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THE MONETARY APPROACH TO INFLATION AND THE BALANCE OF PAYMENTS: THEORETICAL AND EMPIRICAL CONTRIBUTIONS AT THE LEUVEN CONFERENCE

By

Allan H. Meltzer *

The problem of world inflation and the desire to compare our theories of inflation in open economies with the accumulating evidence prompted the sponsors to organize a conference on Bank Credit, Money and Inflation at the Katholieke Universiteit Leuven in September 1974. The papers and comments in this volume are the contributions of the conference and its principal work.

Most of the papers fall within the very broad framework known as the monetary approach to the balance of payments and inflation. The distinguishing characteristic of this approach is not a particular analytical structure or model but a set of general principles guiding research. Two principles appear to be generally and perhaps universally accepted by those who use the framework. Both are long-run propositions.

*) I owe more than my usual debt to Karl Brunner. The paper benefited from many helpful discussions with Michele Fratianni, Michael Hamburger, Hai Hong, Pieter Korteweg and Johan Myhrman and the financial support of the National Science Foundation.

In a long-run, steady state, all goods must trade at the same price, and all assets must have the same return. These propositions about prices and interest rates, properly understood, are the standard fare of monetary economics. Their truth values are neither greater nor less than the proposition that tastes, productivity, opportunities, endowments and given distribution of wealth determine relative prices, and the quantity of money determines the absolute price level. The novelty, if the novelty has not worn off in two hundred years, of the monetary approach to the balance of payments lies in the concept of a world level of absolute prices and the application of relative price theory to explain the price levels of individual countries and equilibrium exchange rates.

The monetary approach to the balance of payments and inflation is more explicit about the long-run consequences of policies or decisions than about the mechanisms of short-run adjustment or the adjustments themselves. Alternative theories of short-run adjustment are consistent with the long-run proposition that the quantity of world money determines the world price level. Dornbusch (1973), Johnson (1972), Mussa (1974), Swoboda (1974).

Many attempts to contrast the monetary approach to the Keynesian emphasis on foreign trade multipliers fail to distinguish the two theories sufficiently. The usual statement of the monetary approach says nothing about the trade balance or about changes in the terms of trade. Keynesian multiplier theory is best understood as an explanation of the short-run response of the trade balance to autonomous spending. The price level in each country is fixed. It is difficult, therefore, to treat the multiplier theory as a theory of

the balance of payments or as a theory of inflation, and the pristine form is no longer advanced for either purpose. The international version of the Keynesian model, like the domestic counterpart, has survived, however, by adding some "cost-push" elements to make prices rise and a Phillips curve to keep them rising. Inflation is transmitted by the balance of payments mainly through the price of imports used to produce exports or as substitutes for consumption of domestically produced goods and services.

The appeal of this version of the Keynesian theory to politicians and central bankers should be obvious. In an extreme, but common, version, all inflation is imported from abroad, and none is the result of domestic policies. The appeal to the economists at the conference was much less. None of the authors attempted to explain world inflation in this way. T. Willett and R. Sweeney raise and comment on some of these issues in their lengthy survey, and M. Parkin and M. Gray attempt to develop a model that is capable of discriminating among rival explanations.

There are three principal explanations of inflation in open economies, Keynesian or neo-Keynesian, institutionalist and monetarist. Each is incomplete.

The neo-Keynesian theory explains inflation in each country by referring to events in other countries. The inflationary impulse comes from abroad. Propagation occurs through some built-in mechanism that is best described as a general cost-push or Phillips-type relation. The so-called Nordic model is an example. Everyone imports inflation, and possibly everyone exports infla-

tion to a lesser extent. Why does world inflation start or end? Why does the rate of inflation increase or decrease? The neo-Keynesians have not produced an answer and generally do not ask such questions.

The institutionalist approach is more in the nature of a description than of a set of testable propositions. Confusion between particular prices and the general price level is one of the few unifying characteristics. The third approach is the monetary approach. Much credit is due to Harry G. Johnson (1958) and Robert Mundell (1968) for reaffirming the monetary approach and stimulating interest in the analysis of inflation in open economies. Wide acceptance is now given to the proposition that the world economy is a closed economy, a proposition that Johnson and later Mundell advanced with much vigor. There is also renewed, widespread acceptance of the ancient proposition that, with fixed exchange rates, countries cannot continually inflate at different rates.

It is both a useful analytical device and, I believe, a reliable basis for policy to assert that in the long-run prices of all goods and assets, financial and real, are equalized. Evidence to support the proposition for short periods is lacking and seems unlikely to be found in observations for prices of assets and output drawn monthly, quarterly and even annually. Moreover, it is difficult to reconcile the existence of non-traded goods -- the device commonly used to explain observed differences in output prices -- with the neglect of "non-traded assets". Why are all rates of interest everywhere equal when prices of goods are not? What mechanism assures that deviations from the single, world rate of interest are

always negligible and that domestic bonds are perfect substitutes not only for domestic capital but for foreign bonds and foreign capital? These questions merit attention and seem particularly relevant to a world with multiple currencies and independent, autonomous budget policies.

Insistence on the high degree of truth in the monetary theory of the balance of payments must not be confused with the particular forms in which the analysis has been cast, for example by Mundell (1968). Most papers at the conference did not make this error. Some compared the predictions of the Mundell versions of the monetary approach with the accumulating evidence on world inflation or the evidence from the Belgian experience with a two-tier market in foreign exchange. Others extended the monetary analysis of inflation in open economies to a world with multiple assets by developing the relation between money, bank credit or earning assets and the markets for debt at home and abroad. Still others tested open economy models on new sets of data.

In the remainder of the paper, I use Mundell's general approach as an organizing device. The following sections present the theory, discuss some shortcomings and offer an extension to permit analysis of a world with multiple currencies. A principal difference between a multi-currency world and a world with a single international money is that individuals adjust portfolios by selling one currency for another. A principal difference between the world of Bretton Woods and the world of the classical gold standard is that countries pursue independent fiscal policies.

Below, I analyze fiscal policy in a model that retains as much of the structure of the Mundell model as is possible. Fiscal policy is destabilizing in this simple model. There appears to be an inconsistency between fixed exchange rates and independent fiscal policies.[1a)] Either countries adjust their fiscal policies, or fixed exchange rates are unstable. Moreover, I am able to give an interpretation of the "small country" assumption commonly made in analyses of this kind.

The Leuven Conference gave considerably more attention to empirical findings than is customary at meetings of this kind. My summary discusses extensions of the theory and some of the evidence presented at the Conference, and offers some interpretations of the relation of the evidence to the theory.

1. The Mundellian Theory

Mundell's analysis of the balance of payments is not a single, uniform theory of the relation between money, output, prices, exchange rates, interest rates and the balance of payments. There are a number of models containing changing subsets of the variables mentioned. McKinnon and Oates (1966) add wealth to the list without altering the basic procedures.[1)]

1a) This conclusion is reinforced by two recent papers. Fratianni (1976) explores the relation between fiscal policy and external forces. Alphandery (1975) reconsiders the relation between fiscal policy and the balance of payments in the context of the assignment problem.
1) See the survey by Willett and Sweeney in this volume and the more direct comparison of various models in the survey by Mahrman (1974). Brunner and Meltzer (1974) develop a model that includes stocks, flows, prices and interest rates. See also Fratianni (1976).

A common feature of most of the analysis is the "small" country assumption: the home country must sell or buy at world market prices and borrow or lend at world market interest rates. In some versions, fixed prices and interest rates are postulates. Prices or interest rates are invariant, and quantities adjust. Other versions assume ever-full employment. Output is fixed, but prices adjust to maintain world equilibrium. I have chosen to work with a version in which prices and interest rates are variable, and output is fixed. This version seems more useful than others for discussing the roles of money and credit markets in inflation that was the theme of the conference.[2)]

There are four markets. The assumption of full use of resources and fixed real output means that the labor market is always in equilibrium. Walras' law is invoked to eliminate analysis of the securities market. If the remaining markets for output and money are in equilibrium, the securities market and the economy are in full equilibrium.

Three equilibrium conditions summarize the balance of payments, the output and money markets and their interrelations. I have written the equilibrium conditions as three excess supply or excess

2) The model in Mundell (1968, Chapter 11) is my starting point. This choice was criticized by some participants who suggested that the model in Mundell (1968), Chapter 18, was more appropriate. The latter permits real output to change, but prices are fixed because the problem considered is the effects of monetary and fiscal policies on employment in open economies operating with idle resources. The model seems wholly inadequate for an analysis of inflation. Since a choice must be made in the Mundell analysis, fixed output seems least undesirable. Below, I adjust the model of Chapter 11 to eliminate some of the more peculiar features.

demand equations.

(1) $X = E + B - Y = 0$ for the output market;

(2) $F = B - T = 0$ for the foreign exchange market;

(3) $M = M^s - M^d = 0$ for the money market;

(4) $M^s = R + D$ is the stock of money.

Variables are defined as follows:

- B = the balance of trade
- D = the stock of domestic debt at the central bank, a policy variable
- E = expenditure
- F = the excess supply of foreign exchange
- M = the excess supply of money
- M^d = the demand for money
- M^s = the stock of money
- R = the stock of foreign reserves at the central bank
- T = the net flow of securities to and from the rest of the world
- X = the excess demand for goods
- Y = current output

Three equations describe the adjustment of the economy under fixed exchange rates.

(5) $X = X(r, p; e)$ $X_1, X_2 < 0$

(6) $F = F(r, p; e)$ $F_2 < 0 < F_1$

(7) $M^d = L(r, p; e)$ $L_1 < 0 < L_2$

where p is the domestic price level, proximately determined on the output market;

r is the market rate of interest, proximately determined on the foreign exchange market; and

e is the exchange rate assumed to be fixed.

In a regime of fixed exchange rates, eqs. (5) and (6) determine p and r. Eq. (7) then has no independent role. Once p and r are determined, the demand for money is determined. Substituting eqs. (4) and (7) into eq. (3) brings out a main implication of the monetary approach to the balance of payments.

(8) $R + D = L(r, p; e)$

Any change in D necessarily results in an equal and opposite change in R. The central bank or government has only one degree of freedom. Within the limits imposed by existing stocks and a rigid commitment to fixed exchange rates, the government can determine the composition of the monetary base. I call this proposition Ricardo's law.

A simple adjustment yields a common interpretation. If interest rates are determined in the world market, r is a given to which the home country must adjust. One equation must be eliminated. Equation (6) is usually choosen, and if this is done, $F = \frac{dR}{dt}$, and p is determined, as before, in the output market. Equilibrium in the money market, $M^d = M^s$, now implies that $\frac{dR}{dt} = -\frac{dD}{dt}$. This is a strong implication that is unlikely to hold in many economies and

fortunately so. The central bank continuously offsets changes in D and R without any feedback.

Johnson (1972) has a similar interpretation. He chooses to retain the demand for money (as a function of income). If we make explicit that, in equilibrium with fixed exchange rates,

$$p = p^{\star}e$$

where $p^{\star}$ is the price level in the rest of the world and real income is determined by productivity and real resources, all that remains is Ricardo's law. [3] All price changes and inflation are imported.[4]

3) We can write Johnson's (1972) system as

$$E(r,y) - y = -B(y,y^{\star})$$
$$B = F$$
$$F = \frac{dR}{dt}$$

with $y^{\star}$ the real income in the rest of the world. Ricardo's law is unaffected. In this version, the model is similar to Mundell's Chapter 18, and the frequent objection that Johnson's version is more "monetarist" than Mundellian vanishes. Adding, $L(r,y) = \frac{M^D}{p}$ does not change any result but is necessary to assure that the money stock is constant at full employment.

4) Analysis of stability conditions is unnecessary to show the conditions under which Mundell's fixed exchange rate system is stable. There are always policies at home and abroad that maintain fixed exchange rates. If all countries maintain the domestic source component unchanged -- accept the gold or single currency standard -- exchange rates are stable. If any country changes the domestic source component, it loses reserves to the others. Sufficiently large changes in either direction either force devaluation or revaluation somewhere in the world or require offsetting changes in the domestic source components of other countries. If all countries are "small", all adjustments are made at "home" if this model is correct.

2. Some Extensions of the Theory

Ricardo's law is an important long-run implication, and insistence on the proposition is a contribution to policy discussions because the proposition was overlooked for a long time. The main shortcomings of Mundell's approach, however, are the neglect of short-run positions and his neglect of stock-flow interaction. In this section, I retain his "small country" assumption, add some content, and expand the analysis to permit changes in the demand for money.

In Mundell's system, the demand function for money has no independent role. Stocks are adjusted by flows, and all flows are willingly accumulated. A decision by the citizens of a country or the central bank to shift from one reserve money to another can be implemented only, if at all, by allowing balance of payments flows to adjust the stock of reserves. An essential difference between the multi-currency world, that emerged under the Bretton Woods agreement, and the gold standard is overlooked or neglected.

A second problem is Mundell's postulated adjustment process. The adjustment of interest rates depends on the flow excess supply of foreign exchange and generally is independent of the existing stock of reserves and assets. This peculiar feature has been noted by others. McKinnon and Oates (1966), Branson (1968), Myhrman (1974). Mundell writes (1968, p. 171)

$$\frac{dp}{dt} = k_1 X(p, r)$$

$$\frac{dr}{dt} = -k_2 F(p, r)$$

where the k's are speeds of adjustment.[5)]

To partly correct for the neglect of asset positions, let the stock of reserves, R, enter the excess demand functions. The system now determines R, r, and p for given value of D and e. The total stock of assets includes money, domestic securities owned by domestic residents and foreign securities owned by domestic residents. Bonds and capital are perfect substitutes, as in Keynes-Metzler models, and the flow supply of foreign bonds is perfectly elastic at the world rate of interest, r^*. Individuals may reduce money holdings to purchase foreign securities. Let $\frac{dL}{dt}$ be the change in the demand for money per unit time. The accumulation or loss of reserves is

$$\frac{dR}{dt} = F(R, r, p) - \frac{dL}{dt}(R, r, p).$$

These definitions and postulates, the assumption of full employment, and Walras' law permit us to write adjustment equations for a modified version of the Mundellian theory. With obvious changes to incorporate the stock of reserves in eqs. (1) to (8) as required, the motion of the system is determined by eqs. (9) to (11). Domestic debt held by the central bank, and actual and anticipated exchange rates remain fixed by assumption. The constants, k_i, are speeds of adjustment.

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5) I am not clear how one reconciles $k_i \neq 0$ with the other features of the model, notably the absence of wealth transfers and the assumption that prices and interest rates are the same everywhere. With prices and interest rates everywhere "the same", why is adjustment slower than instantaneous?

(9) $\frac{dR}{dt} = -k_1 M(R, r, p) \quad M_R, M_r > 0 > M_p$

(10) $\frac{dr}{dt} = -k_2 F(R, r, p) \quad F_r > 0 > F_R, F_p$

(11) $\frac{dp}{dt} = k_3 X(R, r, p) \quad X_R > 0 > X_r, X_p$

Holders of money are permitted to shift from domestic to foreign assets by exchanging existing stocks. An excess supply of money lowers the change in foreign reserves. Although interest rates are as before proximately determined in a flow dominated market, <u>changes</u> in the demand to hold money, $\frac{dL}{dt}$, change R and F.

Using standard techniques to analyze dynamic stability shows that the fixed exchange rate system is stable unless M_p is large and the excess demand for goods is much more responsive to R than the excess supply of foreign exchange. This seems unlikely. It follows that the modified Mundellian system attributes the numerous devaluations and revaluations and the instability of the Bretton Woods system mainly to government policies, for example changes in D that induce losses or gains in reserves.[6] The incorporation of stocks of reserves and changes in the demand for money does not change the main implications of Mundell's theory.

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6) In Brunner and Meltzer (1974), we have shown that in a model that permits changes in interest rates, asset prices, output and output prices, the fixed exchange rate system is likely to be unstable. The instability of the Bretton Woods exchange rates is attributed to independent domestic fiscal policies.

3. The Role of Fiscal Policy

The importance of D as a policy variable suggests that we should look in greater detail at the fiscal policy required to maintain fixed exchange rates. In this section, I incorporate fiscal policy and the financing of budget deficits. I show that the model requires domestic and foreign bonds and capital to be perfect substitutes and that a small country can be defined in terms of the slope of the excess demand for goods. Unless a country is very small, fiscal policy is destabilizing in a fixed exchange rate regime.

The current value of D is a record of current and past government borrowing from the central bank and shows the cumulated effect of the budget on the monetary base or the money stock. Debt retirement and new borrowing at the central bank is direct in some countries; in others, the government buys or sells securities on the open market, and the central bank finances some portion of the fiscal deficit or surplus by open market operations. The result of either procedure is the same.

The government's budget equation can be written

$$\frac{dD}{dt} = G - T - \frac{dS}{dt}$$

where G and T are government expenditures (including transfers) and tax collections, and $\frac{dS}{dt}$ is the change in the stock of government securities held outside the central bank. In models of this kind, it is easiest to let interest payments be a perfect substitute for other components of G. If the government finances all deficits at the central bank, $\frac{dS}{dt}$ and the current fiscal surplus or deficit is

equal to the value of $\frac{dD}{dt}$ implied by the choice of D. Or, more accurately, the current value of D is the result of a policy of financing a surplus or deficit equal to $\frac{dD}{dt}$ at the central bank.

Suppose, however, that the government finances fiscal surpluses by retiring debt held by the public and finances fiscal deficits by selling new issues of debt to the public. Three interpretations are possible. Two are unlikely, so I discuss them briefly. The third focuses attention on some principal features of the model and provides the definition of a "small country".

First, government bonds and money are perfect substitutes in portfolios. If we treat M as the excess supply of financial assets, not the excess supply of money, we remove any special problem when bonds are issued or withdrawn instead of money. However, the conflict with the theory of prices and with empirical evidence limits interest in this interpretation.

Second, fiscal policy contracts abroad whenever the home country expands, so that world interest rates are equilibrated by world fiscal policy. This interpretation seems inconsistent with the small country assumption and, more importantly, is inconsistent with the facts.

Third, foreigners purchase or sell an appropriate amount of domestic securities to keep world interest rates in equilibrium. This solution is compatible with the Metzler interpretation of Keynes. Domestic bonds are perfect substitutes for private capital and for foreign bonds. The stock of bonds rises or falls in all

countries as the home country stock rises or falls.

In a multiple currency world, the unit in which the bonds are denominated matters. If all bonds do not have a gold, or commodity unit, guarantee, the postulate that foreign and domestic bonds are perfect substitutes at a common world rate of interest is not tenable. Differences in degree of risk become an important missing element. Further, if countries at times revalue or devalue, there are wealth transfers that are not considered in the model. And, if countries pursue independent fiscal policies, even Ricardo's law does not prevent default on gold guarantees.

I will disregard some of the problems of fully incorporating fiscal policy into the Mundell model. The model does not lend itself to a full treatment of the effects of fiscal (or monetary) policy. Either there are no markets for debt, distinct from markets for private capital, or there is no debt. Either output or the price level is fixed. These and other properties restrict the analysis to a very limited range of cases.[7)]

The extension presented here is the simplest extension I can find that retains features of Mundell's model but includes fiscal policy and asset stocks. Interest rates are determined in world markets and treated as a given by citizens of the home country. Debt issued

7) These arguments are developed in greater detail in several recent papers with Karl Brunner. The open economy analysis is in Brunner and Meltzer (1974). Myhrman (1975) also analyzes an economy with asset stocks and fiscal policy and finds cases of instability in the fixed rate system. See also Alphandery (1975) and Fratianni (1976).

to finance fiscal policy is sold to foreign and domestic purchasers at the interest rate determined on world markets. The stock of bonds in home country portfolios is the amount remaining after purchase by foreigners.

There are many currencies, but exchange rates are fixed. Citizens of the home country can hold deposits abroad (Eurocurrency). The interest rate on these deposits is determined abroad. The capital stock is fixed, and the price of a unit of capital is always equal to the current reproduction cost; the latter is, p, the price of current output.

Domestic wealth consists of money, Eurocurrency, bonds and capital. Domestic output is constant, at full employment, but prices can change. Fiscal policy must be set to balance the government budget, and this involves a choice of tax rates or expenditure. I choose to keep tax rates as a policy variable, but tax collections change as p changes. The requirements of a balanced budget force the government to set expenditure (including interest payments) at the proper level. Let G be nominal expenditure and T be tax collections. Real government expenditure and nominal expenditure are determined by the system, not by the government.

Four equilibrium conditions summarize behavior of the government and on the markets for money, debt and output. The excess supply of money (M), the excess supply of debt net of foreign purchases (S) and the excess demand for goods (X) must be zero in equilibrium. The government budget must be balanced. The signs above the variables denote partial derivatives. R is the volume of

international reserves, as above. The negative sign of S_R indicates that increases in international reserves lower the excess stock-supply of domestic bonds.

$$(12) \quad M(\overset{+}{R}, \overset{-}{p}; D) = 0$$

$$(13) \quad X(\overset{+}{R}, \overset{-}{p}, \overset{+}{G}, \overset{-}{T}) = 0$$

$$(14) \quad S(\overset{-}{R}, \overset{-}{p}, \overset{+}{G-T}) = 0$$

$$(15) \quad G = T$$

Equations (12) and (14) jointly determine R and p. Equation (13) determines either G or T, and eq. (15) determines the other. The presence of G and T in the S function as G-T is not an entirely satisfactory way of incorporating debt issues and the government budget equation. The procedure implies that, given D, tax reduction requires a sale of bonds. Interest rates rise on the world markets. Debt retirement lowers world rates. Foreigners purchase a portion of the issue that finances the deficit and sell when there is a surplus. Domestic demand rises by less than the amount of bonds issued and falls by less than the amount withdrawn. The excess stock-supply increases with a deficit and falls with a surplus. On the output market, the response to budget deficits or surpluses is restricted by the usual assumption that $X_G > - X_T > 0$.

$$1 > X_G + X_T > 0.$$

The requirement that the budget is balanced at every equilibrium and the equilibrium condition for the output market imply that net foreign investment is zero. This follows from G-T = S-I = 0. The

balance of payments is in balance. Moreover, with K fixed and the budget balanced, all stocks are unchanging and willingly held. The four equations, (12) to (15), therefore, imply that any equilibrium in this model is a full stock-flow equilibrium at fixed exchange rates.

Analysis of dynamic adjustment shows whether the stock-flow equilibrium of the augmented model is stable. By assumption tax rates are fixed and real output is given, so real tax revenue depends on the price level,

$$t = T(p)$$

Real government spending, g, must be chosen to balance the budget at the prevailing price level. Solving

$$G = G(p, g)$$

for the appropriate value of g, balances the budget. Equation (18) specifies the adjustment of g that satisfies the tax and expenditure equations.

The system given by (16) to (18) describes the adjustment of p, R and g that maintain equilibrium with a balanced budget and a fixed exchange rate.

$$(16) \quad \frac{dR}{dt} = - h_1 M(R, p)$$

$$(17) \quad \frac{dp}{dt} = h_2 X(R, p, g)$$

$$(18) \quad \frac{dg}{dt} = - h_3 S(R, p, g)$$

Stability of the system depends on the roots of the characteristic equation obtained from the following matrix.

$$\begin{bmatrix} \lambda + h_1 M_R & h_1 M_p & 0 \\ -h_2 X_R & \lambda - h_2 X_p & -h_2 X_g \\ h_3 S_R & h_3 S_p & \lambda + h_3 S_g \end{bmatrix}$$

Stability of the system requires a positive determinant of the matrix. Let a_o denote the determinant. We can write a_o as:

$$a_o = [X_g(S_p M_R - S_R M_p) + S_g(X_R M_p - X_p M_R)]$$

The sign of a_o is most likely negative. The only positive term in the equation is $-X_p M_R S_g$. This term must be very large (in absolute value) relative to other terms to assure stability. A sufficiently small absolute value of X_p is a sufficient condition for instability. A sufficiently small value of S_g is also a sufficient condition for instability. In this case, most of the deficit or surplus is financed abroad. Foreigners absorb the home country bonds and sell goods.

The dependence of stability on X_p and S_g gives content to "the small country" assumption used in the Mundellian analysis. In a "small country" the excess demand function must be very responsive to the price of domestic output. Small increases in domestic prices induce relatively large reductions in the demand for output, and small reductions in price stimulate demand. "Small countries" must finance much of their deficit or surplus by security sales or

purchases to foreigners (or changes in net foreign liabilities).

Interpretation of the stability condition helps to clarify the problems raised by fiscal policy and debt finance in open economies with fixed exchange rates. We can treat X_g as the multiplier of a change in government expenditure. Any change in government expenditure, with tax rates fixed, changes total expenditure and excess demand. With domestic output given, an increase in excess demand raises domestic prices and tax collections, and a reduction in excess demand lowers prices and tax collections. The size of the price change determines the size of the government budget deficit or surplus and the amount of debt issued or withdrawn.

Any change in domestic prices reduces private expenditure following fiscal expansion and increases private expenditure following fiscal contraction. A relatively large value of X_p implies that prices transfer spending from the private sector to the government. Price increases, following fiscal expansion, are the mechanism of "crowding out" in this model. Fiscal contraction "crowds in" private spending. Import substitution reinforces the effects of "crowding in" and "crowding out".

A small X_g and large (negative) X_p contribute to stability by limiting the change in prices induced by fiscal policy. Without some limitation on fiscal policy or its effect on the price level, the fixed exchange rate system is unstable in the modified Mundell model.

There is some evidence of the effects of fiscal policy on the stabil-

ity of fixed exchange rate system. The United States and the United Kingdom pursued relatively expansive fiscal and monetary policies, relative to the policies of other open economies in the fixed rate system, during the 1960's and early 1970's. Neither country operated according to gold standard rules, so countries and individuals that accumulated U.S. and U.K. securities gradually came to believe that the securities they had accumulated were not close substitutes for domestic securities. Prices rose in the U.S. and the U.K. relative to prices in other countries. The fixed rate system came to an end.

The Mundell model has a deficiency shared by all Keynesian models. The stock-flow analysis is incomplete. The deficiency is particularly important in a multiple currency world. The deficiency is less important, but remains, if countries do not engage in independent fiscal policies and do not finance deficits (or surpluses) at a rate inconsistent with world equilibrium. The deficiency can be reduced by defining a "small country" as a country that does not finance fiscal policy by issuing debt or money. The last solution limits the general applicability of the model.

A related problem arises if there is a change in taste or monopoly power that alters the terms of trade. The assumption that domestic and foreign securities are perfect substitutes implies that securities sold abroad must be denominated in foreign currency to avoid gains or losses for the rest of the world when the country revalues or devalues.[8)] Again, we are driven back to the gold standard or a gold guarantee to rationalize features of the model. Or, we can recognize the long-run truth implied by Ricardo's law

while at the same time recognizing the inadequacy of the model for discussion of current policy or interpreting current events in countries conducting most of the world trade.[9)]

4. The Conference Papers

The inadequacies of the stock-flow analysis in the Mundell model are recognized implicitly in many of the papers. The adjustment of asset stocks, or portfolio adjustment, is one of the main problems addressed at the conference and is treated in both empirical and theoretical papers. A related issue that some papers addressed is the extent to which central banks and the governments in open economies can choose fiscal or monetary policies to offset inflationary or deflationary impulses from abroad. A broader aspect of the same issue is the extent to which Ricardo's law holds for annual observations in major trading countries. In this section, I summarize some of the contributions the conference papers made to the resolution of these issues.

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8) Contrast this conclusion to Mundell's analysis (1968, Chapter 8). Devaluation and revaluation do not change wealth, so if there are securities outstanding they must be claims to real income -- perfect substitutes for real capital. Johan Myhrman has pointed out that Johnson (1972a) recognizes this problem in an appendix to his paper.

9) It is not a full solution, but a stopgap, to argue that the problem is resolved by making some commodities nontradeable. The tradition of economic theory is to decide what is traded by looking at relative prices, not to impose the choice as a constraint or fixed coefficient. Moreover, the distinction between tradeable and nontradeable goods is not only inconsistent with the long-run model to which it is joined but difficult to reconcile with the assumption that all assets in the world are perfect substitutes.

a) Theoretical Papers

Attempts to complete the analysis of asset stocks in open economies produced a number of recent papers. Three papers at the Conference are, at least partly, in this tradition. In this section, I discuss the papers by Girton and Henderson and by Brunner. Fratianni's paper deals with many of the same issues but includes some empirical work, so I discuss his paper with other empirical papers.

Lance Girton and Dale Henderson develop a short-run, partial equilibrium model of securities markets in two countries under fixed, managed floating and fully floating exchange rates. Income and prices are fixed in both countries, but interest rates are variable. Both countries issue money and securities, and in the short-run neither country is bound by Ricardo's law. Both choose policies. World reserves are fixed, as under a gold standard with no new mining.

The principal propositions obtained by the authors concern the effects of country size and exchange rate or reserve on interest rates and asset stocks in the two countries. With the dollar as a reserve currency, an open market purchase by the Federal Reserve produces a capital outflow from the U.S. that lowers interest rates in both countries. If the Bank of England (rest of the world) passively accepts the capital inflow, the U.K. money stock increases. When the monetary standard is gold or SDR's, the U.K. has the choice of acquiring these assets, and if the Bank of England so elects, there is a smaller demand for U.S. securities.

Under a gold or SDR standard, Girton and Henderson show that the size of the change in interest rates and domestic money following an open market operation depends on the demand for money and the policy of the Bank of England. If the Bank stabilizes domestic interest rates, the change in rates is smaller than if the Bank stabilizes its holding of reserves. The latter policy requires the Bank to adopt the same policies as the Federal Reserve. The Bank must buy or sell in the open market whenever the Federal Reserve buys or sells. Under dollar standard, the reserve losses to the U.S. following an open market purchase are larger than under a gold standard. Foreigners sell U.S. securities, not gold, under a dollar standard.

The point to be emphasized is that the analysis has moved beyond the rigid small country case to consider countries that choose policies. Girton and Henderson show that the small country case is a limiting case of their analysis of asset adjustment. Small and large are measured by national wealth, and small implies that world securities are perfect substitutes for domestic securities. But small countries can conduct monetary policy if securities are not perfect substitutes. There is, in short, some opportunity for all but the smallest countries to control money in the short-run.

Karl Brunner takes up a related but not identical issue. In earlier work on open, interdependent economies, Brunner and Meltzer (1974) permitted wealth holders to own money, domestic bonds, foreign bonds and real capital and to purchase current output at home or abroad. Brunner's paper disaggregates the bond (or credit) market into loans and securities. He shows that, for a

broad range of problems, the addition of the loan market, does not change the principal results or conclusions of a model with money, bonds and capital. This result is distinctly anti-Radcliffe and anti-banking school. The details of financial allocation have little importance for aggregates. If Brunner is correct, additional disaggregation yields few benefits once we have included three distinct assets in our analysis of stocks.

Why is there a gain from the introduction of a third asset but not a fourth? Broadly speaking, a two asset model permits analysis of substitution between nominal and real assets and thereby introduces a principal difference between a monetary and a non-monetary economy. Wealth owners have the opportunity to substitute assets that have fixed nominal values for assets that do not. Introduction of a credit market adds some additional options, the opportunity to hold government securities and time deposits. The difference between credit (bank earning assets) and money (currency and demand deposits) is approximately equal to the differences between time deposits and central bank money or the monetary base. Hence, the introduction of a third asset, bonds, and a market for bank credit allows intermediation and disintermediation to affect real and nominal rates in the short-run and in this way to affect expenditure and prices.

The approach taken in the papers by Girton and Henderson and by Brunner differs from other recent attempts to extend the analysis of asset stocks in open economies. Several papers distinguish tradeable and nontradeable assets. This distinction is not the same as the distinction between bonds and real capital once there

are differences in countries' rates of inflation.

b) Empirical Papers

I treat as empirical all papers that estimate equations or test hypotheses, even if the papers contain lengthy analytical sections. This section discusses some of the main findings and their relation to the discussion of stocks and flows above. Generally, the empirical papers support the view that there is more to international economics than has been captured in the Mundell approach or, for that matter, in its principal alternatives.

No one can read the data in John Pattison's paper without recognizing some of the difficulty of explaining inflation under the fixed and floating system. A major difficulty is separation of once and for all changes in prices and terms of trade from maintained changes in the rate of price change. Whether the price change occurs at a unique point in time or is distributed over several months, the measured rate of price change that includes the period will be affected. The measured rate of price change will differ from the maintained rate of inflation. This problem arises in other economic time series, notably in separating real growth and recovery from recession. Another difficulty arises from the use of fixed weight price indexes.

Nevertheless, two of Pattison's findings are striking. First, he finds that the standard deviation of the inflation rate for major industrial countries (world inflation) has remained approximately the same despite a doubling in the mean rate of inflation. Second, the standard deviation of the world inflation rate is about three

times the standard deviation of inflation rates in leading Canadian cities.[10)]

Suppose we accept the basic truth emphasized by adherents of the monetary approach to the balance of payments. Prices in trading countries are pushed toward equality by profitable opportunities offered to traders, speculators and producers when the same commodity sells at a price differential greater than the cost of transport. The computed standard deviations of the rates of price change in major trading countries are a crude, but useful, measure of the degree to which rates of price change are equalized across countries. The approximate constancy of the standard deviation for each of the five year periods following the restoration of convertibility in 1958 suggests that there were differences in country rates of change each year, but the deviations from the mean remained about the same during the sample period. Pattison's data suggest that the standard deviation generally was between 1.5 and 1.75, so

10) The results differ from the findings reported by Hans Genberg (1975). Genberg used analysis of variance to test whether rates of inflation for individual countries differed from the average rate of inflation in sixteen countries. Call the latter the world rate. The world rate is defined as a band or range of two percentage points. Genberg's data show at most that under fixed rates, countries that deviate from the band persistently must revalue or devalue. This is a relatively weak test of the proposition sometimes called the "law of one price". The data do not reject the hypothesis that the rates of inflation differed in one of the three periods used. Genberg then performs a similar test for U.S. cities, obtains a similar result and concludes that if the U.S. is a single market, then the "world" is a single market. If we accept Genberg's result without qualification, we would conclude that resources do not move quickly enough to equalize prices in the U.S. at every point in time and also that countries can have different rates of inflation and fixed exchange rates for a time, but not permanently.

two standard deviations on each side of the mean include differences in rates of price change of 6 % to 7 %. For any pair of countries, the deviation may be less, and of course with fixed rates, countries cannot maintain fixed exchange rates if they are persistently at the same end of the distribution.[11)]

A difference of six to seven per cent between countries with high and low annual rates of price change leaves room for countries to pursue independent monetary policy under fixed exchange rates, even if Ricardo's law is a fully correct long-run proposition. The difference between rates of price change in Canadian cities is considerably smaller than for the world. This suggests that there is potential for equalizing rates of inflation in the major trading countries; the differences are not at a minimum.[12)]

The conference heard other evidence difficult to reconcile with Mundell's theory. Cross and Laidler show that their measures of past world rates of inflation affect the domestic rates of price change in many countries for given values of output and past rates of price change in the home country.[13)] The Mundell theory implies that rates of inflation are equalized by changes in the growth of money, a type of price-specie flow theory. Countries that inflate

11) If the increase in the rate of inflation is a result of increased monopoly power or trade unions as is suggested by some, it seems strange that monopoly pricing has not changed the standard deviation of inflation rates in the seventeen countries or in Canadian cities where the power of local unions is very different.

12) The standard deviations for the seventeen countries do not appear to have increased under floating rates. The range between the highest and lowest rate increased, however, when autonomy increased.

13) See next page.

fastest lose foreign reserves to countries that deflate or inflate more slowly.

Cross and Laidler compare two hypotheses. In one, each country's rate of price change depends on output and its own past rate of price change. In the other, the world rate of inflation affects each country by changing anticipations in a manner that cannot be deduced from the past home country rate of price change.

The evidence discriminates between the two and supports the hypothesis that world and past domestic rates of price change have separate effects in many countries. Cross and Laidler test this proposition in several ways. One of their tests shows that differences between domestic and world rates of price change affect the acceleration or deceleration of prices in several countries. One may question, as always, the model or its interpretation. Their equation does not adequately summarize the effects of foreign demand and domestic financial policies. In an area in which there has been little information, however, their evidence retains importance.

There is an obvious problem with the Mundell hypothesis. Countries' rates of inflation differ under fixed exchange rates. The usual attempt to rescue the hypothesis invokes the distinction between tradeable and nontradeable goods. The distinction seems at best a peculiar description of short- and long-run adjustment,

13) The paper, "Inflation, Excess Demand and Expectations in Fixed Exchange Rate Open Economies: Some Preliminary Empirical Results", was presented and discussed at the conference but is published in the Proceedings of the University of Manchester Conference on Inflation, July 1974.

since in the long-run relative prices determine what is traded. Moreover, the distinction is usually invoked without specifying a definition of tradeable, so content is removed. Cross and Laidler offer a definition and test the hypothesis that differences in rates of inflation can be explained by the hypothesis. They conclude that the distinction is not useful.

In a paper crammed with fascinating problems seeking solutions, Decaluwe and Steinherr analyze the distinctively Belgian contribution to recent policy -- the two-tier exchange market. Belgium would appear to be an example of a small open economy, yet the data show that Belgium was able to maintain separate exchange rates for the commercial and financial franc for many years.

I interpret the data and the authors' results as showing that the Belgian franc did not have a fixed exchange rate as that term is understood in current literature or is used in references to the gold standard. The reason is that the financial franc could float outside a fixed band. The average spread between the commercial and financial franc is a measure of the increased risk borne by holders of financial francs, the average price of risk. Decaluwe and Steinherr interpret the difference as a measure of anticipations. Differences between anticipated and actual exchange rates are to a considerable extent the result of perceived exchange risks, so our terms may differ more than our interpretation.

For monetary theory and policy, changes in the spread between the two rates are more interesting than the mean difference. Belgium was able to let the band between the intervention price and

the official price widen by allowing the financial franc to float beyond the intervention point. If the financial franc remains outside the intervention point, the profit from disguising financial francs as commercial francs increases, so the commercial franc moves toward the intervention point.

If my interpretation of the data is correct, the Banque Nationale had greater opportunity to conduct monetary policy than the monetary theory of the balance of payments grants to small open economies. The central rate for the commercial franc remained unchanged throughout the decade. The monetary base was determined, in the longer-run, by the balance of payments. However, the Banque Nationale could widen or narrow the spread between commercial and financial francs by buying or selling foreign exchange. By engaging in these market operations, the Banque Nationale was able to control or offset short-term changes in the monetary base and the money stock.

The papers by Heremans, Sommariva and Verheirstraeten on the Belgian monetary and credit process and by Fratianni on the Italian monetary process dig deeply into the relations between the central bank and the markets for money and credit. These authors analyze the markets for debt and money, or bank credit and money, in a regime where debt, money and real capital are substitutes -- but not perfect substitutes -- in the portfolios of wealth owners.

The paper by Heremans, Sommariva and Verheirstraeten is part of an ambitious program of monetary theory and empirical science being carried out at the Center for Economic Studies at the

Katholieke Universiteit at Leuven. The authors develop a series for the monetary base and make preliminary tests of the relationships between the base and financial variables. The tests show that, in Belgium, foreign securities are very close substitutes for domestic securities on the bank credit market, suggesting that Ricardo's law is a good approximation in the short-run for an open economy like Belgium.

However, the authors' model implies that the two-tier system increases the power of the central bank to control the base. The degree of control had not been estimated in the work completed at the time of the conference.

The Belgian experience shows that the central bank financed a large part of the government's budget deficit. Ceilings were placed on bank credit expansion, so the banks and the public borrowed abroad. This point is recognized in Governor Vandeputte's informative discussion of central bank instruments of policy. By allowing the financial franc to float, the Banque Nationale lowered the degree to which foreign and domestic securities are substitutes in private portfolios and raised the cost of foreign borrowing.

Michele Fratianni recognizes that the usual statement of Ricardo's law presumes that all securities are perfect substitutes. If foreign and domestic securities are imperfect substitutes, monetary policy changes relative interest rates even if changes in the domestic source component of the base produces an equal but opposite short-run change in international reserves. As in his previous work, Fratianni shows that in Italy domestic and foreign secu-

rities are not perfect substitutes in portfolios. With a fixed and relatively stable exchange rate, the Banca d'Italia was able to control the base and the money stock to an extent sufficient to influence economic activity in the short-run.

Discussion of the degree to which the base is controlled or to which monetary policy is effective in the short-run is often clouded by a side issue, the extent to which the instrument of monetary policy is a change in the base or a change in the discount rate. The issue becomes more confused when the subject of endogeneity or exogeneity comes under discussion.

Consider a system with discounting but without open market operations. The central bank sets the discount rate to control the quantity of discounts, and the banks adjust the quantity of discounts by comparing the rates at the bank and in the market. Now, consider a system with open market operations and no discounting. The central bank chooses the quantity to purchase and the market determines the price. I do not deny that institutional arrangements are important for understanding how monetary processes work to shape the outcome of the process, but it is difficult to find any difference of fundamental importance in this difference in arrangements.

5. Conclusion

Most of the papers at the Leuven Conference on Bank Credit, Money and Inflation in Open Economies can be described as extensions of the framework known as the monetary approach to the balance. There are two exceptions. Michael Parkin and Malcolm

Gray attempt to develop an hypothesis capable of discriminating between alternative explanations of inflation. Richard Sweeney and Thomas Willett survey theoretical and empirical work and point out some shortcomings in current theories of inflation in open economies.

The principal work of the conference and its principal contribution, however, lies in the attempts to extend and test current theories. These extensions take the form of new analyses, detailed consideration of the Belgian contribution to recent policy tools -- the two-tier market for foreign exchange -- and examination of some empirical evidence on current theories. I believe the papers bring out the deficiencies of several current versions of the so-called monetary approach. By doing so, they focus our attention on the strengths and weaknesses of our current theory of inflation in open economies.

A main difference between the monetary theory of the balance of payments and its immediate predecessors is the attention given to the balance of payments as a whole, as opposed to a particular component, usually the trade account. The monetary approach brought back to international monetary theory the proposition that relative prices -- including exchange rates -- are, in the long-run, determined by real factors. In full, long-run adjustment of real balances and commodity prices to a change in domestic money, exchange rates are unchanged.

The problem is that conditions under which the proposition holds are often neglected, and the adjustment process is ignored entirely.

There is not a single international reserve currency; there are currencies and alternative reserves. A multi-currency reserve with a variable mix of currencies differs from a gold standard. In a multi-currency world, changes in preferences for a particular reserve asset shift the demand to hold a stock of "money" and change relative prices. Current versions of the monetary approach do not consider asset adjustments of this kind.

Recognition of asset adjustment in a multi-currency world is a first step toward a more complete analysis of stock-flow interaction. The absence of asset markets in the monetary approach neglects some principal developments in monetary theory.

A main theme of early postwar monetary theory is the importance of the real balance effect -- the response to changes in the real values of financial assets induced by changes in prices. The real balance effect is ignored in most discussions of currency devaluations or revaluations and in discussions of the monetary theory of the balance of payments. The omission has little empirical significance as long as money is a single, composite good that is only a small fraction of total world wealth, and there is a single price level for the world.

"Real balances" are a place holder in the two asset model for the broader effects of wealth in a more fully developed stock-flow analysis. All assets do not sell always and everywhere at a price equal to minimum reproduction cost in the country with lowest cost of production. Changes in the relative prices of assets and output become a relevant "wealth effect" once we separate money,

bonds and real capital in our analyses. Attempts to explain why price levels differ and change cannot neglect these effects of price level changes on wealth and of changes in asset stocks on exchange rates. Attempts to explain why the fixed exchange rate system broke down cannot ignore differences in fiscal policies and the financing of these policies.

In the monetary analysis of closed economies, recent work has emphasized the role of the government budget and the stocks of debt, money and real capital. The analysis of fiscal policy and monetary policy now recognizes the dependence of financial asset stocks on the budget position. The presence of three (or more) assets in portfolios permits substitution between types of assets that change relative rates of return independently of flow adjustment processes. Such adjustments are often described as intermediation or disintermediation. Correct interpretation of the role of Eurocurrency markets cannot begin until asset adjustment of this kind becomes a relevant part of the monetary theory of an open economy.

My attempt to incorporate asset stocks and fiscal variables in a Mundellian model raises serious doubts about the stability of the expanded model and the relevance of the simpler model. Severe restrictions on fiscal policy would appear to be necessary to maintain stability of the fixed rate system. The papers and discussion at the Leuven Conference show that research on stock-flow interaction is actively underway. The analysis of inflation and our understanding of the interaction of money, debt, real capital and real output in open economies will increase as a result of these efforts and of the empirical work that will show how much or how little the implications of our analyses change.

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Nicht im Handel!