Tariff Policy and Quantity Expectations in an Economy with Classical Unemployment*

Chen-Min Hsu**

Abstract

An intertemporal two-sector, fix-price model for an open economy by taking account of future quantity expectations on either goods or labor markets is developed. Exportables prices are set by firms, while importables prices are given in the world markets. It is shown that the "classical unemployment" might come out under different exchange rate regimes as long as the importables firms pessimistically expect that sales constraints will be binding. Moreover, given that the economy is under the classical unemployment, a reduction in the tariff rate combined with a reduction in the government transfer payments might raise national income and make the trade balance deteriorate less sharply in the flexible exchange rate regime under some conditions. The policy implication is that to pursue the trade liberalization policy an economy might also need to consider to allow the exchange rate to adjust flexibly.

I. Introduction

It is due to highly accumulated foreign exchange reserves on the one hand, and due to internationally political pressure on the other that Taiwan intends to enforce a trade liberalization policy. It is hoped that foreign reserves would accumulate slowly and the political pressure could be relieved. To achieve this end, it is proposed that some kinds of commercial policies should be imposed. For example, tariffs on imports should be reduced and other import restrictions should be removed.

* This paper was financed by the National Science Council of ROC. Comments by the participants in the seminars in Chung-Hua Institution for Economic Research, National Taiwan University, and National Chengchi University are greatly helpful.

** Department of Economics, National Taiwan University, Taiwan
R. O. C.

On the other hand, in the literature on the effect of tariff policy in small, fix-price, open economies, it is shown that the imposition of a tariff raises aggregate output and employment in a fixed exchange rate economy suffering from unemployment, while it unambiguously causes a deterioration in the level of employment under a flexible exchange rate regime (see, for example, Chan (1978), Eichengreen (1981), Johansson and Lofgren (1980, 1981), and Cuddington, Johansson and Lofgren (1984, Ch.7)). However, most of these models lack of an explicitly intertemporal framework. In different contexts, Persson (1982), Persson and Svensson (1983), Cuddington and Vinals (1986a, 1986b), and van Wijnbergen (1987) discussed non-Walrasian system, within the intertemporal framework. In particular, Persson and Svensson (1983) extended the Neary and Stiglitz (1983) analysis of expectations of future quantity constraints to an open economy with Keynesian unemployment.¹

The purposes of this paper are two folds. Firstly, we want to construct an intertemporal two-sector, fix-price model for an open economy by taking account of quantity constraints on either goods or labor markets in the future. It is assumed that the open economy is small in importables production but large in exportables production so that the world price of importables and the domestic price of exportables are fixed. This is likely if the domestic exportable good is a differentiated product in the world market or if the country is a large supplier relative to the size of the world market. Thus, under this assumption, we will set up a model in which the exportables firms are price setters, while the importables firms are price takers. It is shown that whenever the firms in the importables sector pessimistically expect that future sales constraints will be binding, since the policy of trade liberalization will be enforced, the classical unemployment emerges under both exchange rate regimes.

Secondly, we want to explore the effect of a reduction in the tariff rate on national income and the balance of trade under perfect capital mobility. It is shown that under a fixed exchange rate regime national income falls, while the tariff's effect on trade balance is indeterminate. However, under a flexible exchange rate regime, national income increases while the balance of trade deteriorate less sharply under some conditions, comparing with those under fixed exchange rates. The policy implication of this analysis is that whenever the government intends to pursue the aim of trade liberalization by reducing the tariff rate, it may also need to intervene less in the exchange market. Thus, a small open economy may want to allow the exchange rate to adjust flexibly, while

1. Van Der Ploeg (1987) gave excellent survey of rationing in open economies. His survey ended up with a discussion of rationing in dynamic, closed economies, however.

enforcing a trade liberalization policy.

The remainder of the paper is organized as follows. Section two establishes the basic structure of the model. The behavior of each agent is studied. Section three describes the market-equilibrium and the market-disequilibrium situations under different exchange rate regimes. Section four examines the effects of a tariff reduction and a transfer payment decrease on national income and the balance of trade. Section five gives some concluding remarks.

II. The Model

We consider a macroeconomic model for an open economy with five commodities; money, non-monetary asset, labor, importable and exportable goods. There are four types of agents; households, an exportables sector, an importables sector, and the government.

1. The Households

Households make their decisions of consumption and saving at the beginning of each period. They receive wages and profits from firms, and receive transfer and interest payments from the government. They also receive advertisements about commodity prices and sellers' locations of exportables at the beginning of each period. It is assumed that advertisements are allocated randomly among households, with each household having an equal chance to receive each message. And the assignment of each message is independent of all others, including those sent out by the same seller, so that it is possible that some households may receive two or more advertisements from the same seller while some others may not receive any message from the same seller. We also assume that households receiving advertisements are free of being charged and that they have no other means of receiving information about sellers. They cannot search for sellers or obtain information from other households. However, we assume that each household receives at least one advertisement at the beginning of each period so that it can decide how much to buy.

Since households make intertemporal decisions, they do not know which prices will be offered to them in the following periods. However, we assume that each household knows a priori the distribution of prices charged in the market. And it is possible that the store which the particular household visited during this period may charge different prices in the following periods. In other words, we will not consider the advertisement lingering effect.

Moreover, we assume that the domestic price of importables are known to households and money wages are set by a trade union. For simplicity, we also assume that households' labor supply is inelastic.

The model has three periods. This makes the overall problem simple to be analyzed. It should be noted, however, that the third period is not the end of life. Generality to $T > 3$ periods is straightforward but messy. And there are m households with identical preference. Suppose that households expect that one of two cases might prevail for each future period, i.e., in period t there is a probability $1-\mu$ that households will find themselves unable to realize their desired supply of labor. Let $L_t = \bar{L}_t$ if each household is rationed in the labor market during the period t .

We assume that real money balances and real non-monetary financial assets (i.e., bonds) yield utility directly (see Hool (1980) and Casson (1981), Sargent (1987, ch. 4). Thus, both money and bond yield utility directly. We further assume that the country is a small open economy in a world of perfect mobility for the internationally traded, nonmonetary financial asset and that expectations about the changes of the exchange rate are static. Thus, the interest rate is exogenously fixed at the world level. Moreover, to simplify the mathematical manipulation and to allow tractable analysis of the problem in hand, we assume that households' financial and real decisions are made independently. Following Barro and Grossman (1976, ch.3), households make real and financial decisions recursively. That is, after making the consumption and saving decisions, households adjust the composition of their end-of-period wealth between money and internationally trading bonds. However, we will not analyze in detail how households make their financial decisions. Instead, we emphasize the consumption-saving decision problem, and only sketch the portfolio balance roughly.²

The representative household chooses C_1 , D_2 , $\{C_{at}\}_{t=2}^3$, $\{C_{bt}\}_{t=2}^3$, $\{D_{at}\}_{t=2}^3$, and $\{D_{bt}\}_{t=2}^3$ by solving the problem:³

$$\text{Maximize } E \sum_{t=1}^3 [C_t + D_t + A_t/q_{t+1} - aC_t^2 - b(A_t/q_{t+1})^2 - dD_t^2], \quad (1)$$

subject to

2. In fact, to derive asset demands from the explicit utility maximizing behavior is beyond the scope of this paper. For a detailed discussion of portfolio balance in open economies, see Branson and Henderson (1985).
3. We assume that the subjective discount factor is one. The results will not be altered if we explicitly introduce the discount rate into the model.

$$A_1 = A_0 + \pi_1 + W_1 L_1 - P_1 C_1 - R_1 D_1 + \xi_1 \quad (2)$$

and the sequential constraints that for all $t > 1$

$$\begin{array}{ll}
 C_t = C_{at} & \\
 D_t = D_{at} & \\
 \text{labor supply is not rationed} & \\
 A_t = A_{at} = A_{t-1} + \pi_t + W_t L_t - P_t C_{at} - R_t D_{at} + \xi_t & \\
 C_t = C_{bt} & \\
 D_t = D_{bt} & \\
 L_t = \bar{L}_t & \\
 A_t = A_{bt} = A_{t-1} + \pi_t + W_t L_t - P_t C_{bt} - R_t D_{bt} + \xi_t & \\
 C_t \geq 0, L_t \geq 0, A_t \geq 0 \text{ for all } t, \text{ and } A_0 \geq 0 \text{ is also given,} &
 \end{array}
 \begin{array}{l}
 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{with prob. } \mu, \\
 \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{with prob. } 1 - \mu,
 \end{array}$$

where

C = real exportables consumption,

D = real importables consumption,

A = nominal wealth = $M + B^*$,

M = nominal money balances,

B^* = total nominal bonds,

q = general price level,

π = nominal profit,

W = money wage rate,

L = labor supply,

P = money price of exportables,

R = domestic price of importables,

ξ = government lump-sum transfer and interest payment,

and C_{at} , D_{at} and A_{at} are respectively the consumption purchases and the end-of-period nominal asset held by the household when the household is not rationed in the labor market in period t , while C_{bt} , D_{bt} and A_{bt} are the corresponding variables when the individual is rationed in the labor market in period t . It should be noted that the

utility of real nominal wealth at the end of period three has been included in (1) by allowing the utility-of-bequest to have the same functional form as the utility of holding wealth. And it is the general price level in the next period serves as a deflator in the utility function, since it is the purchasing power of wealth in the next period that is really of concern to the household.

Uncertainty comes from those variables intrinsic to the economy, i.e., the general price level q and other future variables, and others extrinsic to the economy. The latter is due to some psychological factors like panics, animal spirits, expert opinions, etc. (see Azariadis (1981) and Cass and Shell (1983)). Thus, the uncertainty that people expect to be rationed in the labor market is extrinsic. We will assume that households know the distributions of random variables. Each of the random variables is distributed identically and independently.

The problem is a stochastic dynamic programming one. The detailed solution process to the household's problem is available on request.⁴ The currently household's demand functions for exportables and importables are respectively⁵

$$C_1 = C(P_1 \bar{Z}_1, R_1 \bar{Z}_1, (A_0 + \pi_1 + W_1 L_1) \bar{Z}_1, \xi_1 \bar{Z}_2, \mu) \quad (3)$$

$$D_1 = D(P_1 \bar{Z}_1, R_1 \bar{Z}_1, (A_0 + \pi_1 + W_1 L_1) \bar{Z}_1, \xi_1 \bar{Z}_2, \mu), \quad (4)$$

where $\bar{Z}_t$ is $E(1/q_t)$. It can be shown that the effects of real wealth, real wage income and real transfer and interest payments on C_1 and D_1 are unambiguously positive. Besides, if we assume that the marginal indirect utility of wealth decreases with probability μ , we can show that the consumption demand for importables and exportables are increasing functions of μ as long as the difference between the relative price R_1/P_1 and the marginal rate of substitution between exportables and importables, which is due to the change of μ , is small. It should be noted that the assumption that the marginal indirect utility of wealth decreases with μ is reasonable, since one household that expects the future employment constraint to be less binding finds that increases in wealth will give rise to less utility.⁶

As usual the price effects are indeterminate. However, if both goods are normal and gross substitutes, then the price effects are negative. In the following analysis we

4. Detailed solution process can also be found in Hsu(1986).

5. In fact, these two functions are linear. However, we write them in implicit forms.

6. Also see Hsu (1986) for rigorous proof.

will assume that both price effects are negative.

By aggregating over m households, we can get each aggregate demand function. Without causing any confusion, the aggregate demand functions of exportables and importables are expressed by (3) and (4).

2. The Exportables Sector

As in the last section, the model is a three-period one. There are n monopolistically competitive firms with identical technology to produce a homogeneous, storable commodity. At the beginning of each period, each firm sets its commodity price and sends out its price catalogues in addition to making its employment decision. The representative firm makes these decisions by perceiving a demand curve of its commodity. It does not know the true structure of its commodity demand schedule as stated in (3) in the last section. Instead, the firm constructs a subjective demand one. The subjective demand schedule is composed of two components. One is the perceived demand which is the maximum quantity of the commodity that the firm believes it can sell, the other is the unexpected demand or the demand disturbance. The firm's perceived demand is defined as a function of commodity price and the information available to the firm at the beginning of the current period (see Benassy (1976), (1977) and (1982, ch. 5)). Formally, the perceived demand is written as

$$E(C_t) = \delta_1 R_t \bar{Z}_t - \delta_2 P_t \bar{Z}_t + \delta_3 (A_{t-1} + W_t L_t) \bar{Z}_t + \delta_4 \xi_t \bar{Z}_{t+1} \quad (5)$$

$$= -\delta_2 P_t \bar{Z}_t + \delta a_t, \quad (6)$$

where $\delta = (\delta_1, \delta_3, \delta_4)$, $a_t = (R_t \bar{Z}_t, A_{t-1} \bar{Z}_t + W_t L_t \bar{Z}_t, \xi_t \bar{Z}_{t+1})$ and $\delta_1 > 0$.

Note that in each period the firm has the information of the aggregate money stock and government bonds.⁷ The subjective demand schedule is

$$C_t = E(C_t) + \Theta_t. \quad (7)$$

It is assumed that the demand disturbance Θ_t is distributed over the interval $[\Theta_t, \Theta_t]$ with $E(\Theta_t) = 0$.

7. It is assumed that firms distribute profits instantaneously to households during each period. Therefore, they do not hold money at the end of each period.

Following Benassy (1982, ch.4), we will assume that the representative firm has a simple linear production function, i.e.,

$$y_t^X = \tau l_t^X \quad (8)$$

where τ is a technical coefficient and l_t^X is employment. The firm holds inventories at the end of period t such that

$$h_t = h_{t-1} + y_t^X - C_t, \quad (9)$$

which describes the law of motion of the end-of-period inventories. Following Blinder (1982), we will ignore the stock-outs of inventories. This simplifies the problem to be analyzed.⁸

Holding inventories is costly (this may be due to the storage costs and limited warehouse space). It is assumed that the inventory holding-cost function is U-shaped, i.e., the inventory cost function is $(v_1 h_t + v_2 h_t^2)$ with $v_2 > 0$. Note that it is the end-of-period inventories that are included in the inventory cost function, since inventory costs occur to commodities once they are produced and before they are sold.

The value of inventories at the end of period three is assumed to be quadratic and concave, i.e.,

$$X(h_3) = x_1 h_3 - x_2 h_3^2, \text{ where} \quad (10)$$

$$x_1 > 0, \quad x_2 > 0 \text{ and } X' > 0.$$

It is assumed that there exists a probability λ such that firms expects to realize their desired supply of commodities, and they expect that sales constraints may occur with probability $1 - \lambda$.

The representative firm chooses $\{l_t^X\}_{t=1}^3$ and $\{P_t\}_{t=1}^3$ by solving⁹:

$$\text{Maximize } E \left\{ \frac{1}{q_t} \left[\sum_{t=1}^3 (P_t C_t - W_t l_t^X) \right] - v_1 h_t - v_2 h_t^2 + X(h_3) \right\}, \quad (11)$$

8. Amihud and Mendelson (1983) and Benassy (1982, Appendix C) introduce the "min" or switching rule in the firm's objective function. However, they generally do not get closed forms of the decision variables.

9. For simplicity, we also assume the discount rate is assigned to be one.

subject to

$$h_1 = h_0 + y_1^x - C_1, \quad (12)$$

$$y_1^x = \tau l_1^x \quad (13)$$

$$C_1 = -\delta_1 P_1 Z_1 + \delta a_1 + \Theta_1 \quad (14)$$

and the sequential constraints, for all $t > 1$,

$$\left. \begin{array}{l} h_t = h_{t-1} + y_t^x - C_t \\ y_t^x = \tau l_t^x \\ C_t = -\delta_2 P_t Z_t + \delta a_t + \Theta_t \end{array} \right\} \quad \text{with probability } \lambda,$$

$$\left. \begin{array}{l} h_t = h_{t-1} + y_t^x - \bar{S}_t \\ y_t^x = \tau l_t^x \\ S_t < E(C_t) + \underline{\Theta}_t \end{array} \right\} \quad \text{with probability } 1 - \lambda$$

where $\bar{S}_t$ is the effective demand for the firm's output.

We ignore the advertisement costs for simplicity. This will not change results if these costs are included.

Uncertainty comes from those variables intrinsic to the economy, i.e., $\{q_t\}_{t=1}^3$, $\{\Theta_t\}_{t=1}^3$ and other future variables intrinsic to the economy, and those extrinsic to the economy. The uncertainty that firms expect to be rationed in the commodity market is extrinsic.

Again, the firm's problem is also a stochastic control problem. We also assume that firms in this exportables sector know the distributions of the random variables and that the random variables are distributed identically and independently. The detailed solution process to the firm's problem is also available on request. By using dynamic programming, we can obtain the price and the labor demand function respectively¹⁰

$$P_1 = P(A_0 \bar{Z}_1, \xi_1 \bar{Z}_2, R_1 \bar{Z}_1, W_1 \bar{Z}_1, v_1, \lambda, \Theta_1^x) \quad (15)$$

$$l_1^x = l(A_0 \bar{Z}_1, \xi_1 \bar{Z}_2, R_1 \bar{Z}_1, W_1 \bar{Z}_1, v_1, h_0, \lambda, \Theta_1^x) \quad (16)$$

where Θ_1^x represents other variables that affect both functions. It can be shown that

10. Again, these two functions, should be linear. However, we write them in the explicit way.

the effects of real wealth, real interest and transfer payments and relative price of importables on P and I^x are positive. While the effect of real wage on prices is unambiguously positive, its effect on employment is negative under the condition that $\tau < \delta_2/\delta_3$. With higher initial inventory holdings, or marginal inventory carrying costs, the firm would like to hire less workers and produce less. However, the firm's pricing policy is independent of the initial inventory holdings and the marginal inventory carrying costs. These are consequences of linear production function. Suppose that we have a strictly concave production function, then the firm may charge less whenever its initial inventories are at high level or the marginal inventory carrying costs are higher.

The effect of probability λ on the labor demand and the price are ambiguous. However, if we assume that the marginal profit of inventory holdings is an increasing function of λ , then employment increases with λ as long as the effect of λ on the marginal profits of inventory holdings dominates that on the marginal profits of changing commodity price.

To sum up, $\partial I_1^x/(\partial A_0 \bar{z}_1)$, $\partial I_1^x/(\partial \xi_1 \bar{z}_2)$, $\partial I_1^x/(\partial R_1 \bar{z}_1)$ and $\partial I_1^x/\partial \lambda$ are positive, while $\partial I_1^x/(\partial W_1 \bar{z}_1)$, $\partial I_1^x/\partial v_1$ and $\partial I_1^x/\partial h_0$ are negative.

The aggregate labor demand in the exportables sector can be obtained by aggregating over n firms. Without causing any confusion, we will use (16) to express the aggregate labor demand function. The aggregate supply of exportables is

$$\begin{aligned} y_1^x &= \tau_1^x + h_0 \\ &= y^x(A_0 \bar{z}_1, \xi_1 \bar{z}_2, R_1 \bar{z}_1, W_1 \bar{z}_1, v_1 \bar{z}_1, h_0, \lambda, \Theta_1^x), \end{aligned} \quad (17)$$

where $\partial y_1^x/(\partial A_0 \bar{z}_1)$, $\partial y_1^x/(\partial \xi_1 \bar{z}_2)$, $\partial y_1^x/(\partial R_1 \bar{z}_1)$, $\partial y_1^x/\partial h_0$ and $\partial y_1^x/\partial \lambda$ are positive, while $\partial y_1^x/(\partial W_1 \bar{z}_1)$ and $\partial y_1^x/\partial v_1$ are negative.

3. The Importables Sector

In this model, we assume that the country is small in the world market for its importables. The domestic price of importables R will differ from the world price R^* only to the extent that country imposes a tariff on imports. Thus, normalizing so that $R^* = 1$, we have

$$R = e(1+t) \quad (18)$$

where e is the exchange rate and t is the tariff rate.

There are n' competitive firms in this sector. The firms in the importables sector are price takers. Thus, given the domestic price of importables, the representative firm chooses $\{l_t^m\}_{t=1}^3$ by solving:¹¹

$$\text{Maximize } E\{1/q_t [\sum_{t=1}^3 (R_t D_t - W_t l_t^m - \tilde{v}_1 \tilde{h}_t - \tilde{v}_2 \tilde{h}_t^2) + X(\tilde{h}_3)]\}, \quad (19)$$

subject to

$$\tilde{h}_1 = \tilde{h}_0 + y_1^m - D_1, \quad (20)$$

$$y_1^m = \epsilon l_1^m, \quad (21)$$

and the sequential constraints, for all $t > 1$,

$$\begin{aligned} \tilde{h}_t &= \tilde{h}_{t-1} + y_t^m - D_t \\ y_t^m &= \epsilon l_t^m && \text{with probability } \eta, \\ \tilde{h}_t &= \tilde{h}_{t-1} + y_t^m - \bar{D}_t \\ y_t^m &= \epsilon l_t^m && \text{with probability } 1 - \eta, \\ \bar{D}_t &< D_t \end{aligned}$$

where

l_t^m = labor demand,

h_t = inventories,

$x(\tilde{h}_t) = (x_1 \tilde{h}_3) - (x_3 \tilde{h}_3^2)$ = values of inventories at the end of period three,

$(v_1 \tilde{h}_t) + (v_2 \tilde{h}_t^2)$ = inventory cost function,

ϵ = technical coefficient,

D_t = effective demand for importables,

η = probability that the firm expects not to be rationed in the importables market,

$\tilde{v}_1 < 0$, $\tilde{v}_2 > 0$, $\tilde{x}_1 > 0$, $\tilde{x}_2 > 0$ and X' is positive.

Also, by using dynamic programming, we can obtain the employment function

11. The problem is very similar to that considered by Muellbauer and Portes (1978) except that we explicitly specify the future quantity constraints.

for the firm, i.e.,

$$l_1^m = l_1^m(\widetilde{W}_1 \widetilde{Z}_1, h_0, v_1, \eta, \Theta_1^m) \quad (22)$$

where Θ_1^m represents other variables affecting the employment function.

It can be shown that $\partial l_1^m / \partial W_1 \widetilde{Z}_1 < 0$, $\partial l_1^m / \partial \widetilde{h}_0 < 0$ and $\partial l_1^m / \partial \widetilde{v}_1 < 0$. By assuming that the marginal profit of inventory holdings increases with η , we can show that $\partial l_1^m / \partial \eta > 0$. The assumption is reasonable since a firm expecting future sales constraint to be less binding finds its inventory holdings have much more value. In other words, a firm with optimistic sales expectation will find it profitable to store more output for future sales.

For simplicity, we use (22) to denote the aggregate employment in the importables sector. And aggregate supply of importables is thus

$$\begin{aligned} y_1^m &= \varepsilon l_1^m + \widetilde{h}_0 \\ &= y_1^m(\widetilde{W}_1 \widetilde{Z}_1, \widetilde{h}_0, \widetilde{v}_1, \eta, \Theta_1^m) \end{aligned} \quad (23)$$

where $\partial y_1^m / \partial W_1 \widetilde{Z}_1$ and $\partial y_1^m / \partial \widetilde{v}_1$ are negative, while $\partial y_1^m / \partial \eta$ and $\partial y_1^m / \partial \widetilde{h}_0$ are positive.

4. The Government Sector and the Trade Balance

Let G be consumption demand of the government. To finance its expenditures, interest and transfer payments to households, the government collects tariffs and issues bonds and money. The government budget constraint may then be written as¹²

$$G_1 = T_1 - \xi_1 + M_1 - M_0 + B_1 - B_0 \quad (24)$$

where $\xi_1 = i_1 + j_1$, i_1 is the interest payments, j_1 is the transfer payments, and T_1 is the tariff revenue which is written as

$$T_1 = e t I_1 \quad (25)$$

and

12. We assume no other taxes except tariffs are imposed.

I_1 = the domestic import demand = $D_1 - y_1^m$

The export supply X is defined as

$$X_1 = y_1^x - C_1. \quad (26)$$

Thus, the trade balance in units of foreign currency can be written as

$$BT = (P_1/e)X_1 - I_1, \quad (27)$$

where P_1 is the average price of exportables which is a weighted average of the prices faced by households. A BT value different from zero can be maintained indefinitely by capital flows.

The model is completed a definition of national income,

$$Y_1 = P_1 y_1^x - e(1+t)y_1^m \quad (28)$$

a definition of the general price level which is $q_t = q(P_1, e(1+t)) = wP_t + (1-w)e(1+t)$, where $0 < w < 1$ is the share of exportables in domestic consumption, and a money demand equation. The money demand function can be derived by considering a simple portfolio balance model in which the money demand is given by

$$M_1^d \bar{z}_1 = M(P_1 \bar{z}_1, R_1 \bar{z}_1, r_1, (A_0 + \pi_1 + W_1 L_1) \bar{z}_1, \xi_1 \bar{z}_2, \mu), \quad (29)$$

where r is the interest rate, and $\partial M / \partial (A_0 + \pi_1 + W_1 L_1) \bar{z}_1 > 0$, $\partial M / \partial \xi_1 \bar{z}_2 > 0$, $\partial M / \partial \mu < 0$ and $\partial M / \partial r_1 < 0$, since bonds and money are substitutes.¹³

It is assumed that real money balances and transfer payment elasticities of money demand are less than one. Note that the real money demand function is a function of the interest rate and the saving function which is the residual can be obtained from (2), (3) and (4). It should be noted that people hold money to purchase goods in the future. If the price elasticity of the demand for importables and exportables is less than one, increases in either price cause people to expend more and to save less. Moreover, money is held for precautionary purposes also. Thus, whenever households has pessimistic expectations about future employment situations (i.e., μ falls), they will

13. The interest rate is assumed to be exogenously given in the world capital market. Here, we will not consider the expectation of the change of the exchange rate.

save more money.¹⁴

III. Unemployment Equilibria

1. The market equilibrium

The goods-market equilibrium is

$$Y_1 = P_1 C_1 + R_1 D_1 + G_1 + eBT, \quad (30)$$

while the labor-market equilibrium is defined by equating labor supply L_1 to employment.

$$L_1 = l_1^m + l_1^x. \quad (31)$$

And the money-market equilibrium condition is

$$M_1^s = M_1^d. \quad (32)$$

Under fixed exchange rates, since the monetary authority is to keep the exchange rate fixed, the money supply in (32) is endogenous. (30) and (31) can be solved for Y and l and equation (32) then yields the equilibrium value for M^s in the standard recursive fashion. Thus, monetary equilibrium does not impinge on the determination of output and employment. Under a flexible exchange rate regime, the money supply is exogenous. The equilibrium output, employment and exchange rate are solved simultaneously through all three market-equilibrium condition (30), (31) and (32). Thus, our model with constant quantity expectations can be regarded as an extended Mundell-Flemming model with a rigid money wage and rigid commodity prices (see Bruce and Purvis (1985, Section 3)).

14. Our specification of money demand function is therefore different from that in the Cuddington-Lofgren (1984, ch.7) model which lacks of firm microfoundation. In their model money serves as the medium of exchange. Following the "cash-in advance" literature they specified that household's money depends positively on expenditure. Thus increases in the price of either commodity will raise total expenditure. Therefore, households' money demand is an increasing function of commodity prices.

2. The market disequilibrium under fixed exchange rates

Suppose that all markets are in equilibrium initially, but due to the news of trade liberalization policy, firms producing importable goods become more pessimistic and expect that sales are more likely to be rationed in the future. More precisely, probability η falls down. More precisely, probability η falls down. Therefore, under fixed exchange rates, there is excess supply of labor but with excess demand for importables.¹⁵ That is,

$$Y = Y_1 < P_1 C_1 + R_1 D_1 + G_1 + eBT \quad (33)$$

$$l = l_1^m + l_1^x < L_1 \quad (34)$$

This is the "classical unemployment" regime in which buyers in commodity markets are rationed, while sellers in the labor market are rationed.

Suppose that households also pessimistically expect that there will be employment rationing in the labor market. More precisely, probability μ goes down also. Therefore, there is still excess supply of labor. But commodity markets may either be in excess demand or in excess supply which depends on the reactions of agents to the future market situations. If households are more sensitive to quantity constraint expectations than the importables firms are, the "Keynesian unemployment" regime in which sellers in both the labor and commodity markets are rationed. In contrast, the classical unemployment regime emerges as long as the importables firms react more strongly than households react to the future market situations. In addition, there is a case called the orthodox Keynesian case in which both the markets for exportables and importables are in equilibrium while the labor market is in excess supply.¹⁶ This case might come out as long as both agents react to future market conditions the same degree. Formally,

$$l = l_1^m + l_1^x < L_1 \quad (35)$$

and

15. We assume no quantity rationing ever occurs in the financial market for a small open economy where bonds are tradable.

16. This case is also called the 'reappraisal' view of the economy by Hines(1980).

$$Y_1 \geq P_1 C_1 + R_1 D_1 + G_1 + eBT, \quad (36)$$

$$\text{if } R_1(\partial y_1^m / \partial \mu) \geq \partial(P_1 C_1 + R_1 D_1) / \partial \mu$$

3. The market disequilibrium under flexible exchange rates

Under flexible exchange rates, it is assumed that the exchange rate fluctuates to clear exportables (and money) markets.

Suppose that the firms in the importables sector expects that the sales constraints will be binding in the future. Then, there will exist excess supply in the labor market and excess demand in the importables market, i.e., the classical unemployment emerges. The temporary equilibrium conditions are thus expressed by (37):

$$Y = P_1 y_1^x + e(1+t)y_1^m < P_1 C_1 + R_1 D_1 + G_1 + eBT \quad (37a)$$

$$l = l_1^m + l_1^x < L_1 \quad (37b)$$

$$M_1^s = M_1^d. \quad (37c)$$

IV. Tariff Policy under Different Exchange Rates

In this section, we will explore the effects of the tariff policy. Suppose that the government eventually decreases the tariff on imports. The general price level will decline since the import price will fall down. By the definition of the general price level it is reasonable to assume that the expected general price level is a function of the tariff rate t . But the effect of t on the exchange rate is indeterminate. However, given a BT value in equation (27), increases in t will cause imports to decrease and therefore the exchange rate should decrease in order to maintain a given level of BT . In the following analysis, we will assume that $-1 < \partial e / \partial t < 0$. Thus, changes in the tariff rate are supposed to induce changes in people's expectations of the general price level and $\partial \bar{q}_1 / \partial t > 0$ (and therefore $\partial \bar{z}_1 / \partial t < 0$) under either exchange rate regime.

A decrease in t would discourage the firms in the importables sector to hire more labor and thus produce less goods. Formally,

$$(dy_1^m / dt) = (\partial y_1^m / \partial W_1 \bar{z}_1) \cdot (dw_1 \bar{z}_1 / dt) > 0 \quad (38)$$

On the other hand, a decrease in t would also cause output and employment in the exportables sector to fall if the real wealth effect is negligible. Formally,

$$(dy_i^x/dt) = [(\partial y_i^x / \partial W_i \bar{z}_1) \cdot (dW_i \bar{z}_1 / dt)] + [(\partial y_i^x / \partial A_0 \bar{z}_1) \cdot (dA_0 \bar{z}_1 / dt)]. \quad (39)$$

Decreases in the tariff rate reduce government tax revenue. To balance its budget, the government is assumed to cut the transfer payments to households. And a decrease in the transfer payment will lead to a decrease in the production of exportables. Formally,

$$dy_i^x / dj > 0. \quad (40)$$

Under fixed exchange rates, in the classical unemployment national income decreases whenever the government reduces transfer payments and tariffs. That is,

$$(dY_1/dt) + (dY_1/dj) = [e(1+t)(dy_1^m/dt)] + ey_1^m + P_1(dy_1^x/dt) + P_1(dy_1^x/dj) > 0 \quad (41)$$

if the real wealth effect on y^x is negligible. On the other hand, the effect of decreases in tariff and transfer payment on the balance of trade is ambiguous. Formally,

$$(dBT/dt) + (dBT/dj) = (P_1/e)(dX_1/dt + dX_1/dj) - (dI_1/dt) - (dI_1/dj), \quad (42)$$

where $dX_1/dt = (dy_1^x/dt) - (dC_1/dt)$, $dX_1/dj = (dy_1^x/dj) - (dC_1/dj)$,
 $dI_1/dt = (dD_1/dt) - (dy_1^m/dt) < 0$, $dI_1/dj = (dD_1/dj) > 0$.

As noted above, under flexible exchange rates the goods-market, labor-market and money-market equilibrium conditions must be solved simultaneously. Total differentiating the system (37) yields:

$$\begin{bmatrix} -1 & 0 & a \\ 0 & -1 & b \\ \partial M / \partial Y & 0 & \partial M / \partial e \end{bmatrix} \begin{bmatrix} (dY/dt) + (dY/dj) \\ (dI/dt) + (dI/dj) \\ (de/dt) + (de/dj) \end{bmatrix} = \begin{bmatrix} \alpha \\ \beta \\ \gamma \end{bmatrix}$$

where

$$a = P_1(\partial y_1^x / \partial e) + (1+t) y_1^m + e(1+t) (\partial y_1^m / e),$$

$$b = (\partial I_1^x / \partial e) + (\partial I_1^m / \partial e),$$

$$\begin{aligned}
\alpha &= -P_1(dy_1^x/dt) - e(1+t)(dy_1^m/dt) - cy_1^m - P_1(dy_1^x/dj) < 0, \\
\beta &= -(dl_1^x/dt) - (dl_1^m/dt) - (dl_1^x/dj), \\
\gamma &= -(dM/dt) - (dM/dj), \\
\partial y_1^x/\partial e &= (\partial y_1^x/\partial W_1\bar{z}_1) \cdot (\partial W_1\bar{z}_1/\partial e) + (\partial y_1^x/\partial A_0\bar{z}_1) \cdot (\partial A_0\bar{z}_1/\partial e), \\
\partial y_1^m/\partial e &= (\partial y_1^m/\partial W_1\bar{z}_1) \cdot (\partial W_1\bar{z}_1/\partial e) > 0, \\
\partial l_1^x/\partial e &= (\partial l_1^x/\partial W_1\bar{z}_1) \cdot (\partial W_1\bar{z}_1/\partial e) + (\partial l_1^x/\partial A_0\bar{z}_1) \cdot (\partial A_0\bar{z}_1/\partial e), \\
\partial l_1^m/\partial e &= (\partial l_1^m/\partial W_1\bar{z}_1) \cdot (\partial W_1\bar{z}_1/\partial e) > 0, \\
\partial M/\partial e &= (\partial M/\partial R_1\bar{z}_1) \cdot (\partial R_1\bar{z}_1/\partial e) + \{[\partial M/\partial (A_0 + W_1L_1)\bar{z}_1] \cdot (A_0 + W_1L_1) \\
&\quad + (\partial M/\partial P_1\bar{z}_1) \cdot P_1\}(\partial \bar{z}_1/\partial e),
\end{aligned}$$

$$\begin{aligned}
dM/dt &= (\partial M/\partial R_1\bar{z}_1) \cdot [\partial R_1\bar{z}_1/\partial t + (1+t)\bar{z}_1] + \{(\partial M/\partial P_1\bar{z}_1) \cdot P_1 \\
&\quad + [\partial M/\partial (A_0 + W_1L_1)\bar{z}_1] \cdot (A_0 + W_1L_1)\} \partial \bar{z}_1/\partial t.
\end{aligned}$$

The effects of changes in exchange rates on employment and production in the exportables sector are ambiguous. However, if the real balance effects are negligible, then $\partial y_1^x/\partial e$, $\partial l_1^x/\partial e$ and therefore a and b would be positive. Also, the effects of changes in exchange rates and tariffs on money demand are ambiguous. Suppose that the direct price effects dominate other indirect effects, then $\partial M/\partial e$ and dM/dt are negative. The comparative static results of tariff reduction are written as

$$(dY/dt) + (dY/dj) = [-\alpha(\partial M/\partial e) + a\gamma]/\Delta = -[(\alpha(\partial M/\partial e) + a(dM/dt) + a(dM/dj))/\Delta], \quad (44)$$

$$(de/dt) + (de/dj) = [\gamma + \alpha \partial M/\partial Y]/\Delta = -[(dM/dt + dM/dj) + \alpha(\partial M/\partial Y)]/\Delta, \quad (45)$$

$$(dl/dt) + (dl/dj) = -\beta/(\partial M/\partial e) + (\alpha b - \alpha\beta)(\partial M/\partial Y) + b\gamma, \quad (46)$$

where

$$\Delta = (\partial M/\partial e) + (\partial M/\partial Y) [P(\partial y_1^x/\partial e) + (1+t)y_1^m + e(1+t)(\partial y_1^m/\partial e)].$$

Thus a decrease in the tariff rate combined with a decrease in the transfer payment

may stimulate firms to produce more output, if the income and the transfer-payment effects on money demand dominate the tariff and the exchange rate effects. That is, $(dY/dt) + (dY/dj) < 0$. In other words, by allowing the exchange rate to adjust freely, a decrease in the tariff rate tends to raise the exchange rate and therefore induces both sectors to produce more goods. Thus, if the government cuts the tariff rate, national income might be raised under flexible exchange rates, while it is lowered under fixed exchange rates, while it is lowered under fixed exchange rates.

On the other hand, the effects of decreases in the tariff rate and transfer payments on the balance of trade is

$$(dBT/dt) + (dBT/dj) = (P_1/e)[(dX_1/dt) + (dX_1/dj)] - X_1(P_1/e^2)[(de/dt) + (de/dj)] - [(dI_1/dt) + (dI_1/dj)], \quad (47)$$

where

$$(dX_1/dt) + (dX_1/dj) = [(dy_1^x/dt) + (dy_1^x/dj)] - [dC_1/dt + (dC_1/dj)],$$

$$(dI_1/dt) + (dI_1/dj) = [(dD_1/dt) + (dD_1/dj)] - (dy_1^m/dt),$$

$$(de/dt) + (de/dj) = \{ -[(dM/dt) + (dM/dj)] + \alpha(\partial M/\partial Y) \} / \Delta.$$

Again, the balance of trade may move in either direction. However, as we assume before, if the income and transfer-payment effects on money demand dominate the tariff rate and the exchange rate effects, then $(de/dt) + (de/dj)$ is negative. And $[(dBT/dt) + (dBT/dj)]$ in (47) under a flexible exchange regime becomes larger comparing with that in (42) under a fixed exchange regime. Thus, the trade balance is worsened less under flexible exchange rates, whenever the tariff rate and the transfer payment are lowered.

V. Concluding Remarks

In this paper, we have developed an intertemporal two-sector, fix-price model for an open economy by taking account of future quantity constraints on either goods

or labor markets. We have also examined the effect of a reduction in the tariff rate combined with a reduction in the government transfer payments on national income and the balance of trade. It is shown that why different regimes of unemployment might emerge. Suppose that the firms in the importables sector pessimistically expect that sales constraints will be binding in the future, then the classical unemployment might come out under both exchange rate regimes.

We have also analyzed the effects of reduction in the tariff rate and a reduction in the government transfer payment. We have demonstrated that if the real balance effect is negligible, then in the case of the classical unemployment national income falls under fixed exchange rates. The balance-of-trade effect is, however, ambiguous. Under flexible exchange rates, national income might be raised if the income and the transfer-payment effects on money demand dominate the tariff and the exchange rate effects. And the trade balance is worsened less under flexible exchange rate regime in contrast to the case of fixed exchange rates, since the exchange rate is allowed to adjust freely through the mechanism of the adjustments in the foreign exchange market. Intuitively, under fixed exchange rates, a decrease in the tariff rate induce more imports, while domestic output of importable goods will be reduced. On the other hand a decrease in the government transfer payments lowers the production of exportables as well as aggregate expenditure. Thus, national income falls. However, if the exchange rate adjusts flexibly, a decrease in the tariff rate might tend to raise the exchange rate and therefore promote firms to produce more output. Thus, under flexible exchange rate regime, national income might increase although the government reduces the transfer payments. Furthermore, under the flexible exchange rate regime, the trade balance adjusts to the changes of the exchange rate as well as those of the tariff rate and the government transfer payment. Thus, if the trade balance deteriorates, it turns out to be lowered smaller under flexible exchange rates.

However, there are two main weaknesses of our analysis that should be emphasized. First, only the classical unemployment was considered when we analyzed the effects of trade liberalization policy. Although for most less developed countries, classical unemployment is likely to be more common than Keynesian unemployment,¹⁷ the Keynesian unemployment case should not be ignored, especially when households also pessimistically expect that employment constraints will be binding in the future. Second, no microeconomic foundations are given about how households make financial decisions. The financial asset demand functions are expressed very crudely. These remain for further researches to develop

17. See Cuddington, Johansson and Lofgren (1984, ch.6).

intertemporal models where portfolio decisions are explicitly taken into account.

References

- Amihud, Y. and H. Mendelson, "Price Smoothing and Inventory," *Review of Economic Studies* 50, 1983, pp. 87-98.
- Aoki, M., *Optimization of Stochastic Systems* (Academic Press, New York) 1967.
- Azariadis, C., "Self-fulfilling Prophecies," *Journal of Economic Theory* 25, 1981, pp. 380-396.
- Barro, R.J. and H. I. Grossman, *Money, Employment and Inflation* Cambridge University press, Cambridge) 1976.
- Benassy, J.P., "The Disequilibrium Approach to Monopolistic Price Setting and General Monopolistic Equilibrium," *Review of Economic Studies*, 43, 1976, pp. 69-81.
- , "A Neo-Keynesian Model of Price and Quantity Determination in Disequilibrium," in G. Schwodiauer, ed., *Equilibrium and Disequilibrium in Economic Theory* D. Reidel Publishing Company, Dordrecht 1977.
- , *The Economics of Market Disequilibrium*. (Academic press, New York) 1982.
- Blinder, A.S., "Inventories and Sticky Prices: More on the Microfoundations of Macroeconomics," *American Economic Review* 72, 1982, pp. 334-349.
- Branson, W.H. and D.W. Henderson, "The Specification and Influence of Asset markets," in R.W. Jones and P.B. Kenen, eds., *Handbook of International Economics* (Elsevier Science Publishers B.V., Amsterdam) 1985.
- Bruce, N. and D. D. Purvis, "The Specification and Influence of Goods and Factor Markets in Open-Economy Macroeconomic Models," in R. W. Jones and P. B. Kenen, eds., *Handbook of International Economics* (Elsevier Science Publishers B.V., Amsterdam) 1985.
- Cass, D. and K. Shell, "Do Sunspots Matter?" *Journal of Political Economy* 91, 1983, pp. 193-227.
- Casson, M., *Unemployment: A Disequilibrium Approach* (Halstead Press, New York) 1981.
- Chan, K.S., "The Employment Effects of Tariffs under a Free Exchange Rate Regime. A Monetary Approach," *Journal of International Economics* 8, 1978, pp. 415-423.
- Chow, C.C., *Analysis and Control of Dynamic Economic Systems* (John Wiley and

Sons, New York) 1975.

Cuddington, J. T., P. O. Johansson and K. G. Lofgren, *Disequilibrium Macroeconomics in Open Economics* (asil Blackwell, Oxford) 1984.

_____, J. T., and J. M. Viñals, "Budget Deficits and the Current Account in the Presence of Classical Unemployment," *The Economic Journal* 96, 1986a, pp. 101-119.

"Budget Deficits and Current Account-An Intertemporal Disequilibrium Approach," *Journal of International Economics*, 21, 1986b, pp. 1-24.

Dreyfus, S. E. and Law, A. M, *The Art and Theory of Dynamic Programming* Academic press, New York 1977.

Eichengreen, B. J, "A Dynamic Model of Tariffs, Output and Employment under Flexible Exchange Rate," *Journal of International Economics* 11, 1981, pp. 341-359.

Hines, A. G., "Involuntary Unemployment," in E. Malinvaud and J. Fitoussi, eds., *Unemployment in Western Countries* St. Martin's press, New York 1980.

Hool, B., "Monetary and Fiscal Policies in Short Run Equilibria with Rationing," *International Economic Review* 21, 1980, pp. 301-316.

Hsu, C., "The Consumption Function and Intertemporal Spillover Effects," *Journal of Economic Dynamics and Control* 10, 1986, pp. 443-455.

Johansson, P. O. and Lofgren, K. G., "The Effects of Tariffs and Real Wages on Employment in a Barro-Grossman Model of an Open Economy," *Scandinavian Journal of Economics* 82, 1980, pp. 167-183.

_____, "A Note on Employment Effects of Tariffs in a Small Open Economy," *Weltwirtschaftliches Archiv* 117, 1981, pp. 578-583.

Muellbauer, J. and Portes, R., "Macroeconomic Models with Quantity Rationing," *Economic Journal* 88, 1978, pp. 788-821.

Neary, J. P. and Stiglitz, J.E., "Towards a Reconstruction of Keynesian Economics: Expectations and Constrained Equilibria," *Quarterly Journal of Economics*, 1983, 98 Supplement, pp. 199-228.

Persson, T., "Gloal Effects of National Stabilization Policies under Fixed and Floating Exchange Rates," *Scand. Journal of Economics*, 1982, 84(2), pp. 165-192.

_____, T., and Svensson, L. E. O., "Is Optimism Good in Keynesian Economy?," *Economica*, 1983, 50, pp. 291-300.

Sargent, T., *Dynamic Macroeconomic Theory* (Harvard University, Cambridge) 1987.

Van Der Ploeg, F., "Rationing in Open Economy and Dynamic Macroeconomics : A

Survey," *De Economist* 135, 1987, pp. 488-519.

Wijnbergen, S. Van "Government Deficits, Private Investment and the Current Account : An Intertemporal Disequilibrium Analysis," *DRD Discussion Paper*, No. DRD256 1987.