal interest rate on deposits, with $\partial u(r)/\partial r < 0$.

Given the above specifications, the following end-of-period supply of domestic credit to the nongovernment sector and overall demand for base money can be derived:

$$DC_p^S = \frac{1-v}{1+u()} M^d() + A \quad (7.a)$$

$$(C_u^d + R_e^d) = \frac{u() + v}{1+u()} M^d() \quad (7.b)$$

Turning to the derivation of the households' demand functions, reduced-form intertemporal utility maximization subject to the budget constraint (1.a) is assumed to provide the following demand functions:

$$\frac{M^d}{P_h} = m^d \left((1-\tau) \frac{Y}{P_h}, r, \frac{P_m}{P_h}, \frac{M(\tau-1)}{P_h} \right) \quad (8.a)$$

$$c_{hp} = \alpha \left[(1-\tau) \frac{Y}{P_h} - \left(m^d - \frac{M(\tau-1)}{P_h} \right) \right] \quad (8.b)$$

$$c_{mp} = (1-\alpha) \left[(1-\tau) \frac{Y}{P_m} - \left(\frac{P_h m^d}{P_m} - \frac{M(\tau-1)}{P_m} \right) \right] \quad (8.c)$$

where the variables α and $1-\alpha$, i.e., the shares of nominal spending on nontraded and import goods, respectively, are constant. The sign of partial derivatives of $m^d()$ are

$$m_1^d > 0, m_2^d > 0, m_3^d > 0, m_4^d > 0. \quad (8.d)$$

A formal rationalization of the above demand functions is provided in Appendix II; the restriction $0 < m_1^d < 1$ also applies. Since the overall demand for money $M^d()$ is positively related to the interest rate on bank deposits, $m_2^d > 0$, so will the supply of domestic credit DC_p^S given equation (7.a). It is, however, postulated that the relative interest elasticities of $\frac{u() + v}{1 + u()}$ and $M^d()$ are such that the demand for base money (7.b) is negatively related to the interest rate on bank deposits; i.e., $\partial (C_u^d + R_e^d) / \partial r < 0$.

Assuming purchasing-power parity, the domestic price of imports satisfies $p_m = e p_m^*$, where p_m^* is the international import price in foreign currency terms. 1/ Then, an important implication of $m_3^d > 0$ is that a depreciation of the exchange rate has a direct and positive effect on the nominal end-of-period demand for money M^d , in addition to the indirect positive effect it may have on the domestic value of the export and nontraded goods sectors' incomes in Y . Note that while the resulting potential deflationary effect of exchange rate depreciation has become a familiar theme in the macroeconomic stabilization literature, the theoretical underpinning of the positive relationship between end-of-period demand for money and the exchange rate is actually not as clearcut as is now often thought. Current thinking seems dominated by beginning-of-period portfolio choices based on inelastic price expectations, target real money balances, or ad hoc transaction demand considerations. 2/

Some of the above issues are illustrated in the intertemporal choice theoretic model developed in Appendix II. The property $m_3^d > 0$ also follows from inelastic exchange rate expectations. However, in the fixed-price, managed exchange rate economy considered here, that latter assumption could appear somewhat counterintuitive, unlike in a flexible price, flexible exchange rate economy. A current-period exchange rate devaluation is unlikely to be viewed as a short-run departure from equilibrium! Nevertheless, it is shown that to the extent that current-period devaluation implies greater uncertainty about the future real purchasing power of any given end-of-period money holdings--a plausible scenario in the present setup--monetary savings will tend to rise even if elastic expectations prevail. Accordingly, $m_3^d > 0$ then continues to apply. It is also shown that the positive relationship between demand for money and the exchange rate follows from the same

1/ Consequently, it is assumed that foreign exchange rationing, as it may apply to capital outflows, does not sufficiently affect import goods as to lead to the buildup of a wedge between the domestic market price of import goods and their international price at the official exchange rate.

2/ See, in particular, Dornbusch (1980), Chapter 11; Chand (1987); Cuddington, Johansson, and Löffgren (1984), Chapter 5; and Helpman and Razin (1981).

intertemporal model under elastic expectations, if the consumers wish to ensure for the undefined future a stock of monetary wealth fixed in real purchasing power terms.

To complete the specification of the macroeconomic model, the supply of nontraded goods, the demand for imported inputs and the investment and, accordingly, domestic credit demand by the enterprise sector must be stipulated, in addition to the other current and capital expenditure functions of the government. Some prior discussion of the market environment and assumptions regarding price flexibility is necessary, however. So far, little attention has been paid to the labor market, which can be viewed as a unified labor market for both the export and home goods sectors. Implicitly, a situation of chronic excess supply of labor prevails, with actual employment being determined by the demand side. The households consider this employment and, thus, the income constraint, in their overall budget constraint, which is why the excess supply function for labor dropped out of Walras's Law. As is well known, this specification is nevertheless consistent with two very different situations in the nontraded goods market: one where production and employment are constrained because of a lack of product demand (Keynesian unemployment) and the other where production and employment coincide with unconstrained profit maximization by the firms but are associated with unemployment because of too high real labor costs (classical unemployment). The first is mainly associated with stickiness of product prices, while the latter with stickiness of wages. Of course, the small open-economy assumption prevents the lack of product demand situation from happening in the export goods sector, and, accordingly, such a situation is exclusively a phenomenon related to the nontraded goods market. Output in the export sector is supply determined and depends negatively on the real labor cost w/ep_x^* , where w stands for the nominal wage.

In the following analysis it will be assumed that a Keynesian unemployment situation prevails, given nontraded goods prices and money wages fixed in the short run. However, the possibility that the resulting short-run equilibrium level of economic activity on the nontraded goods market might be above what the enterprises would willingly produce, and its implications for revisions needed in the analysis ought to be considered at a later stage. At first sight this situation appears less problematic with regard to correcting an associated balance of payments problem since a reduction of aggregate demand could clearly reduce the external disequilibrium without necessarily inducing a contraction of domestic output. In any case, when the production of nontraded goods is demand determined, the demand for imported input itself depends on the level of output of nontraded goods as an independent variable. An increase in demand for nontraded goods relieves the firms' sales constraint and leads to higher production y_h , which requires additional imported inputs.

Whether or not the domestic credit market to the nongovernment sector clears through appropriate adjustment of the domestic interest

rate has also a significant impact on the macroeconomic outcome. Hence, a situation of excess demand for credit directly feeds back on aggregate demand to the extent that the level of credit actually obtained is supply determined. An important implication of this situation is that investment demand for nontraded and import goods no longer directly depends on the interest rate, but rather, independently, on the level of domestic credit extended by the banking system. The link between domestic credit, aggregate demand, and the balance of payments plays a central role in short-run Fund-supported stabilization programs. Yet, whether outstanding credit is determined by the borrowers' demand or deposit money banks' willingness to supply credit, and its implication for macroeconomic policy, including interest rate policy, is rarely discussed. One objective of this paper is to clarify these issues. Accordingly, while interest rate rigidity at levels that are too low in many developing countries makes the situation of chronic excess demand for credit most relevant empirically, for the sake of generality and to allow appropriate comparison, perfect interest rate flexibility will also be reviewed.

Taking into account the discussion above, the following remaining behavioral equations are introduced:

$$n = k \frac{p_h y_h}{p_m} \quad (9.a)$$

$$i_{hp} = \pi \frac{p_m^{1-\epsilon}}{p_h} \phi(r_1, w, p_h, y_h(1)) \quad (9.b)$$

$$i_{mp} = \frac{\phi(r_1, w, p_h, y_h(1))}{p_m^\epsilon} \quad (9.c)$$

$$(DC_p^d - DC_p(t-1)) = (1 + \pi) p_m^{1-\epsilon} \phi(r_1, w, p_h, y_h(1)) \quad (9.d)$$

$$c_{hg} = \gamma \frac{\bar{C}_g}{p_h} \quad (9.e)$$

$$c_{mg} = (1 - \gamma) \frac{\bar{C}_g}{p_m} \quad (9.f)$$

$$i_{hg} = \eta \frac{\bar{I}_g}{p_h} \quad (9.g)$$

$$i_{mg} = (1 - \eta) \frac{\bar{I}_g}{p_m} \quad (9.h)$$

The demand function for imported input, n , given by equation (9.a) is formally derived in Appendix III as part of a particular profit

maximization model under sales constraints, as it applies to the Keynesian unemployment situation. The variable k itself ($0 < k < 1$) depends on relative prices, and as a result, the elasticity of equation (9.a) with respect to p_m can be shown to be less than unity. Equations (9.b) through (9.d), also derived in Appendix III, specify simple investment and domestic credit demand functions for the situation where at the prevailing (lending) interest rate, the enterprise sector is not constrained by the availability of credit, hereafter referred to as the case of interest rate flexibility. Parameters π and ϵ (with $0 < \epsilon < 1$) are specified in Appendix III; $y_h(1)$ represents the expected future level of demand for nontraded goods, which is assumed exogenous. The elasticity of investment demands with respect to their own price is less than unity; of course, investment demands are negatively related to the lending rate of interest, that is, $\partial \Phi() / \partial r_1 < 0$.

Finally, equations (9.e) through (9.h) specify current and investment expenditure on nontraded and import goods by government. For analytical simplicity, the total amount of current outlays $\bar{C}_g$, and capital outlays $\bar{I}_g$, are assumed to be exogenously fixed in nominal terms. In parallel with the private sector, the shares of nominal expenditures on nontraded goods, γ and η , are constant. When analyzing the impact of an exchange rate adjustment, this specification will imply an equiproportional adjustment of government import volumes. The alternative extreme would be to specify government expenditure policies in real terms, $\bar{c}_{hg}$, $\bar{c}_{mg}$, $\bar{i}_{hg}$, $\bar{i}_{mg}$. The impact of an exchange rate adjustment in this case could always be interpreted within an extension of the above framework as involving an accompanying exogenous increase in nominal expenditure (of unitary import content) for the amount needed to maintain the initial level of real expenditures constant.

When the imperfect flexibility of domestic interest rates implies a chronic situation of excess demand for domestic credit, actual credit to the nongovernment sector is rationed to coincide with the supply, hereafter referred to as the case of credit rationing. Private investment expenditures on both nontraded goods and imports are constrained by the availability of credit, and it is shown in Appendix III that equations (9.b) through (9.d) then become:

$$i_{hp} = \beta \frac{(DC_p - DC_p(t-1))}{p_h} \quad (10.a)$$

$$i_{mp} = (1 - \beta) \left(\frac{DC_p - DC_p(t-1)}{p_m} \right) \quad (10.b)$$

$$(DC_p - DC_p(t-1)) < (1 + \pi) p_m^{1-\epsilon} \Phi(r_1, w, p_h, y_h(1)) \quad (10.c)$$

where DC_p is given by equation (7.a), that is,

$$DC_p = \frac{1-v}{1+u(\cdot)} p_h m^d(\cdot) + A \quad (10.d)$$

and where β is shown to be a fixed constant. Accordingly, the elasticity of i_{mp} with respect to p_m becomes unitary, in contrast with the case where there is no financing constraint.

Note that the above investment demands for nontraded and import goods become positively related to the level of the domestic interest rate to the extent that an increase in the latter encourages deposits in the banking system (at the same time as it induces an increase in the overall demand for money). An increase of the deposit base in turn allows more credit expansion, and this relieves the financing constraint faced by the enterprises. It should be kept in mind that the central bank in the present model does not directly intervene to control credit, and thus the deposit money banks are generally fully "loaned up." If the central bank directly controlled domestic credit to nongovernment, and the reserve requirement and "advances" policies were not coordinated accordingly, a situation could occur where substantial excess reserves existed in the banking system with the result that the deposit base would not be determined by the households' demand for, but by the deposit banks' willingness to accept deposits. In such a situation, which is not analyzed here but is sometimes observed, an increase in interest rates could have a perverse impact on the actual deposit base.

Throughout the following analysis of the short-run macroeconomic outcome implied by the above model, both the exchange rate and the central bank's net foreign assets target are fixed; any resulting imbalance on the foreign exchange market will, ex post, be resolved by an accommodating change in end-of-period net foreign assets. Adjustment of the exchange rate will, of course, be one of the policy instruments.

1. Case I: Interest rate flexibility

The short-run quasi-equilibrium outcome in the case where the interest rate is allowed to adjust to ensure no rationing of domestic bank credit (i.e., equations (9.b) through (9.d) apply) is defined as the values of y_h and r that set the following excess demand functions for nontraded goods and end-of-period domestic bank credit to zero:

$$\left\{ \alpha \left[\frac{(1-t) Y}{p_h} - (m^d - \frac{M(t-1)}{p_h}) \right] + \pi \frac{p_m^{1-\epsilon} \phi(\cdot)}{p_h} + \gamma \frac{\bar{C}_g}{p_h} + \eta \frac{\bar{I}_g}{p_h} \right\} - y_h = 0 \quad (11.a)$$

$$\left[\frac{(1+\pi) p_m^{1-\epsilon} \phi(\cdot) + DC_p(t-1)}{p_h} \right] - \left[\frac{1-v}{1+u} m^d + \frac{A}{p_h} \right] = 0 \quad (11.b)$$

Associated with this quasi-equilibrium will be values of the following excess demand functions for foreign exchange and base money:

$$\left\{ p_m^* \left[(1-\alpha) \left[\frac{(1-t)Y}{p_m} - \left(\frac{p_h m^d}{p_m} - \frac{M(t-1)}{p_m} \right) \right] + \frac{\phi(\cdot)}{p_m^\epsilon} + (1-\gamma) \frac{\bar{C}}{p_m} + (1-\eta) \frac{\bar{I}}{p_m} + \right. \right. \\ \left. \left. k \frac{p_h y_h}{p_m} + r^* B^*(t-1) - r^* NFA^*(t-1) \right\} - \left\{ p_x^* y_x + G^* + (B^* - B^*(t-1)) - (NFA^* - \right. \\ \left. NFA^*(t-1)) \right\} \geq 0 \quad (11.c)$$

$$\frac{u+v}{1+u} p_h m^d - \{ e(t) \overline{NFA}^* + DC_g + A + Rev \} \geq 0. \quad (11.d)$$

In equations (11.a) - (11.b), Y is given by equation (3) and m^d by equation (8.a); furthermore, DC_g in equation (11.d) is derived from equations (1.c') and (9.e) - (9.h) to equal:

$$DC_g = DC_g(t-1) + W_g + \bar{C}_g + \bar{I}_g + e r^* B^*(t-1) - e r^* NFA^*(t-1) - tY - e G^* - e(B^* - B^*(t-1)) \quad (11.e)$$

It is important to recall that at the short-run quasi-equilibrium defined by equations (11.a) through (11.d), potential inequalities (11.c) and (11.d) are not independent. Indeed, since Walras's Law (5) applies, equations (11.a) and (11.b) holding require that the excess supply (demand) for base money be exactly matched by an equivalent excess demand (supply) of foreign exchange; hence the values of (11.c) and (11.d) (in domestic currency terms) will be equal in absolute terms, but of opposite sign.^{1/} As indicated earlier, this observation underpins the so-called monetary approach to the balance of payments. The short-run quasi-equilibrium defined by equations (11.a) through (11.d) is illustrated in Figure 1 for the case where the configuration of the fixed nontraded goods price, the exchange rate, and other predetermined and exogenous variables implies an excess demand for foreign exchange and, thus, excess supply of domestic base money. The loci y_h and DC_g/p_h yield combinations of values of nontraded goods production and rate of interest for which the nontraded goods market and the domestic bank credit market, respectively, are in equilibrium; their intersection defines a short-run quasi-equilibrium $(\hat{y}_h, \hat{r})$ at E. Along the loci FX and m^d , the excess demand for foreign exchange and base money, respectively, are zero; it will be easily verified that on the right of FX (left of m^d) an excess demand (supply) for foreign exchange (base money) prevails.

^{1/} Recall that in the present model specification, the demand and supply of bank deposits are always identically equal.

Figure 1

Figure 2

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Given $\hat{y}_h$, the interest rate $\hat{r}$ is too low to promote saving and constrain imports to a level consistent with external equilibrium; at the same time it is too high to induce households to hold base money (rather than higher-yielding financial assets in the form of deposits in the banking system), resulting in an excess supply of base money. Putting the argument the other way around, given $\hat{r}$, the level of economic activity $\hat{y}_h$ in the nontraded goods sector is too low to generate a demand for base money that absorbs the available supply (particularly since a low level of economic activity tends to worsen the government deficit); at the same time, it is too high to constrain the demand for imports to a level consistent with external equilibrium although a higher level of income encourages higher saving.

As indicated earlier, the above model differs from the familiar IS-LM apparatus. The main reason is the "end-of-period" equilibrium approach which does not require equilibrium in the financial markets to be matched by equilibrium in the so-called money market. ^{1/} It facilitates the integration of the disequilibrium aspects of the monetary approach to the balance of payments with neoclassical macroeconomics, emphasizing budget constraints and the operation of Walras's law. It also means that the saving/investment relationship, in addition to liquidity considerations, becomes a main determinant of market interest rates. In the present setup, therefore it matters whether the interest rate adjusts to clear the domestic credit market or the (base) money market. If the latter specification was adopted (somewhat artificially), the short-run quasi-equilibrium would be illustrated by E' rather than E in Figure 1. At E', the interest rate would be lower and the output of nontraded goods higher. However, this outcome could not be more than a "virtual" one, since it would coincide with an excess demand for domestic credit, and the deposit money banks could not generally be expected to lend more than they wished. The situation is quite different when the base money market is ex ante in disequilibrium; the central bank's commitment under fixed exchange rates to let its net foreign assets adjust to the level consistent with private sector and government behavior must be mirrored by its willingness to see base money supply contract (or expand) accordingly. An interesting by-product of the present setup is the prediction that an increase in government expenditure, financed through central bank credit, would tend to reduce domestic interest rates in the short run, since the resulting higher level of income would enhance money demand, including bank deposits, thereby enlarging the deposit money banks' lending base.

^{1/} In this presentation, demand and supply in the financial market can be reinterpreted as demand for claims on the private sector by banks (i.e., supply of credit) and supply of such claims by the private sector (i.e., demand for credit). Given equations (6.a) and (7.a), the banks' demand for claims on the private sector is related to the consumers' demand for interest-bearing deposits in the banking system by the relationship $DC_p^s = (1-v) D^d + A$.

Whether the relative slope of loci y_h and DC_p/p_h is as illustrated in Figure 1, and whether the strict stability of the short-run quasi-equilibrium E prevails under the assumption that y_h and r adjust positively to the excess demand for nontraded goods and domestic credit to the nongovernment sector, respectively, depends on whether the Hessian, $/D/$, of the system of equations (11.a) and (11.b) is positive, that is,

$$/D/ = \begin{vmatrix} -[1 - \alpha(1-t)(1-k)(1-m_1^d)] & -\alpha m_2^d + \pi \frac{p_m^{1-\epsilon}}{p_h} \frac{\partial \phi(\cdot)}{\partial r} \\ -\frac{(1-v)}{1+u} (1-t)(1-k) m_1^d & (1+\pi) \frac{p_m^{1-\epsilon}}{p_h} \frac{\partial \phi(\cdot)}{\partial r} - \frac{\partial}{\partial r} \left[\frac{1-v}{1+u} m^d \right] \end{vmatrix} > 0 \quad (12)$$

This inequality holds under the specifications of the model detailed above.

2. Case II: Credit rationing

In the case of credit rationing, as discussed above, demand functions (10.a) through (10.c) apply instead of (9.b) through (9.d). The short-run quasi-equilibrium outcome is then defined as the values of y_h and DC/p_h , given a fixed interest rate r , that set the following excess demand functions for nontraded goods and domestic bank credit relationship to zero: 1/

$$\left\{ \alpha \left[\frac{(1-t)Y}{p_h} - (m^d - \frac{M(t-1)}{p_h}) \right] + \beta \frac{(DC - DC(t-1))}{p_h} + \gamma \frac{\bar{C}}{p_h} + \eta \frac{\bar{I}}{p_h} \right\} - y_h = 0 \quad (13.a)$$

$$\frac{DC}{p_h} - \left[\frac{1-v}{1+u} m^d + \frac{A}{p_h} \right] = 0 \quad (13.b)$$

with which the values of the following excess demand functions for foreign exchange and base money are associated:

$$\begin{aligned} & \left\{ p_m^* \left[(1-\alpha) \left[\frac{(1-t)Y}{p_m} - \left(\frac{p_h m^d}{p_m} - \frac{M(t-1)}{p_m} \right) \right] + (1-\beta) \frac{(DC - DC(t-1))}{p_m} + (1-\gamma) \frac{\bar{C}}{p_m} \right. \right. \\ & \quad \left. \left. + k \frac{p_h y_h}{p_m} + (1-\eta) \frac{\bar{I}}{p_m} + r^* B^*(t-1) - r^* NFA^*(t-1) \right] - \left\{ p_x^* y_x^* + G^* + (B^* - B^*(t-1)) - (NFA^* - \right. \right. \\ & \quad \left. \left. NFA^*(t-1)) \right\} \right\} \geq 0 \end{aligned} \quad (13.c)$$

1/ Calling equation (13.b) an excess demand for domestic credit to nongovernment would be a misnomer; it determines the actual level of DC_p/p_h .

$$\frac{u + v}{1 + u} p_h m^d - \{e(t) \overline{NFA}^* + DC_g + A + Rev\} \geq 0 \quad (13.d)$$

where DC_g is also given by equation (11.e). Unlike Case I, the level of domestic credit to nongovernment enters as an independent variable in the aggregate demand for nontraded and import goods (in equations (13.a) and (13.c), respectively). As in Case I, however, Walras's Law implies that the values of equations (13.c) and (13.d) (in domestic currency terms) will be equal in absolute terms, but of opposite sign. The above short-run quasi-equilibrium is illustrated in Figure 2, again for the situation where an excess demand for foreign exchange and, thus, excess supply of domestic base money prevails.

The excess demand for base money (given a fixed domestic interest rate) becomes zero for a unique level of activity on the home goods market since neither the demand nor the supply of base money depends on the endogenously determined level of domestic credit to the nongovernment sector DC_p . The latter result is sensitive to a relaxation of the specifications of the model but without affecting its main structure. Hence, if indirect taxes apply to spending on investment, government tax revenue and thus the level of financing of the government deficit by the central bank, which is part of base money, would become functions of DC_p . In this instance, the m^d locus in Figure 2 would be downward sloping; a reduction of domestic credit to enterprises would lead to a decline in government indirect tax revenue and eventually to an expansion of base money, which could only be reduced and absorbed if output y_h was larger.

Considering the short-run quasi-equilibrium $(\hat{y}_h, \hat{DC}_p/p_h)$ defined at the intersection D of y_h and DC_p/p_h , the level of domestic credit $\hat{DC}_p/p_h$ is too high, given output $\hat{y}_h$, to constrain imports to a level consistent with external equilibrium. At the same time, no level of domestic credit to enterprises could reduce the supply of base money enough (by for instance lowering central bank financing of the government deficit) to be consistent with the demand for base money at the level of economic activity $\hat{y}_h$ on the nontraded goods market. Again, putting the argument the other way around, given $\hat{DC}_p/p_h$, the level of economic activity $\hat{y}_h$ on the nontraded goods market generates a level of income that is too high to constrain import demand to a level consistent with external equilibrium in spite of its positive effect on savings; at the same time, it is too low to generate a demand for base money that absorbs the available supply (particularly since a lower level of income tends to worsen the government deficit).

Whether the relative slope of loci y_h and DC_p/p_h is illustrated as in Figure 2 depends on whether the Hessian, $/F/$, of the system of equations (13.a) and (13.b) is negative; that is,

$$/F/ = \begin{vmatrix} - [1 - \alpha(1-t)(1-k)(1-m_1^d)] & \beta \\ - (\frac{1-v}{1+u})(1-t)(1-k) m_1^d & 1 \end{vmatrix} < 0 . \quad (14)$$

The negative sign of equation (14) is also the condition for strict stability of the short-run quasi-equilibrium D under the assumption that y_h adjusts positively to the excess demand for nontraded goods, and DC_p adjusts negatively to any excess of actual domestic credit to the nongovernment sector over supply. This inequality holds under the specifications of the model detailed above.

The simple framework described above can be used to illustrate the impact of an external or domestic shock on an initial short-run equilibrium where external balance prevails. Turning first to the case of an external shock characterized by a fall in the export price p^* , the short-run macroeconomic quasi-equilibrium represented by A in Figure 3 would move to a position like B where both nontraded goods output and the level of domestic credit to the nongovernment sector have declined. At B, there would also be an excess demand for foreign exchange matched in local currency terms by an excess supply of base money. Specifically, the fall in the export sector's income generates a reduction both in monetary savings and in aggregate demand, including nontraded goods. Hence, the locus DC_p/p_h shifts downward, and the locus y_h leftward, with the resulting short-run quasi-equilibrium B being southwest of A. Moreover, the locus m^d moves rightward since the decline in demand for base money and the increase in government domestic bank financing needs, which both result from the fall in the export sector's income, can only be offset by an increase in nontraded goods output and income. Hence, point B coincides with an excess supply of base money. It follows that the locus FX has shifted all the way to a position on the left of B, implying an excess demand for foreign exchange, because otherwise Walras's Law would be violated.

In the case of a domestic shock associated with an increase in government current expenditure C_g (financed to the extent necessary by domestic bank financing), in Figure 4 the locus y_h shifts rightward while the locus DC_p/p_h remains unaltered, ensuring that the new short-run quasi-equilibrium C is northeast of A. Since part of the increase in government current expenditure will be on imports, only a lower level of nontraded goods output and income, implying less private demand for imports, is consistent with equilibrium between demand and supply for foreign exchange. Accordingly, the locus FX moves leftward, and a situation of excess demand for foreign exchange prevails at C. Hence, the locus m^d will have shifted all the way to a position on the right of C, with an excess supply of base money resulting, because otherwise Walras's Law would again be violated. The higher demand for base money associated with the increase in incomes is more than offset by the expansion of supply resulting from the domestic bank financing of the larger government deficit.

Figure 3

Figure 4

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It is interesting to observe that if the external shock was characterized by a contraction in the foreign financing made available to government, the short-run quasi-equilibrium A in Figures 3 or 4 would not be affected. However, an excess demand for foreign exchange would clearly prevail, as the locus FX moves leftward. At the same time, an excess supply of base money would emerge, reflecting higher central bank domestic credit to government, as the locus m^d shifts rightward. Of course, the main reason that the outcome A remains unaffected in the above experiment is the implicit assumption that the reduction in foreign financing does not impose a contraction on government spending. Otherwise, the locus y_h would shift leftward; the new equilibrium would then also be characterized by a lower level of output y_h and of domestic credit to the nongovernment sector DC_p . Note that if direct foreign financing as a source of investment funds for the nongovernment sector was explicitly considered in the model, a contraction in such financing would similarly alter the short-run quasi-equilibrium.

III. Stabilization Policies Without Domestic Recession

In this section, the issue of stabilization policies that correct the external imbalance without inducing a domestic recession is addressed in the context of the particular model specification discussed above. Again, it is initially assumed that the original short-run quasi-equilibrium can be characterized as demand-determined as far as the level of activity on the nontraded goods market is concerned. Given a fixed money wage, and notwithstanding the possible impact of an exogenous exchange rate adjustment, the supply-determined output of the export sector is fixed in the short run. Specifically then, one is looking for changes of policy instruments in the fiscal, monetary, or external areas that would reduce the excess demand for foreign exchange (or excess supply of base money) without reducing the level of economic activity in the nontraded goods sector. Analysis of the above issue is both more operational and analytically simpler in the case of credit rationing (Case II of Section II), which will accordingly receive priority. Except, of course, for the implementation of an interest rate policy itself, the results obtained would not be qualitatively different where the interest rate clears the domestic credit market.

The main policy instruments available in the present case are (a) tax policy, t_i ; (b) government wage policy, W_g ^{1/}; (c) government current expenditure, C ; (d) government capital expenditure, I ; (e) the central bank's advances to the deposit money banks, A ; (f) reserve ratio, v ; (g) interest rate, r ; and (h) exchange rate, e . As is well known, since the problem addressed involves two policy objectives, concentration on any single policy instrument mentioned above could not generally yield a satisfactory solution. Indeed, any of these policy instruments when

^{1/} Government (taxable) transfer policy to households would have the same macroeconomic impact in this simple model.

applied alone to reduce, unambiguously, the assumed situation of excess supply of base money would also, unambiguously, imply a contraction of economic activity in the nontraded goods sector. This situation is also accompanied by a decline in domestic bank credit to the nongovernment sector. It is a simple exercise to check these results using the comparative static properties of equations (13.a) and (13.b) and then the differentiation of equations (13.c) and (13.d). The two possible exceptions relate, of course, to exchange rate and interest rate policies, which deserve further attention.

1. Exchange rate policy

With regard first to the exchange rate, a devaluation should have a positive impact on the production of export goods, through a reduction in the real labor cost, w/ep^* , and possibly of nontraded goods, through a substitution induced by a depreciation of the real exchange rate p_h/ep^*_m . As is well evidenced, the short-run impact on production of export goods, particularly basic commodities, is often quite small, and the assumption that this impact is negligible in the short run will be adopted in the following analysis. 1/ Given the unitary price elasticity of consumption demand for nontraded and import goods, and notwithstanding other important short-run impacts discussed below, a devaluation would not directly affect the consumption demand for nontraded goods or the amount of local currency spent on consumption imports, but would reduce the volume of consumption imports. On the other hand, while devaluation would also reduce the volume of imported inputs, it would increase the amount of local currency spent on imported inputs because the price elasticity of equation (9.a) with respect to p_m is less than unity. 2/ Accordingly, and again notwithstanding other important short-run effects, the above properties imply that a devaluation would tend to lessen the balance of payments disequilibrium measured in foreign currency terms but to increase it in domestic currency terms.

Regarding the other important effects of a devaluation in the present model, the dependency of end-of-period demand for money on the level of the real exchange rate implies, as already noted, that a devaluation in the short run would increase savings. But the present model also accounts for the disposition of higher savings in additional loanable funds in the banking system and for their utilization to

1/ The implications of this section differ significantly from Khan and Montiel (1987), largely reflecting the non-market-clearing and unused capacity assumptions of the present model. Also, compare with Crockett (1981).

2/ Note that since the production of nontraded goods is demand determined, and unemployment prevails, the reduction in the volume of imported inputs simply reflects substitution with labor, and, again, there is no relevant supply effect. However, the less-than-unit price elasticity of equation (9.a) implies that a devaluation would reduce the value added of the nontraded goods sector.

finance investment. Changes in the latter expenditures would have their own impact on both demand for nontraded goods and the balance of payments. In terms of Figure 5, to the extent that a devaluation increases the end-of-period demand for deposits in the banking system and hence the supply of bank credit, the locus DC_p/p_h shifts upward. If the other components of aggregate demand remained unchanged, higher private investment made possible by the availability of bank financing would necessarily lead to an increase in production of nontraded goods. The quasi-equilibrium point D would move upward along the same locus y_h , and the level of both domestic credit and nontraded goods output would be larger.

However, by increasing the end-of-period demand for money, a devaluation also reduces consumption spending, including that on nontraded goods. At the same time it affects incomes in two opposite ways: on the one hand, the nominal income of the export sector rises, despite the lack of supply effect in the short run; on the other, the nominal income of the nontraded goods sector declines, at whatever level of output, because of the negative impact of a devaluation on the value added of that sector. Consequently, the locus y_h will not remain unaffected and will tend to shift rightward, if the expansionary effect of the larger nominal income of the export sector is all dominant (the case envisaged in Figure 5) and leftward otherwise. Note, in addition, that demand for money will itself in turn be affected by the income effects of a devaluation.

Generally, whether output on the nontraded goods market increases or declines at the new short-run quasi-equilibrium will depend on the sign of the expression (15) obtained from the differentiation of equations (13.a) and (13.b).

$$\beta_1 \frac{1-v}{1+u} (m_1^d (1-t)z + m_3^d \frac{p_m^*}{p_h}) \gtrless \alpha (-(1-m_1^d) (1-t)z + m_3^d \frac{p_m^*}{p_h}) \quad (15)$$

where $z = \frac{p_x y_x}{p_h} - y_h \frac{\partial k}{\partial e}$.

The interpretation of expression (15) is straightforward: output on the nontraded goods market will increase if the additional demand made possible by a relaxation of the firms' financing constraint associated with an increase of the deposit base in the banks (itself induced by the direct and indirect impact of the devaluation on money demand) is larger than the impact which that same devaluation could have in reducing consumer spending on nontraded goods, taking into account the net effect on the incomes of the export and nontraded goods sectors.

Not surprisingly, the sign of equation (15) depends not only on the properties of the demand function for money, the relative size of the incomes of the export and nontraded good sectors, and the elasticity of substitution between labor and imported inputs but also on the nontraded

goods content of nongovernment investment versus consumption spending and on the banks' reserve requirement coefficient. In what follows, the net effect of a devaluation on incomes will be assumed positive, that is, $z > 0$, on the presumption that there is sufficient substitutability between labor and imported inputs to make $\partial k/\partial e$ relatively small.

The simplest way to verify whether the exchange rate depreciation improves the balance of payments outcome (in domestic currency terms) at the new short-run quasi-equilibrium is to check whether it increases the excess demand for base money (reduces its excess supply). Differentiation of equation (13.d), after using equations (4) and (11.e), indicates that the external disequilibrium will be reduced provided that

$$\left\{ \frac{u+v}{1+u} \left[m_1^d (1-t) (p_x^* y_x - p_h y_h \frac{\partial k}{\partial e}) + m_3^d p_m^* \right] - \frac{dDC_g}{de} - (\overline{NFA}^* - NFA^*(t-1)) \right\} + p_h \left[\frac{u+v}{1+u} m_1^d (1-t) + t \right] (1-k) \frac{dy_h}{de} > 0 \quad (16.a)$$

The two expressions in brackets in equation (16.a) are positive, and dy_h/de is given by

$$\frac{dy_h}{de} = \frac{-\Delta}{|F|} \quad (16.b)$$

where Δ is the difference between the left-hand side and right-hand side of equation (15). Hence, the direct impact that an exchange rate depreciation has in improving the balance of payments through its effect on demand for money will be strengthened if it also turns out to support an increase of output on the nontraded goods market and an expansion of domestic credit to the nongovernment sector.

To summarize, when there are unemployed resources in the economy, a devaluation that will encourage production in the export sector in the medium term need not be deflationary in the short run. This is particularly true if the additional savings that are likely to be generated in the economy can be channeled to finance nontraded goods intensive expenditure. In fact, the more the devaluation turns out to be expansionary for the nontraded goods market, the more favorable will be its impact on the balance of payments. The above process requires, however, letting the endogenous expansion of domestic credit to the nongovernment sector to run its course. The larger the increase in nontraded goods output y_h that accompanies the devaluation, the larger will be the accompanying expansion of domestic credit to the nongovernment sector. The latter will decline only if the locus y_h and

Figure 5

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the resulting equilibrium of nontraded goods output contracts sufficiently. But a depreciation of the exchange rate that has a deflationary impact on output in the nontraded goods market could well have a perverse effect on the balance of payments.

Note, however, that $\frac{dy_h}{de} > 0$ does not necessarily ensure that equation (16.a) is positive because of the presence of terms $\frac{dDC}{de}$ and $(NFA^* - NFA^*(t-1))$. To the extent that a depreciation of the exchange rate increases the domestic bank financing needs of the government, or that the central bank aims at increasing its net foreign assets (in foreign currency terms), a depreciation of the exchange rate would increase the supply of base money, which would tend to offset the expansion of demand for base money.

2. Interest rate policy

An active interest rate policy emphasizing both competitive rates and flexibility is often considered an important element of stabilization programs in dependent economies. The conventional view is that such a policy contributes to balance of payments stabilization by enhancing domestic savings, reducing (encouraging) capital outflows (inflows), and promoting the efficient allocation of domestic financial resources to the most productive investments. It may not be sufficiently recognized that the macroeconomic effects of such a policy, including the effects on the balance of payments, may very much depend on the (dis-) equilibrium conditions prevailing on the domestic credit market.

The above analysis of the impact of devaluation largely applies for an exogenous increase in interest rates in the case of credit rationing. In the present setup, however, there is no direct effect on incomes, and accordingly, the locus y_h in Figure 5 shifts unambiguously leftward as a result of the rise in demand for money. Whether output on the nontraded goods market increases or declines at the new short-run quasi-equilibrium will simply depend on whether

$$\beta \frac{\partial}{\partial r} \frac{1-v}{1+u} m^d \geq \alpha m_2^d, \quad (17)$$

which can be interpreted in the same way as equation (15). Output on the nontraded goods market will increase if the additional demand made possible by a relaxation of the firms' financing constraint associated with the higher money demand by consumers is larger than the decline in consumption spending on nontraded goods. Again, differentiation of the excess demand for base money function (13.d) implies that the impact of an increase in the rate of interest on the external disequilibrium is stabilizing if

$$\frac{\partial}{\partial r} \frac{u+v}{1+u} m^d + \left[\frac{u+v}{1+u} (1-t) m_1^d + t \right] (1-k) \frac{dy_h}{dr} > 0 \quad (18.a)$$

where $\frac{dy_h}{dr}$ is given by

$$\frac{dy_h}{dr} = - \frac{\Delta}{|F|} \quad (18.b)$$

with Δ coinciding here with the difference between the left-hand side and right-hand side of equation (17). Since an increase in the interest rate on bank deposits has a negative impact on the demand for base money, the first term of equation (18.a) is negative. Accordingly, only if output on the nontraded goods market expands as a result of the increase in the interest rate could the latter reduce the external disequilibrium.

The above findings differ sharply from the results obtained in the case where the domestic credit market clears through adjustment of the interest rate. An increase in interest rates must then be engineered through a reduction of central bank advances to deposit money banks or an increase in reserve requirement (cf. equation (11.b)). In this instance, the supply of base money would be reduced, and so would its excess supply and thus the external imbalance, in spite of the depressing effect that higher interest rates and the unambiguous decline in economic activity would have on the demand for base money. In contrast, in the case of credit rationing, an increase in interest rates is potentially expansionary because it allows a rise in domestic credit to the private sector to accompany an increase in savings. Since the increase in interest rates can be implemented without a reduction of the supply of base money, and yet this increase reduces demand for base money, it will worsen the balance of payments unless economic activity y_h on the nontraded goods market rises sufficiently. A reduction of interest rates would have the opposite effect, but the improvement of the balance of payments could be reversed if output y_h falls sufficiently.

It could be argued that the lack of capital mobility plays a critical role in the above results. Indeed under perfect capital mobility, the domestic interest rates would need to be pegged to the world interest rates. The credit market conditions (11.b) (assuming an excess demand for credit at the prevailing world interest rates) would then be replaced by a relationship defining the level of nongovernment foreign borrowing rather than the supply-determined level of domestic credit, and there could not be any form of effective domestic credit rationing. What makes this observation of only limited applicability in many developing countries is that while residents may readily hold on to domestic financial assets as soon as domestic deposit rates are brought in line with foreign deposit rates, there may be significant differences between domestic and foreign investors concerning the assessment of

risks in developing countries. These differences could result in wide margins between international deposit rates and effective lending rates as the latter apply to the nongovernment sector in developing countries. These margins are likely to be substantially wider than those prevailing in the domestic banking system of these developing countries. Accordingly, the investments that have been rationed because of the unavailability of domestic financing at prevailing domestic interest rates may not have sufficiently high rates of return to meet the requirements of foreign financing. At the limit, foreign lending rates may well be above the domestic interest rates that clear the (domestic) credit market. In this instance, the credit rationing case studied above applies as long as the authorities are hesitant to let domestic deposit rates rise far enough above foreign deposit rates, or until the domestic credit market clears, while foreign financing plays no role in the financing of domestic nongovernment investment.

The observation that the possible contractionary effect of an exchange rate devaluation or an increase in interest rates on the nontraded goods market reduces rather than strengthens the effect of these policies on improving the balance of payments also applies to all other stabilization policies mentioned above. In the latter cases, however, as already indicated, there is no ambiguity with regard to the contractionary effect of the policy, and domestic credit to the nongovernment sector would also need to fall, unambiguously. A given contraction of aggregate demand aimed at reducing the external disequilibrium will be relatively more successful the more it can be targeted at traded goods without leakages onto the nontraded goods market. Since the contractionary impact on the nontraded goods market is directly related to the extent of these leakages, there is an inverse rather than a positive relationship between improvement in the balance of payments and the contraction of income.

3. Standard demand management policies

The preceding discussion indicates that the exchange rate instrument could be a more powerful tool than is sometimes thought for stabilizing the balance of payments and encouraging domestic growth in the short run, even if there is little initial supply response from the export sector. Nevertheless, if devaluation is contractionary in the short run, it would reinforce the deflationary effect of any standard demand management policy applied to correct an external disequilibrium. There would not be much room to reverse the latter policy, since this would tend to worsen the balance of payments at a time when the effect of the devaluation in improving the external position is likely to be particularly weak, as shown earlier.

The above observation and the fact that the exchange rate instrument may not always be immediately available to the policymakers raise the question of how a mix of such standard demand management policies could be used to improve the balance of payments situation without inducing a contraction in the level of economic activity. This

familiar policy assignment choice discussed a long time ago by Mundell will be reviewed in the context of the formal model of Section II. This review will throw some fresh light on the importance of the composition of fiscal and monetary stabilization policies as far as their impact on economic activity is concerned.

The analysis will concentrate on policy mixes that can improve the balance of payments while keeping economic activity constant. Qualitatively, the policy recommendations would apply as well for the case where the aim is also to increase economic activity; then, the short-run growth promoting policy will need to be quantitatively somewhat stronger, and the balance of payments improvement will be somewhat less. Simplicity is not the only merit of the present approach; to the extent that limited information may be available to judge the extent of the unutilized capacity of production in the economy, an expansionary mix of policies could have an impact on domestic inflation pressures.

Concentrating on changes in two policy instruments at a time, say dz_1 and dz_2 , the impact of such changes on demand for nontraded

goods and output, $\frac{\partial y_h}{\partial z_1} dz_1$ and $\frac{\partial y_h}{\partial z_2} dz_2$ can be derived from the

comparative statics of equations (13.a) and (13.b). Subsequently, a relationship between dz_1 and dz_2 can be obtained from the restriction that nontraded goods output y_h remains unaffected (i.e.,

$$dy_h = \frac{\partial y_h}{\partial z_1} dz_1 + \frac{\partial y_h}{\partial z_2} dz_2 = 0). \text{ Then, taking the total derivative of the}$$

excess demand for base money function (13.d) for dz_1 and dz_2 , it can in turn be checked under what conditions particular directions in policy changes dz_1 and dz_2 will tend to increase the excess supply of base money and hence to lessen the associated external disequilibrium.

The results of such an experiment are discussed in some detail below for the case where government tax policy and expenditure (say current expenditure) policy are considered means of stabilizing the external disequilibrium; these results are illustrated in Figure 6. Combinations of Y_{dt} , dC in the shaded area above the locus $dXDBM = 0$, along which the excess demand for base money remain unchanged, would result in an improvement of the external disequilibrium. ^{1/} Whether a combination of other current expenditure and tax rate cuts, or increases, would be appropriate (point A or B) depends on whether the locus where nontraded goods production remains unaffected by policy instrument changes, $dy_h = 0$, crosses the shaded area in Figure 6 in the southwest or northeast quadrant, i.e., whether

^{1/} Note that in deriving the locus $dXDBM = 0$, the fact that dy_h is targeted to be $dy_h = 0$ can already be used.

Figure 6

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$$\frac{\gamma}{\alpha (1-m_1^d) + \beta \frac{1-v}{1+u} m_1^d} \leq \frac{1}{1 - \frac{u+v}{1+u} m_1^d} \quad (19)$$

where the left-hand side of the inequality coincides with the slope of $dy_h = 0$.

It should prove fairly easy to estimate the sign of the inequality (19) from knowledge of the fundamental parameters of the economy. The left-hand side of equation (19) is the ratio between the effects on the aggregate demand for nontraded goods arising from an increase in government current expenditure and a cut in taxes, $-Ydt$. The latter operates, first, through a higher disposable income for households and, second, through the relaxation of the nongovernment domestic credit constraint, because part of the increase in disposable income would be saved in the form of deposits in the banking system, therefore enlarging the deposit money banks' lending base. The right-hand side of equation (19) is the ratio of the effects on the excess supply of base money arising from an increase in government current expenditure (financed by domestic credit from the central bank) and a reduction in taxes (also financed by domestic credit from the central bank but inducing at the same time an additional demand for base money by recipient households). Clearly, the relative sizes of nontraded goods content γ and α, β are critical in determining the sign of equation (19).

The above discussion is, of course, a specific illustration of the familiar optimal policy-mix rule:

"When the effectiveness of policy direction i relative to policy direction j in reducing the demand for nontraded goods is less than its relative effectiveness in reducing the excess supply of base money (external imbalance), policy direction i should be targeted at improving the external imbalance, while policy direction j should be targeted at sustaining the level of economic activity."

(20)

Note that from the differentiation of equation (11.e) with respect to dy_h , dt , and $d\bar{C}_g$, one obtains

$$dDC_g = d\bar{C}_g - tp_h (1-k) dy_h - Ydt \quad (21)$$

which, for the policy mix considered above and associated with points A or B in Figure 6, reduces to

$$dDC_g = \left[1 - \frac{\gamma}{\alpha (1-m_1^d) + \beta \frac{1-v}{1+u} m_1^d} \right] d\bar{C}_g \quad (22)$$

This implies that if the fiscal policy mix envisaged coincides with $d\bar{C} > 0$, $Y dt > 0$, it would be one that unambiguously reduces the government deficit and thus domestic financing by the central bank. Indeed, only when the left-hand side of equation (19) is greater than one could the optimal policy mix entail $d\bar{C} > 0$; but then equation (22) would imply $dDC < 0$. The only reason why this is not necessarily the outcome in the alternative case where $d\bar{C} < 0$, $Y dt < 0$ is that a reduction in the tax rate tends to increase the demand for base money; accordingly, reduction in the excess supply of base money is possible with some increase in domestic bank financing of government.

The above analysis can easily be extended to alternative combinations of fiscal and/or monetary policy instruments. The results are summarized in Table 1 for a limited number of policy mixes. They provide a number of very simple ground rules for the composition of demand management policies, rules that need to be respected if external disequilibrium is to be reduced without domestic recession. The first two columns of the table are to be interpreted as stated in the optimal policy mix rule (20). The effect of each optimal policy mix on the government budget deficit, and thus on the domestic bank financing to government given unchanged external resources, are also indicated in the last column of the table. The results establish, in particular, that:

a. There is no possible choice between government wages and tax policy on improving the balance of payments without domestic recession; any combination that reduced external disequilibrium would also reduce economic activity. The ratio between the effect on the aggregate demand for nontraded goods arising from a change in the government wage bill and in taxes turns out to be simply $(1-t)$. But this is also the ratio of the effects on the excess supply of base money; in terms of Figure 6, the locus of $dy_h = 0$ and $dXDBM = 0$ coincide. A corollary is that offsetting the negative balance of payments effect of an increase in the government wage bill alone requires the economy-wide tax rate to be increased such as to fully eliminate the expansionary effect of the wage bill increase on the nontraded goods sector.

b. The conditions that determine whether expenditure cuts accompanied by tax rate reductions or tax rate increases accompanied by expenditure increases can stabilize the balance of payments without domestic recession (the case which was discussed in greater detail earlier) also determine whether, notwithstanding structural considerations, concentration on other current expenditure cuts and wage increases rather than the converse could allow these objectives to be attained. A change in other current expenditure directly affects the demand for nontraded goods, while changes in the government wage bill affect disposable incomes and thus the demand both for nontraded goods and for money, including deposits. This relieves the financing constraint faced by the firms, which also implies a further positive effect on the demand for nontraded goods. The relative effectiveness of the two policy directions in affecting demand for nontraded goods must

Table 1. Optimal Composition of Demand Management Policies

Policy Mix	Macroeconomic Conditions	Policy Directions <u>1/</u>	Change in Budget Deficit and Domestic Bank Financing
t, W_g	$1-t = 1-t$	No trade-off between dt and dW_g	$dDC_g = 0$
$\bar{C}_g, t$	$\frac{\gamma}{\alpha(1-m_1^d) + \beta \frac{1-v}{1+u} m_1^d} < (>) \frac{1}{1 - \frac{u+v}{1+u} m_1^d}$	$d\bar{C}_g < 0 ; Ydt < 0$ (>) (>)	$dDC_g \begin{matrix} \leq \\ < \end{matrix} 0$ (<)
$\bar{C}_g, W_g$	$\frac{\gamma}{\alpha(1-t)(1-m_1^d) + \beta \frac{1-v}{1+u} (1-t)m_1^d} < (>) \frac{1}{(1-t)(1 - \frac{u+v}{1+u} m_1^d)}$	$d\bar{C}_g < 0 ; dW_g > 0$ (>) (<)	$dDC_g \begin{matrix} \leq \\ < \end{matrix} 0$ (<)
$\bar{C}_g, \bar{I}_g$	$\frac{\gamma}{\eta} < (>) 1$	$d\bar{C}_g < 0 ; d\bar{I}_g > 0$ (>) (<)	$dDC_g < 0$ (<)
v, t	$\frac{\beta \frac{1}{1+u} p_h m^d}{\alpha(1-m_1^d) + \beta \frac{1-v}{1+u} m_1^d} < (>) \frac{\frac{1}{1+u} p_h m^d}{1 - \frac{u+v}{1+u} m_1^d}$	$dv > 0 ; ydt < 0$ (<) (>)	$dDC_g > 0$ (<)
$\bar{I}_g, v$	$\frac{\eta}{\beta \frac{1}{1+u} p_h m^d} < (>) \frac{1}{\frac{1}{1+u} p_h m^d}$	$d\bar{I}_g < 0 ; dv < 0$ (>) (>)	$dDC_g < 0$ (>)
A, t	$\frac{\beta}{\alpha(1-m_1^d) + \beta \frac{1-v}{1+u} m_1^d} < (>) \frac{1}{1 - \frac{u+v}{1+u} m_1^d}$	$dA < 0 ; Ydt < 0$ (>) (>)	$dDC_g > 0$ (<)
$\bar{I}_g, A$	$\frac{\eta}{\beta} < (>) 1$	$d\bar{I}_g < 0 ; dA > 0$ (>) (<)	$dDC_g < 0$ (>)

1/ The relative size of the second policy directions (for instance, ydt) in terms of the first policy direction (for instance dC_g) required to maintain y_h unchanged while reducing the external disequilibrium is given in absolute terms by the left-hand side of macroeconomic conditions appearing in the first column of this table (which is why these conditions have not been simplified).

be compared with their relative effectiveness in affecting the excess supply of base money. While both tend to affect the government deficit directly, and thus the government domestic financing needs, a change in the government wage bill also affects income tax receipts as well as the end-of-period demand for money, including base money.

c. Notwithstanding structural or long-term considerations, whether cuts in government capital expenditure accompanied by increases in current expenditure (rather than the converse) should be used to reach the external and domestic objectives depends, not surprisingly, on whether the home goods content of current expenditure is larger than capital expenditure. Note that this result is derived assuming a given level of foreign financing.

d. Easily identifiable conditions, to be interpreted as equation (19), determine whether tax increases accompanied by reductions in the reserve requirement (or, similarly, increases in central bank advances to the banks) rather than tax cuts accompanied by increases in the reserve requirement (or, similarly, decreases in central bank advances) are effective in reducing the external disequilibrium without generating domestic recession. Hence, these conditions determine to what extent fiscal rather than monetary policy ought to be directed toward reducing the external imbalance with the other policy directed toward offsetting the recessionary impact on the demand for nontraded goods. Where fiscal policy consists of expenditure cuts or increases, the choice of policy mixes simply depends on the relative nontraded goods content of government expenditures versus nongovernment sector expenditures financed by domestic credit.

It is interesting to compare the above results with those of Mundell's analysis under fixed exchange rates and (limited) capital mobility. In a nutshell, the reason why Mundell's results imply, unambiguously, that government expenditure policy ought to be directed at the domestic balance and monetary policy at the external balance is that the tightening up of both policies have opposite effects on interest rates (reducing them in the case of fiscal policy and increasing them in the case of monetary policy). To the extent that higher interest rates are favorable to net capital inflows, monetary policy has a comparative advantage in improving the balance of payments, requiring less contraction of output to be associated with a given reduction in the external imbalance. As suggested earlier, in the present setup a contraction of government expenditure allowing a reduction in the domestic financing of government by the central bank also tends to increase interest rates: the resulting contraction in nontraded goods output and incomes leads to a reduction in monetary savings, including deposits in the banks, which in turn reduces the lending base. This is also the outcome of a contractionary monetary policy; hence, compared with Mundell's case, interest rates move in the same direction. The above argument is not fundamentally altered where the level of credit extended rather than the interest rates adjusts on the credit market. In the end-of-period model considered here with

price or quantity adjustments on the credit rather than the money market, monetary policy in the short run loses its comparative advantage as an instrument to reduce the external imbalance under managed exchange rates. Accordingly, the optimal policy mix becomes critically dependent on the relative import content of government versus credit-financed nongovernment expenditures.

4. Government external financing

In the nonrecessionary stabilization policies discussed above the availability of foreign financing is taken as given. A temporary way of addressing a prevailing external disequilibrium is to try financing it through higher government foreign borrowing. This raises the issue of the short-run impact of such a strategy on economic activity (or prices), particularly in relation to the way these additional resources are used. As already illustrated in Section II, if the additional foreign financing, say, on commercial terms, is used to reduce the domestic bank financing of the government deficit, there would be no short-run impact on the determinants of output y_h and nongovernment domestic credit DC_p (assuming a fixed exchange rate in the short run). Hence, output and nongovernment domestic credit would remain unchanged. The reduction in the target base money supply (through the reduction in net domestic credit to government), and hence in its excess supply, would be matched by an equal reduction in the excess demand for foreign exchange. Note that because under a fixed exchange rate net foreign assets adjust (presumably decline) ex post to bring supply of base money in line with an unchanged demand for base money, the short-run quasi-equilibrium level of y_h and DC_p in the following period will not be affected by the switch in the financing mix in the current period. (This, of course, does not mean that y_h and DC_p will not evolve over time; ceteris paribus, the path of y_h and DC_p will reflect the wealth effect of monetary savings accumulation on the demand for nontraded goods and imports.)

Particularly when the additional foreign financing is on concessional terms and project-related, its disbursement may need to be in the context of specific additional government expenditures. It is frequently argued that these expenditures should be allowed to increase, at most, by the amount of additional foreign financing available, as would the government deficit. One reason might be to ensure that the overall balance of payments does not deteriorate. But that prescription can lead to difficulties regarding the actual disbursement of foreign resources because of the domestic contribution generally required as a counterpart to the foreign financing to cover the cost of the project. The model developed in this paper can throw some light on this issue, as follows: Assume that the additional concessional foreign financing (say, external grants) edG^* (in local currency terms) is to finance an increase in government investment expenditure $d\bar{I}$. The latter will induce an increase in output of nontraded goods δy_h and nongovernment domestic credit dDC_p provided by the comparative statics of the short-run quasi-equilibrium conditions (13.a) and (13.b), that is,

$$\frac{\partial y_h}{\partial \bar{I}_g} = \frac{-\eta}{P_h |F|} > 0 ; \quad \frac{\partial DC/P_h}{\partial \bar{I}_g} = \frac{-\eta \left(\frac{1-v}{1+u}\right)(1-k)(1-t)m_1^d}{P_h |F|} > 0. \quad (22)$$

The impact of the above developments on the external disequilibrium can again be derived by checking under which conditions the excess demand for base money (equation (16.d)), given the government domestic bank financing relationship (equation (17)), will increase (its excess supply be reduced) as a result of the higher foreign financing-cum-government investment expenditure. Differentiating equations (11.d) and (11.e), and using equation (22), it follows that the external disequilibrium will be reduced if

$$\left[\frac{\left(\frac{u+v}{1+u}\right)(1-t)m_1^d + t)(1-k)\eta}{-|F|} \right] d\bar{I}_g - d\bar{I}_g + edG^* > 0 \quad (23)$$

where the term in brackets is positive, but can be shown to be less than unity.

Accordingly, even if the additional government expenditure $d\bar{I}_g$ was to be larger than the additional foreign financing edG^* , the balance of payments could still improve. The reason is, of course, that the rise in equilibrium output as a result of the increase in government expenditure will also increase the demand for base money; furthermore, the supply of base money itself would tend to decline, as higher tax revenue associated with larger incomes reduces the government domestic financing needs. The implication is that contrary to what was suggested above there is generally some room to accommodate the domestic counterpart to the foreign project assistance through a further increase of the budget deficit without necessarily making the balance of payments worse than its initial position. The maximum extent of that accommodation can be obtained by setting expression (23) to zero and solving for $d\bar{I}_g$ in function of edG^* . While recognizing that it may be imperative to program for an improvement in net foreign assets, it appears that the main argument against accommodation needs to be couched in terms of the possible impact of a higher level of demand for nontraded goods on domestic prices. But this issue should not be an overriding one when, as presently assumed, sufficient unused capacity and unemployed labor exist in the economy.

The actual change in domestic bank financing of the government deficit that will result from the above experiment is derived from equation (11.e), using equation (22), to obtain

$$\begin{aligned} dDC_g &= d\bar{I}_g - t p_h (1-k) dy_h - edG^* \\ &= (1 - t \frac{(1-k) \eta}{-|F|}) d\bar{I}_g - edG^* \end{aligned} \quad (24)$$

where the term in parentheses is positive. If $d\bar{I}_g$ sufficiently exceeds edG^* , the change in domestic bank financing dDC_g will be positive. Considering, at the limit, the level of $d\bar{I}_g > 0$ that would equate expression (23) to zero, the change in domestic bank financing of the government deficit, as given by expression (24), would be

$$dDC_g = \frac{\eta}{-|F|} \frac{u+v}{1+u} (1-t)(1-k) m_1^d d\bar{I}_g > 0 \quad (25)$$

where

$$d\bar{I}_g = edG^* / [1 - \frac{(\frac{u+v}{1+u} (1-t) m_1^d + t) (1-k) \eta}{-|F|}] > 0. \quad (26)$$

Hence, the government deficit will have increased by more than the additional foreign financing and yet the balance of payments will not be worse than its initial position.

IV. Concluding Remarks

Since the main results of the paper have been summarized in Section I, these concluding remarks focus on some immediate issues raised and extensions suggested by the above analysis.

Except for the immediate effect of devaluation on the GDP deflator and the consumer price index, domestic prices have been assumed fixed in the short run, which is justified by the assumption of unemployed labor and unused production capacity at prevailing price/cost relationships (accompanied by the downward stickiness of domestic wages and prices). While that assumption may remain operational in an inflationary environment where price behavior is largely induced by expectational factors, genuine situations of excess demand require changes in the behavioral equations of the model and in the disequilibrium situations considered. In the full employment market clearing case resulting from perfect wage and price flexibility, trade-offs between stabilization and growth-promoting objectives could emerge in the case of foreign financed government expenditure, as would private sector crowding-out concerns.

Although the paper has concentrated on short-run outcomes, medium-term dynamics ensue. The key endogenous stock variables in the present model are domestic credit to nongovernment (determined by equation (13.c)), domestic credit to government (determined by equation (11.e)), ex post net foreign assets of the central bank (determined by solving equation (13.d)--with the equality sign--for NFA^*), and broad money

stock defined by the sum of the above. Although current-period investment affects capital accumulation, and thus the next period's production function, there may not be a one-to-one correspondence between investment and output growth, except through the impact of investment on aggregate demand as long as the macroeconomic regime of Keynesian unemployment remains. Note, however, that in time alternative patterns of capital accumulation would have different implications for income distribution, and this in turn could produce different macroeconomic outcomes. But perhaps the most important consideration regarding investment in the present context is the possibility that insufficient investment would eventually produce a switch of regime from a lack to an excess of aggregate demand.

The analysis in this paper has highlighted the role that must be played by knowledge of the key aggregate structural parameters of the economy in the design of nonrecessionary short-run stabilization programs. Some extensions of the analytical framework, particularly regarding the fiscal environment, would likely yield additional insights on the composition of optimal short-run fiscal policy mixes and enhance the operationality of the model. As indicated earlier, the inclusion of indirect taxes, particularly import duties and sales taxes, would considerably expand the model's implications; on government expenditures, explicit consideration of constraints on the degree of substitutability between nontraded and import goods would enrich the analysis of exchange rate policies.

Walras' Law

Defining the nongovernment and government sectors' savings and investment relationships S_p , S_g and I_p , I_g , respectively, as

$$S_p = Y_d - (p_h c_{hp} + p_m c_{mp}) \quad (1.a)$$

$$S_g = tY + eG^* - (w_g + p_h c_{hg} + p_m c_{mg} + p_h i_{hg} + p_m i_{mg} + e r^* B^*(t-1) - e r^* NFA^*(t-1)) \quad (1.b)$$

$$I_p = p_h i_{hp} + p_m i_{mp} \quad (1.c)$$

$$I_g = p_h i_{hg} + p_m i_{mg} \quad (1.d)$$

and using equation (3) of the text, expression (2) can be derived:

$$S_p - I_p + S_g - I_g = e p_x^* y_x + p_h [y_h - (c_{hp} + i_{hp} + c_{hg} + i_{hg})] - p_m (c_{mp} + c_{mg} + i_{mp} + i_{mg}) - e r^* B^*(t-1) + e r^* NFA^*(t-1) + eG^* \quad (2)$$

Provided that the production of nontraded goods equals the aggregate demand for nontraded goods (which is always the case in an ex post accounting sense), expression (2) obviously coincides with the external current account surplus (deficit) eCA^* , in local currency terms.

Using the budget constraints (1.a), (1.b), and (1.c') of the text, the left-hand side of expression (2) can be expressed in terms of accumulation of financial assets or liabilities by the nonbank sector to derive:

$$(Cu^d - Cu(t-1)) + (D^d - D(t-1)) - (DC_p^d - DC_p(t-1)) - e(B^* - B^*(t-1)) - (DC_g - DC_g(t-1)) = p_h [y_h - (c_{hp} + i_{hp} + c_{hg} + i_{hg})] + eCA^* \quad (3)$$

Taking the deposit money banks' balance sheet identity (1.e) of the text as it applies to the end-of-previous-period, and subtracting it from the (target) end-of-current-period balance sheet identity, expression (4) is obtained:

$$(DC_p^s - DC_p(t-1)) + (Re^d - Re(t-1)) = (A - A(t-1)) + (D^s - D(t-1)) \quad (4)$$

Applying the same procedure to the central bank's balance sheet identity (1.d) of the text, expression (5) is derived:

$$\begin{aligned} & [e(t)\overline{NFA}^* - e(t-1) NFA^*(t-1) + (Rev - Rev(t-1))] + (DC_g - DC_g(t-1)) + (A - A(t-1)) \\ & = (Cu - Cu(t-1)) + (Re - Re(t-1)) \end{aligned} \quad (5)$$

where $e(t-1)$ is the end-of-previous-period exchange rate. The theoretical specification of the change in the revaluation account is:

$$Rev - Rev(t-1) = NFA^*(t-1)(e(t-1) - e(t)) + (\overline{NFA}^* - NFA^*(t-1))(e - e(t)). \quad (6)$$

Adding expressions (3), (4), and (5), and using expression (6), the following identity is obtained:

$$\begin{aligned} & [(Cu^d - Cu(t-1)) + (Re - Re(t-1))] - [(Cu - Cu(t-1)) + (Re - Re(t-1))] \\ & + [(D^d - D(t-1)) - (D^s - D(t-1))] - [(DC_p^d - DC_p(t-1)) - \\ & - (DC_p^s - DC_p(t-1))] + p_h[(c_{hp} + i_{hp} + c_{hg} + i_{hg}) - y_h] = eCA^* + e(B^* - \\ & B^*(t-1)) - e(\overline{NFA}^* - NFA^*(t-1)) \end{aligned} \quad (7)$$

which, given the central bank's balance sheet identities for end-of-periods $t-1$ and t can be rewritten as:

$$\begin{aligned} & [(Cu^d + Re) - (e(t) \overline{NFA}^* + DC_g + A + Rev)] + [D^d - D^s] - [DC_p^d - DC_p^s] \\ & + p_h[(c_{hp} + i_{hp} + c_{hg} + i_{hg}) - y_h] + e[-CA^* - (B^* - B^*(t-1)) + (\overline{NFA}^* - NFA^*(t-1))] = 0 \end{aligned} \quad (8)$$

which coincides with expression (5) of the text.

Households' Decisions

The representative consumer's intertemporal maximization problem is postulated to be: 1/

$$\{c_h, c_m, c_h(1), c_m(1), \frac{M}{p_h}\} \quad \text{Max} \quad [E\{U(c_h, c_m) + \rho U(c_h(1), c_m(1))\}] \quad (1)$$

subject to

$$c_h + \frac{ep_m^*}{p_h} c_m = \frac{Y}{p_h} + \frac{M-1}{p_h} - \frac{M}{p_h} \quad (2.a)$$

$$c_h(1) + \frac{e(1)p_m^*}{p_h} c_m(1) = (1+r) \frac{M}{p_h} \quad (2.b)$$

where $E\{ \}$ stands for expected value, $U()$ is a time-invariant utility function, and ρ the constant rate of time preference ($0 < \rho < 1$). It is assumed that the (inverse of) real exchange rate in the next period could differ from its current value only to the extent that the future nominal exchange rate $e(1)$ would. The latter is also the only source of uncertainty in the model; the prices p_h and p_m are expected to remain constant. The following specific utility function is adopted

$$U(c_h(\bullet), c_m(\bullet)) = c_h(\bullet)^a c_m(\bullet)^b, \quad a+b < 1 \quad (3)$$

where $\bullet$ stands for either the first or the second period.

It is convenient to solve the above maximization problem in two stages. First, the optimal future consumption bundle is derived from expression (1) given expression (2.b), where M/p_h and $e(1)$ are viewed as predetermined, to find

$$c_h(1) = \theta \frac{(1+r)M}{p_h} \quad (4.a)$$

$$c_m(1) = (1-\theta) \frac{(1+r)M}{e(1)p_m^*} \quad (4.b)$$

1/ For simplicity, only one interest-bearing monetary asset is assumed and taxation is ignored.

where $\theta = a/a+b$. Replacing expressions (4.a) and (4.b) in equation (1), the following reduced-to-one-period utility function is obtained:

$$V = c_h^a c_m^b + \rho \theta^a (1 - \theta)^b \left[\frac{(1+r)M}{p_h} \right]^{(a+b)} \left(\frac{e(1)p_m^*}{p_h} \right)^{-b}. \quad (5)$$

The second stage, the maximization of the expected value of expression (5) subject to expression (2.a), can itself be decomposed in two steps. The first is to choose the optimal consumption bundle c_h , c_m , given M/p_h , which yields:

$$c_h = \theta \left(\frac{Y - (M - M_{-1})}{p_h} \right) \quad (6.a)$$

$$c_m = (1-\theta) \left(\frac{Y - (M - M_{-1})}{e p_m^*} \right). \quad (6.b)$$

Replacing expressions (6.a) and (6.b) in (5), the following indirect utility function is obtained:

$$\begin{aligned} & \theta^a (1-\theta)^b \left(\frac{Y - (M - M_{-1})}{p_h} \right)^{a+b} \left(\frac{e p_m^*}{p_h} \right)^{-b} \\ & + \rho \theta^a (1-\theta)^b \left[\frac{(1+r)M}{p_h} \right]^{(a+b)} \left(\frac{e(1)p_m^*}{p_h} \right)^{-b} \end{aligned} \quad (7)$$

The second step consists of the maximization of the expected value of expression (7) with respect to M/p_h , which provides the following first-order condition: $\frac{1}{x}$

$$-\left(\frac{Y - (M - M_{-1})}{p_h} \right)^{a+b-1} + \rho (1+r)^{a+b} \left(\frac{M}{p_h} \right)^{(a+b)-1} \frac{E\{x(1)^{-b}\}}{x^{-b}} = 0 \quad (8)$$

where $x = e p_m^* / p_h$ and $x(1) = e(1)p_m^* / p_h$, $e(1)$ being a random variable. The money-demand function defined by expression (8) can be written in the following compact form:

$$\frac{M}{p_h} = m^d \left(\frac{Y}{p_h}, r, \frac{e p_m^*}{p_h}, \frac{M_{-1}}{p_h} \right). \quad (9)$$

(+) (+) (?) (+)

$\frac{1}{x}$ It can be verified that the second-order conditions for a maximum always hold under the specifications of the present optimization model.

The partial derivative of $m^d(\cdot)$ with respect to $x = ep_m^*/p_h$, in particular, can be obtained as follows: transfer the first term of (8) on the right-hand side, take the $\ln$ of both sides, and subsequently the total derivative to find

$$\frac{\partial m^d}{\partial x} = \frac{\frac{\partial}{\partial x} \ln \frac{E\{x(1)^{-b}\}}{x^{-b}}}{\frac{[1-(a+b)]}{M/p_h} + \frac{[1-(a+b)]}{[Y-(M-M_{-1})]/p_h}} \quad (10)$$

A first immediate implication of expression (10) is that if the probability distribution of $x(1)$ does not depend on the current value x , the case of (absolute) inelastic expectations, $\frac{\partial m^d}{\partial x}$ must be positive. However, as argued in the text, the above assumption may not be realistic under a fixed (managed) exchange rate regime.

To investigate further the possible properties of expression (10), $x(1)$ is postulated to be a lognormally-distributed random variable with mean $\bar{x}(1)$ and variance σ^2 . Furthermore, (unitary) elastic expectations are assumed in the sense that $\bar{x}(1) = x$; that is, on average, the future real exchange rate is expected to be equal to the current-period real exchange rate. It can be established that expression (11) holds. ^{1/}

$$\frac{E\{x(1)\}^{-b}}{x^{-b}} = \exp \left\{ \frac{b(1+b)}{2} \ln \left(1 + \frac{\sigma^2}{2} \right) \right\} \quad (11)$$

Expression (11) together with expression (10) implies that money demand increases (decreases) with a current-period devaluation of the exchange rate whenever σ^2/x^2 --which can be referred to as the (relative) degree of uncertainty attached to the future real exchange rate--increases (decreases) with that devaluation. Under a fixed (managed) exchange rate regime, a short-run increase in the degree of uncertainty appears most likely following a discrete current-period devaluation.

Expression (9) with $\partial m^d/\partial x > 0$, together with expressions (6.a) and (6.b), provides a rigorous rationalization for the specification of the consumers' demand functions introduced in the text.

Alternative rationalizations of the positive relationship between demand for money and the exchange rate under unitary elastic expectations exist, of course. A simple alternative explanation that can be dealt with in a nonstochastic version of the above intertemporal model and that provides less ambiguous results, albeit at the cost of introducing a somewhat more ad hoc ingredient, is as follows: Assume that the representative consumer wishes to provide for the end of his

^{1/} See Aitchison and Brown (1966).

two-period horizon an amount of money balance, M_{+1} , fixed in purchasing power terms, that is,

$$\frac{M_{+1}}{p_h^\theta (ep_m^*)^{1-\theta}} = q \quad (12)$$

where q is a constant and $(1-\theta)$ is the share of expenditures spent on imports. It is convenient to rewrite expression (12) as

$$\frac{M_{+1}}{p_h} = qx^{1-\theta} \quad (12')$$

where x has been defined earlier as the (inverse of the) real exchange rate.

Under the above new specification, the budget constraint (2.b) becomes:

$$c_h(1) + \frac{ep_m^*}{p_h} c_m(1) = (1+r) \frac{M}{p_h} - qx^{1-\theta} . \quad (2.b')$$

Utility maximization along the lines detailed above and subsequent comparative statics analysis yields

$$\frac{\partial m^d}{\partial x} = \frac{-\frac{\partial}{\partial x} \ln \left(\frac{M}{p_h} - qx^{1-\theta} \right)}{\frac{1}{\frac{M}{p_h} - qx^{1-\theta}} + \frac{1}{[Y - (M - M_{-1})]/p_h}} > 0 \quad (13)$$

equivalent to expression (10), but of an unambiguously positive sign.

Firms' Decisions

At the beginning of the current period the representative firm has given stocks of domestically produced and imported capital, $K_h(t-1)$ and $K_m(t-1)$, respectively. It will use labor L and imported input n to produce current-period output of nontraded goods. The firm may also purchase in the current period domestically produced and imported investment goods, i_h and i_m , respectively, which will be added to the existing capital stocks and become effective in the following period. The firm finances these investments by borrowing from the domestic banks. The maximization of the discounted stream of profits subject to sales constraint and possibly financing constraint can be approached in two steps.

First, the firm chooses L and n , which maximize current-period profits (excluding investment expenditures) subject to the sales constraint y_h , corresponding to current aggregate demand for nontraded goods. It will be assumed to face the following Cobb Douglas production function for nontraded goods 1/

$$y_h = K_h(t-1)^{\tau_h} K_m(t-1)^{\tau_m} L^{\tau} n^{1-\tau} \quad (1)$$

where τ_h , τ_m , and τ are parameters assuming values between zero and one. Presuming that the sales constraint is binding, profit maximization is equivalent to cost minimization, and the following demand function for imported input, in particular, can be derived

$$n = [A(t-1)^{-1} \left(\frac{1-\tau}{\tau}\right)^{\tau} \frac{w^{\tau} p_m^{1-\tau}}{p_h}] \frac{p_h y_h}{p_m} \quad (2)$$

where $A(t-1) = K_h(t-1)^{\tau_h} K_m(t-1)^{\tau_m}$, and w is the nominal wage. Defining the term in brackets as k , expression (2) coincides with expression (9.a) in the text.

Second, the firm maximizes discounted second-period profits (net of current-period investment costs), that is,

$$-p_h i_h - p_m i_m + \frac{1}{1+r_1} [p_h y_h(1) - wL(1) - p_m n(1)] \quad (3)$$

(where r_1 is the domestic lending interest rate) subject to an updated

1/ Expression (1) is homogeneous of degree one in L and n purely for analytical simplicity, as it will allow the demand functions for L and n to be linear in y_h .

production function

$$[(1-\delta) K_h(t-1) + i_h]^{\tau_h} [(1-\delta) K_m(t-1) + i_m]^{\tau_m} L(1)^{\tau} n(1)^{1-\tau} \quad (4)$$

(where δ is a depreciation rate) and an expected binding sales constraint $y_h(1)$, as well as a possible financing constraint

$$p_h i_h + p_m i_m \leq [DC_p - DC_p(t-1)] \quad (5)$$

where DC_p is end-of-period domestic bank credit available to the nongovernment sector.

Given the expected binding sales constraint, profit maximization is again equivalent to cost minimization, and the following familiar optimal conditions can be derived

$$\frac{w}{1+r_1} - \lambda \tau \frac{y_h(1)}{L(1)} = 0 \quad (6.1)$$

$$\frac{p_m}{1+r_1} - \lambda(1-\tau) \frac{y_h(1)}{n} = 0 \quad (6.2)$$

$$(1+\mu)p_h - \lambda \tau_h \frac{y_h(1)}{(1-\delta)K_h(t-1) + i_h} = 0 \quad (6.3)$$

$$(1+\mu)p_m - \lambda \tau_m \frac{y_h(1)}{(1-\delta)K_m(t-1) + i_m} = 0 \quad (6.4)$$

$$y_h(1) - [(1-\delta)K_h(t-1) + i_h]^{\tau_h} [(1-\delta)K_m(t-1) + i_m]^{\tau_m} L(1)^{\tau} n(1)^{1-\tau} = 0 \quad (6.5)$$

where λ and μ are multipliers associated with the sales and financing constraints, respectively.

In the case where the financing constraint is not binding, that is, $\mu=0$, the investment demand functions of the following forms can be obtained from (6.1) - (6.5) (purely for analytical simplicity, it is assumed that $\delta=1$).

$$i_h = \pi \frac{p_m^{1-\varepsilon}}{p_h} \Phi(r_1, w, p_h, y_h(1)) \quad (7.1)$$

$$i_m = \frac{\Phi(r_1, w, p_h, y_h(1))}{p_m^{\varepsilon}} \quad (7.2)$$

where ϵ is a constant ($0 < \epsilon < 1$), $\pi = \tau_h / \tau_m$, and $\phi()$ is a decreasing function of r_1 and an increasing function of $w, p_h, y_h(1)$. Expressions (7.1) and (7.2) coincide with equations (9.b) and (9.c) of the text.

Note from expressions (6.3) and (6.4) that whether the financing constraint is binding or not, the ratio of values of investment in domestic capital produced or imported capital will be the same and equal to the constant $\pi = \tau_h / \tau_m$. Hence, if the financing constraint is binding, expression (5) can be used with the equality sign to derive

$$i_h = \frac{\pi}{1+\pi} \frac{(DC_p - DC_p(t-1))}{p_h} \quad (7.3)$$

$$i_m = \frac{1}{1+\pi} \frac{(DC_p - DC_p(t-1))}{p_m} \quad (7.4)$$

which coincide with expressions (10.a) and (10.b) of the text, defining β as equal to $\pi/(1+\pi)$.

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