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Currency Depreciation and Nonclearing Markets in Developing Economies

Prepared by Iqbal M. Zaidi*

Approved by Anthony Lanyi

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Summary

This paper uses a disequilibrium model to analyze the effect of exchange rate policy in a developing economy. The disequilibrium model takes into account the effect that rationing of consumers or producers in particular markets has on their demands or supplies in other markets. The analysis highlights the macroeconomic adjustment process when there is wage rigidity. The contractionary effects that currency depreciation has on the supply side of an economy with imported intermediate goods and credit rationing are also considered. A simple two-dimensional representation of the various disequilibrium regimes is made possible by focusing on the states of the domestic markets for labor and nontraded goods.

The model developed in this paper yields useful insights into the short-run impact of exchange rate policy in developing countries. Two simple policy analyses are used to illustrate the usefulness of the disequilibrium model. Within this framework it is found that the nature of a disequilibrium affects the impact of exchange rate policy. In particular, the paper demonstrates that the response to currency depreciation differs substantially depending on whether classical or Keynesian unemployment prevails.

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I. Introduction

The exchange rate is an important policy instrument for correcting balance of payments disequilibria, and the role of currency depreciation in economic adjustment is the subject of numerous theoretical and empirical papers. 1/ But an important strand of the literature has questioned the efficacy of currency depreciation in the setting of a developing economy. 2/ This paper sheds light on this controversy by developing a two-sector, fix-price model for analyzing exchange rate policies in developing economies. This model, which distinguishes between tradable and nontradable goods, is used to analyze the scope for currency depreciation to bring about macroeconomic and balance of payments adjustments. Attention is focused not only on the demand side of the economy--the expenditure-switching and expenditure-reducing effects of devaluation--but also on the supply side of the economy. The model takes into account the effect that rationing of consumers or producers in particular markets has on their demands or supplies in other markets.

The central focus of this paper is the adjustment process following a currency depreciation in an economy that has wage and price rigidity. The analysis highlights the links between sectoral disequilibrium and domestic employment. One policy issue examined is whether the short-run effects of currency depreciation depend on excess supply or demand in labor and output markets. Another policy issue examined is whether currency depreciation has a contractionary effect on the supply side of an economy that imports intermediate goods and has credit rationing. The paper demonstrates that the regimes of classical and Keynesian unemployment respond in quite different ways to currency depreciation.

The procedure adopted in this paper is to organize the discussion of exchange rate policies in developing countries by using a single, integrated analytical framework. This procedure is facilitated by widespread agreement concerning the analytical framework that is appropriate to use in dealing with these issues. This area of agreement is embodied in what might be termed the "standard Meade-Salter-Swan model of the open economy" 3/ In this model, which is sometimes also called the "dependent economy model" to emphasize the fact that the country is assumed to be a price taker in the world market for importables and exportables alike, industries are conceptually divided into tradables and nontradables sectors.

1/ Meade (1951), Alexander (1952), Johnson (1958), and Dornbusch (1973).

2/ Cooper (1971), and Krugman and Taylor (1978).

3/ Developed in a series of papers by Meade (1959), Salter (1959), and Swan (1963).

This distinction makes it possible, in turn, to distinguish between the effects of aggregate and relative disturbances, as well as between internal and external disturbances. This model is particularly relevant in the case of developing economies, where quantitative adjustments tend to be much more important in the short-term than are price adjustments.

The rest of the paper is structured as follows. In Section II, the general equilibrium aspects of currency depreciation are analyzed, including a discussion of the elasticities approach in terms of the Meade-Salter-Swan model. In Section III, the structure and behavior of the Meade-Salter-Swan model are analyzed in a market-clearing framework. In Section IV, the framework of analysis is extended from a market clearing into a disequilibrium framework, thereby permitting an examination of exchange rate policy when markets do not clear. This extension is in the spirit of models developed by Neary (1980) and van Wijnbergen (1984). In Section V, the disequilibrium model is used to analyze two examples of currency depreciation in developing countries. These examples illustrate that careful distinction between alternative economic environments yields useful insights into the appropriateness of exchange rate policy under different short-run situations. Section VI discusses how the analysis alters when credit rationing and intermediate imports are incorporated into the model. Finally, Section VII summarizes the principal results.

II. Exchange Rate Policy and General Equilibrium

In the popular elasticities approach, currency depreciation is viewed as a method of improving a country's "competitiveness," or in other words rendering domestically produced goods cheaper abroad while making foreign produced goods dearer at home. This shift in the attractiveness of traded goods causes the volume of net exports to rise and domestic employment to increase. It is well known, however, that as long as all demand and supply functions are homogeneous of degree zero in nominal prices and expenditure, and all nominal prices and assets are free to adjust to a new numeraire, a currency depreciation should have no effects on real variables because the exchange rate is a nominal variable. In order for it to have an effect on a real variable in the system, one of the arguments in the real demand functions must not change in proportion to the other arguments. Such a nonproportional adjustment can occur in several ways. For example, the increase in domestic prices may be less than that of foreign prices after a currency depreciation, i.e., a change in the terms of trade. 1/

1/ See, for example, Guitian (1976) and Miles (1978).

Even when currency depreciation affects real variables, it may result in a deterioration rather than an improvement in the trade balance. Although export volumes rise and import volumes decline as domestic goods become more competitive, it is also true that the economy has to pay more per unit of imports. This cost effect dominates unless exports and imports in physical terms are sufficiently price elastic. The basic conclusion of the elasticities approach is that a rise in the relative price of imports will improve the trade balance, provided that the sum of export and import elasticities exceeds unity.

A major theoretical objection to the elasticities model is that the analysis is based on partial equilibrium. If the currency depreciation leads to offsetting price increases, relative prices and external competitiveness will remain unchanged and depreciation will exert no real effect. For instance, there may be a real-wage resistance to the depreciation-induced price increase in traded-goods prices, with the consequence that a general rise in nominal wages offsets the increased competitiveness due to the depreciation. One possible justification of the partial equilibrium approach is to assume foreign trade is a sufficiently small activity in the economy, so that the general purchasing power of money is invariant to exchange rate changes, and cross-price elasticities need not be incorporated into the analysis.

An alternative and more accepted interpretation is provided by the Meade-Salter-Swan model, in which it is assumed that in addition to a traded good, the price of which is determined on the world market, there is also a nontraded good, the price of which is determined domestically. In an economy at full equilibrium, where both the home goods market is clearing and the trade balance is in equilibrium, currency depreciation will increase the relative price of traded goods. Productive resources will be moved into the traded-goods industry, and consumers will substitute nontraded for traded goods. But at the higher relative price of traded goods, there will be an excess demand for nontraded goods and an excess supply of traded goods, with the result that the price of nontraded goods will increase. In the new long-run equilibrium, all nominal magnitudes will have increased by the same proportion, and the initial relative price structure will have been restored. In order for currency depreciation to exert real effects, there must be a government policy that controls the nominal price of nontraded goods.

Dornbusch has shown that fiscal policy can be used to maintain a fixed nominal price of nontraded goods, assuming (i) a unit marginal propensity to spend on nontraded goods; and (ii) zero cross-price effects (substitution effects) between traded goods. The essential elements of his analysis are that a devaluation, by raising the relative price of traded goods in terms of nontraded goods, generates a balance of payments surplus. But for the devaluation to be successful, it is essential that

there be an "internal balance" policy that validates the relative price change by a reduction in absorption. The implication is that the government has to levy income taxes whenever there is an excess demand for nontraded goods; the increase in income taxes reduces private expenditure, thereby eliminating the excess demand and preventing the price of nontraded goods from rising.

> This implies that the counterpart of the trade balance surplus is an identically equal tax collection or budget surplus. It follows that the analysis is fully consistent with the absorption approach, since it readily explains the decline in expenditure relative to income implied by the trade balance surplus. It follows, too, that in the absence of this fiscal policy the price of home goods would increase in response to the excess demand until relative prices returned to their initial position with no real effects persisting. 1/

Dornbusch's analysis makes it possible to specify the conditions implicitly assumed in the elasticities approach, namely that currency depreciation is accompanied by controls over aggregate demand that reduce domestic absorption and release goods for export once expenditure switching occurs. To push the argument to an extreme, the government controls its budget, so that there is an improvement in the trade balance following a currency depreciation. 2/

Adherents to the monetary approach to the balance of payments criticize the elasticities approach for failing to incorporate the interactions between markets. They argue that partial equilibrium analysis is not suitable for studying the balance of payments because changes in the government budget, private savings and investment will have significant repercussions on other markets, in particular, the money market. The current account deficit equals the sum of the excess of private sector investment over private sector saving and the budget deficit of the government. This implies that, other things being equal, the current account deficit will be higher, the greater is the accumulation of capital, the smaller is the accumulation of private wealth, and the larger is the budget deficit. Any improvements in the current account balance must involve a rise in private saving, a rise in government saving, or a fall in domestic investment, regardless of price changes initially influencing the volume of exports and imports.

1/ Dornbusch (1975), p. 864.

2/ A detailed discussion of the effect of the government budget on the current account balance is provided by Branson (1976) and McKinnon (1981).

In adopting a general equilibrium framework as the means for analyzing the balance of payments, however, the monetary approach literature chooses a very specific concept of equilibrium. For example, it is assumed that wages and prices are flexible, that real output is at the full employment level, and that the supply side of the economy is independent of monetary variables. Furthermore, it is assumed that there is perfect commodity arbitrage ("the law of one price"). That is, under fixed exchange rates, domestic inflation and interest rates are equal to world inflation and interest rates. In sum, the determinants of the demand for monetary liabilities are unaffected by domestic monetary policy. With all of the determinants of the demand for money fixed, changes in the domestic monetary base are offset by changes in foreign reserves.

According to the monetary approach, deficits and surpluses in the balance of payments are the result of a process of adjustment to the desired stock of real money balances, so that currency depreciation provides only a temporary remedy for a balance of payments deficit. Currency depreciation raises domestic prices and creates a temporary excess demand for money, thereby inducing domestic economic agents to restore the initial level of real money balances through current account surpluses, which raises the domestic money stock. Currency depreciation may therefore be used to increase official international reserves, for example, when reserve holdings are inadequate to allow the monetary mechanism to operate. But the resulting current account improvement is only a temporary reversal of the balance of payments position, because once the stock equilibrium is achieved, with the demand for money equal to the supply of money, then the balance of payments flows will return to their normal levels. The normal levels of these flows in the monetary approach are determined by the growth of domestic credit relative to the growth of demand for high-powered money. Another way to put this result is to state that only the composition of monetary assets--domestic credit and net foreign assets--and not the total level of monetary assets is an instrument of policy for a small, open economy.

Krugman and Taylor (1978) have formulated a model that is designed to bring out the income effects suppressed in the elasticities and monetary approaches, and they establish the plausibility of a fall in output following a currency depreciation. They show that neglecting the contractionary impact of currency depreciation amounts to ignoring income effects, especially the transfer of real purchasing power toward economic sectors with a high marginal propensity to save. By redirecting income to high savers, currency depreciation can create an excess of saving over planned investment, ex-ante, and reduction in real output and imports, ex post. Krugman and Taylor focus their analysis on the demand side of the economy and the effects of currency depreciation on income distribution. Nevertheless, currency depreciation also has important supply-side effects

in an economy with imported intermediate goods, credit rationing, and wage-price rigidities. These are the characteristics of the developing countries that will be the focus of this paper.

The disequilibrium model presented in this paper incorporates the interactions between markets that are emphasized in the monetary approach. However, it is a non-Walrasian model, that is, it does not make the typical assumption that markets clear by means of rapid adjustment of prices to excess supplies or demands. The disequilibrium model is sufficiently general to incorporate both relative-price and sectoral-imbalance phenomena and yet specific enough to generate results useful to the policy maker. In the model, the consistency between individual actions is achieved by adjustments of quantities traded rather than prices. Within the unit period of the model, agents adjust their behavior in the light of perceived constraints, which typically include quantity constraints on their transactions, so that their actions are mutually consistent. This is a general equilibrium model that takes into account the short-term quantitative adjustments that are so important in developing economies.

III. The Two-Sector Equilibrium Model

The objective in this section is to clarify the structure and behavior of a simple macroeconomic model for a small, open economy, emphasizing the interaction between the markets for goods and labor. The model developed by Calmfors (1979) will serve as a starting point, but his model has been simplified by abstracting certain inconsequential details, in order to highlight the key points. The Calmfors model itself is in the tradition of the Meade-Salter-Swan model. In the following section, the framework of analysis is extended from a market-clearing into a disequilibrium framework, thereby permitting an examination of exchange rate policy when markets do not clear. Since detailed treatment of the Meade-Salter-Swan model can be found in several papers, the present discussion will necessarily be brief, focusing on those issues most relevant to the subsequent discussion of the disequilibrium model.

The model consists of the following assumptions. The country produces and consumes two classes of commodities, traded goods, Q_T, and nontraded goods, Q_N. The relative prices of goods within each class are fixed; in particular, the terms of trade between different traded goods are determined independently of the home country's actions on the world market. The two goods are produced by two-factor neoclassical production functions, $F_i(K_i, L_i)$, with capital, K_i, and labor, L_i, as arguments. The capital stock in each sector is fixed, is specific to that sector, and is immobile between sectors. The labor force is homogeneous and mobile between sectors, thereby ensuring the equalization of money wages between sectors. Table 1 gives a list of definitions of symbols; superscript numerals indicate partial derivatives with respect to the various

Table 1. Symbols Used

GNP = nominal gross national product

Y = real GNP (measured in terms of traded goods)

Q_T = supply of traded goods

Q_N = supply of nontraded goods

P_T = price of traded goods in domestic currency

P_N = price of nontraded goods in domestic currency

C_T = private consumption demand for traded goods

C_N = private consumption demand for nontraded goods

T = personal real income taxes (measured in terms of traded goods)

A = real wealth

L_S = supply of labor

$L_{D,T}$ = demand for labor in sector producing traded goods

$L_{D,N}$ = demand for labor in sector producing nontraded goods

E = employment

U = unemployment

G_T = government demand for traded goods

G_N = government demand for nontraded goods

I_T = investment demand for traded goods

I_N = investment demand for nontraded goods

X = net exports

e = exchange rate (value of one unit of foreign currency in domestic currency)

P_T^* = price of traded goods in foreign currency

$\hat{W} = \frac{\dot{W}}{W}$ = rate of change of wages

$\hat{W}^e$ = expected rate of wage inflation

arguments in the functions, while subscript letters show whether a certain variable refers to traded goods, T, or nontraded goods, N. The time rate of change for all X, dX/dt, is denoted by $\dot{X}$, and the percentage rate of change of X by $\hat{X}$.

The model represented in equations (1) through (13) is presented in Table 2. Nominal GNP is given by $P_TQ_T + P_NQ_N$ and real GNP in terms of traded goods is represented in equation (1) as the sum of output values in the two sectors. Real disposable income is the difference between real GNP and real taxes measured in terms of traded goods. Equations (2) and (3) show private consumption demand for traded and nontraded goods, respectively, as functions of the relative price between the two goods, real disposable income and real wealth. In equations (4) and (6) the supply of traded goods and the demand for labor in the traded goods sector, respectively, are expressed as functions of the real wage in terms of traded goods, while in equations (5) and (7) the corresponding variables in the nontraded goods sector are functions of the real wage in terms of nontraded goods. These supply functions for the goods and demand functions for labor can be derived from the assumptions of linear homogeneous production functions, competition, and that the capital stock in each sector is fixed. Under these assumptions, producers maximize profits by equating the wage rate with the value of the marginal product of labor in each sector. Equations (8) and (9) are the market clearing conditions for traded and nontraded goods, respectively. In equation (10) actual employment is the sum of the demands for labor in the two sectors, and equation (11) shows unemployment as the difference between the total supply of labor, which is assumed to be fixed, and actual employment. Equation (12) is the commodity arbitrage condition stating that the price of traded goods in domestic currency is equal to the exogenously given world market price in foreign currency multiplied by the exchange rate. Equation (13) is an expectations-augmented Phillips relation, where the rate of wage change is taken to be a function of unemployment and the expected rate of wage inflation.

Equations (1) to (13) may be combined to yield four basic equations determining four endogenous variables: net exports (X), the real wage in terms of nontraded goods ($W_N = W/P_N$), unemployment (U), and the rate of change of the real wage in terms of traded goods ($\hat{W}_T = \hat{W}/\hat{P}_T$). 1/

1/ In the substitution, use is made of the following definitions:

$$\frac{W}{eP^*_T} = \frac{W}{P_T} = W_T; \quad \frac{W}{P_N} = W_N;$$

$$\frac{P_N}{eP^*_T} = \frac{P_N}{P_T} = \frac{W_T}{W_N}; \text{ and } \hat{W} - \hat{e} - \hat{P}^*_T = \hat{W} - \hat{P}_T = \hat{W}_T$$

Table 2. Equations

(1) $Y = Q_T + \frac{P_N}{P_T} Q_N$

(2) $C_T = C_T(\frac{P_N}{P_T}, Y-T, A), \; C_T^1 > 0, \; C_T^2 > 0, \; C_T^3 > 0$

(3) $C_N = C_N(\frac{P_N}{P_T}, Y-T, A), \; C_N^1 < 0, \; C_N^2 > 0, \; C_N^3 > 0$

(4) $Q_T = Q_T(\frac{W}{P_T}), \qquad Q_T^1 < 0$

(5) $Q_N = Q_N(\frac{W}{P_N}), \qquad Q_N^1 < 0$

(6) $L_{D,T} = L_{D,T}(\frac{W}{P_T}), \quad L_{D,T}^1 < 0$

(7) $L_{D,N} = L_{D,N}(\frac{W}{P_N}), \quad L_{D,N}^1 < 0$

(8) $C_T + G_T + I_T + X - Q_T = 0$

(9) $C_N + G_N + I_N - Q_N = 0$

(10) $E = L_{D,T} + L_{D,N}$

(11) $U = L_S - E$

(12) $P_T = eP_T^*$

(13) $\hat{W} = a + bU + c\hat{W}^e$

$$(8a) \quad C_T\left[\frac{W_T}{W_N},\ Q_T(W_T) + \frac{W_T}{W_N} Q_N(W_N) - T,\ A\right] + G_T + I_T + X - Q_T(W_T) = 0$$

$$(9a) \quad C_N\left[\frac{W_T}{W_N},\ Q_T(W_T) + \frac{W_T}{W_N} Q_N(W_N) - T,\ A\right] + G_N + I_N - Q_N(W_N) = 0$$

$$(11a) \quad U = L_S - L_{D,T}(W_T) - L_{D,N}(W_N)$$

$$(13a) \quad \hat{W}_T = a - bU + c\hat{W}^e - \hat{P}_T^* - \hat{e}$$

The reason for substituting W_T/W_N for P_N/P_T in the equations above is that the analysis emphasizes the changes in W_T and W_N, from which output and employment effects can be derived directly. If money wages and prices were adjusting instantly to conditions prevailing in the markets, then all markets would clear. In particular,the wage rate would adjust rapidly so that the demand and supply for labor would be continuously equal with zero unemployment. In this case, the endogenous variable would be the real wage in terms of traded goods and not unemployment.

The short-run equilibrium determination of the model is shown in Figure 1. In order to keep the diagrams reasonably uncluttered, especially when the disequilibrium version of the model is presented, the upward sloping curve indicating trade balance equilibrium and labeled XX by Calmfors is not drawn in Figure 1. The figure shows the pairs of the real wage in terms of traded goods (W_T) and the real wage in terms of nontraded goods (W_N) that hold the demand for nontraded goods equal to its supply (NN locus) and the total demand for labor equal to its fixed supply (LL locus) for given values of taxes (T) and government and investment expenditures for both traded and nontraded goods (G_T, G_N, I_T, and I_N). To obtain the slope of the NN curve, one considers a rise in P_T for a given W; this change leads to excess demand for nontraded goods, which can be eliminated by an increase in P_N (at a given W), which are standard assumptions. Accordingly, the NN curve has a positive slope. The slope of the LL curve is explained by considering an increase in W_N at an unchanged W_T, which causes the demand for labor to decrease in the sector producing nontraded goods. In order to maintain labor market equilibrium, W_T must decrease so as to increase the demand for labor in the traded goods sector. Therefore, the locus of W_N and W_T values that is compatible with labor market equilibrium has a negative slope. 1/

1/ Mathematical derivations of the NN and LL curves are provided in Calmfors (1979).

It should be noted that certain changes in labor productivity are endogenously determined in the model. Such changes are exogenous when they are due to shifts of the production function--e.g., capital accumulation and technical progress. But labor productivity changes are endogenous when caused by movements along a given labor demand function because of a change in the real wage. For example, a rise in the ratio of the money wage to the price of nontraded goods leads to a reduction in the supply of nontraded goods, because plants with the highest unit labor cost will be forced to cut production, and average labor productivity in this sector will therefore rise.

The locus NN divides the $W_T - W_N$ space into a region of excess supply of nontraded goods (to the left of NN) and an excess demand region (to the right of NN). The locus LL divides the $W_T - W_N$ space into a region of excess supply of labor (to the right of LL) and an excess demand region (to the left of LL). The intersection point of the LL and NN curves is the point of Walrasian equilibrium, W_O, where both the labor and nontraded goods market clear.

To demonstrate how this model works, the effects of an exogenous increase in the money supply are analyzed. The higher money supply will create a stock disequilibrium in the money market and will lead to increased consumption demand. Given the small country assumption (the price of tradable goods is determined as the product of the exchange rate and the foreign price of tradable goods), the increased demand for traded goods does not cause any change in the price of traded goods but simply deteriorates the trade balance. The higher demand for nontraded goods, however, causes the NN curve to shift to the left (Figure 1). To understand why this shift occurs, one may first note that the relative price of nontraded goods increases, with the result that part of the initial excess demand for nontraded goods is shifted into the traded goods market. The increase in the relative price of nontraded goods implies a higher real wage in terms of traded goods; the traded goods sector will therefore shed labor and reduce output under the pressure of increased labor costs. The workers who lost their jobs in the traded goods sector will have to be absorbed in the nontraded goods sector, causing the real wage in terms of nontraded goods to decline.

IV. The Disequilibrium Model

This section introduces the possibility of disequilibrium or nonmarket clearing in the labor and nontraded goods markets. The disequilibrium model, which is also referred to in the literature as a "temporary equililbrium model with rationing," yields a solution commonly referred to as a "fixed-price" equilibrium. Adherents to the disequilibrium approach argue that Walrasian models in which prices quickly adjust to

THE TWO-SECTOR MODEL

FIGURE 1

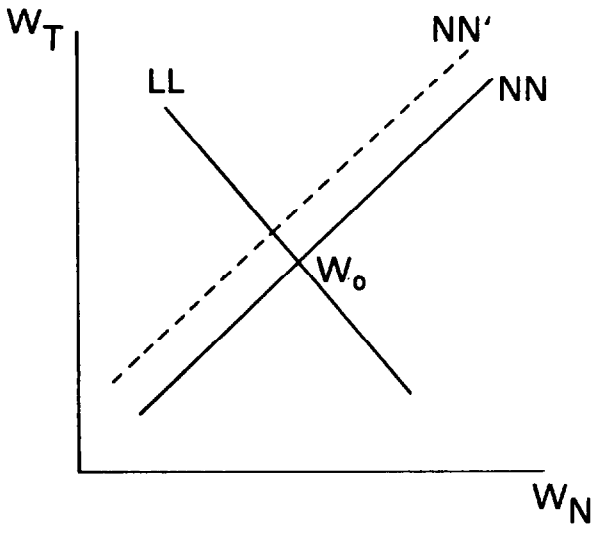
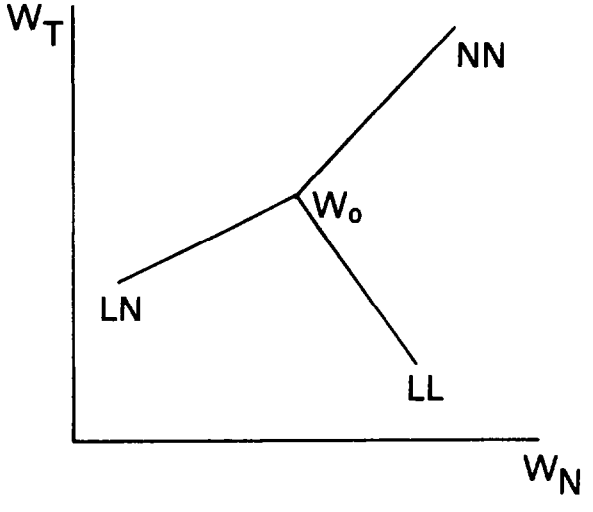


FIGURE 2



excess supplies or demands are inadequate for short-run macroeconomic analysis. This point is particularly relevant in the case of developing economies, where quantitative adjustments tend to be much more important in the short term than are price adjustments. When economic activity is attempted at sticky prices, it is the adjustment of quantities that leads to a short-run or temporary equilibrium. In a market where the price fails to adjust, the "short" side of the market determines the actual amount transacted, and the "long" side is rationed. Transactors who have failed to satisfy their initial demands or supplies in one market recalculate their actions in other markets. This "dual-decision hypothesis" implies a distinction between situations in which realized transactions do appear as arguments in the excess demand functions and those in which they do not. The disequilibrium model presented here uses this hypothesis for studying the balance of payments problems in developing countries.

The dual-decision hypothesis drops the Walrasian assumption that transactions are not made until the short-run market equilibrium price is established. In the Walrasian analysis, wage and price responses are thought of as instantaneous as well as simultaneous; this analytical framework is conveyed more strictly by assuming an "auctioneer" whose task it is to announce "trial values" of money wages and prices, adjusting each before trade commences in response to the excess demands and supplies. But in the dual-decision hypothesis of the disequilibrium model, trading can take place at an incorrect set of wages and prices, because individuals presume that the price they face is the best one then available. When trading begins at an incorrect set of wages and prices, the commitments entered into will prevent the realization of market clearing. In analysing interrelationships among markets when disequilibrium exists, the conventional equilibrium model needs to be revised so that the excess demand function for one good depends on the excess demands in other markets. For example, the individual consumers' demand is a function of prices and realized or effective income--the amount actually received--rather than of notional income or the amount that would be received in an equilibrium situation. Since effective income in a certain market is determined by realized transactions in other markets, the discrepancies between an individual's planned and realized transactions will cause spillover effects from one market to another.

It is convenient at this stage to define the taxonomy of the disequilibrium model that is due to Malinvaud (1977). In classical unemployment (C) situations, there is excess supply in the labor market accompanied by excess demand for nontraded goods because the real wage is too high. In this region, households are on the long side in both markets and the firms' notional or unconstrained demands are realized. Firms do not hire more labor to satisfy the excess demand for goods because it is unprofitable to do so at the given high real wages. Keynesian unemployment (K) is characterized by excess supply in the labor

market as well as in the nontraded goods market. This could occur if consumers find that the labor services they are offering at the going wage do not allow them to demand a level of output that corresponds to equilibrium. At the same time, firms find that even though real wage costs are less than the marginal product of labor, hiring more labor to produce more output would be inappropriate in the absence of a demand for the extra output. In the Keynesian unemployment regime, therefore, demand constraints force firms and households to hire less labor and spend less, respectively, than they would at equilibrium. In repressed inflation (R) situations, wages and prices are below their market-clearing levels. Consequently, there is excess demand for both labor and nontraded goods. There is an excess demand for labor because the real wage is fixed below the Walrasian equilibrium level. Firms want to hire more labor but they face a constraint on the available supply of labor.

In the fourth case, which Muellbauer and Portes (1978) call underconsumption (U), there is excess demand for labor and excess supply of nontraded goods. In the present model, however, this case will not arise if it is assumed that at least some of the labor rationing falls on firms producing nontraded goods. If this assumption is dropped, then it would be possible that nontraded goods firms could not sell all their supply at the going wages and prices but had hired all the labor they wanted; whereas traded-goods firms, which do not encounter sales constraints, would have excess demand for labor. However, there is no reason to assume that rationing of labor would be confined to firms only in the traded-goods sector and this possibility is therefore excluded. When labor rationing takes place in both sectors, the distinction between the Keynesian and underconsumption cases disappears and the LL and NN curves collapse into one curve, LN, separating the repressed inflation region from the Keynesian unemployment region (Figure 2). The slope of the LN curve is likely to be positive and the derivation is provided in the Appendix to this paper. The value of the marginal product of labor is greater than the wage rate in both the repressed inflation and Keynesian unemployment regions. More workers are not hired in the repressed inflation situation because there is no more labor available. But in Keynesian unemployment, more workers are not hired because their output cannot be sold for lack of effective demand.

Figures 1 and 2 show loci of notional or unconstrained equilibria; when effective demands and supplies are considered, the shape of the figures is altered. An agent's effective demand on a given market is that which he expresses on that market, taking account of constraints on his transactions in other markets. If he encounters no such quantity constraints on other markets, then his effective demand will be the same as his notional demand. Excess supply in one market lowers the effective demand in the other market relative to the notional demand there; thus, the region of general excess effective supply (which is

denoted by K) must not only contain that of general excess notional supply but extend beyond it. An analogous argument applies for general excess demand (region R). Hence when effective demands are considered instead of notional demands, regions K and R expand, so region C must contract, as is shown in Figure 3. 1/

V. Trade Deficits, Exchange Rate Policy, and Macroeconomic Adjustment

This section uses the disequilibrium model developed in the previous section in order to study the role of exchange rate policy in correcting a balance of payments problem. The effectiveness of exchange rate policy in correcting a balance of payments disequilibrium depends crucially on what created the disequilibrium in the first place. Accordingly, two examples of balance of payments deficits and the role of exchange rate policy are provided. 2/ The first example is a developing economy where central bank credit is used to finance large government budget deficits, resulting in an excessive growth of the money supply. The second example is a developing economy where export receipts drop, originating from uncontrollable external factors such as recession in the industrial countries.

1. Monetary expansion

In the first example, the higher money supply will lead to increased demand for traded goods, which causes a deterioration in the trade balance. Furthermore, for reasons similar to those described in the previous section, the higher demand for nontraded goods with given wages and prices causes the NN and LN curves to shift upwards. But the LL curve to the right of and below W_0 does not depend on disposable income or private sector wealth and, therefore, will not shift (see Figure 4). The new equilibrium position is given by W_1. But prices and wages do not immediately change and the economy will move towards W_1 only gradually. Thus, if the economy is at point W_0, which initially represents Walrasian equilibrium, after an increase in the money supply the economy will remain on the LL curve with labor demand equal to labor supply but shift off the NN curve into the regions of excess demand for nontraded goods. The excess demand for nontraded goods does not immediately translate itself into labor market disequilibrium. Whether the economy will slide into repressed inflation or classical unemployment, depends on the wage-price dynamics of the system which are represented in equation (13).

1/ This argument was developed by Dixit (1978).

2/ In a very useful paper, Neary (1980) has derived the comparative static multipliers for the various regimes in a similar model.

If the share of traded goods in the consumption basket is small, it is the price of nontraded goods that is important in the dynamics of wage increases. 1/ When the money supply is increased and the equilibrium position shifts from W_0 to W_1, the new equilibrium has lower real wages in terms of nontraded goods and a higher relative price of nontraded goods to traded goods. This is because the price of traded goods is fixed by the small country assumption, while the price of nontraded goods is assumed to move gradually upwards in response to the excess demand in the nontraded goods market. The higher relative price of nontraded goods implies a higher real wage in terms of traded goods and a lower real wage in terms of nontraded goods. Thus, the traded goods sector will decline under the pressure of increased labor costs. But since the expenditure share in traded goods is relatively small, the decline in W_N will not be large enough to fully absorb the labor released by the traded goods sector. Therefore, when the money supply is increased and the equilibrium position shifts from W_0 to W_1, the economy is going to move into the classical unemployment region (excess supply in the labor market accompanied by excess demand for nontraded goods).

In this situation a currency depreciation will cause an improvement in the balance of trade. 2/ In region C all firms are unconstrained in their sales and the level of employment is determined by their notional demand for labor. In particular, since the nontraded goods firms are unconstrained on the goods market, their labor demand is the neoclassical demand $L_{D,N}(W_N)$ given in equation (7). This region has unambiguously classical properties and a fall in the real wage rate will promote employment. Depreciation will raise the domestic currency price of traded goods and make it profitable for traded goods firms to hire labor, thereby helping the economy in its movement towards full employment. As for external balance in region C, the balance of trade equals the difference between the notional supply of traded goods and the effective household demand for traded goods, who are constrained in both the labor market and the nontraded goods market. In order to distinguish effective demands and supplies from the corresponding notional demands and supplies, a bar above the relevant variables is placed, indicating the constraint level. When the agent encounters constraints in both the labor market and the nontraded goods market, then a double tilde is placed above the function; when only one constraint is operative, then a single tilde is placed above the function. Thus, the balance of trade in the classical unemployment

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1/ Many developing countries have high prohibitive tariff barriers on imported consumer goods.

2/ However, the introduction of intermediate imports and credit rationing into the model will reduce the effectiveness of devaluation even in this situation, and this is discussed in the following section.

THE ADJUSTMENT PROCESS IN
THE DISEQUILIBRIUM MODEL

FIGURE 3

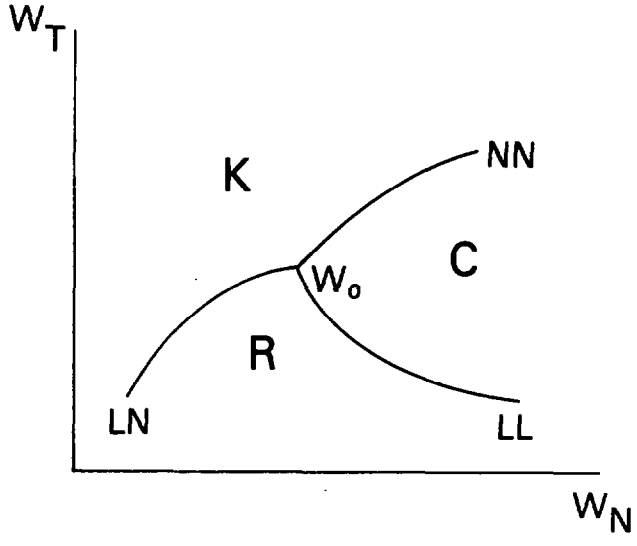
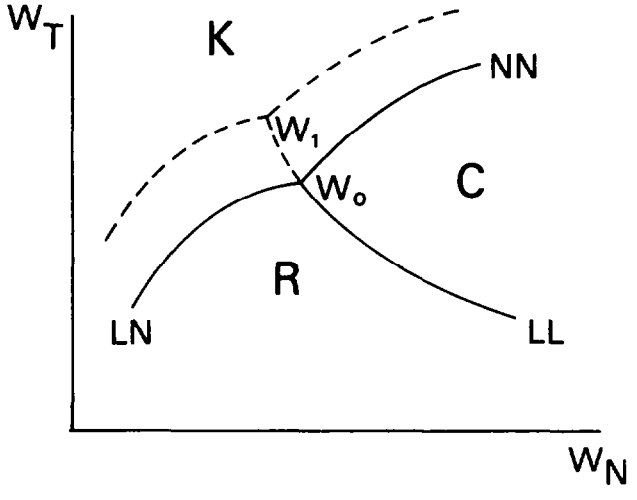


FIGURE 4



region is obtained by rearranging equation (8a) and denoting the constraint levels:

$$X = Q_T - \underset{\approx}{C_T}\{\bar{L}(.), \bar{C}_N, P_T, P_N, W, A\} - G_T - I_T \qquad (14)$$

The second term on the right hand side denotes the effective demand for traded goods; $\bar{L}$ and $\bar{C}_N$ represent the constraint levels faced by the households in the labor market and the nontraded goods market, respectively.

The effect of a devaluation can be obtained by differentiating equation (14) with respect to the price of traded goods. In differentiating the equation for the trade balance, the effects via the variations in the rationing constraints on the different parts of the goods and labor market are taken into consideration.

$$\frac{\partial X}{\partial P_T} = \frac{\partial Q_T}{\partial P_T} - \frac{\partial \underset{\approx}{C_T}}{\partial P_T} - \frac{\partial \underset{\approx}{C_T}}{\partial \bar{L}} \cdot \frac{\partial \bar{L}}{\partial P_T} \qquad (15)$$

It has been assumed that government demand and investment demand for traded goods are exogenously given. Equation (15) shows that devaluation has both a price effect, tending to improve the balance of trade by increasing the supply of and reducing the demand for traded goods, and an income or absorption effect tending to deteriorate the balance of trade. The first term in equation (15) is the increase in the domestic supply of traded goods due to the increase in the domestic currency price of traded goods following the devaluation, while the second term is the reduction in consumption demand due to the price increase. The third term represents the increase in the demand for traded goods due to the increase in income caused by the increased employment. In region C the labor market constraint facing households is the unconstrained demand for labor by the two sectors. Since the firms perceive no quantitative constraints on the goods markets, their demand for labor has the neoclassical form:

$$\bar{L} = L_{D,T}(W_T) + L_{D,N}(W_N) < L_S \qquad (16)$$

In this region, the increase in employment will occur only in the traded goods sector ($\frac{\partial \bar{L}}{\partial P_T} = \frac{\partial L_{D,T}}{\partial P_T}$) because the nontraded goods firms are on their notional demand schedule for labor. Traded goods firms hire more labor because real wages decline in that sector. This implies that the third term in equation (15) is the marginal propensity to consume traded goods times the increase in employment (or income) in the traded goods sector. Assuming that the marginal propensity to consume traded goods is less than unity, the third term is smaller than the first term. This is to say that the income effect is smaller than the price effect and there will be an improvement in the trade balance.

2. Fall in export receipts

The second example of the use of exchange rate policy is the case of a developing economy in which export earnings decline because of uncontrollable external factors such as recession in the industrial countries. Two points should be made here. First, the fall in export earnings is caused by a decrease in the world price of traded goods. The small country assumption that has been employed in the analysis contained in this paper precludes the possibility of the developing country facing constraints on the volume of its exports. The domestic price of traded goods is determined as the product of the world price of traded goods and the exchange rate, and the producers of the traded goods are able to sell any quantity of output they desire at the prevailing world price. Second, the decrease in the price of traded goods will lower the aggregate price index and, therefore, increase the real value of money balances in the economy. As is emphasized in the monetary approach, this has a positive effect on real absorption and on the real demand for nontraded goods. But the substitution effect of the decrease in the price of traded goods will operate in the opposite direction. When the price of traded goods decreases, there is substitution in the domestic demand away from nontraded to traded goods. Furthermore, there will be a relative price effect which will reduce the supply of traded goods. The decline in the traded goods sector reduces income, which lowers demand in the nontraded goods sector. In the analysis which follows, it is assumed that the substitution effect is large enough to offset the positive absorption effect. This facilitates the analysis without affecting the results in a substantial way.

The decline in the traded goods sector following a reduction in foreign demand reduces income, which lowers demand in the nontraded goods sector as well. Since nontraded goods prices and wages do not change immediately, potential output in the nontraded goods industry does not

change. Inspection of the expressions for the equilibrium loci shows that this results in excess supply in both the labor and output markets and the economy shifts into region K. In region K, employment is demand-constrained; but the demand for labor on the part of nontraded good firms depends on the sales constraint that they face, and this sales constraint in turn depends on the employment constraint facing households. In this situation when the economy is in region K, it is not clear that currency depreciation will have a favorable effect on the balance of trade.

Since in region K the traded goods firms are unconstrained in both markets, and households are constrained in the labor market and nontraded goods firms are constrained in the goods market, the equation for the balance of trade is

$$X = Q_T - \tilde{C}_T \{\bar{L}(.), P_T, P_N, W, A\} - G_T - I_T \qquad (17)$$

To obtain the effect of currency depreciation on the balance of trade, equation (17) is differentiated with respect to the price of traded goods.

$$\frac{\partial X}{\partial P_T} = \frac{\partial Q_T}{\partial P_T} - \frac{\partial \tilde{C}_T}{\partial P_T} - \frac{\partial \tilde{C}_T}{\partial \bar{L}} \cdot \frac{\partial \bar{L}}{\partial P_T} \qquad (18)$$

The first two terms are positive and lead to an improvement in the balance of trade, reflecting the price effects of the depreciation in increasing the supply of and reducing the domestic demand for tradables. The supply of tradables increases because depreciation lowers the real wage in terms of traded goods and increases profitability in that sector. The domestic demand for traded goods declines because there is substitution of non-traded goods for traded goods. The third term, however, may reverse the positive effect. It represents an additional effect of depreciation that could lead it to worsen the trade balance in the Keynesian unemployment region. This additional effect is the increased demand for traded goods due to the higher employment and income in both tradables and nontradables. In region K, the labor market constraint facing households is the unconstrained demand for labor by the traded goods sector but the constrained demand for labor by the nontraded goods sector. Producers of

nontraded goods face a sales constraint $\bar{Q}_N$ on their output because domestic demand is less than the unconstrained profit maximum supply of nontraded goods. Thus, the effective demand for labor is found by inserting the short-run production function and evaluating it at the point where output equals the sales constraints.

$$\bar{L} = L_{D,T}(W_T) + Q_N^{-1}[\tilde{C}_N + G_N + I_N] < L_s \qquad (19)$$

By increasing the demand for nontradables, depreciation relaxes the goods market constraint facing nontraded sector firms. This means that the expansion in employment and income following the depreciation will occur in both sectors. The change in demand for labor resulting from a depreciation is represented by

$$\frac{\partial \bar{L}}{\partial P_T} = \frac{\partial Q_N^{-1}}{\partial C_N} \cdot \frac{\partial C_N}{\partial P_T} + \frac{\partial L_T}{\partial P_T} \qquad (20)$$

The first term represents the employees of nontraded goods firms for which the demand for goods was less than the unconstrained profit maximum level. Since these firms are now able to sell more goods, they will demand the corresponding number of labor. The second term is the expansion in employment in the traded goods sector because of the lower real wages. Unlike the previous example, however, there is no presumption that the third term in equation (18) will be smaller than the first two terms. Indeed, the resulting expansion in employment and income could lead to a sufficiently large increase in spending on traded goods to offset the first two terms and thereby worsen the balance of trade.

The two examples presented here have shown that external disequilibrium is only one facet of the total economic situation and it is intimately linked with domestic aggregate employment and sectoral disequilibrium. They illustrate that careful distinction between alternative economic environments permits a better evaluation of the appropriateness of a given policy. Hence, analysis of the balance of payments must be integrated into a broader macroeconomic framework for the economy.

VI. Extensions: Imported Intermediate Inputs and Credit Rationing

Before completing this discussion of the disequilibrium model, it is important to note that imported intermediate goods and credit rationing are important characteristics of the developing countries and they must be taken into account when building a theory of short-term equilibrium and balance of payments adjustment. In many developing countries, imports are necessary to avoid under-utilization of existing resources because machinery, intermediate goods and spare parts are a major component of the import bill. The import requirement includes maintenance imports necessary to keep existing capacity fully utilized, as well as imports of capital goods for the expansion of industries. Furthermore, many developing countries have been attracted to a development strategy that results in the accumulation of financial assets at a slower pace than the accumulation of nonfinancial wealth or total output. By imposing controls or ceilings on interest rates, excess demand for savings is created, which must be resolved by rationing. The system of financial intermediation is relatively underdeveloped, with the public holding few primary securities, and commercial bank short-term credit is rationed with official interest rate ceilings. Sometimes an informal curb market exists as a marginal and very high-cost source of short-term finance to firms. In an economy with these characteristics, currency depreciation will have two important adverse effects on the supply side. First, by raising the price of key intermediate imports in the production process, and second, by raising prices that cause a liquidity squeeze in the bank-oriented capital market, currency depreciation will force some factories to cut back on production. The balance of payments position will improve if aggregate demand for goods and services is reduced relative to aggregate supply. However, the reduction of aggregate demand via currency depreciation may impinge on the aggregate supply of goods and services because of imported intermediate goods and credit rationing.

In order to incorporate these considerations into the model developed earlier, an imported intermediate input, IN, is introduced into the production of the nontraded goods, and its price is denoted by P_{IN}. It is assumed, as is usually done, that an increase of one input in the production process will increase the marginal product of the other. The increase in P_{IN} following a devaluation will lead to a reduction in the use of intermediate imports. Using a smaller quantity of intermediate imports, however, adversely affects the value of the marginal product of labor. Real wages must go down in order to maintain equilibrium in the labor market or the LL curve shifts to the left. When real wages are sticky downwards, there will be a reduction in employment. Whether the unemployment is Keynesian or classical depends on the nontraded goods market.

The increase in the price of intermediate imports not only reduces the supply of nontraded goods but also income, and so the demand for nontraded goods. If the supply effect dominates, then the LN and NN curves shift to the left and the initial Walrasian equilibrium point will be in the C region. On the other hand if the demand effect is sufficiently strong (investment demand also falls in response to lower profitability), then the curves will shift to the right and the economy will be in the K region.

If credit rationing in the economy is superimposed on this situation, it magnifies the existing adjustment problem. When the purchase of variable inputs takes place some time prior to product sales, then the costs of finance have to be taken into account. The idea is that firms need working capital because they pay their factors of production before they receive revenues from sales. Furthermore, firms wishing to borrow must borrow from banks or the "curb" market because the commercial paper market is in an early stage of development. Suppose that firms can obtain only a limited amount of credit from the official financial market at a rate of interest (government imposed ceiling) that does not clear the market. For financing the difference the firms have to go to a "curb" market that is risky and highly segmented, so that the rate of interest facing firms will be increasing with the amount of borrowing. In this situation, currency depreciation increases intermediate import costs, resulting in an increase in domestic finance. Since more firms will now be forced to go to the curb market for the financing of their working capital, marginal borrowing rates will be driven up. This increase in the cost of finance will magnify the contractionary effects that the increase in the price of imported intermediate goods had on the supply side of the economy. This means that when the economy is in the C or K regions, the contractionary effects of currency depreciation on the supply side will make the goal of internal equilibrium (full employment) more difficult to attain.

While the author has chosen to focus on the complications arising from introducing intermediate imports and credit rationing within the disequilibrium model, it should be clear that the analysis can be extended fruitfully in other directions as well. The analysis presented here has been a short-run one. Any extension of the analysis within a longer-run frame of reference must pay particular attention to the relationship between stocks and flows in the system, including, in particular, the effects of asset assumulation. In such a framework, surpluses or deficits in the balance of trade change the money balances held by the consumers, with implications for the dynamic adjustment of the economy in the labor and goods markets and also for the impact of a currency depreciation on the trade balance. Similarly, a government deficit must be financed, with resulting changes in the stock of government debt held by the private sector. As these examples make clear, the dynamics of the adjustment path followed by the economy when it moves to the long-run equilibrium

position can be quite complicated and the long-term adjustment mechanism depends on many factors. The latter include, inter alia, institutional features, such as the speed with which wage and price contracts are changed; the behavior of economic agents and in particular the way they form their expectations; the policy reactions of monetary and fiscal authorities and especially the role of sterilization policies. These long-run considerations and financial relationships were given only a sketchy treatment in this paper, and future research will have to integrate the role of the financial sector into the model in greater detail. The integration of the financial sector into a similar model of temporary equilibrium with rationing would provide a very useful framework for the discussion of the effects of exchange rate changes in the developing countries.

VII. Conclusions

The disequilibrium model developed in this paper yields useful insights into the characteristics of short-run situations and the potential for exchange rate policy in developing countries. Once it is realized that prices do not always equilibrate demand and supply continuously and that part of the economy's adjustment to an exogenous shock will be in quantities, it becomes important to know how market imbalances are likely to condition the economy's adjustment to policy intervention. The disequilibrium model takes into account the effect that rationing of consumers or producers in particular markets has on their demands or supplies in other markets. Since it was assumed in the model that agents are not myopic about the existence of rationing and take account of it when formulating their demands and supplies, the interactions between the different markets included variations in price as well as variations in the rationing constraints.

Disequilibrium analysis shows that the short-run effects of currency depreciation depend critically on whether the labor and output markets are in equilibrium. The explicit manner in which the assumptions about the state of the markets are expressed is an important advantage of the disequilibrium model. In contrast to the implication of the elasticities approach that a currency depreciation improves the trade balance for a small open economy, the analysis shows that in some disequilibrium states the effect of a depreciation on the trade balance can be ambiguous. Furthermore, by including credit rationing and imported intermediate goods in the model, it was shown that the contractionary effects of devaluation on the supply side of the economy have important implications for macroeconomic equilibrium and full employment. Hence, the analysis of the balance of payments must be integrated into a broader macroeconomic analysis of the economy, and a currency depreciation is then most usefully seen not as an isolated action but as part of a policy package.

A basic message of the temporary equilibrium models with rationing is that it is important for policymakers to accurately diagnose the state of excess supply or demand in labor and output markets if appropriate policies are to be recommended. This paper has demonstrated that under the regimes of classical and Keynesian unemployment, the economy responds in quite different ways to currency depreciation. However, if information regarding economic disturbances can be obtained in advance of information about market disequilibrium, then it would be helpful to derive results linking the states of market disequilibrium to various types of disturbances. This would require information on the key parameters characterizing the short-run functioning of the economy. In this respect, the analysis of temporary equilibrium models with rationing could provide some clues as to which are the important parameters in the econometric model under the different rationing regimes.

APPENDIX

Slope of the LN Curve

The LN curve is the locus of W_N and W_T values compatible with both labor market equilibrium under excess supply of nontraded goods and nontraded goods market equilibrium under excess demand for labor. The slope of the LN curve depends on the particular rationing scheme used for allocating labor. If it is assumed that rationing of labor falls only on the firms producing nontraded goods, then the slope of the LN curve will be positive. Since, there is an excess supply of nontraded goods in this region, firms must produce less than their notional supply of nontraded goods, and their effective demand for labor is given by the inverse of their supply function for nontraded goods.

$$L_{D,N} = Q_N^{-1}(C_N + G_N + I_N) \qquad (A.1)$$

But given the assumptions that traded goods firms are not rationed in either the labor market or the goods market, their labor demand is equal to their notional demand for labor, which implies that the labor market equilibrium condition will be of the following form.

$$L_S = Q_N^{-1}(C_N + G_N + I_N) + L_{D,T}(W_T) \qquad (A.2)$$

The condition for equilibrium in the nontraded goods market is also straightforward.

$$C_N + G_N + I_N = Q_N(L_S - L_{D,T}(W_T)) \qquad (A.3)$$

But under excess demand for labor, the firms producing nontraded goods will be able to hire only the labor that is left over after the traded goods firms have hired their notional labor demand or $L_s - L_T(W_T)$. Hence equation (A.3) also describes the nontraded goods market equilibrium under excess demand for labor, and the two loci collapse to give the LN curve.

The positive slope of the LN curve can be shown by substituting for C_N in equation (A.3):

$$C_N[\underset{W_N}{W_T},Q_T(W_T) + \underset{W_N}{W_T} Q_N(L_s-L_{D,T}(W_T)) - T,A] + G_N + I_N - Q_N(L_s-L_{D,T}(W_T)) = 0 \quad (A.4)$$

and differentiating, we have 1/

$$M_1 dW_T + M_2 dW_N - C_N^2 dT + C_N^3 dA + dG_N + dI_N = 0 \quad (A.5)$$

where

$$M_1 = \underset{(+)}{\frac{C_N^1}{W_N}} + \underset{(+)(-)}{C_N^2 Q_T^1} + \overbrace{(1 - \underset{(+)(-)}{C_N^2 \frac{W_T}{W_N}})}^{(+)} \underset{(+)}{Q_N^1 L_{D,N}^1} + \underset{(+)(+)}{C_N^2 \frac{Q_N}{W_N}}$$

$$M_2 = - \underset{(+)}{\frac{C_N^1 W_T}{(W_N)^2}} - \underset{(+)}{\frac{C_N^2 W_T Q_N}{(W_N)^2}}$$

C_N^1/W and $-C_N^1 W_T/(W_N)^2$ measure the "relative-price" effects on demand for nontraded goods, $C_N^2 Q_T^1$ measures the "income" effect on demand for nontraded

1/ Superscript numerals are used to indicate partial derivatives with respect to the various arguments in the functions.

goods of a change in the output of traded goods, $(1 - \frac{C_N^2 W_T}{W_N}) Q_N^1 L_{D,N}^1$ measures the "income" effect on excess supply of nontraded goods of a change in the output of nontraded goods, and $C_N^2 Q_N / W_N$ and $-C_N^2 W_T Q_N / (W_N)^2$ give the "income" effects on demand for nontraded goods of a change in the relative price. Assuming that these latter income effects are small in relation to the other effects, then we have $M_1 < 0$ and $M_2 > 0$. This implies

$$\left.\frac{dW_T}{dW_N}\right|_{LN} = \frac{-M_2}{M_1} \qquad (A.6)$$

which means that the LN curve will have a positive slope.

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