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12 Exchange Rate Unions as an Alternative to Flexible Rates: The Effects of Real and Monetary Disturbances

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Although the current period is often characterized as one of flexible exchange rates, many currencies are tied together in joint floats against other currencies, forming exchange rate unions within a system of flexible rates. This paper investigates how a small country fares by joining such an exchange rate union.[1]

The country is assumed to be buffeted by real and monetary disturbances originating at home and abroad. By joining the union, this country is able to fix the exchange rate between its currency and the currencies of the union countries. The central question addressed in the paper is whether or not fixing this exchange rate helps to modify the effects of disturbances on the domestic economy.

The paper shows that the impact of a union depends on several key factors:[2]

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1. The terminology here is potentially confusing. In this study, the term "exchange rate union" refers to an arrangement in which member countries of each union maintain fixed exchange rates between member currencies, but with each country retaining its own central bank with control over its national monetary policy. This limited type of union, which Corden (1972, p. 3) calls a "pseudo exchange rate union," is to be distinguished from a "complete exchange rate union," or monetary union, with a single central bank and a union-wide currency.

2. Tower and Willett (1976) provide a comprehensive survey of the literature on optimum currency areas which examines the conditions necessary for successful exchange rate or monetary unions; Allen and Kenen (1980, chap. 14) discuss the more recent literature. Among the more important contributions are those of Mundell (1961), McKinnon (1963), Corden (1972), and Ingram (1973). A recent paper by Canzoneri (1981) compares exchange rate unions with more general forms of exchange market intervention.

1. *Wage and price behavior* at home and abroad, a factor emphasized by Corden (1972) in his study of monetary integration. Wage behavior abroad determines the specific form which foreign disturbances take in the domestic economy, while wage behavior at home determines the difference which the choice of regime makes to the behavior of domestic output.

2. *The trade pattern* of the country joining the union. What is important is not just the general openness of the economy, as in McKinnon (1963), but the share of trade between potential member countries relative to trade with the rest of the world.

3. *The sources and types of economic disturbances* giving rise to fluctuations in exchange rates. To some extent the analysis will follow that of the literature on fixed versus flexible exchange rates, of which Mundell's (1963) study is representative. But the decision to join a union is more complicated than that; when there are two foreign countries or regions involved, the specific source of foreign disturbances becomes important, as well as any correlation between disturbances originating in different countries. Of particular interest will be foreign disturbances which are alternatively positively and negatively correlated, since these have very different implications for the choice between regimes.

The paper will investigate two intuitively plausible propositions about these last two factors: that the case for a union is stronger when the home country trades primarily with other countries in the union and when disturbances primarily originate outside the union.

The national models used to investigate the effects of the union consist of three basic equations: an aggregate demand equation dependent on the terms of trade as well as foreign output, an aggregate supply equation derived from a wage indexation model, and a financial equation that determines the exchange rate of the domestic currency relative to one of the two foreign currencies (the other being determined by triangular arbitrage). The paper shows to what extent aggregate supply and demand behavior are important in determining the effects of the union. Supply behavior varies depending upon whether wages respond to prices with a lag or are indexed to current changes in the general price level, while demand behavior is particularly sensitive to price elasticities.

The small country model has the advantage of analytic simplicity, but by itself gives misleading results when foreign disturbances are examined. The model can be used to show, for example, that variations in foreign income due to foreign disturbances anywhere abroad unambiguously lead to greater domestic output variance in the union. But without a model of the two foreign regions, the union countries and the rest of the world, it is difficult to determine the *total* effects of the underlying foreign disturbances, since these disturbances affect the domestic economy through a variety of channels. For example, in addition to changing foreign output, a foreign demand disturbance concentrated in one of the two foreign regions will change the

terms of trade between the foreign goods imported by the small country and the exchange rate between the two foreign currencies. The total effects of this foreign disturbance thus may be quite different from the effects of a change in foreign income alone.

To study foreign disturbances, the paper introduces a model of the two foreign trading regions with the same analytical structure as the small country model. This model determines the exchange rate and terms of trade between the two regions as well as the prices, interest rates, and output in each region. Foreign disturbances are studied first within this model, then are traced through the domestic model to determine the effects on the small country.

The first section of the paper introduces the small country model, and the next two sections successively examine the effects of disturbances within the one country and extended models.

12.1 Outline of the Model

Country 1 is a small country which has economic ties with two countries: country 2 is the potential partner of country 1 in an exchange rate union, while country 3 represents the rest of the world. Country 1 has important trade and financial ties with the other two countries; the relative importance of these economic ties will be an issue in the analysis below. Country 1 is assumed to be too small to influence conditions in either foreign country.[3] The two foreign countries affect country 1 through their outputs (Y_t^2, Y_t^3), the prices of their goods (P_t^2, P_t^3), both expressed in logarithms, and interest rates (r_t^2, r_t^3).[4]

In this three-country world, there are three exchange rates to be determined. If the franc is the currency of country 1, the mark the currency of country 2, and the dollar the currency of country 3, then the three exchange rates are as follows (all expressed in logs):

$$X_t^1 = \text{the franc price of the dollar,}$$

$$X_t^2 = \text{the mark price of the dollar, and}$$

$$X_t^{12} = X_t^1 - X_t^2 = \text{the franc price of the mark.}$$

Figure 12.1 illustrates the relationships among the three currencies. X_t^2 is exogenously determined for country 1, while a second exchange rate is determined by triangular arbitrage.

3. The two foreign countries could represent blocs of countries with fixed exchange rates within each bloc, in which case country 1 does not need to be small relative to individual countries in each bloc. Country 2, for example, might represent a group of countries in an existing union (e.g., the European Monetary System) and country 3 represent a second group of countries tied to the dollar.

4. A list of variables in provided in Appendix 1.

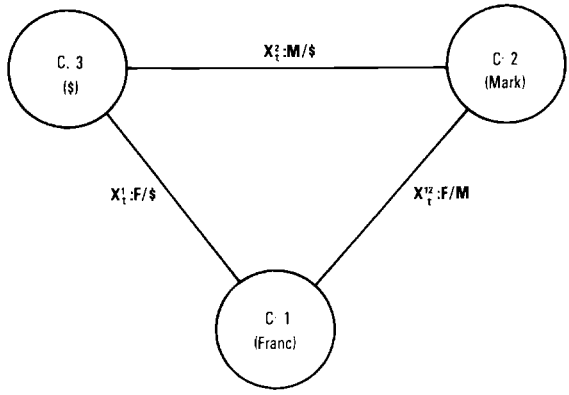

Fig. 12.1 Currencies and exchange rates. Country 1 = domestic country; country 2 = potential partner (or partners) in union; country 3 = rest of world.

12.1.1 Demand Behavior

Unless purchasing power parity is assumed, demand behavior in a country trading with two other countries is inherently complicated. Three national prices are involved as well as at least two exchange rates. I begin by defining the prices of the three countries' goods expressed in francs:

$$P_t^1 = \text{the price of country 1's good,}$$

$$P_t^3 + X_t^1 = \text{the price of country 3's good in francs, and}$$

$$P_t^2 + X_t^{12} = \text{the price of country 2's good in francs.}$$

It is convenient for later analysis to measure country 2's prices relative to country 3. Define the terms of trade between countries 2 and 3 as $T_t = P_t^2 - (P_t^3 + X_t^2)$. Then the price of country 2's good in francs can be written as $P_t^3 + T_t + X_t^1$. The general price level in country 1 can be expressed as a weighted average of the prices of the three goods:

$$I_t^1 = a_{11}P_t^1 + a_{12}(P_t^3 + T_t + X_t^1) + a_{13}(P_t^3 + X_t^1),$$

where a_{1j} is the expenditure weight for country j's good.[5]

There are two relative prices affecting demand in country 1, the price of country 1's good relative to each of the foreign goods. The demand for domestic output can be expressed as a function of these relative prices, output in the two foreign countries, the real rate of interest, and a stochastic factor with a mean of zero and serially uncorrelated:[6]

5. When expressed in levels, this price index has a geometric form with weights $a_{11} + a_{12} + a_{13} = 1$.

6. In Appendix 2 this demand function is derived from a more standard demand function, and the coefficients, g_{pi} and g_{yi}, are expressed in terms of conventional income and price elasticities.

$$(1) \qquad Y_t^1 = g_0 + g_{p2}(P_t^3 + T_t + X_t^1 - P_t^1) + g_{p3}(P_t^3 + X_t^1 - P_t^1) g_{y2}Y_t^2 + g_{y3}Y_t^3 - g_r[r_t^1 - ({}_tEI_{t+1}^1 - I_t^1)] + u_t^{d1}.$$

A rise in foreign prices relative to the domestic price is assumed to increase aggregate demand, as is a rise in foreign output. A rise in the real interest rate is assumed to reduce aggregate demand.[7] In the case of perfect substitution between foreign and domestic goods, where either g_{pj} becomes infinite in size, the aggregate demand equation reduces to the familiar purchasing power parity relationship.

12.1.2 Supply Behavior

Supply behavior is based on a labor contract lag of one period with the partial or complete indexation of wages to current prices. Supply behavior is more complicated than in a closed economy because there are two prices important for supply decisions, the price of domestic output (P_t^1) and the general price level (I_t^1). Output is responsive to nominal wages relative to the price of domestic output, but nominal wages may be at least partially indexed to current changes in the general price level.

The supply equation (2) is derived from a Cobb-Douglas production function (2a), a labor market equilibrium condition (2b) determining the contract wage, $W_t^{1\prime}$, and a wage indexation equation (2c):

$$(2) \qquad Y_t^1 = c(P_t^1 - {}_{t-1}EP_t^1) - cb(I_t^1 - {}_{t-1}EI_t^1) + c_0$$

$$(2a) \quad Y_t^1 = (1 - c')L_t^1 = -c(W_t^1 - P_t^1) + c\ ln(1 - c')$$

$$(2b) \quad W_t^{1\prime} = {}_{t-1}EP_t^1 + ln(1 - c') - c'\bar{L}^1$$

$$(2c) \quad W_t^1 = W_t^{1\prime} + b(I_t^1 - {}_{t-1}EI_t^1),$$

where $c = (1 - c')/c'$ and $c_0 = (1 - c')\bar{L}^1$. The contract wage, reflecting expectations at time $t - 1$, is based on labor demand (derived from the production function) and an inelastic labor supply ($\bar{L}^1$).[8] The actual wage, W_t^1, will differ from the contract wage if the indexation parameter, b, is different from zero; this parameter is assumed to vary between zero (no

7. ${}_tEI_{t+1}^1$ is country 1's general price level for period $t + 1$ expected at period t, so $({}_tEI_{t+1}^1 - I_t^1)$ is the expected change in that price level. ${}_tEI_{t+1}^1$ is assumed to be formed rationally from the rest of the model, as are all other expectations in the model.

8. The desired labor supply is inelastic, but once the contract is signed the amount of labor supplied is determined by the demand for labor as in Gray (1976). The desired labor supply, alternatively, might be sensitive to nominal wages relative to the general price level. None of the results below would be affected by this change in specification, since current output would be a function of the same price prediction errors as in (2). When labor supply is variable, however, an alternative objective function measuring deviations of output from desired output is no longer equivalent to our objective function. (See section 12.2 below.)

indexation) and one (full indexation).[9] With no indexation, only domestic price prediction errors matter, but with partial or full indexation, price prediction errors in the general price index also matter. With full indexation, in fact, equal increases in P_t^1 and I_t^1 leave supply unaffected. When indexation is less than complete, however, equal increases in P_t^1 and I_t^1 *increase* supply since the real wages faced by producers fall.

12.1.3 Financial Behavior

The three countries have two financial assets each: money and bonds (the latter bearing interest rate r_t^i). To keep the financial sector simple, however, the three bonds are assumed to be perfect substitutes so that their expected returns expressed in the same currency are equal:[10]

$$r_t^1 = r_t^3 + ({}_tEX_{t+1}^1 - X_t^1),$$
$$r_t^2 = r_t^3 + ({}_tEX_{t+1}^2 - X_t^2).$$

The demand for money is expressed as a function of real income, with money balances and income being deflated by the general price level, as well as the domestic interest rate:[11]

$$M_t^1 - I_t^1 = (P_t^1 + Y_t^1 - I_t^1) - k_1 r_t^1 + k_0. \tag{3}$$

The behavior of the money supply depends on the exchange rate regime. Under flexible rates, the money supply is assumed to be exogenously determined as follows: $M_t^1 = \overline{M}^1 + u_t^{m1}$. The current money supply is equal to a base level plus a random term, where the latter has a mean of zero and is serially uncorrelated as well as uncorrelated with the demand disturbance. The supply of money in the exchange rate union is described below.

12.1.4 Foreign Behavior

All foreign variables in the model are exogenously determined by the small country assumption. I express each foreign variable as a constant plus

9. For studies of wage indexation behavior, see Gray (1976), Fischer (1977), Modigliani and Padoa-Schioppa (1978), Sachs (1980) and Flood and Marion (1982). Flood and Marion provide an interesting analysis of how indexation behavior may respond to the choice of exchange rate regime. Because in many countries indexation behavior is governed by institutional or legal constraints, however, I prefer to assume that the degree of indexation remains the same when the exchange rate regime changes. Thus the analysis will show how the choice of exchange rate regime differs between countries with different types of wage and price behavior.

10. For a more general study of financial behavior in an exchange rate union, see Marston (1984). In that study, where the effects of various financial disturbances are analyzed, foreign and domestic bonds are assumed to be imperfect substitutes.

11. The income elasticity of the demand for money is assumed to be one. If it were not equal to one, a change in the general price level, which could be due to a change in the exchange rate or one of the prices, would have an effect on the net demand for money proportional to one minus this elasticity. Note that the exchange rate can still affect the demand for money in this model by changing the interest rate.

a random variable where the latter is the innovation in that variable for period t:[12]

$$
\begin{aligned}
P_t^i &= \bar{P}^i + u_t^{pi}, \\
Y_t^i &= \bar{Y}^i + u_t^{yi}, \\
X_t^2 &= \bar{X}^2 + u_t^{x2}, \\
T_t &= \bar{T} + u_t^T, \\
r_t^i &= \bar{r}^i + u_t^{ri}, \; i = 2, 3.
\end{aligned}
$$

In the third part of the paper, the random variables will be expressed in terms of the underlying foreign disturbances. Until then these variables are assumed to have zero mean, to be serially uncorrelated, and to be uncorrelated with each other.

12.1.5 Description of the Two Exchange Rate Regimes

The exchange rate union will be compared with a regime of flexible exchange rates where no exchange market intervention occurs. The flexible regime is discussed first.

Flexible Exchange Rates

The basic equations of the model, (1)–(3), determine three domestic variables, Y_t^1, P_t^1, and X_t^1, as functions of all the stochastic and nonstochastic variables (X_t^{12} is then determined by triangular arbitrage). To facilitate comparison between the two regimes, equations (1) and (2) are first solved for Y_t^1 and P_t^1 as functions of X_t^1 and the exogenous variables. The resulting expressions, equations (I) and (II) in table 12.1, describe aggregate demand and supply behavior in *both* exchange rate regimes.[13] The stochastic variables influencing Y_t^1 and P_t^1 include the domestic aggregate demand disturbance, u_t^{d1}, as well as the random components of X_t^1 and the foreign variable.

Under flexible rates, the franc price of the dollar, X_t^1, can be expressed as a function of exogenous variables alone by solving all three equations, (1)–(3), for the reduced form. Equation (IIIa) in table 12.1 presents the expression for X_t^1.

12. u_t^{pi} is the innovation in P_t^i, $u_t^{pi} = P_t^i - {}_{t-1}EP_t^i$, and similarly for other variables. The underlying foreign disturbances have a mean of zero and are serially uncorrelated, so the expected value of each variable is equal to its value in a stationary equilibrium; for example, ${}_{t-1}EP_t^i = \bar{P}^i$. (See section 12.3 below.)

13. $\bar{Y}^1$, $\bar{P}^1$ are the solutions for Y_t^1 and P_t^1 when the disturbances in equations (1) and (2) are equal to zero. To obtain the coefficients of u_t^T in table 12.1, I have assumed that the shares of the two foreign goods in the price indexes are proportional to the respective price elasticities in the aggregate demand equation: $a_{12}/a_{13} = g_{p2}/g_{p3}$. This restriction allows trade to be biased toward one foreign country or the other (see below), but the bias must be equally reflected in the a_{1j}'s and g_{pj}'s.

Table 12.1 **Country 1's Model**

(I) $$Y_t^1 = \bar{Y}^1 + \frac{c(1 - ba_{11})}{D_1}(u_t^{d1} + g_{y2}u_t^{y2} + g_{y3}u_t^{y3}) + \frac{(g_{p3}c(1 - b) - g_r ca_{13})}{D_1}(u_t^{p3} + u_t^{x1})$$
$$+ \frac{[g_{p2}c(1 - b) - g_r ca_{12}]}{D_1}(u_t^{p3} + u_t^{x1} + u_t^T) - \frac{[g_r c(1 - ba_{11})]}{D_1}(u_t^{r3} - u_t^{x1}).$$

(II) $$P_t^1 = \bar{P}^1 + \frac{(u_t^{d1} + g_{y2}u_t^{y2} + g_{y3}u_t^{y3})}{D_1} + \frac{(g_{p3} - g_r a_{13} + cba_{13})}{D_1}(u_t^{p3} + u_t^{x1})$$
$$+ \frac{(g_{p2} - g_r a_{12} + cba_{12})}{D_1}(u_t^{p3} + u_t^{x1} + u_t^T) - \frac{g_r}{D_1}(u_t^{r3} - u_t^{x1}).$$

(IIIa) *Flexible Rates*

$$X_t^1 = \bar{X}^1 + \frac{D_1}{D}u_t^{ml} - \frac{[1 + c(1 - ba_{11})]}{D}(u_t^{d1} + g_{y2}u_t^{y2} + g_{y3}u_t^{y3}) + \frac{\{k_1 D_1 + g_r[1 + c(1 - ba_{11})]\}}{D}u_t^{r3}$$
$$- \frac{\{g_{p3}[1 + c(1 - b)] + a_{13}cb - a_{13}g_r(1 + c)}{D}u_t^{p3} - \frac{\{g_{p2}[1 + c(1 - b)] + a_{12}cb - a_{12}g_r(1 + c)\}}{D}(u_t^{p3} + u_t^T).$$

(IIIb) *Exchange Rate Union*

$X_t^1 = X_t^2 = \bar{X}^2 + u_t^{x2}$,

where $D_1 = g_{p2} + g_{p3} + g_r a_{11} + c(1 - ba_{11}) > 0$ and $u_t^{x1} = X_t^1 - \bar{X}^1$.

$D = (1 + k_1)D_1 + c(1 - b)[g_r a_{11} + (g_{p2} + g_{p3}) - 1] > 0.$

Exchange Rate Union

If country 1 joins an exchange rate union with country 2, the monetary authorities must intervene in the exchange market to ensure that $X_t^{12} = X_t^1 - X_t^2$ remains constant. For convenience I assume that the franc price of the mark is initially equal to one (so that the log of this exchange rate, X_t^{12}, is initially equal to zero). In that case, intervention keeps $X_t^1 = X_t^2$ at all times. Suppose that the foreign intervention is carried out by the monetary authority of country 1 which buys (or sells) country 2's currency and sells (or buys) country 1's currency to keep X_t^{12} fixed. (The results would be the same if country 2 carried out this intervention.)[14] In that case, equation (3) describing money market equilibrium simply determines the money supply consistent with keeping X_t^1 equal to X_t^2. In place of equation (IIIa) determining X_t^1 on the basis of country 1's behavior, I have an exogenously determined exchange rate, $X_t^1 = X_t^2 = \overline{X}^2 + u_t^{x2}$. By joining the union, country 1 has not only fixed its mark exchange rate but has effectively surrendered control over its dollar exchange rate.

Two other characteristics of this regime should be pointed out. First, I assume that the private sector is fully confident that the union is permanent in the sense that the authorities will be able to maintain the fixed exchange rate between the franc and the mark. Thus ${}_tE\, X_{t+1}^{12} = X_t^{12}$. Since I abstract from inflation and other secular trends, this assumption is not an unrealistic one. But in adopting it, I ignore some interesting problems associated with actual unions such as the European Monetary System where expectations about changes in pegs are important. Second, I ignore any changes in private behavior which the formation of the union might induce. Cooper (1976) and others have pointed out that a change in exchange rate arrangements might lead to changes in trade and financial behavior affecting the parameters of the behavioral functions. While recognizing the importance of this point, I follow previous writers in assuming that these parameters are invariant to the regime since otherwise I would need to model explicitly the microeconomic behavior of trading firms and investors.[15]

12.2 Evaluation of the Union: Domestic Disturbances

The two domestic disturbances in the model, u_t^{d1} and u_t^{m1}, need further discussion. Following Mundell (1963) and other studies of internal-external balance, I might view these factors as deliberate instruments of fiscal and

14. The choice of which country to intervene would be important if the intervention took the form of buying or selling foreign bonds (as would be the case if the foreign currency were used as a reserve currency), but here I assume a simple form of intervention with no sterilization of the intervention effects. For an analysis of different types of intervention policy, see Marston (1980).

15. One study which does take into account changes in behavior is that by Flood and Marion (1982), which allows wage indexation to vary with the regime.

monetary policy, respectively, in which case the objective naturally would be to *maximize* their impact on the economy.[16] Given the stochastic assumptions adopted in this paper, these policies would have to be unanticipated and temporary. (See Marston, [1983] for a discussion of stabilization policy in stochastic models.) I prefer to view u_t^{d1} and u_t^{m1} as economic disturbances originating in private sector behavior, however, and to regard the task of policy to *minimize* the effects of these disturbances.

To judge the desirability of an exchange rate union, I also need to specify which macroeconomic variables I am interested in stabilizing, since a union modifies the impact of disturbances on most macroeconomic variables in country 1. Although I discuss the response of other variables such as prices, I follow the traditional literature on the choice between regimes by focusing on one variable only, domestic output. More specifically, the choice between flexible rates and the exchange rate union is based on which regime minimizes the effects of economic disturbances on the variance of domestic output.[17]

Most of the analysis below follows closely that of a country choosing between fixed and flexible rates. That is because country 1's disturbances have no effect on the exchange rate between the mark and the dollar, so that in a union country 1 is affected by the disturbances just as if it had a fixed exchange rate with the dollar as well as the mark. The analysis departs from the traditional literature on fixed and flexible rates, however, in showing how wage indexation modifies the effects of monetary and aggregate demand disturbances. This will be important in the discussion of foreign disturbances to follow.

I begin by examining the effects of the disturbances in the case where there is no wage indexation in the domestic economy, then I consider the effects of indexation. For convenience, I present below the equations for domestic output and the exchange rate (equations [I] and [IIIa] of table 12.1) expressed as a function of domestic disturbances only:

$$Y_t^1 - \bar{Y}^1 = \frac{c(1 - ba_{11})}{D_1} u_t^{d1} + \frac{(g_{p2} + g_{p3} + g_r a_{11})c(1 - b)}{D_1} u_t^{x1}, \tag{4}$$

$$u_t^{x1} = X_t^1 - \bar{X}^1 = \frac{D_1}{D} u_t^{m1} - \frac{[1 + c(1 - ba_{11})]}{D} u_t^{d1}, \tag{5}$$

16. For an analysis of fiscal and monetary policies in a union context, see Allen and Kenen (1980, chaps. 15–18), who study the effects of the policies in an exchange rate union as well as in a full-fledged monetary union where there is a single central bank.

17. Following Gray (1976), we might measure domestic output relative to desired rather than expected output, where the former is defined as that output which would prevail in a frictionless economy without contract lags. As long as labor supply is inelastic, these two objectives are equivalent since desired output, like expected output, is unaffected by the disturbances.

where $D_1 = g_{p2} + g_{p3} + g_r a_{11} + c(1 - ba_{11}) > 0,$

$D = (1 + k_1)D_1 + (g_{p2} + g_{p3} + g_r a_{11} - 1)c(1 - b) > 0.$

In the exchange rate union, u_t^{x1} is equal to zero because X_t^1 is tied to the exogenously determined mark, while under flexible rates u_t^{x1} can be expressed as in equation (5) in terms of both domestic disturbances.

Consider first the effects of a monetary disturbance. A monetary disturbance has no effect on output in an exchange rate union. An expansion of the money supply, for example, leads to pressure on both franc exchange rates, but intervention in the exchange market ensures that $X_t^1 = X_t^2$ where the latter is exogenously determined. The disturbance simply results in an equal and offsetting capital flow.[18] In a flexible regime, in contrast, a monetary expansion leads to a depreciation of the franc and an increase in output, at least when there is no indexation.[19] Thus, as in the case where only one foreign country is involved (see, for example, Mundell [1963]), domestic monetary disturbances cause variations in output only under flexible rates.

An aggregate demand disturbance in country 1, in contrast, leads to greater changes in output in an exchange rate union. An increase in aggregate demand raises domestic output and prices. There is pressure on both franc exchange rates because of the incipient rise in the domestic interest rate, but once again intervention in the exchange market ensures that $X_t^1 = X_t^2$. Under flexible exchange rates, however, the increase in output leads to an appreciation of the domestic currency (X_t^1 and X_t^{12} fall) which dampens the overall increase in aggregate demand.[20] Thus there is less output variation under flexible rates.

When indexation is complete ($b = 1$), however, these familiar results break down. To understand why this is true, notice that the effect of the exchange rate on domestic output is dependent on the degree of indexation in the domestic economy. As equation (4) indicates, the effect is proportional to $c(1 - b)$, with full indexation ($b = 1$) preventing the exchange rate from affecting domestic output at all. For that reason, the difference in

18. If country 1 were not small, its dollar exchange rate could change because the monetary expansion together with the accompanying foreign exchange intervention would also significantly affect the money supply in country 2.

19. The monetary disturbance affects output only through the exchange rate, as equation (4) indicates. The exchange rate depreciates, $u_t^{x1} = X_t^1 - \bar{X}^1 > 0$, so output increases under flexible rates.

20. Under flexible rates, the direct (positive) impact of u_t^{d1} on Y_t^1 in equation (4) is modified by the decline in u_t^{x1} (which reduces Y_t^1). Output nonetheless increases even under flexible rates. In contrast, Mundell's (1961) study of fixed and flexible rates showed that output did not increase at all in response to a demand disturbance (in his study, an increase in government spending); given his assumption that exchange rate expectations were static, only a constant output was consistent with money market equilibrium. In this study, the exchange rate appreciates relative to the expected exchange rate, with the domestic interest rate rising accordingly; so output can increase despite a constant money supply.

output variation *between* the two regimes must be proportional to $c(1 - b)$. And with full indexation, each disturbance must have an identical effect on output in the two regimes. These results can be illustrated in figures 12.2 and 12.3, which show how aggregate demand and supply adjust to the disturbances when indexation is complete.

First consider the monetary disturbance. Under flexible rates, the resulting depreciation leads to an outward shift in the aggregate demand function (to point *B* in fig. 12.2) because of the sensitivity of aggregate demand to relative prices and the real interest rate. When wages are fully indexed to the general price level, however, there is a corresponding leftward shift in aggregate supply (to point *C*) because the depreciation leads to a rise in the nominal wage. The price of domestic output accordingly rises further; in fact, the price of domestic output and the exchange rate increase by the same amount, with the constant terms of trade ensuring that output remains fixed at its original level.[21] In the union, in contrast, no depreciation occurs, so the aggregate supply and demand curves remain at point *A*. With full indexation of wages, therefore, the monetary disturbance leaves output unaffected in both regimes. The two regimes differ with respect to price behavior, however, since prices increase only under flexible rates.

The aggregate demand disturbance does change real output in both regimes. In the union, the demand disturbance shifts equilibrium to point A' in figure 12.3. Under flexible rates, the increase in demand leads to an appreciation of the franc and to a smaller increase in aggregate demand than

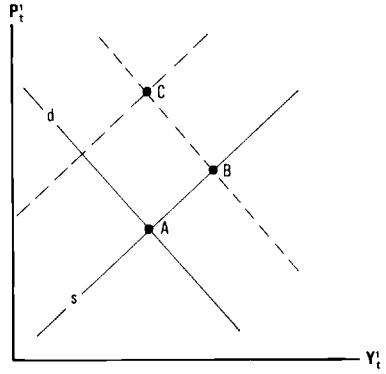

Fig. 12.2 Domestic monetary disturbance.

21. Sachs (1980) and Flood and Marion (1982) also discuss the case of full wage indexation. In the model specified by Sachs, constant terms of trade ensure that the disturbance has no net effect on aggregate demand. In the present model, aggregate demand is also a function of expectations through the real interest rate. But because the expected change in the exchange rate is equal to the expected change in the domestic price as well as in the general price level, the real interest rate also remains constant.

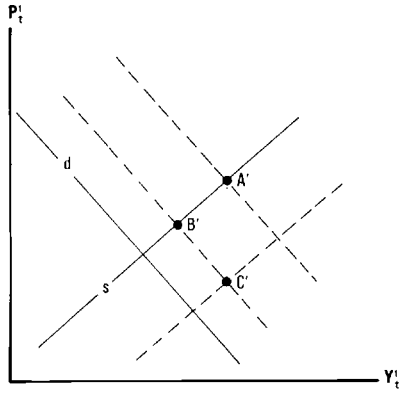

Fig. 12.3 Domestic aggregate demand disturbance

in the union (to point B'). With complete indexation of wages, however, the appreciation of the exchange rate also raises aggregate supply by lowering real wages faced by producers. Point C' is reached where the change in output is the same as in the union. Thus, as in the case of a monetary disturbance, full indexation results in the same variance of output in the two regimes. In both cases, indexation ensures that the shift in aggregate demand due to the exchange rate is matched by an offsetting shift in aggregate supply, so that the exchange rate has no net effect on domestic output.

In the absence of indexation, exchange rate flexibility is preferred in the case of the aggregate demand disturbance, but the union is preferred in the case of the monetary disturbance. The effect of wage indexation is to blur these differences, with full indexation eliminating the advantages or disadvantages of flexibility in stabilizing output.

12.3 Evaluation of the Union: Foreign Disturbances

Foreign disturbances affect the domestic economy through a variety of channels: *(a)* Changes in foreign output directly affect domestic aggregate demand (proportionally to g_{y2} and g_{y3}). *(b)* Changes in foreign prices or in the foreign terms of trade induce substitution with the domestic good (depending on the price elasticities, g_{p2} and g_{p3}). *(c)* In the union, changes in the mark price of the dollar affect aggregate demand (through those same price elasticities). *(d)* Foreign interest rates affect domestic demand indirectly by changing the franc price of the dollar under flexible rates and directly through the real interest rate effect on aggregate demand.

All of these channels are potentially important. For many disturbances, moreover, country 1's output is pushed in contrary directions. The net effect of foreign disturbances on country 1 depends upon which of these channels are most important. That, in turn, depends on the types of economic distur-

bances encountered as well as on the pattern of trade. One might expect the union to be more desirable if economic disturbances predominantly originate from outside the union and if the pattern of trade is biased so that country 1 trades primarily with country 2. Both of these propositions will be explored in the analysis below.

In order to investigate foreign economic disturbances, I need to specify models of the two foreign countries. To keep the models relatively simple, I adopt the following assumptions:

1. Countries 2 and 3 have identical economic structures. That is, the structural parameters in the aggregate supply and demand equations and in the financial equations are the same for the two countries. Thus I can specify one national model which can apply to both countries.[22] This assumption does not restrict the nature of country 1's relationships with the two foreign countries since any asymmetries in country 1's links with the foreign countries could not affect the latter given the small country assumption. More specifically, country 1 may choose to trade with one country more than the other or may be more sensitive to one country's prices or output.

2. For most of the discussion below, there is complete wage indexation in both foreign countries so that equal increases in domestic prices and exchange rates (or foreign prices) leave aggregate supply unaffected. Foreign output is then solely a function of the terms of trade. This assumption considerably simplifies the analysis of the two foreign countries, making it easier to show the channels through which foreign disturbances affect country 1. Even with the simplifying assumption, some of the effects of foreign disturbances are ambiguous, but I am able to distinguish clearly which factors are important in determining the net impact of the disturbances.

Later in this section I relax the assumption about foreign indexation to consider the opposite case of no wage indexation abroad. The contrast between the two cases is interesting, since it shows once again how wage and price adjustments affect the relative performance of different exchange rate regimes.

12.3.1 The Foreign Country Model

The model closely parallels that specified for country 1. Differences arise primarily because only two countries are involved, given the small country assumption for country 1, and because the aggregate supply equation takes a simple form when wage indexation is complete. Each national model can be expressed in three equations (where $i = 2, 3, j \neq 1$):

22. The countries' price indices, for example, are mirror images of one another; the weight of each country's own good in its price index is the same for both countries, $a_{22} = a_{33} = a$. Note that country 1's prices and output are assumed to have a negligible impact on the foreign countries; for example, a_{21} and a_{31}, the weights of country 1's good in the foreign price indices, are assumed to be negligibly small.

$$(1)' \qquad Y_t^i = g_0^f - g_p^f T_t^i + g_y^f Y_t^j - g_r^f[r_t^i - ({}_tEI_{t+1}^i - I_t^i)] + u_t^{di},$$

$$(2)' \qquad Y_t^i = c^f{}_0 + c^f(1 - a)(T_t^i - {}_{t-1}ET_t^i),$$

$$(3)' \qquad \overline{M}^i + u_t^{mi} - I_t^i = [P_t^i + Y_t^i - I_t^i] - k_1 r_t^i + k_0,$$

where $T_t^2 = T_t = P_t^2 - (P_t^3 + X_t^2)$, $T_t^3 = -T_t$, $I_t^2 = aP_t^2 + (1 - a)(P_t^3 + X_t^2)$, and $I_t^3 = aP_t^3 + (1 - a)(P_t^2 - X_t^2)$. Aggregate demand is a function of the terms of trade, T_t, foreign output, and the real interest rate as well as a disturbance term, u_t^{di}. Aggregate supply is a simple function of the terms of trade. Money demand and supply in the foreign countries are assumed to be identical in form to those of country 1.[23]

The two-country model is naturally complex, but one can analyze its behavior relatively easily by focusing on two variables, the terms of trade of country 2 and the price of country 3's good.[24] The remaining variables can then be expressed in terms of these two.

The terms of trade of country 2, defined as $T_t = P_t^2 - (P_t^3 + X_t^2)$, can be expressed as a function of the two aggregate demand disturbances, u_t^{d2} and u_t^{d3}:

$$T_t = \overline{T} + \frac{(u_t^{d3} - u_t^{d2})}{(N^1 - N^2)}$$

where $N^1 = -g_p^f - c^f(1 - a)(1 + g_y^f + g_r^f/k_1) + g_r^f(1 - a) < 0$,

$$N^2 = g_p^f + c^f(1 - a)(1 + g_y^f - g_r^f/k_1) + g_r^f a > 0.^{25}$$

A rise in aggregate demand in country 3 lowers the terms of trade (since $N^1 - N^2 < 0$), while a rise in aggregate demand in country 2 raises the terms of trade. With full indexation, monetary disturbances have no effect on the terms of trade.

The price of country 3's good is a function of the aggregate demand disturbances as well as the monetary disturbance in country 3:

$$P_t^3 = \overline{P}^3 + \frac{k_1}{g_r^f(1 + k_1)} \frac{[N^1 u_t^{d2} - N^2 u_t^{d3}]}{(N^1 - N^2)} + \frac{u_t^{m3}}{(1 + k_1)}.$$

A rise in aggregate demand in either country increases the price of country 3's good (as well as of country 2's good), while an increase in country 3's money supply also raises this price.

23. In particular, I assume that the interest elasticities of the money demand functions are the same as those in country 1. The disturbance terms, u_t^{di} and u_t^{mi}, are assumed to have mean zero and to be serially uncorrelated.

24. The price of country 2's good, alternatively, could have been singled out since the model is symmetric with respect to the two countries. Recall, however, that in country 1's model, the foreign prices were defined relative to country 3's price.

25. The real interest rate effect on aggregate demand is assumed to be small enough so that N^1 and N^2 have the signs indicated.

Output in either country is a function of the terms of trade as shown in equation (2′). Note that a rise in the terms of trade increases country 2's output (because it reduces the real wage faced by its producers) but decreases country 3's output. In fact, the increase in country 2's output and decrease in country 3's output are equal in size.

The two remaining foreign variables appearing explicitly in country 1's model, r_t^3 and X_t^2, can be expressed in terms of P_t^3, T_t, and the monetary disturbance by solving the money market equilibrium conditions:

$$r_t^3 = \bar{r}^3 + \frac{1}{k_1}[(P_t^3 - \bar{P}^3) - c^f(1 - a)(T_t - \bar{T}) - u_t^{m3}],$$

$$X_t^2 = \bar{X}^2 - \frac{1}{(1 + k_1)}\{[1 + 2c^f(1 - a)](T_t - \bar{T}) + (u_t^{m3} - u_t^{m2})\}.$$

Monetary disturbances naturally affect both nominal variables, although an equal increase in both money supplies leaves the mark price of the dollar unaffected since there are no asymmetries between the two economies. An aggregate demand disturbance affects both variables by changing the terms of trade and, in the case of the interest rate, by changing country 3's price.

12.3.2 Foreign Monetary Disturbances

This section shows exchange rate unions in their most unfavorable light. That is because flexible exchange rates are so effective in insulating the domestic economy from foreign monetary disturbances, at least when foreign wages are fully indexed. Under flexible rates, monetary disturbances originating abroad have no effect on output or prices in country 1. This is true regardless of the degree of wage indexation in country 1; what matters is that the foreign countries be fully indexed.

Consider first what I term general monetary expansions, disturbances that are perfectly correlated and of the same magnitude in the two foreign countries: $u_t^{m2} = u_t^{m3} = u_t^m > 0$. These disturbances raise the price of country 3's good (and country 2's good) by $u_t^{p3} = P_t^3 - \bar{P}^3 = u_t^m/(1 + k_1)$ but have no effect on foreign output as long as the foreign countries are fully indexed. The interest rate in country 3 (or country 2) falls by $u_t^{r3} = r_t^3 - \bar{r}^3 = -u_t^m/(1 + k_1)$, the same absolute amount by which u_t^{p3} rises.

As far as country 1 is concerned, what matters under flexible rates are the franc prices of the two foreign goods and the franc return on the dollar (or mark) security, since these are the only variables that can affect country 1's aggregate demand or supply. By consolidating price terms, I can write country 1's output as a function of these variables:

$$(6) \qquad Y_t^1 - \bar{Y}^1 = \frac{[(g_{p2} + g_{p3})c(1 - b) - g_r c(a_{12} + a_{13})]}{D_1}[u_t^{p3} + u_t^{x1}] - \frac{g_r c(1 - ba_{11})}{D_1}[u_t^{r3} - u_t^{x1}].$$

The foreign prices expressed in francs and the franc return both remain constant under flexible rates since the franc price of the dollar (and of the mark) falls by $u_t^{x1} = X_t^1 - \bar{X}^1 = -u_t^{m3}/(1 + k_1)$, thereby completely insulating country 1 from the disturbance.

Insulation also occurs with respect to any other foreign monetary disturbances under flexible rates, whether the disturbances are negatively correlated, for example, or concentrated in one of the two countries (two types of disturbances considered below). The key to this result lies in the full indexation assumption, but as noted above, it is full indexation abroad rather than in country 1 that insulates the latter.

In an exchange rate union, a monetary disturbance in country 3 still has no effect on country 1. Flexibility in the mark price of the dollar, which falls by $u_t^{x2} = -u_t^{m3}/(1 + k_1)$, simply replaces the franc price of the dollar as the insulating factor (with the franc tied to the mark).

If the monetary disturbance is in country 2, however, then in the union the fixed exchange rate with that country's currency ensures that the disturbance is transmitted to country 1. Consider first the effects of the monetary expansion on the two foreign countries. The price of country 2's good rises while its interest rate falls: $u_t^{p2} = u_t^{m2}/(1 + k_1) = -u_t^{r2}$. The mark price of the dollar rises enough so that country 3 is unaffected by the disturbance: $u_t^{x2} = u_t^{m2}/(1 + k_1)$; that is, country 3's price and interest rate as well as its output remain fixed.

In terms of the franc, country 1's currency, the prices of both foreign goods rise in the union: the franc price of country 2's good rises because its mark price rises, and the franc price of country 3's good rises because of the depreciation of the mark (and hence the franc) relative to the dollar: $u_t^{p2} = u_t^{p3} + u_t^{x1} = u_t^{m2}/(1 + k_1)$. In addition, country 1's interest rate falls. So output in country 1 rises.[26] Thus, if there is a union between countries 1 and 2, monetary disturbances originating in country 2 are transmitted to country 1.

With full indexation abroad, flexible rates have a clear advantage over the union in shielding the domestic economy from foreign monetary disturbances. Later in the paper I consider these same disturbances under the assumption of no indexation. Flexible rates will still generally be superior to the union, but country 1 will not always be insulated from the disturbances.

12.3.3 Aggregate Demand Disturbances

Demand disturbances generally do affect country 1's output under flexible exchange rates as well as in the union. How a country fares in the two

26. Country 1's interest rate falls because with a fixed rate between the franc and mark, r_t^1 must decline with r_t^2. Only if there is full wage indexation in country 1 does this purely nominal disturbance leave country 1's output unaffected in the union. (This can be shown by solving equation [6] for u_t^{m2} and simplifying.) The flexibility of wages and prices then makes up for the fixity of the exchange rate.

regimes depends on the specific form which the disturbances take. I will consider three types of demand disturbances because they all provide insight into the effects of the union:

1. Negatively correlated disturbances representing a shift in demand from the products of country 3 to those of country 2. The shift in demand affects country 1 primarily by changing the terms of trade and shifting output (and hence demand for country 1's products) from one foreign country to another. This type of disturbance serves to illustrate the importance of the pattern of trade between country 1 and the other countries.

2. Positively correlated disturbances which have the same magnitude in both countries, representing a general increase in foreign demand. Since the increase in demand is of the same magnitude in both foreign countries, Country 1 responds as if it were trading with one foreign country under flexible and fixed exchange rates, respectively.

3. An increase in demand which is concentrated in one country more than the other, a third case combining the first two to show the importance of where the disturbance occurs.

All of these disturbances have the effect of changing interest rates abroad. If the real interest rate effect on aggregate demand in country 1 is large enough, however, even a general expansion of demand abroad will have ambiguous effects on country 1's output since the resulting rise in foreign interest rates runs counter to other effects on the foreign demand expansion. To avoid this additional ambiguity, I assume in this section that the real interest rate effect in country 1 is zero ($g_r = 0$). Under this assumption, higher foreign interest rates can still have a significant effect on country 1's output, but indirectly by changing exchange rates.

Negatively Correlated Aggregate Demand Disturbances

Suppose that there is a shift in demand to country 2's products from those of country 3 with $u_t^{d2} = v_t^d$, $u_t^{d3} = -v_t^d$, $v_t^d > 0$. Then the terms of trade of country 2 rise by $u_t^T = T_t - \bar{T} = -2\, v_t^d/(N^1 - N^2) > 0$. Output rises in country 2 and falls in country 3 proportionately to the change in the terms of trade. Interest rates rise in country 2 but fall in country 3; as a result, the mark appreciates by

$$u_t^{x2} = \frac{-[2k_2c^f(1 - a) + 1]}{(1 + k_1)}\, u_t^T < 0.$$

Since the two foreign economies are identical, this shift disturbance moves each economy in equal but opposite directions.

With the two foreign countries responding symmetrically to the disturbance, the effect on country 1 clearly depends on its pattern of trade with the two countries. The expression for Y_t^1 in table 12.1 can be rewritten as a function of the terms of trade and the exchange rates in a form which shows the role of the trade pattern:

$$(7) \qquad Y_t^1 - \bar{Y}^1 = \frac{c(1 - ba_{11})}{D_1}(g_{y2} - g_{y3})c^f(1 - a)u_t^T + \frac{g_{p3}c(1 - b)}{D_1}\left(\frac{-u_t^T}{2} + u_t^{x1} - \frac{u_t^{x2}}{2}\right) + \frac{g_{p2}c(1 - b)}{D_1}\left(\frac{u_t^T}{2} + u_t^{x1} - \frac{u_t^{x2}}{2}\right).$$

As in table 12.1, this expression holds for either exchange rate regime. Under flexible rates, the franc price of the dollar is given by

$$(8) \qquad u_t^{x1} = \frac{u_t^{x2}}{2} - \frac{[1 + c(1 - ba_{11})]}{D}(g_{y2} - g_{y3})c^f(1 - a)\,u_t^T - \frac{\{(g_{p2} - g_{p3})[1 + c(1 - b)] + (a_{12} - a_{13})cb\}}{D}\frac{u_t^T}{2}.$$

In these equations, the aggregate demand coefficients, g_{yi} and g_{pi}, and price index weights, a_{1i}, all reflect the pattern of trade between country 1 and the two foreign countries.

Just what is meant by the pattern of trade in this model? I have chosen a definition based on the *share* of country 1's trade with each of the two foreign countries. The price index weight, a_{1i}, reflects the share of country 1's imports from country i expressed as a fraction of domestic expenditure. Similarly, as Appendix 2 shows, the aggregate demand coefficients, g_{yi} and g_{pi}, reflect the share of country 1's exports to country i (as well as the share of imports from country i since trade is assumed to be balanced initially) expressed as a fraction of domestic output. The income coefficients also depend on the income elasticities of demand for country 1's good in the two foreign countries, while the price coefficients also depend on export and import price elasticities. I assume that these elasticities are the same for both foreign countries so that differences in the aggregate demand coefficients solely reflect the share of trade.[27] Alternatively, I could interpret the results obtained below in terms of the elasticities themselves. Country 1 might be particularly sensitive to aggregate demand expansions in country 2, for example, not because its trade is biased toward country 2, but because country 2's demand for its product has a relatively high income or price elasticity. The reader might wish to keep this alternative interpretation in mind, although I will confine this discussion to trade shares alone.

I begin by considering the neutral case where country 1's trade is evenly balanced between country 2 and country 3, so that the output and price elasticities in equation (7) and (8) are equal, $g_{y2} = g_{y3}$ and $g_{p2} = g_{p3}$, as well as the weights in the general price index, $a_{12} = a_{13}$. In this case, the shift in demand has no effect on country 1's output under flexible rates. The

27. I assume, for example, that $h_2 = h_3$, so that g_{y2}/g_{y3} is proportional to $(EX^2/Q^1)/(EX^3/Q^1)$, where EX^i denotes the exports of country 1 to country i and Q^1 the output of country 1. (See Appendix 2.)

foreign output term in equation (7) is equal to zero. That is, the change in the terms of trade raises country 2's output and lowers country 3's output by the same amount, so the shift in demand has no direct output effect on country 1's aggregate demand. In addition, the franc appreciates by exactly one-half as much as the mark relative to the dollar: $u_t^{x1} = u_t^{x2}/2$. So the franc prices of goods from the two countries move in equal and opposite directions as follows:

$$\text{country 3's good: } u_t^{p3} + u_t^{x1} = -u_t^T/2,$$

$$\text{country 2's good: } u_t^{p3} + u_t^{x1} + u_t^T = u_t^T/2.$$

This change in relative prices also has opposing effects on aggregate demand. So country 1's output is insulated from the disturbance. The insulation occurs because country 1 can take advantage of its diversified trade pattern, with one foreign country's contraction offset by another country's expansion.[28] The advantage is not confined to demand disturbances, as we shall see below; it is the negative correlation between the foreign disturbances which is important.

Under flexible rates, as noted above, the franc appreciates relative to the dollar; with balanced trade, the franc appreciates one-half as much as the mark. (Recall that the shift in demand toward country 2's products raises country 2's interest rate and lowers country 3's interest rate by the same absolute amount.) In the union, the franc is tied to the mark, so it appreciates more than under flexible rates (i.e., twice as much). The franc prices of both foreign goods fall, so output in country 1 must fall in the union.[29]

For similar reasons, country 1 fares better under flexible rates when trade is biased toward country 3 ($g_{y3} > g_{y2}$, $g_{p3} > g_{p2}$). In that case, the direct effect of the shift in foreign output is to reduce country 1's aggregate demand since the output of its closest trading partner, country 3, drops. Since the appreciation of the franc in the union is greater than under flexible rates, country 1's output falls even further in the union than under flexible rates.[30] The greater appreciation associated with the union adds to the deflationary effects of the shift in demand.

If country 1's trade is biased toward country 2 ($g_{y2} > g_{y3}$, $g_{p2} > g_{p3}$), which may be the more likely case for a country joining a union, then the

28. If country 1 produced a variety of goods, the negative correlation between disturbances would not necessarily prevent individual industries in country 1 from expanding or contracting if they were more sensitive to one foreign country's behavior than another's.

29. In the union, the franc price of country 3's good must fall because of the appreciation of the franc. The franc price of country 2's good also falls as long as

$$\frac{u_t^T}{2} + u_t^{x1} - \frac{u_t^{x2}}{2} = -\frac{[2c^f(1-a) - k_1]}{2(1+k_1)}u_t^T$$

is negative, which it will be assuming that $c^f(1-a) > k_1/2$.

30. Note that it can be shown that country 1's output falls under flexible rates even though $u_t^{x1} - u_t^{x2}/2 > 0$ in equation (7).

direct output effect is positive. That is, the shift in output toward country 2 tends to raise country 1's output. Now a greater appreciation of the franc in the union than under flexible rates may help to stabilize country 1's output.[31] So the union may be superior to flexible rates when trade is biased toward country 2. If the price elasticities (g_{pj}'s) are large enough so that the price effects in equation (7) dominate the output effect, however, then once again the greater appreciation of the franc in the union becomes a drawback. Country 1's output then varies more in the union than under flexible rates.[32]

Positively Correlated Disturbances (General Increase in Demand)

There is no longer the same presumption in favor of flexible rates when the demand disturbance is a general one, $u_t^{d2} = u_t^{d3} = u_t^d$. Flexible rates are superior to the union only when price elasticities are high.

If demand increases (or decreases) by the same amount in both countries, there is no change in the terms of trade nor in the mark price of the dollar. Since foreign output is a function of the real wage, which is constant as long as the terms of trade remain fixed, output in both countries is constant.[33] So this demand disturbance has effects only on nominal quantities. Prices in both foreign countries rise:

$$u_t^{p3} = k_1 \frac{u_t^d}{[g_r^f(1 + k_1)]} = u_t^{p2} > 0.$$

Similarly, both rates of interest rise (proportionally to the prices): $u_t^{r3} = u_t^{p3}/k_1 = u_t^{r2}$. The change in output in country 1 can be written

$$Y_t^1 - \bar{Y}^1 = \frac{(g_{p2} + g_{p3})c(1 - b)}{D_1}(u_t^{p3} + u_t^{x1}), \tag{9}$$

where as before u_t^{x1} depends on the exchange rate regime.

In the exchange rate union, there is no change in the franc price of the dollar since the mark price of the dollar is fixed. But the rise in foreign prices increase output in country 1 with the increase proportional to the price elasticities, $g_{p2} + g_{p3}$.

Under flexible rates as well, country 1's output is increased because $u_t^{p3} + u_t^{x1} > 0$. Whether output is increased more or less under flexible rates, however, depends on whether the franc appreciates or depreciates. The franc price of the dollar can be written

31. Since the franc prices of both foreign goods fall in the union, the price effects run counter to the output effect. One may neutralize the other, thus helping to stabilize country 1's output.

32. In equation (7), the price terms increase in (absolute) value relative to the foreign output term as the price elasticities (g_{p2}, g_{p3}) increase.

33. If indexation were less than complete in the foreign countries, this type of demand disturbance would lead to increases in output as well as prices, with the relative importance of changes in output increasing as the degree of indexation fell.

$$(10) \qquad u_t^{x1} = X_t^1 - \bar{X}^1 = -\frac{(g_{p2} + g_{p3} - 1)c(1 - b)}{D} u_t^{p3}.$$

To interpret this equation, note that there are two influences on the exchange rate: higher foreign interest rates lead to a *depreciation* of the franc, while a higher domestic interest rate due to the increase in domestic transactions leads to an *appreciation*. How much the domestic interest rate increases depends on the price elasticities, g_{p2} and g_{p3}, since higher price elasticities imply greater increases in domestic output. The franc appreciates if the sum of these price elasticities exceeds unity and depreciates if the sum is less than unity:[34] $u_t^{x1} \lesseqgtr 0$ as $(g_{p2} + g_{p3}) \gtreqless 1$. If the franc appreciates, then domestic output increases less under flexible rates than in the union. A depreciation, on the other hand, causes domestic output to increase more under flexible rates. Thus in the presence of this general demand disturbance, the union increases or decreases the variation in output depending on whether $(g_{p2} + g_{p3})$ is greater or less than one.[35]

Positively Correlated Disturbances (Increase in Demand Concentrated More in One Country)

The final aggregate demand disturbance to be considered represents a modification of the general demand disturbance to allow for differences in the intensity of the disturbance between the two foreign countries. Many demand expansions or contractions are highly correlated across countries but may be concentrated more in one country than in another. Such demand disturbances can either strengthen or weaken the case for an exchange rate union depending on which country experiences the greater change in demand.

34. In the union (when u_t^{x1} is constant), the foreign interest rate rises by $u_t^{r3} = u_t^{p3}/k_1$, whereas the domestic interest rate rises by

$$u_t^{r1} = \frac{u_t^{p1} + u_t^{y1}}{k_1} = [1 + c(1 - b)(g_{p2} + g_{p3} - 1)/D_1] \frac{u_t^{p3}}{k_1}.$$

If $(g_{p2} + g_{p3}) > 1$, then the domestic interest rate rises more than the foreign interest rate; thus under flexible rates, the franc appreciates relative to the dollar and mark. But if $(g_{p2} + g_{p3}) < 1$, the franc depreciates.

35. An analogous condition would apply to a small country choosing between fixed and flexible exchange rates (i.e., where only one foreign country is involved). The above condition resembles the Marshall-Lerner condition, which requires that the sum of the elasticities of export and import demand exceed one. These elasticities, however, are those of the aggregate demand function as a whole; in fact, as Appendix 2 shows, the Marshall-Lerner condition is required in order for these elasticities to be positive. When indexation is less than complete in the two foreign countries, the effect of foreign demand disturbances depends not only on these price elasticities but also on the relative degree of indexation in the domestic and foreign countries. Marston (1982) discusses the effect of different degrees of foreign indexation on the choice between fixed and flexible exchange rates.

The analysis of this more general case, however, can draw on the first two cases, since this disturbance can be regarded as a combination of the first two. Suppose that both countries experience a demand expansion but that the expansion is greater in country 2 (or 3). Then the two disturbances take the form

$$u_t^{d2} = u_t^d \underset{(-)}{+} v_t^d,$$

$$u_t^{d3} = u_t^d \underset{(+)}{-} v_t^d,$$

where each disturbance includes a common element (u_t^d) modified by the shift term (v_t^d).[36]

The general increase in demand (represented by the u_t^d factor) raises output in country 1 under both exchange rate regimes. Under which regime output expands more depends again on the price elasticities. Suppose that $(g_{p2} + g_{p3}) = 1$, so that the general increase in demand has the same effect on output in the union as under flexible rates. Then the choice between regimes depends on which country is more subject to the demand disturbance.

Consider the case where trade is balanced between country 1 and the two foreign countries (the neutral case considered in section 12.1), but where the increase in demand is more concentrated in country 2. Then, strangely enough, country 1 is better off in the exchange rate union—tying itself to the country with greater demand disturbances. That is because changes in relative prices counter the effects of the general expansion.[37] With the disturbance more concentrated in country 2, the terms of trade of that country rise and the mark appreciates. Under flexible rates, the franc also appreciates relative to the dollar, but by less than the mark does. By joining the union, country 1 ties the franc to the mark and finds its output increasing less because of the dampening effect of the mark's appreciation.

When the increase in demand is more concentrated in country 3, in contrast, country 1 is worse off in the union. Now the mark depreciates, and the depreciation of the mark exceeds that of the franc. So joining the union further increases the effect of the disturbance on country 1's output.

Thus the net impact of this disturbance depends not only on price elasticities but also on the location of the disturbance, with output variation being smaller in the union when the disturbance is concentrated in the union country. This disturbance serves well to illustrate the pitfalls in easy generalizations about how the sources of economic disturbances affect the case for a union.

36. I assume that v_t^d is proportional to u_t^d, $v_t^d = \bar{s}\, u_t^d$, where $\bar{s}$ is a fraction less than one so that $(1 - \bar{s})\, u_t^d > 0$.

37. The demand shift, however, is assumed not to be large enough to lower country 1's output in either regime.

Summary of Results for Demand Disturbances

The form which a foreign demand disturbance takes clearly determines how desirable an exchange rate union would be. Only in the case of a demand shift between countries is there a definite presumption in favor of one regime or the other, but that presumption is in favor of flexible rates. In the second case, that of a general increase in demand, the union is superior only if price elasticities are low. In the third case, where the disturbance is concentrated more in one country than in the other, the result also depends on where the disturbance is primarily located. The final set of disturbances to be considered provides further evidence on the relative advantages of the two regimes, while clarifying the role of foreign wage indexation and trade patterns.

12.3.4 Foreign Monetary Disturbances with No Indexation Abroad

I now briefly investigate the effects of monetary disturbances when there is no wage indexation abroad. I will show that the insulation properties of the flexible regime are very sensitive to the indexation assumption. Flexible rates do not generally provide full insulation from foreign monetary disturbances if the foreign countries are less than fully indexed. But the case for flexible exchange rates still remains quite strong. I will also investigate again the importance of trade patterns. When the foreign countries are less than fully indexed, the trade pattern helps to determine the effects of monetary disturbances, but the influence of trade bias is opposite to that commonly assumed.

I begin by modifying the model of the foreign economies for the case of no wage indexation. With no indexation, the supply equations for countries 2 and 3 are changed to

$$(2'') \qquad Y_t^i = c_0^f + c^f(P_t^i - {}_{t-1}EP_t^i).$$

Since with no indexation wages are fixed throughout the contract period, output in each country is responsive to the price of that output alone. After solving the two-country model, I can express the terms of trade of country 2 and the price of country 3's output in terms of the monetary disturbances.[38]

$$u_t^T = T_t - \bar{T} = -\frac{c^f(1 + g_y^f)(u_t^{m2} - u_t^{m3})}{N^3}$$

$$u_t^{p3} = P_t^3 - \bar{P}^3 = \frac{g_r^f u_t^{m3}}{N^4} + \frac{k_1 c^f N^5}{N^3 N^4}(u_t^{m2} - u_t^{m3}),$$

38. For simplicity I have omitted aggregate demand disturbances from these expressions, since I shall consider only monetary disturbances in the analysis below.

where

$$N^3 = (1 + g_y^f)c^f k_1 + \{2g_p^f + g_r^f[a - (1 - a)]\}(1 + k_1 + c^f) > 0,^{39}$$

$$N^4 = k_1 c^f(1 - g_y^f) + g_r^f(1 + k_1 + c^f) > 0$$

$$N^5 = -(g_p^f + g_r^f a)(1 - g_y^f) + g_r^f \gtrless 0.$$

According to these equations, a generalized monetary expansion, where money supplies increase by an equal amount in the two foreign countries, has no effect on the terms of trade but raises country 3's price. A monetary expansion in country 3 alone raises its own price but improves the terms of trade of country 2 by causing an appreciation of the mark relative to the dollar. A monetary expansion in country 2 has an indeterminate effect on country 3's price but lowers country 2's terms of trade.

As in the earlier section, I can express country 3's interest rate and the mark price of the dollar in terms of P_t^3, T_t, and the disturbances:

$$u_t^{r3} = r_t^3 - \bar{r}^3 = \frac{(1 + c^f)(P_t^3 - \bar{P}^3) - u_t^{m3}}{k_1}$$

$$u_t^{x2} = X_t^2 - \bar{X}^2 = \frac{-(1 + c^f)(T_t - \bar{T}) + (u_t^{m2} - u_t^{m3})}{1 + k_1 + c^f}.$$

Monetary disturbances generally affect both variables, although as before an equal change in both money supplies has no effect on the exchange rate.

Having modified the foreign model to eliminate wage indexation, I will reexamine the relative advantages of the exchange rate union for both positively and negatively correlated monetary disturbances.

Positively Correlated Monetary Disturbances (General Increase in Demand)

If the disturbance is a general one occurring simultaneously in both countries, $u_t^{m3} = u_t^{m2} = u_t^m$, then flexible rates will not generally insulate country 1 from the disturbance when there is no wage indexation abroad. Under flexible rates, in fact, country 1's economy is pushed in two contrary directions by the disturbance. The foreign monetary disturbance raises output in both foreign countries, and so there is an increase in demand for country 1's product via this channel. But at the same time an appreciation of the franc lowers the franc prices of the two foreign goods. The lower foreign prices by themselves cause a reduction in demand for country 1's good. Because

39. I assume that N^3 and N^4 are positive. N^3 must be positive if in each country there is no bias in consumption toward the foreign good ($a \geq \frac{1}{2}$). N^4 must be positive if the cross-income elasticity, g_y^f, is less than or equal to one.

the foreign output and price effects oppose one another, country 1's output can increase or decrease under flexible rates.

By using the expression for foreign outputs and interest rates introduced above, output in country 1 can be written as a function of country 3's price and the franc price of the dollar:[40]

$$(11) \qquad Y_t^1 - \bar{Y}^1 = \frac{c(1 - ba_{11})}{D_1}(g_{y2} + g_{y3})c^f u_t^{p3} + \frac{(g_{p2} + g_{p3})c(1 - b)}{D_1}(u_t^{p3} + u_t^{x1}).$$

Because country 3's price rises (as does country 2's price), foreign output rises proportionally as reflected in the first term above. But under flexible rates, X_t^1 appreciates enough to lower the franc prices of both foreign goods:

$$(12) \qquad u_t^{x1} = X_t^1 - \bar{X}^1 = -u_t^{p3} - \frac{[(1 + c(1 - ba_{11}))(g_{y2} + g_{y3})g_r^f + k_1 D_1(1 - g_y^f)]c^f u_t^{m3}}{(D)N^4}.$$

So the second term in (11) above, representing the effect of changes in the franc prices of the foreign goods, is negative. Country 1's output rises or falls depending primarily on the sensitivity of aggregate demand to foreign output, on the one hand, and to prices, on the other.

In the exchange rate union, this same monetary disturbance unambiguously raises country 1's output. With the franc exchange rate tied to the mark and the mark-dollar rate constant, the franc prices of both foreign goods rise along with P_t^3 and P_t^2. As a result of higher foreign output and prices, the demand for country 1's good increases, as does its output.

With price effects countering foreign output effects only under flexible rates, the advantage of exchange rate flexibility is evident in the case of this disturbance. Although full insulation only occurs in a razor's edge case where foreign output and price effects exactly offset one another, country 1's output generally changes less under flexible rates than in the union. Only at extreme parameter values does the appreciation of the franc become too much of a good thing, increasing the variance of output beyond that found in the union.[41]

40. In this expression and others later in the section, the real interest rate effect on country 1's aggregate demand is assumed to be equal to zero ($g_r = 0$). None of the results would be changed if this assumption were relaxed.

41. What is required is for country 1's aggregate demand to be highly sensitive to relative prices, but even with high price sensitivity flexible rates are superior as long as the change in the foreign interest rate, and hence the change in the franc exchange rate, is not unusually large. For further discussion of this question (in the context of fixed vs. flexible rates), see Marston (1982).

Negatively Correlated Monetary Disturbances

As in the case of an aggregate demand disturbance, flexible exchange rates are advantageous if monetary disturbances are negatively correlated, at least when trade is balanced. Country 1 can then benefit from the opposite movements in output and prices in the two foreign countries. The argument follows the same lines as that in the earlier discussion. If the disturbance takes the form of an increase in country 2's money supply and decrease in country 3's money supply, output rises in the former and falls in the latter. The terms of trade of country 2 fall while the mark price of the dollar rises, with prices in the two foreign countries moving in opposite directions.[42]

The effect on country 1's output can be most easily understood by writing equation (I) in table 12.1 in terms of the prices and exchange rates as follows:

$$(13) \qquad Y_t^1 - \bar{Y}^1 = \frac{c(1 - ba_{11})}{D_1}(g_{y2} - g_{y3})c^f(-u_t^{p3}) + \frac{g_{p2}\, c(1 - b)}{D_1}(u_t^T/2 + u_t^{x1} - u_t^{x2}/2) + \frac{g_{p3}\, C(1 - b)}{D_1}(-u_t^T/2 + u_t^{x1} - u_t^{x2}/2).$$

The first term in (13) represents the effects of changes in foreign output (which are proportional to u_t^{p3}), while the last two terms reflect the effects of changes in the franc prices of the two foreign goods:

$$\text{country 2's good: } u_t^{p3} + u_t^{x1} + u_t^T = u_t^T/2 + u_t^{x1} - u_t^{x2}/2,$$

$$\text{country 3's good: } u_t^{p3} + u_t^{x1} = -u_t^T/2 + u_t^{x1} - u_t^{x2}/2.$$

If country 1's trade is balanced between the two foreign countries, the change in foreign outputs has no net effect on country 1's output (since $g_{y2} = g_{y3}$ in the first term above). As far as price effects are concerned, the franc price of the dollar depreciates by exactly one-half of the depreciation of the mark relative to the dollar: $u_t^{x1} = u_t^{x2}/2$. As a result, the franc prices of the two foreign goods move by the same absolute amount but in opposite directions, so there is no net effect through changes in relative prices. Country 1's output is completely insulated from the disturbance. In the union, in

42. Prices and outputs in the two foreign countries will be negatively correlated for many other types of monetary disturbances as well. A monetary expansion in one of the foreign countries, for example, leads to a fall in price and output in the other country (for the case of high price elasticities, at least) because of the appreciation of the latter country's exchange rate. The effects of this disturbance on country 1 are more complicated to analyze than the effects of a negatively correlated disturbance because movements in foreign output are generally not symmetric.

contrast, the franc depreciates as much as the mark, so country 1's output rises.[43]

Biases in trade patterns produce surprising results, however. It is trade biased toward country 3 rather than country 2 that provides a case for the union. The reason lies in the relative movement of the franc in the two regimes. If trade is biased toward country 2, the direct effect of the shift in foreign output is to raise demand for country 1's good. By tying the franc to the mark in a union, the demand for country 1's good is affected by a larger depreciation than in the flexible regime, thus raising country 1's output even further. As in the case of balanced trade, therefore, country 1's output varies more in the union than under flexible rates.

If trade is biased toward country 3, however, the shift in foreign output lowers demand for country 1's good, so a larger depreciation may help to stabilize output. The effect of the disturbance on country 1's output may be smaller in the union than in the flexible regime, depending on the relative magnitudes of the output and price effects. In the union, in fact, domestic output can actually remain constant in the face of this disturbance with the effect of the shift in foreign output being neutralized by the depreciation of the franc relative to the dollar.[44] Thus trade biased toward the rest of the world rather than the union country provides the best case for the union.

12.4 Conclusion

This paper has shown how an exchange rate union would affect a country subject to monetary and aggregate demand disturbances originating at home or abroad. How much difference a union makes depends first of all on domestic wage behavior. Any disturbance has an identical effect on output in the home country under flexible rates or in an exchange rate union if wages are fully indexed to the general price level. Short of full indexation, the case for a union is stronger if monetary disturbances originate at home rather than abroad and weaker if domestic demand disturbances are important. But the advantage of one regime over another diminishes the closer is the country to full indexation.

As far as foreign disturbances are concerned, the form which those disturbances take is crucial. When the disturbances are perfectly correlated general disturbances, the choice between a union and flexible rates is based on

43. In the union, the franc prices of both foreign goods rise. In the case of country 2's good, the franc price rises despite the fall in the terms of trade since $u_t^T/2 + u_t^{x1} - u_t^{x2}/2 = (u_t^T + u_t^{x2})/2 > 0$.

44. In the union the franc prices of both foreign goods always rise, thus tending to raise country 1's output. Only when trade is biased toward country 3 does the foreign output effect run counter to this price effect (since then $(g_{y2} - g_{y3}) < 0$). For some parameter values, $Y_t^1 - \bar{Y}^1 = 0$ in equation (13), so that country 1's output is completely insulated from the disturbance.

the same criteria as the choice between fixed and flexible rates. Other forms of disturbances, however, introduce some of the complexities involved in trading with two or more regions. Among the most important is the correlation pattern itself. The domestic country generally benefits from having foreign disturbances less than perfectly correlated. Indeed, a country may be completely insulated from negatively correlated disturbances under flexible rates, depending on the pattern of trade, even though it might not be insulated from monetary or aggregate demand disturbances when they are perfectly correlated between countries. The key to the insulation lies in the movement of the exchange rate; if the exchange rate is fixed to one of the two foreign currencies, the advantage of the negative correlation is lost. Second, for most disturbances, the pattern of trade is important because it determines how the outputs and prices of different foreign countries affect the domestic economy. But patterns of trade biased toward the rest of the world rather than the union partner strengthen the case for a union, at least in the presence of foreign monetary disturbances. Third, the sources of disturbances are important, although as the last demand disturbance illustrated, sometimes it is best for the disturbances to originate in the union partner rather than the rest of the world.

The effects of an exchange rate union are no doubt complex, and factors which we might think would strengthen the case for a union may sometimes weaken it. As a result, it is difficult to build a case in favor of joining a union. On the other hand, the analysis above provides no overwhelming case for flexible rates either. To choose between the two regimes, empirical evidence is indispensable—evidence on structural behavior, the sources and types of economic disturbances, and other factors emphasized in this paper.

Appendix 1: List of Variables

All variables are in logarithms except interest rates. The innovations in some variables are included in parentheses.

$Y_t^i(u_t^{yi})$ = output in country i,
$P_t^i(u_t^{pi})$ = price of country i's output,
$T_t(u_t^T)$ = terms of trade of country 2, $P_t^2 - (P_t^3 + X_t^2)$,
$X_t^i(u_t^{xi})$ = exchange rate (see figure 12.1),
$r_t^i(u_t^{ri})$ = interest rate of country i,
I_t^i = general price level in country i,
${}_tEJ_{t+1}$ = expected value of a variable at $t + 1$, J_{t+1}, based on information available at t,
L_t^i = units of labor of country i,

W_t^i = nominal wage of country i,
$W_t^{i\prime}$ = nominal contract wage of country i,
M_t^i = money supply of country i,
u_t^{mi}, u_t^{di} = monetary, aggregate demand disturbances of country i,
u_t^m, u_t^d = perfectly correlated foreign monetary, aggregate demand disturbances,
v_t^m, v_t^d = negatively correlated foreign monetary, aggregate demand disturbances.

Appendix 2: The Aggregate Demand Function

The foreign output and price coefficients in the aggregate demand equation play a major role in the analysis of foreign disturbances. This Appendix derives the aggregate demand equation from a more traditional equation (in level form) and interprets the output and price coefficients in terms of this more traditional model.

I begin with an expression relating output to expenditure, exports, and imports:

$$(A1) \qquad Q^1 = C^1(Q)^1 + EX^2(Q^2, R) + EX^3(Q^3, R) - R\,IM^2(Q^1, R) - R\,IM^3(Q^1, R).$$

All variables are expressed in level form with the time subscripts omitted. Q^i and C^i are domestic output and expenditure in country i, respectively, while EX^i is the demand for exports of country 1 by country i and IM^i is the demand for imports from country i by country 1. To simplify the analysis, I assume that there are no changes in the terms of trade between the two foreign countries and that the dollar prices of the two foreign goods are initially equal. Thus R can represent the terms of trade between either foreign country and country 1. I also assume that trade is initially balanced with each foreign country so that $EX^i = RIM^i$, and that R is initially equal to one.

Define the following elasticities, where the partial derivative with respect to the first (second) argument of a function has the subscript 1 (2):

h_i = income elasticity of foreign demand for country 1's good,

$= EX_1^i(Q^i/EX^i)$,

n_{fi} = price elasticity of foreign demand for country 1's good,

$= EX_2^i(R/EX^i)$,

n^i = price elasticity of domestic demand for country i's good,

$= -IM_2^i(R/IM^i)$.

Also, define d equal to the sum of the marginal propensities to save and to import by country $1 = (1 - C_1^1) + IM_1^2 + IM_1^3 > 0$. Then equation (A1) can be written in terms of percentage changes as follows:

$$\text{(A1')} \qquad \frac{dQ^1}{Q^1} = \frac{1}{d}\left[h_2\frac{EX^2}{Q^1}\left(\frac{dQ^2}{Q^2}\right) + h_3\frac{EX^3}{Q^1}\left(\frac{dQ^3}{Q^3}\right) + (n_{f2} + n_2 - 1)\frac{EX^2}{Q^1}\left(\frac{dR}{R}\right) + (n_{f3} + n_3 - 1)\frac{EX^3}{Q^1}\left(\frac{dR}{R}\right)\right].$$

Thus the coefficients of the aggregate demand equation in the text, which is expressed in logarithms, can be written

$$g_{yi} = h_i\left(\frac{EX^i}{Q^1}\right)/d,$$

$$g_{pi} = (n_{fi} + n_i - 1)\left(\frac{EX^i}{Q^1}\right)/d.^{45}$$

The relative sizes of the g_{yi} coefficients depend on the income elasticities in the two foreign countries (h_i) as well as the share of exports to country i as a fraction of total domestic output. The relative sizes of the g_{pi} coefficients depend on the underlying price elasticities as well as the share of exports. The Marshall-Lerner condition for the trade balance between country 1 and country i is $n_{fi} + n_i - 1 > 1$, a condition which is necessary for g_{pi} to be positive.

Comment

Peter B. Kenen

The fundamental problem with which Marston is concerned, the choice of exchange rate regime for a small economy, is one that has been studied frequently. In too many cases, however, the models used to analyze it have been excessively simple. In some models, for example, purchasing power parity deprives the real exchange rate of any role in the adjustment process; in consequence, a flexible exchange rate cannot insulate domestic output from shifts of foreign demand and other real shocks coming from abroad. In many models, the outside world is represented by a single foreign country, and the choice between a fixed and a flexible exchange rate is necessarily posed in all-or-nothing terms; a fixed exchange rate internalizes all external disturbances. Finally, most papers on this subject examine the effects

45. In cases where the terms of trade change between countries 2 and 3, there are additional cross effects of changes in the prices of goods in the third country which further complicate the expression for g_{pi}.

of one or two disturbances; one wonders whether the conclusions would stand up to the inclusion of additional disturbances.

Marston's paper is much better than most others in all three of these dimensions. His treatment of goods markets is more general, because it allows the real exchange rate to change. His framework is more realistic, because the country under study trades with two other countries, and an exchange rate union with one of those countries does not internalize all foreign disturbances. His treatment of disturbances is more comprehensive, because there are so many of them. If Marston's results are a bit bewildering, even after he has introduced a number of simplifications, he should be congratulated rather than criticized. The real world is bewildering too.

This is an important paper, and the critical comments made below do not diminish it in any major way. They should be regarded as proposals for more work rather than objections to the work that Marston has reported. My comments fall into three groups. I begin with two comments on the structure of the model. I turn next to the way that Marston has made his comparisons. I conclude with comments on the objective function he uses to assess fixed and flexible exchange rates.

I find it a bit difficult to understand Marston's labor market. If I interpret his equations correctly, his contract wage is set so that the corresponding real wage will clear the labor market. (The contract wage divided by the expected price of the domestic product is equal to the marginal product of labor at full employment output.) Furthermore, the supply of labor is inelastic. It does not depend on either of the two real wages—the one defined by the price of the domestic product or the one defined by the price index. Nevertheless, there is wage indexation, and it takes a strange form. The contract wage is raised or lowered by some fraction of the *error* made in forecasting the price index. If the price index and the forecast of that index do not affect the contract wage, why should the error made in forecasting the index be allowed to influence the actual wage? There may be nothing fundamentally wrong with this specification. But it puzzles me.

Marston's goods markets give the real exchange rate an important role. Home and foreign goods are not perfect substitutes. His assets markets are very much more primitive. Home and foreign bonds *are* perfect substitutes. This assumption makes Marston's model much more manageable but renders his analysis somewhat less interesting. On the one hand, it deprives monetary policy of any influence on aggregate demand, apart from the influence it exercises by way of its effect on the nominal exchange rate and therefore the real rate. On the other hand, it may be responsible for one of Marston's strong results—that a flexible exchange rate can afford full and instantaneous insulation from certain external disturbances.

To illustrate my problem with the way Marston uses his model to study the effects of fixed and flexible exchange rates, I will concentrate on his treatment of domestic disturbances, summarized by his equations (4) and

(5). The effects of these disturbances are clearcut, compared to others, and least dependent on the trade pattern.

When indexation is incomplete, a random increase in domestic demand raises real output, and the increase is larger when the exchange rate is fixed than when it is flexible (because the domestic currency cannot appreciate to dampen the impact of the disturbance). Score 5 points, then, against an exchange rate union. But a random increase in the money supply has no effect on real output when the exchange rate is fixed and increases real output when the rate is flexible. Score 5 points in favor of an exchange rate union.

Is this the right way to keep score? If changes in the money stock are completely random, as in Marston's paper, it may be satisfactory. But there is another way of coming at the problem. Let us give the central bank extraordinary insight. Let it be able to identify immediately the random fluctuations in domestic demand and introduce offsetting fluctuations in the money supply to neutralize their influence on real output. It can do so in principle with a flexible exchange rate. It has merely to set the left-hand side of equation (4) at zero, solve for the exchange rate change that offsets the random change in domestic demand, and insert that change into equation (5) to calculate the change in the money supply that will produce the requisite change in the exchange rate. In other words, it can conduct a managed float to stabilize domestic output. We have therefore to score 10 points against a union. The first 5 are those it lost because fluctuations in domestic demand lead to larger output changes when no one does anything about them. The next 5 are lost because the union emasculates monetary policy.

With full indexation, my objection disappears. The exchange rate term drops out of equation (4), because indexation pegs the real rate, and there is no link between the money stock and real output. In Marston's terms, the central bank is rendered harmless. In my terms, it is rendered helpless. It cannot conduct a managed float to stabilize domestic output.

This illustration raises two broad questions. First, when we compare exchange rate regimes, how should we weigh their impact on economic policies? Do we want to minimize the damage that policies can do when conducted badly or maximize the contribution they can make when conducted well? Second, how should we approach institutional arrangements such as indexation? Should they be regarded as immutable features of the economy, or should we stress the need to change them? (When Marston gave his paper at Bellagio, in January 1982, he and I would probably have said that indexation is pernicious but immutable, and we would therefore have said that exchange rate arrangements must be built around it. This version of my comment was drafted in July 1982, and events in the interim have led me to change my mind. Indexation has been attacked successfully in one of its strongholds, Belgium, and is under attack in another, Italy.)

I have one other problem with the way that Marston treats wage indexa-

tion. In most of his paper, he assumes that indexation is complete in the two foreign countries. Having tried to work my way through certain disturbances without making this assumption, I know why he adopts it. Does it make sense, however, to assume that indexation is complete in the foreign countries but incomplete in the small country? This asymmetry is not crucial for some of Marston's main results. It is crucial for others. (I was at first tempted to ridicule this asymmetry by asking a rhetorical question. Would Germany, where wage rates are not indexed, want to join a union with countries whose wage rates *are* completely indexed? But Germany belongs to a union in which indexation is widespread! Marston may have taken the right tack after all.)

My final comment has to do with the objective function implicit in Marston's comparison between fixed and flexible exchange rates. They are compared exclusively in terms of their effects on the volatility of real output. At several important points in his paper, however, Marston notes that they have different effects on prices—on the domestic product price and on the price index. A comprehensive comparison between them, then, should examine their effects on prices as well as their effects on real output. There is, of course, a problem here. When two arguments appear in the objective function, we have to give them weights, and those weights will affect the comparison between exchange rate regimes. But when we look at one argument without looking at the other, we are likewise using weights and failing to confront the choice that we have made.

Marston has constructed an interesting model and used it to produce important results. What more can he do with it?

If I were writing one more paper based on this model, I would adopt two of the suggestions in this comment. First, I would take the "optimistic" view of monetary policy, asking what it can do to stabilize output under alternative exchange rate arrangements rather than asking how those arrangements can minimize its nuisance value. Returning to my earlier illustration, I would use equations (4) and (5) to endogenize monetary policy. Second, I would try to remove the worrisome asymmetry between degrees of indexation, even if this made the analysis more difficult.

If I were amending the model itself, I would introduce imperfect substitutability between home and foreign bonds. Monetary policy would be effective under a fixed exchange rate, if only in the short run, and a flexible exchange rate would not confer full insulation, except in the long run.

I have one more suggestion. It would be interesting to introduce a nontraded good, to assign to monetary policy the task of stabilizing total employment in the face of random shocks, and to look at the effects of fixed and flexible exchange rates on employment in each sector (i.e., on the allocation of the labor force). Critics of current exchange rate arrangements seem to be worrying about this sort of problem. Individual industries and

regions, they say, are affected seriously by the short-term changes in real exchange rates brought about by macroeconomic policies and shocks. These sectoral effects may bear some blame for the recrudescence of protectionist pressures and for dissatisfaction with exchange rate flexibility.

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