XXVI ANNUAL CONFERENCE OF THE

REGIONAL PROGRAMME OF MONETARY STUDIES

THE TRANSMISSION OF MONETARY SIGNALS TO THE REAL SIDE IN A DEVELOPING ECONOMY: A SURVEY

Dr. Damien King

JAMAICA CONFERENCE CENTRE

KINGSTON, JAMAICA, W.I.

●

November 23 - 26, 1994

One of the principal ingredients in stabilization/structural adjustment programs is monetary contraction designed to reduce aggregate demand to achieve, among other objectives, a reduction in inflation. The results have been, at best, disappointing [Reichmann, 1978]. This has drawn attention to the importance of understanding the mechanisms by which monetary signals get transmitted to the real economy in developing countries. This paper seeks to contribute to that understanding by surveying the transmission processes that have appeared in the development literature. The survey reveals that once development macroeconomics began to take the specific characteristics of the LDC economy into account, the nature of transmission was revealed to have a more profound role affecting the use of policy to manage the economy than was indicated by mainstream macroeconomic theory. This is important, not only for monetary policy, but also for the use of other macro policies, such as currency devaluation, as tools of stabilization.

As context for the survey and discussion of transmission in LDCs, section 1 provides a broad synthesis of the views on the nature of monetary transmission. The survey itself begins in section 2 with early macroeconomic analysis in developing economies, showing that that analysis was largely confined to standard Keynesian and monetarist frameworks. As a result of this confinement, its conclusions never went further than the claim to have shown whether or not monetary policy "worked" in LDCs. The scope of policy analysis expanded considerably in the late 1970s and 1980s. From high inflation and large balance of payments deficits there emerged a new focus on the economics of stabization. That focus, in turn, gave rise to a recognition of the specific institutional and structural characteristics of LDCs that were relevant to the transmission process. Amongst these structural characteristics, the role of credit constraints and private money-lending (the "curb" market for credit) has received the most attention. This is the subject matter of section 3, which surveys that literature and discusses its implications for policy. Section 4 looks at transmission via the foreign exchange market.

A Pure Portfolio Adjustment Synthesis

Amongst the areas in which Keynes departed from his classical predecessors was in the provision of a macroeconomic framework in which a transmission mechanism from monetary changes to the real economy was explicit [Keynes, 1936, and Hicks, 1950]. Before the General Theory, the extension of the Walrasian general equilibrium system to include money did not contain a mechanism through which a change in the quantity of money actually caused a change in prices. In fact, the system merely reflected the view that "a large and a small quantity of money can serve the same purposes of turnover if commodity prices rise or fall proportionately to the quantity...."[1] In determining the absolute value of the numeraire prices, the purpose of money in the Walrasian system was confined to money's role as a unit of account.

The Keynesian contribution was the now familiar liquidity mechanism through which excess money balances lower the rate of interest on a limited range of clearly identifiable securities. Since this reduces the cost of borrowing, marginal investment projects become profitable and are undertaken, raising expenditure on investment goods. The income multiplier takes over and accounts for the remaining effect on the real side.

This gave rise to a "debate" which had at its poles the following positions: The neo-monetarist view of the world derived from the quantity theory of money the logical proposition that changes in the quantity of money eventually have a proportional effect on the level of nominal income. This conclusion was arrived at without the benefit of an explicit transmission mechanism. In the other corner, the Keynesian transmission mechanism and the analysis that later came to be known as the IS/LM model supported the position that changes in the money supply did not necessarily have a definite, much less a proportional impact on the level of income. This view depended on supposed "weak links" in a clearly specified Keynesian transmission mechanism (e.g., the interest-elasticity of money demand, the interest-sensitivity of investment). Since the Keynesian position depended on the importance of these links, the debate reduced to one about the nature of the transmission process per se.

[1] Wicksell, quoted in Hansen (1982).

After Keynes, macroeconomic literature as it relates to the transmission process reflected two simultaneous developments. The first was the elaboration of Keynesian mechanics beyond IS/LM, and the second was the rising influence of the neo-monetarist Chicago school and its attempts at specifying a transmission process consistent with its economic framework (e.g., Friedman and Schwartz, 1963). These two paths subsequently converged to yield a framework for synthesizing the views of Keynesians and monetarists on the nature of the transmission process.

In the efforts to explain how monetary changes affect markets for goods and services, economic literature focused on money's role, not as a unit of account, but as a store of value. Money became a form of wealth alternative to holding financial assets. The common starting point for transmission stories, and the basis for the attempts at synthesis, therefore, was portfolio adjustments.

At its broadest level of abstraction, the portfolio adjustment synthesis runs as follows.[2] Economic agents, including productive enterprises, financial institutions, and households, consider as part of their portfolio a full spectrum of real and financial assets, each of which yields a return. Agents may hold negative levels of some assets (by incurring various kinds of debt), and some rates of return may be implicit, as is true of the convenience yield of holding money or the stream of consumption yielded by consumer durables. It is assumed that asset-holders initially hold their desired levels of asset stocks, given prices and rates of return on the various assets.

Now suppose that there is an increase in the stock of money, which somehow is distributed amongst the asset-holders. Since the marginal convenience return on money falls as holdings increase, the increase in the money supply lowers the return relative to that of other assets. Actual holdings of money are deemed to exceed desired holdings. Attempting to restore equilibrium, agents begin to exchange money for other assets. As a result, the rates of return on other assets fall as well. If the asset is a security with a fixed income stream, the fall in the rate of return is accomplished purely by a rise in price. Otherwise, it is accomplished by some combination of a rise in price and a fall in yield. With respect to real

[2] This story is a consolidation and considerable extension of Freidman and Schwartz (1963), Freidman (1969), Park (1972), and Laidler (1978).

assets, there will be a rise in the price of existing stocks relative to the cost of production of new stocks. This induces production of new stocks, and the real effects begin.

This broad schematic description could be modified to reflect the specific aspects of the transmission mechanism that were emphasized by Keynesians and Monetarists. The differences concern the identity of the assets which are important to the mechanism. The specific financial and real assets that transmit the impulse necessarily determine the nature of the impact on the real economy.

The original Keynesian IS-LM story of transmission focused on a small class of marketable financial securities as the alternative to holding money. In such a case the transmission mechanism could be reduced to two clearly-identifiable steps. Holders of excess money exchange money for "bonds" and drive down the rate of interest on those bonds. Firms issue (sell) bonds and use the proceeds to invest. That is, they compare the now lower interest on bonds to the return on investment in fixed capital, and make a portfolio shift from bonds into capital goods. Borrowing from the commercial bank for capital investment is similarly a portfolio shift, with the firm exchanging bank credit such that its holdings are negative (i.e., acquiring debt) in order to shift into fixed capital.

The monetarist view of transmission focused on the pervasiveness of the transmission process by encompassing the broadest range of available assets [Friedman and Schwartz (1963), Friedman (1969)]. Monetarism considered a portfolio to include any embodiment of wealth, including human capital. Excess money balances are exchanged for other real and financial assets, bidding up the prices (or lowering the return) on all assets. As in the synthesis discussion, real effects derive from the discrepancy between the price and cost of production of real assets. But they also derive from a shift in demand from the now relatively costly sources of service flows (a house) to the service flows themselves (rental). Because it does not depend on a few narrowly defined links, the transmission is complete and nominal income changes proportionally to the monetary change.

This was the framework inherited by development economists as their attention shifted from the growth and development issues that dominated the literature in the 1960s to the stabilization problems that usurped academic attention in the 1970s. In addressing such

stabilization issues, why should the transmission process be any different in the typical LDC from that suggested by the above broad framework? There were three reasons, all deriving from the under-development of the financial structure. The broad range of instruments of intermediation that are available in financially sophisticated economies are not present in the typical small LDC.

First, there is a limited range of assets to act as conveyance for the monetary signals. The majority of asset-holders in the typical less developed country have access to currency, bank deposits, land and livestock, black market foreign exchange, and curb market IOUs. There is relatively little participation in an organized market for either corporate debt or equity. In terms of our broad framework for the transmission process, the limited range of available financial assets will affect the efficiency, but not the nature of the transmission. It remains a matter of portfolio adjustment, but amongst a different and narrower range of assets.

A second difference in the character of the transmission derives from the presence of financial market imperfections. The absence of accessible and wide-spread markets for many assets results in some market segmentation and thus the persistence of price disparities. Tightly controlled commercial banking sectors allowed for asset prices that did not move freely to equate demands and supplies for some assets. As a result, there was a rationing of some assets.

In its general form, the portfolio adjustment explanation uses only price signals to link the various asset markets to each other and to output. However, quantitative adjustment can easily move the system in the direction of optimum portfolio holdings, without doing violence to the general framework. Some asset markets set the asset price above (or the yield below) the market clearing level. Thus, there is always an excess supply of the asset (or an excess demand for the liability), and asset-holders are prevented from holding their desired portfolios. Portfolio shifts cause more or less of the excess supply to be satisfied, and the monetary impulse is transmitted in that way. Once again, this bears only upon the efficiency of the transmission.

Quantitative allocation better described the transmission process in many developing countries at the time that stabilization issues were first being addressed in the literature, and this was the third difference. Consider a developing economy with money, bank credit, and physical capital, and in which the rate of interest on bank credit is set below that which would clear the market. An increased stock of money induces banks to increase their lending (shift into bank credit). Firms are already away from their optimal portfolios. They would like to be holding more physical capital in place of (negative) bank credit, but are constrained. The increase in bank credit now allows them to move closer to their optimal portfolios, in pursuit of which they use bank credit and increase their demand for physical capital. The monetary impulse is transmitted to the real economy, without the use of price signals.

Both the paucity of alternative assets and the slow adjustment of asset prices preserve the manner, if not the power, of Keynesian/monetarist transmissions that were prevalent at the time. The common focal point for the transmission in the Keynesian/monetarist synthesis was the amount of spending on goods. The Keynesian/monetarist framework was inadequate for explaining transmission in the typical LDC because the expenditure hub was not the sole conveyance of monetary signals.

In terms of the portfolio adjustment framework, the Keynesian/monetarist synthesis suggested that, in the transmission process, there is a shift into produced assets such as investment goods (the original Keynesian focus) and consumer durables (the monetarist emphasis). As an alternative, suppose that there is a class of productive assets in portfolios. A productive asset is one that yields output, from which source its rate of return derives. In the portfolio, it is merely another asset that yields a rate of return. To the goods market, however, it produces a stream of consumables. As an example, consider working capital (that is, capital tied up in inventories of raw materials, partially finished goods, and finished goods). Consider further that the asset-holder is a firm. It will respond to a fall in the rate of return on financial assets by shifting into a productive asset. This will increase the stream of consumer goods available.

A shift towards a productive asset affects the real side of the economy, the demand and supply of goods and services, in a different way from a shift into a merely produced asset.

The former affects the aggregate supply of goods while the latter influences aggregate demand.

Just such a form of transmission was explored in the development literature where much was made of the importance of working capital financing for the production process. Because of the meagerness of markets for equity, firms must finance production, in terms of both fixed and working capital, by acquiring debt. This is evidenced by the fact that debt/equity ratios tend to be higher in developing economies than in industrial economies [van Wijnbergen (1982)]. The result is that output levels tend be more sensitive to the cost and availability of credit.

The portfolio adjustment synthesis, then, accommodated a broad spectrum of transmission mechanisms. In the context of this broad systhesis, both the Keynesian and monetarist views on transmission that prevailed at the start of the 1970s seem to be huddled closely together on the produced-asset, price signal end of the transmission spectrum. It will be seen below that the development literature has progressively examined the full range of that spectrum.[3] In the beginning, however, much of the treatment of the monetary side in development economics was based on standard Keynesian or monetarist specifications

2. *Variations on Keynesian and Monetarist Themes*

The money transmission mechanism was seen as irrelevant to the development debate from the 1950s to the early 1970s since growth concerns dominated. Money was therefore discussed largely in the context of growth, not stabilization [for example, Shaw (1973)]. When money did appear in a model that had short run application, the model invariably exhibited either a Keynesian or monetarist basis. The question of whether, in a developing economy, money may give rise to transmission processes different from those in developed economies never arose. The work of this period, indeed, consisted merely of variations on Keynesian and monetarist themes.

The issue of monetary transmission in LDCs appears to have been first raised explicitly in Bottomley (1965). The analysis questioned how powerful the narrow Keynesian

[3] Outside of the development literature, a role for money in affecting the supply side of the economy has previously been explored in the money-in-the-production-function debate. See, for example, Sinai and Stokes (1972) and Fischer (1974). For a survey, see Moroney (1972).

transmission mechanism was in LDCs. Upon examining each of the major links in the Keynesian story, the author concluded that Keynesian transmission is weak in the typical developing country.

During this period, short run analysis was almost wholly confined to empirical work, and, as in other areas of economics, the Keynesian paradigm dominated [See, for example, Adelman and Kim (1969), Carter (1970), and Beltran del Rio and Klein (1974)]. Klein (1965) set up a standard Keynesian model with a liquidity transmission mechanism. He discussed what modifications to the investment function might be necessary to better suit LDCs, but the basic Keynesian transmission remained unaltered.

From theoretical discussion and empirical results, it became clear that the interest-sensitivity of investment was an inadequate bottleneck through which to squeeze an explanation of how money affects expenditure in a developing country. Consequently, monetarist models have enjoyed some popularity, mainly through the work of economists at the IMF [See, for example, Park (1973), Otani and Park (1976), and Khan and Knight (1983)].[4] Like monetarist models for the developed economies, however, those for developing economies rarely specified an explicit transmission mechanism.

Polak's (1957) seminal model laid the basis for much of the monetarist analysis of LDCs which was to follow. Polak sought to "bring monetary events, monetary data, and monetary problems within the framework of income analysis." The model determines the flow of nominal income on the basis of the equation of exchange and the money supply, and endogenizes the money supply by equating it to the assets of the banking system, including international reserves. But, consistent with its quantity-theory antecedents, the relationship between changes in the money stock and the nominal level of income derive from the equation of exchange identity and assumptions about the constancy of velocity, and not from a description of the transmission mechanism.[5]

[4] Whether the "IMF model" is a monetarist model is apparently a subject of some contention. IMF (1987) and Montiel (1985) claim that the analysis and prescriptions are compatible with non-monetarist theoretical structures.

[5] The absence of an explicitly specified process describing the links between money and price/output variables in monetarist models derives from two propositions: that a high degree of empirical correlation exists between the money stock and nominal income, and a belief that the causation runs in only one direction - from money to income (Laidler, 1978). The propositions, if true, are sufficient to establish that money determines income and the transmission is irrelevant. But the question of the direction of causation is at least empirically ambiguous

IMF (1987) describes how the transmission might proceed in a typical developing economy. Its concession to the LDC setting consists only of describing the transmission in terms of a limited range of assets - money, bank deposits, and curb loans. "Starting from a position of portfolio equilibrium, ...an increase in the money supply leaves the private sector with too much money relative to loans and real assets." The private sector therefore attempts to restore portfolio equilibrium by increasing its curb market lending, increasing the supply of curb market loans. The curb market interest rate falls "and this, together with the initial portfolio imbalance, causes [a shift into real assets and] an increase in the implicit value of real assets relative to production costs."

Since wealth-holders attempt to restore portfolio equilibrium even with only a limited range of alternative assets, transmission appears to work in much the same way that it does in developed economies. Thus far, the literature dis not reveal a departure from the analysis that applies to more developed economies. However, in the mid 1970's, the oil crisis and its effect on the international payments balance along with domestic inflation in many LDCs drew the attention of theorists toward the issue of stabilization. As a result, the mechanics of short-run macroeconomic adjustment received greater attention in theoretical work. Emerging from this were transmission processes that reflect the specific structural characteristics of developing economies, and that were not previously analyzed in relation to more developed economies.

2. The Supply Side and the New Structuralist Critique

A great deal of theoretical discussion emerged in the wake of the new focus on stabilization. Much of it concerned the appropriateness of the IMF model of "structural adjustment" and the response that was then known as the *new structuralist critique*. This critique rested upon the important role of working capital in LDCs.

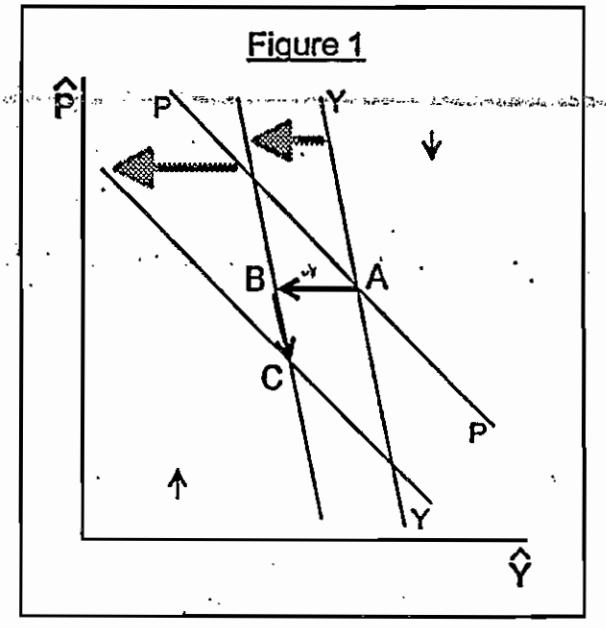
The early focus on the working capital nexus in developing economies appeared in the literature on financial repression [e.g., McKinnon (1973)]. In its initial treatment in this literature, credit for working capital provided a physical limit to the amount of output that could be produced. One example of such a treatment in a formal model was Kapur (1976).

for LDCs (See Wachter, 1979). Furthermore, the plethora of financial assets that smoothly intermediate the transmission in developed economies are not present in the typical LDC. The completeness of the transmission ought therefore not to be taken for granted, and specifying the process becomes necessary.

Output was determined by the stock of working capital, and that in turn was limited by the availability of tightly controlled credit from commercial banks. In a growth and inflationary context, credit needed for working capital just to maintain the existing level of output rises with wage inflation. Only growth of credit in excess of this will permit increasing holdings of working capital and therefore output growth.

The short-run mechanics of monetary policy that follow from this treatment are straight-forward. A decrease in the growth rate of the money supply decreases the availability of new working capital credit and thus further constrains output growth. The steady state outcome for the growth rate remains ambiguous, however. The economy was previously in equilibrium at positive rates of inflation and growth. A reduction in the growth rate of money, while prices and output at time zero continue to rise at their previous rates, produces a monetary "disintermediation." This fall in the real money/output ratio begins to reduce endogenous price and wage inflation. If the economy was previously financially repressed, the fall in inflation may be sufficient to insure a higher rate of output growth in the new steady state. At any rate, the long run outcome for growth is indeterminate, depending on the relative effects of slower credit growth and lower cost inflation. Inflation, however, unambiguously falls as a result of lower "demand pressure."

Figure 1



To illustrate this result, consider the following equations for the growth rate of output and the rate of change of (expected) inflation over time.

$$\hat{y} = a_0\hat{M} - a_1\hat{P} \qquad (1)$$

$$\frac{d\hat{P}^*}{dt} = b_0\hat{M} - b_1\hat{P}^* - b_2\hat{y} \qquad (2)$$

y = output, M = nominal stock of money, P^* is the expected price level, and "hats" denote rates of growth. The growth rate of output rises with the growth of money, through an increase in the availability of credit from the commercial banking system, and falls with the inflation rate since inflation raises credit requirements for maintaining the existing level of output. Aggregate expenditure and therefore the expected rate of inflation rises with monetary growth and falls with the inflation rate. Expected inflation will fall as output growth accelerates. The coefficients for the equations are formally derived in the appendix.

The line labelled YY in Figure 1 is derived from the relationship in equation (1). The line labelled PP is derived from equation (2) and is the locus of points for which $d\hat{P}^*/dt = 0$. Stability requires that the slope of YY be greater than that of PP. A decrease in the growth rate of the money supply shifts both curves to the left. In the system described by equations (1) and (2), $\hat{y}$ adjusts instantaneously to its determinants while $\hat{P}^*$ gradually adjusts to the steady state defined by $d\hat{P}^*/dt = 0$. Adaptively-determined price expectations are implied by this specification.

The economy is initially in equilibrium at A. When the monetary contraction occurs, in Kapur's analysis, the expected inflation rate has not changed at time zero. But output growth responds immediately to the slower nominal monetary growth rate, and decreases as far as point B in figure 1. (In this setting, real credit rationing does not affect output.) After time zero, the monetary contraction begins to slow the expected inflation rate. The falling expected inflation exerts a positive influence on output growth, since less of the credit increase is devoted to the existing stock of working capital. As inflation declines, output increases along the path from point B to C. The steady state value of output growth may be greater or lesser than it was prior to the monetary contraction.

Kapur wishes to emphasize the case where monetary contraction leads to a higher steady state growth rate. If the inflation rate declines sufficiently, there will be a net increase in new credit available to expand growth. This outcome will result from a sufficiently steep PP and a large shift of that curve resulting from the monetary change, relative to the slope and shift of YY. Kapur refers to this as the "financial repression case," since it may be caused by initial inflation rates that are high enough to discourage money holding and reduce the flow of real credit from a given change in the monetary base. However, this result, as Kapur specifies

it depends on the stock of bank credit being less than total working capital needs, that is, on the presence of some self-financing. If, in addition to the flow equilibrium that Kapur specifies, we impose stock equilibrium as well, the financial repression case does not occur.

What does all this achieve for us? First, we get a peculiar dynamic for monetary policy in a credit constrained economy. In addition, Kapur suggests that the outcome for growth is ultimately ambiguous. Furthermore, with segmented and non-clearing credit markets, contractionary policy may be pursued either by slowing the rate of monetary growth or by raising the exogenous commercial bank deposit rate. Kapur shows that using higher deposit rates is the preferred way to achieve price stabilization since it does so without the short-run output decline that accompanies monetary contraction.

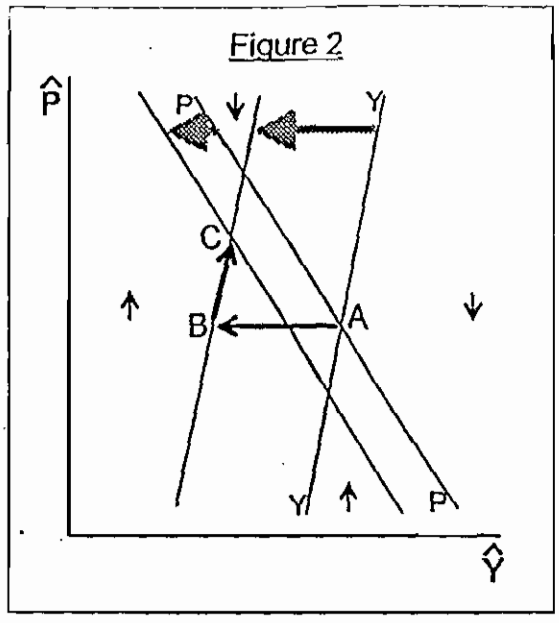
Kapur's contribution was not only to develop formally the working-capital linkage, but also to present the implication for monetary policy and growth in the short run. In addition, the dynamic of endogenous cost inflation in such a context is explored.

However, Kapur models the effect of the working capital constraint without recognizing the curb market as an alternative source of credit. The influences of monetary changes are therefore felt as purely quantitative constraints. This follows from McKinnon, and undoubtably is used because it closely describes the actual nature of commercial credit markets in many developing economies. Following Cavallo's (1977) prior unpublished work, Bruno (1979) recognizes the curb market, even without explicitly modeling it. Increased need for credit is accommodated through the implicitly present curb market, but only at increasing interest cost. This effectively translates quantitative changes in commercial credit availability, even at fixed interest rates, to changes in the rate of interest applied in the curb market. Bruno incorporates the presence of the curb market by endogenizing the curb market rate of interest. Functionally, it is determined by the excess of total credit demand over the amount provided by commercial banks.

In terms of the transmission process, Bruno's contribution was in making explicit the implications of the working capital nexus for inflation - the genesis of the so-called new structuralist critique. The critique of the IMF/monetarist approach to stabilization, based largely on casual empirical observation, was that monetary contraction was often followed by

an acceleration of inflation in many LDCs. Such a response was perverse in the framework of the neo-classical systhesis outlined above. Bruno, acknowledging Cavallo's prior work, shows that monetary contraction raises the amount and therefore the cost of curb market borrowing. The effect is stagflationary - decreasing output growth and worsening inflation.

Figure 2



While both Kapur and Bruno begin from radically different frameworks (Bruno does not cite Kapur), both of can be considered within the model below. An exercise in monetary contraction in Bruno's model can be represented by replacing equation (1) with an equation of the following form.

$$\hat{y} = c_0\hat{M} - c_1\hat{w} + c_2\hat{P}^* \qquad (1a)$$

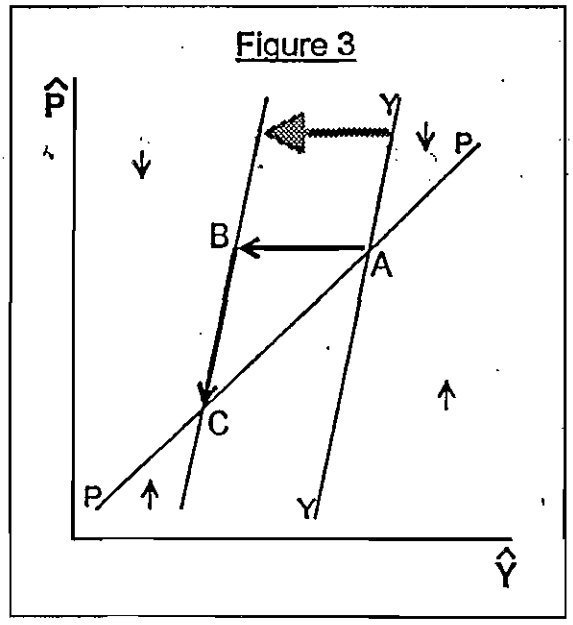
Equation (1a) differs from (1) in a number of respects. First, the coefficient c_0 is different from a_0 by virtue of working through the rate of interest in the curb instead of representing a quantitative effect. Second, nominal wages are growing at some exogenous rate independent of the expected inflation rate in the short run. Therefore, a rise in the inflation rate does not automatically raise the amount of borrowing required. $\hat{P}^*$ appears since firms are now maximizing profits in the usual way, and so a higher expected price (inflation) calls forth a greater output (growth). See the appendix for a formal derivation of this equation.

The effect of these changes is to produce a positive slope for YY, as shown in figure 2. An exercise in monetary contraction now evolves as follows. A decrease in the rate of growth of the money stock forces commercial banks to cut back on credit to firms, which must now therefore obtain more credit on the curb market and pay a higher rate of interest. This immediately reduces the profit-maximizing rate of growth. As before, price adjustment then guides the evolution to a steady state. Specifically, the traditional deflationary monetary

contraction effect working through the demand side begins to have an effect. Whether this effect dominates the previously operating stagflationary tendency is an empirical matter depending on the particular structural and institutional characteristics of each economy. Figure 2 shows the structuralist case where the outcome is inflationary.

The possibility raised by Kapur that, in a sufficiently repressed economy, monetary contraction may spur output growth is now seen to depend additionally on the endogeniety of wage growth (and other input costs). In Bruno's model, monetary contraction unambiguously decreases output growth because, even in the case where the deflationary influence dominates, this does not decrease the amount of credit required to support the existing level of output.

The Bruno/Cavallo model advances our understanding of the use of policy in developing economies in two respects. In light of the failure of IMF-sponsored deflation programs, of which monetary contraction was a large part, to reduce inflation, the new structuralist critique offered an explanation. Bruno's paper also showed the relevance of the working capital transmission mechanism to the use of currency devaluations. The contractionary impact of currency devaluation had been a recurring theme of the structuralist development literature.[6] Bruno showed that devaluation may have an additional contractionary effect because of the credit constraint. For this exercise, the change in the money stock is taken to be endogenously determined by the fiscal and external deficits.[7] A currency devaluation, even if it improves the external deficit, may worsen the external deficit measured in domestic prices. At the same time, the fiscal deficit probably falls because the nominal



[6] See Krugman and Taylor (1978) for the seminal treatment, as well as Taylor (1981), van Wijnbergen (1986), and Buffie (1984 and 1986).

[7] Money is consistently endogenous in Bruno's model. We have adopted an exogenous money supply for expository simplicity and to focus on the nature of the transmission process from monetary changes to the real side.

income level increases. Both developments reduce the money supply and therefore the supply of commercial bank credit. Firms are driven to the curb market where marginal borrowing costs rise with demand.

Bruno recognized the role of curb markets in alleviating the working-capital credit constraint, but failed to model the workings of such a market explicitly. Its presence was reflected in the specification that marginal borrowing costs rose along with the amount of working capital needed. An explicitly specified market for private credit did not appear until Taylor (1981) and van Wijnbergen (1983). Such explicit consideration, at least in the form of Taylor and van Wijnbergen, produced an output growth equation of the same form as equation (1a) [see appendix] and thus does not change the qualitative results .

Taylor (1981) transplants the new structuralist mechanism to a Keynesian income-determination model. In so doing, he shows that, even in the presence of a strong working-capital mechanism, monetary contraction may not be inflationary in a "Fisherian" economy. The Fisherian condition is that investment responds strongly to the profit rate, which in turn is positively related to the level of output.

This case produces a positively-sloped PP curve, as shown in figure 3 and derived in the appendix, since growth raises the profit rate and spurs investment demand sufficient to raise the inflation rate. Taylor demonstrates that monetary contraction, a leftward shift of the YY curve, then reduces inflation in such an economy. This is sufficient to restore the usual Keynesian/monetarist result even in the presence of the working capital constraint.

Elsewhere, Taylor (1983) shows the usefulness of explicit treatment of the curb market. The financial repression theorists have argued that raising the deposit rate will expand financial intermediation and increase credit availability. Kapur, above, argues that deposit rate increases are the preferred stabilization tool since it is not accompanied by credit contraction. In the presence of a fully specified curb market, Taylor shows that money drawn into the banking system out of the curb market will decrease the total supply of credit to firms from all sources. This is because banks have a reserve requirement, while curb lending does not. The working-capital constraint and flourishing curb market combine to make financial liberalization through deposit rate increases an uncertain proposition.

Two later contributors to this literature, Buffie (1984) and Rojas-Suarez (1987), while not challenging the mechanics of the working capital effect as a transmission process, offer richer and more detailed treatment of the financial and real sides respectively.

Buffie adds a more detailed specification of the financial side to better model the implications of the presence of a curb market. Specifically, he postulates wealth-holders who maintain a portfolio with a broader range of assets than in previous models, including a foreign asset. The richer financial model does not alter the new structuralist view of monetary contraction. However, Buffie is able to show how devaluation may indeed not be contractionary in a credit-constrained economy with a foreign asset. Devaluation of the domestic currency raises the domestic value of holdings of the foreign asset (which in his model is currency paying a zero rate of interest). This induces a portfolio shift towards other assets including curb market loans, reducing the cost of credit and stimulating output.

Rojas-Suarez presents the real side as a dynamic exercise with tradable and non-tradable goods. Using a choice-theoretic overlapping-generations model, Rojas-Suarez derives optimizing decision rules for each economic agent (firms, young and old generations), with which the various market demands and supplies are constructed. The treatment of monetary expansion involves essentially the same comparison of demand and supply side influences that has been explored above, but the working capital mechanism has been extended. On the supply side, monetary expansion relaxes the financial constraint, but not only because of the direct effect of more nominal money. The demand expansion also worsens the trade deficit and therefore decreases net foreign assets and the money supply next period. Labor consequently anticipates a lower price level next period, which lowers the current wage and decreases the need for credit. This extension of the influence of the credit constraint falls naturally out of the structure of a model in which agents live two periods and generations overlap.

Rojas-Suarez contradicts the inflation result of the new structuralists. Stability in this dynamic model necessitates that the demand-side effects of a monetary change dominate the supply-side effects, in which case the standard result that monetary contraction is deflationary is restored. The model is also able to show that while an increase in the level of the money

stock is expansionary, a rise in the growth rate of money may be contractionary. This is because a rise in the growth rate of money raises the expected price level and therefore decreases the real money supply.

Much macroeconomic analysis in general, and the works surveyed here in particular, suffer from their symmetrical nature. Increases and decreases in a policy variable are modeled to have exactly opposite results. In the present context, asymmetry may arise from the fact that monetary expansions are almost always born of fiscal splurges and monetized deficits, while contractions are usually achieved by credit restrictions on commercial banks. Again, expansions in the Latin American economies of interest here are often discreet jumps in levels, whereas contractions, as sometimes guided by the IMF, are reductions in rates of growth. This suggests the possibility that the monetarist mechanism may be applicable to expansions, which directly increase spending and which therefore lead to inflation and external deficits, and the structuralist view is correctly applied to contractions, which first hits working capital credit to firms. Both asymmetries are candidates for fruitful future research.

4. Transmission via Foriegn Exchange Markets

All the previously cited work, if they included an external sector at all, did so in the context of a fixed exchange rate regime. This is to be expected since fixed official exchange rates were the rule in Latin America and most other developing areas. At the same time, a literature developed on the behavior of black markets for foreign exchange in these economies, in which markets the exchange rate fluctuates freely [Sheikh (1978), Flood (1978), de Macedo (1982), Cumby (1983), Dornbusch, et al (1983), Nowak (1984), Kamin (1986), Pinto (1986 and 1987), Lizondo (1987).] Just as the macro work ignored the foreign exchange market, much of black market literature either failed to analyze the macroeconomic implications or treated them inadequately.

Nevertheless, transmission processes that work via the black market can be gleaned from some of the works. Cumby (1984), for example, sets out to show how monetary policy and export shocks affect an economy with a dual exchange rate regime. The foreign exchange market in Cumby's model is segmented in such a way that current account transactions take place at the fixed official rate, while capital transactions are executed at a freely fluctuating

secondary rate. Output is fixed and the price level adjusts to match aggregate demand to the fixed supply. In such a setting, open market operations are shown to have a residual effect on the money stock, even in the face of capital mobility. Thus a successfully dichotomized foreign exchange market restores autonomy to monetary policy.

In analyzing monetary policy, Cumby's model revealed how monetary changes may be transmitted to the real economy via the black market. The monetary exercise in the paper consisted of open market purchases rather than domestic credit expansion. As a result there is no immediate wealth effect on aggregate demand. The effect on the financial side is that the excess supply of money generated by the open market purchase induces portfolio changes which drive up the free exchange rate. This raises the value of existing foreign securities, and it is from this that there is a wealth increase that stimulates the demand for goods.

King (1994) included the foreign exchange market (in this case, a black market in a dual exchange rate regime) explicitly in a macro model with a supply side. The result was that, in highly externally-dependent economies, monetary contraction will reduce the exchange rate and thus have a positive effect on output. This suggests that monetary contraction is deflationary, but through the supply side.

Conclusion

The advent of balance of payments crises in the developing world in the 1970s propelled stabilization to the forefront of development analysis. The debate over the appropriate policy path to a stable economy has emerged as a difference over the proper description of the mechanism for the transmission of monetary changes to the real economy. Early on, monetary transmission in developing economies was viewed in much the same terms as in developed economies, where the neo-classical synthesis prevailed. The changed focus to stabilization issues provided the framework in which models could reveal mechanics of economic linkages that were richer.

The differences about the mechanics of monetary transmission cannot be separated from the discussion about the role of monetary policy. What is at stake in a discussion of transmission mechanisms is the answer to the question: what is the proper objective of

monetary policy in LDCs? Is it short-run management of cyclical fluctuations in aggregate demand, as in developed economies? The Latin American monetarist view in this survey suggests just such a role, cyclical in nature or not, since inflation and balance-of-payments deficits are attributed to excess aggregate demand. Alternatively, monetary policy may be geared towards ensuring sufficient credit for economic growth, the long-term view which is consistent with the structuralist position.

APPENDIX

This appendix formally presents the composite model from which the equations and results in the main text were derived.

Let aggregate demand (measured per unit of the capital stock) be separable in wealth and price effects.

$$y^d = v(W)(e/P)^b \qquad \text{(A1)}$$

P is the domestic price level and e is the exogenous (for now) nominal fixed official exchange rate. W is total real private wealth and is identically equal to the sum of the real monetary base (M/P) and the real value of the capital stock (K).

The rate of inflation is determined by the expected rate of inflation and the relative rates of growth of expenditure and output.

$$\hat{P} = \hat{P}^* + \tau(\hat{y}^d - \hat{y}) \qquad \text{(A2)}$$

The expected rate of inflation is adjusted adaptively, to reflect the sluggishness in achieving changes in the inflation rate.

$$\frac{d\hat{P}^*}{dt} = \beta(\hat{P} - \hat{P}^*) \qquad \text{(A3)}$$

where ß<1

Expressing equation (A1) in rate-of-growth form, and substituting it, along with equation (A2), in equation (A3) yields

$$\frac{d\hat{P}^*}{dt} = \beta\left[J\tau\sigma_{vw}s^M\hat{M} - (1-J)\hat{P}^* - J\tau\hat{y}\right] \qquad (A4)$$

where $J^{-1} = 1+\tau(\sigma_{vw}s^M+b) > 1$, s^M is the fraction wealth accounted for by the monetary base, and σ_{ij} is the elasticity of variable i with respect to variable j. This equation corresponds to equation (2) in the main text.

Production is governed by a Cobb-Douglas technology of the following form.

$$Y = T^{-1}\,K^{(a-1)/a}L^{1/a} \qquad (A5)$$

where T and a are parametric and a>1. K is the installed capital stock and L is labor input. From (A5), the following restricted variable-cost function can be derived.

$$c = wl = Ty^a w \qquad (A6)$$

l and y are labor and output per unit of capital stock. Labor, which is in unlimited supply, is procured at nominal cost w.

Production takes place subject to the availability of credit to finance the value of variable inputs tied up in the production process. If the economic period is defined as the length of time in which one production cycle can be completed, then the amount of working capital needed is equal to c(y,w). Some of the initial amount of working capital is derived from self-financing (SF), so the stock demand for credit at any moment is

$$LO = c(y,w) - SF \qquad (A7)$$

To give the monetary authorities policy leverage, we assume that commercial banks do not hold excess reserves. This allows us to write the real supply of commercial bank credit as

qM. where M is the nominal monetary base and q is a fixed multiple. The credit constraint is binding, so output is determined by the solution to

$$c(y,w) - SF = qM \qquad \text{(A8)}$$

Equations (A6) and (A8) can be solved for y. Expressing the result in rate-of-growth form, and assuming that wages rise at the expected inflation rate, we derive the following expression for output growth.

$$\hat{y} = a^{-1}\left[(qM/Twy^{*})\hat{M} - \hat{P}^{*}\right] \qquad \text{(A9)}$$

"Hats" denote a rate of growth. This justifies equation (1) in the main text.

Kapur's financial repression regime result, that a decrease in the money growth rate will result in a higher steady state growth rate for output, occurs only if

$$(SF/qM)\sigma_{vw}s^{M} > b \qquad \text{(A10)}$$

The specification adopted here makes it explicit that if there is no self-financing (SF=0), the condition cannot be satisfied.

To derive Bruno's results, we have firms procure the maximum amount of credit possible from commercial banks, qM, and then go to private lenders to satisfy the remainder, c(y,w)-qM. Consequently, Bruno specifies the curb rate of interest as being determined in a manner similar to

$$1+r = (1+r_0)[c(y,w)/qM]^{n-1} \qquad \text{(A11)}$$

where n>1.

Using c(y,w) from equation (A6) and 1+r from equation (A11), firms maximize the expected profit function, P*y - [c(y,w)](1+r). This yields, in growth form,

$$\hat{y} = (an-1)^{-1}\left[(1-n)\hat{M} - n\hat{w} + \hat{P}^{*}\right] \qquad \text{(A9a)}$$

which is the form of equation (1a) in the text.

The model with an explicit credit market, as in Taylor (1981) and van Wijnbergen (1983), is derived as follows. Since it adds nothing further to the analysis, we now omit consideration of self-financing. The real demand for credit is therefore.

$$LO = c(y,w) \tag{A7a}$$

The banking system and households provide credit in the following amounts.

$$LO^b = qM \tag{A12}$$

$$LO^h = t(i,y)W$$

Imposing credit market equilibrium ($LO=LO^b+LO^h$) determines the following elasticities for the rate of interest.

$$\phi_M = \hat{r}/\hat{M} = -M(q+t)/LO^h\sigma_{tr} < 0 \tag{A13}$$

$$\phi_y = \hat{r}/\hat{y} = (ac - LO^h\sigma_{ty})/LO^h\sigma_{tr} > 0 \tag{A14}$$

$$\phi_w = \hat{r}/\hat{W} = c/LO^h\sigma_{tr} > 0 \tag{A15}$$

$$\phi_M = \hat{r}/\hat{M} = tPK/LO^h\sigma_{tr} < 0 \tag{A16}$$

Determining r endogenously with the above elasticities, profit maximization now yields the following growth function.

$$\hat{y} = \frac{\bar{r}(\phi_{LC}+\phi_P\sigma_{CY}\pi^M)\hat{M} - (\bar{r}\phi_w+1)\hat{w} + (\phi_P-1)\hat{P}^*}{a+\bar{r}(\phi_y+\phi_P J_{ty})-1} \tag{A9b}$$

where $\bar{r} = (1+r)^{-1}$. Equation (A9b) has the same form as equation (1a) in the text.

Finally, Taylor's Fisherian condition is accommodated here by replacing the goods demand equation (A1) with

$$y = v[W,\pi(y)](e/P)^b \tag{A1a}$$

where π is the profit rate. Equation (A1a) generates the following price expectations adjustment equation.

$$\frac{d\hat{P}^*}{dt} = \beta\left[J\tau\sigma_{vw}s^M\hat{M} - (1-J)\hat{P}^* + J\tau(\phi_{v\pi}\phi_{\pi y} - 1)\hat{y}\right] \qquad \text{(A3a)}$$

The coefficient on y may now be positive. A positive coefficient supports the upward-sloping PP curve in figure 3.

Bibliography

Adelman, Irma, and Kim Mahn Je (1969), "An Econometric Model of the Korean Economy (1956-1966)," in Irma Adelman (ed.), *Practical Approaches to Development Planning: Korea's Second Five-year Plan*, Baltimore, Md.: Johns Hopkins University Press.

Beltran del Rio, Abel, and Lawrence R. Klein (1974), "Macroeconometric Model Building in Latin America: The Mexican Case," in Nancy D. Ruggles (ed.), *The Role of the Computer in Economic and Social Research in Latin America*, New York: National Bureau of Economic Research.

Blanchard, Olivier Jean (1987), "Why Does Money Affect Output? A Survey," MIT Working Paper #453, June.

Bloomfield, Arthur I. (1963), "Monetary Policy in Underdeveloped Countries," in Theodore Morgan, George W. Betz, N.K. Choudry (eds.), *Readings in Economic Development*, Belmont, CA: Wadsworth Publishing.

Brunner, Karl, and Allan H. Meltzer (1988), "Money and Credit in the Monetary Transmission Process," *American Economic Review*, Papers & Proceedings, May, 446-451.

Bruno, Michael (1979), "Stabilization And Stagflation In A Semi-industrialized Economy," in: Rudiger Dornbusch And Jacob A. Frenkel (eds.), *International Economic Policy, Theory And Evidence*, Baltimore, Md.: Johns Hopkins University Press.

Buffie, Edward F. (1984), "Financial Repression, The New Structuralists And Stabilization Policies In Semi-industrialized Economies," *Journal Of Development Economics*, 14, 305-322.

Bottomley, Anthony (1965), "Keynesian Monetary Theory and the Developing Countries," *Indian Economic Journal*, XII(4), April-June.

Carter, Nicholos G. (1970), "A Macro Economic Model of Jamaica," *Social and Economic Studies*, 19(2), June.

Cavallo, D.F. (1977), "Stagflationary Effects of Monetarist Stabilization Policies," Unpublished Ph.D. dissertation, Havard University.

Coates, Warren L., and Deena R. Khatkhate (eds.), *Money and Monetary Policy in Less Developed Countries: A Survey of Issues and Evidence*, Oxford: Pergamon Press, 1980.

Cumby, Robert E. (1984), "Monetary Policy Under Dual Exchange Rates," *Journal of International Money and Finance*, 3, 195-208.

de Macedo, Jorge Braga de (1982), "Exchange Rate Behavior With Currency Inconvertibility," *Journal Of International Economics*, 12, 65-81.

Dornbusch, Rudiger, Daniel Valente Dantas, Clarice Pechman, Roberto de Rezende Rocha, and Demetrio Simoes (1983), "The Black Market For Dollars In Brazil," *Quarterly Journal Of Economics*, Feb., 25-40.

Flood, Robert P. (1978), "Exchange Rate Expectations In Dual Exchange Markets," *Journal Of International Economics*, 8, 65-77.

Friedman, Milton (1969), "Factors Affecting the level of Interest Rates," in Thomas M. Havrilesky and John T. Boorman (eds.), *Money Supply, Money Demand, and Macroeconomic Models*, Arlington Heights, Ill.: Harlan Davidson Inc., 1982, reprinted from Proceedings of the 1968 Conference on Savings and Residential Financing, Chicago: The league, 1969, 11-27.

Friedman, Milton, and Anna Schwartz (1963), "Money and Business Cycles," *Review of Economics and Statistics* (Supplement). Reprinted in M.J.C. Surrey, *Macroeconomic Themes*, Oxford: Oxford University Press, 1976.

Hansen, Bent (1982), *A Survey of General Equilibrium Systems*, Malabar, Fl.:Robert E. Krieger.

International Monetary Fund (1987), *Theoretical Aspects of the Design of Fund-Supported Adjustment Programs*, Occasional Paper #55, Washington: International Monetary Fund.

Islam, Shafiqul (1984), "Devaluation, Stabilization Policies and the Developing Countries," *Journal of Development Economics*, 14, 37-60.

Kamin, Steven B. (1986), "Devaluation, Exchange Controls, And Black Markets For Foreign Exchange In Developing Countries," Mimeo, MIT.

Kapur, Basant K. (1976), "Alternative Stabilization Policies for Less-developed Economies," *Journal of Political Economy*, 84(4), 1976, 777-795.

Keller, Peter M. (1980), "Implications of Credit Policies for Output and the Balance of Payments," *Staff Papers*, 27(3), Sep., 451-477.

Keynes, J. M. (1936), *The General Theory of Employment, Interest, and Money*, London: Macmillan.

Khan, Moshin S., and Malcolm D. Knight (1983), "Stabalization Programs in Developing Countries: A Formal Framework," *Staff Papers*, Sep., 1-53.

King, Damien (1994), " Macroeconomic Adjustment in Externally-Dependent Economies with Parallel Exchange Markets," *Social and Economic Studies*, 43(1), 43-70.

Klein, Lawrence R. (1965), "What Kind of Macroeconometric Model for Developing Economies?" *Indian Economic Journal*, XIII(3).

Krugman, Paul, and Lance Taylor (1978), "Contractionary Effects Of Devaluation," *Journal Of International Economics*, 8, Aug., 445-456.

Laidler, David (1978), "Money and Money Income: An Essay on the 'Transmission Mechanism'," *Journal of Monetary Economics*, 4(2), 151-191.

Lizondo, Jose Saul (1987), "Exchange Rate Differential And Balance Of Payments Under Dual Exchange Markets," *Journal Of Development Economics*, 26(1), Jun., 37-53.

Montiel, Peter (1985), "A Monetary Analysis Of A Small Open Economy With A Keynesian Structure," *Staff Papers*, 32, Jun., 179-210.

Montiel, Peter (1986), "Long Run Equilibrium In A Keynesian Model Of Small Open Economy," *Staff Papers*, 33(1), Mar., 28-59.

McKinnon, R.I. (1973), *Money and Capital in Economic Development*, Washington: The Brookings Institution.

Moroney, John R. (1972) "The Current State of Money and Production Theory," *American Economic Review*, Papers & Proceedings, LXII(2), May, 335-343.

Nowak, Michael (1984), "Quantitative Controls And Unofficial Markets In Foreign Exchange," *Staff Papers*, 31, 404-431.

Otani, Ichiro, and Yung Chul Park (1976), "A Monetary Model of the Korean Economy," *Staff Papers*, 23(1), Mar., 164-199.

Park, Yung Chul (1972), "Some Current Issues on the Transmission Process of Monetary Policy," in Thomas M. Havrilesky and John T. Boorman (eds.), *Money Supply, Money Demand, and Macroeconomic Models*, Arlington Heights, Ill.: Harlan Davidson Inc., 1982, reprinted from *Staff Papers*, Mar. 1972, 1-43.

Park, Yung Chul (1973), "The Role Of Money In Stabilization Policy In Developing Countries," *Staff Papers*, 20(2), Jul.

Pinto, Brian (1986), "Exchange Rate Rules, Black Market Premia And Fiscal Deficits: The Bolivian Hyperinflation," Mimeo, The World Bank,

Pinto, Brian (1987), "Black Markets For Foreign Exchange, Real Exchange Rates And Inflation: Overnight Vs. Gradual Reform In Sub-saharan Africa," Mimeo, The World Bank,

Polak, J.J. (1957), "Monetary Analysis of Income Formation and Payments Problems," *Staff Papers*, 5(1), Nov., 1-50

Porter, Richard C., and Susan I. Ranney (1982), "An Eclectic Model Of Recent LDC Macroeconomic Policy Analyses," *World Development*, 10(9), 751-765.

Reichmann, T.M. (1978), "The Fund's conditional Assistance and the Problems of Adjustment, 1973-75," *Finance & Development*, 15(4), Dec., 38-41.

Rojas-Suarez, Liliana (1987), "Devaluation and Monetary Policy in Developing Countries," *Staff Papers*, 34(3), Sep., 439-470.

Shaw, Edward S. (1973), *Financial Deepening and Economic Development*, New York: Oxford University Press.

Sheikh, Munir A. (1976), "Black Market For Foreign Exchange, Capital Flows And Smuggling," *Journal Of Development Economics*, 3, 9-26

Taylor, Lance (1981), "IS/LM In The Tropics: Diagrammatics Of The New Structuralist Macro Critique," In W.R. Cline & S. Weintraub (eds), *Economic Stabilization In Developing Countries*, Washington: The Brookings Institution.

Taylor, Lance (1983), *Structuralist Macroeconomics: Applicable Models for the Third World*, New York: Basic Books.

Wachter, Susan M. (1979), "Structuralism Vs. Monetarism: Inflation In Chile," In Jere Behrman, James A. Hanson, (eds.), *Short-term Macroeconomic Policy In Latin America*, Cambridge, Mass: Ballinger, pp.227-255.

Wijnbergen, Sweder Van (1983), "Credit Policy, Inflation And Growth In A Financially Repressed Economy," *Journal Of Development Economics*, 13, 45-65.