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MACROECONOMIC ADJUSTMENT UNDER AN EXTERNAL AND FISCAL CONSTRAINT: A FIX-PRICE/FLEX-PRICE APPROACH

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ABSTRACT

This paper presents a dual economy model of the fix-price/flex-price kind that explicitly allows for the existence of a government budget constraint in a fully open economy. Both the external and fiscal closures resemble very much the contemporary experience of several Latin American countries, where fiscal discipline and fix exchange rate systems have been the norm. Thus, within the public sector, it is assumed that public investment is the adjustment variable, while foreign reserves variation adjusts the external balance. Short-run impacts of policy-induced variables and changes in exogenous external financing are analysed. Relevant trade-offs, especially between output and inflation, follow from an analysis in which the time perspective is rather short. However, in the medium term, some balancing forces in the economy can moderate the trade-offs. We show among a wide range of events and policy options that this is the case of debt relief or a concerted lending strategy.

1. INTRODUCTION

After the abrupt slowdown in international lending that started before the Mexican suspension of payments in 1982, capital inflows to some developing countries—in Asia and Latin America—were stimulated by a decline in perceived country risk premia and expectations of a recovery in growth. Capital flows were huge in the period from the early 1990s to the onset of the international financial crisis in mid-1997. However, since the Asian crisis, many developing countries have fallen on hard times again. Access to private foreign capital markets became limited and has had an adverse impact on

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government revenues. Net private capital flows to major emerging market economies fell from $169 billion in 2000 to $115 billion in 2001 and were particularly hard hit by the crises in Argentina and Turkey.[1]

This precarious nature of developing countries' access to international financing means that external financing can and often does disappear just when it is most needed to finance a countercyclical fiscal policy. Thus, although it would be desirable temporarily to respond to recession countercyclically, the financing required to do so has vanished.

Fiscal adjustment in highly indebted countries has thus had to take place under extremely adverse circumstances. Concern to avoid the disruptive effects of raising tax revenues and revenues of public enterprises requires financing from domestic borrowing or expenditure cuts, but at a saturation point of domestic borrowing and faced with the potential of an inflationary spiral, governments usually are obliged to reduce their expenditures. Besides, aggressive fiscal adjustment becomes a crucial signal of continued commitment to 'sound policies', and in the absence of this adjustment there is a real danger that capital flight by already nervous investors intensifies, further deepening the economic problems. Thus, public investment seems to have borne the brunt of the adjustment. In this case the fiscal regime implies that the fiscal constraint operates through public investment adjustment.

What we see today in many highly indebted developing countries is that not only has the burden of external shocks and capital markets volatility fallen disproportionately on the public sector, but also the measures taken to deal with stagnation and the external and fiscal constraint have aggravated macroeconomic imbalances.

The purpose of this paper is to develop, within a fix-price/flex-price framework for a semi-industrialized economy, a model that reveals some important aspects of the macroeconomic adjustment process when the economy is externally and fiscally constrained. At the outset, one clarifying comment needs to be made regarding the scope of the paper. Our concern is with short-run macroeconomic issues (such as the determination of output, prices and the external balance) and medium-term dynamics allowing the change of state variables. Space limitation forces the exclusion of growth issues.

In dualistic models with mixed production structure, such as fix-price/flex-price models of the Kaleckian type, aggregate and sector-specific shocks change the internal terms of trade due to asymmetric adjustment rules in each sector. Thus, these models combine output adjustment in one sector

[1] The total is the lowest in a decade, according to what has been reported by the Institute of International Finance.

(usually manufacturing) with price adjustment in another sector (agriculture or basic goods). This gives a novel perspective on dualism where the intersectoral terms of trade between agriculture and manufacturing do adjust with important consequences for the rest of the economy. Many contributions have tried to adapt dualistic models of the fix-price/flex-price kind to address macroeconomic stabilization questions.[2] This paper re-examines these issues based on an extended framework, in which a primary sector is supply constrained, manufacturing is demand constrained and external and fiscal constraints are incorporated. By covering production, demand, income distribution, market clearing conditions, external finance and fiscal balance, the model will allow us to derive a novel short-run equilibrium representation and to examine the macroeconomic stabilization conditions in order to deal effectively with employment, inflation and the external imbalances. Short-run impacts of policy-induced variables and changes in exogenous external financing are analysed. As we shall show, the reconciliation of different policy objectives (namely increase in output and employment, stable prices and external balance) has not proved possible without entering into a number of serious trade-offs. However, if public investment addresses the lack of capital in the supply-constrained sector, the potential inflationary effects of external financing may disappear in the medium run.

The outline of the paper is as follows. In section 2 we present the basic structure of the model. In section 3 we consider the market clearing conditions in both the primary and industrial sectors, and we deal with the adjustment mechanism of the external sector and with the public sector constraint. We also characterize a situation where competing claims for the distribution of income may exist (which may potentially generate inflation in an endogenous manner). In section 4 we analyse the short-run impact of policy-induced and parametric changes in the model. By summarizing four relationships between four basic endogenous variables, namely industrial output, the price of basic goods, public investment in the basic goods sector, and reserves variation, we consider the effects of an external credit crunch, a change in direct taxation, changes in government discretionary spending and devaluation. In section 5, the model is extended to allow for changes in the money wage rate

[2] A macroeconomic model in this line was first stated explicitly by Kalecki (1954) and important variants due to Harris (1967), Porto (1975) and Canitrot (1975) added interesting insights. Although most analyses of flex-price/fix-price models have emphasized the role of macroeconomic and structural constraints on growth, some attention has been given also to the incidence of shocks on output, prices and the external position. Recent contributions can be found in Taylor (1979, 1983, 1991), Cardoso (1981), Bose (1982, 1989), Londoño (1988), Vos (1988), FitzGerald (1989, 1990), Modiano (1989), Rakshit (1989), Sanyal *et al*. (1989), Parkin (1991) and Jha (1994).

and the stock of capital in the supply-constrained sector. Medium-run dynamics show that some balancing forces in the economy can work to moderate some relevant trade-offs. Section 6 provides conclusions and some final remarks.

2. THE BASIC MODEL

Our basic model starts with a fully specified open economy in which two productive sectors exist: a primary sector producing a pure-consumption good (food, raw materials and basic needs), and an industrial sector producing a consumption-cum-investment good. A government budget equation is included, as well as a fully specified external sector. The inflation dynamics directly follow the conflicting behaviour of economic agents.

Specifically, the primary sector in this economy produces 'basics' (or necessities) Q_1 where the subscript 1 will refer to basics. In this typical less-developed economy, basics consist almost wholly of agricultural products—especially food grains.[3] The output level of this type of goods is assumed to be fixed in the short run.[4] These figures fit with the traditional structuralist view of food supply response. The fact of the matter is that an economy that suffers from this kind of productive bottleneck cannot be perceived as a conventional economy with some temporary and not-too-significant deviations from equilibrium that can be overcome in the short term by merely submitting it to the actions of market laws. Instead, it has to be visualized as a peculiar configuration subject to different laws and priorities.

A bottleneck in this primary sector presupposes a production function of (approximately) fixed coefficients, at least in the short run.

$$Q_1 = u_1 k_1 \tag{1}$$

[3] Borpujari (1985), for instance, reports the marginal budget share in basic supplies for rural and urban areas in India. He found that 72 per cent of the marginal budget shares of basics of the lower-income groups in urban areas were for food. In rural areas the figures were not significantly different: 73 per cent of the marginal budget share of basics of the lower-income groups were for food.

[4] Storm (1997) argues that most empirical studies show that price-responsiveness of aggregate agricultural output is relatively weak, and Mamingi (1996), in an extensive review of the empirical literature for less developed countries (LDCs), finds that agricultural supply response is inelastic in the short run. The most comprehensive study on aggregate supply response is by Binswanger *et al.* (1985) covering 58 countries. It arrives at very low price elasticities for time-series analysis and at negative values for cross-section analysis. Reca (1989) estimates long-run elasticities of food production between 0.42 and 0.52 for Argentina but Parkin (1991) arrives at a very low of 0.26 for Brazil.

Hence, production in the primary sector is determined by the output–capital ratio u_1 as shown by equation (1). The stock of capital k_1 is assumed to be non-shiftable. There is an unlimited supply of labour in the sector in the sense that the amount of labour does not affect the level of primary sector output.

$$L_1 = Q_1 / b_1 \tag{2}$$

In post-Keynesian fashion, equation (2) defines short-run employment L_1 as a function that depends on aggregate demand only (where b_1 represents labour productivity).

The demand for basics is determined solely by consumption expenditure of the primary sector and industrial workers L, at an exogenous (for the moment) wage rate W.

$$p_1 Q_1 = \varepsilon W L \tag{3}$$

As shown in equation (3), we assume for simplicity that a proportion ε of salaries is spent on basics and workers do not save. The good is sold in a competitive market, which implies that the basics price p_1 varies to clear the market.

The distribution of income between wages and profits in the primary sector before taxes is given by

$$p_1 Q_1 = W L_1 + r_1 p_2 k_1 \tag{4}$$

Equation (4) will allow us to determine the profit rates r_1. As we shall see below, the government may obtain tax revenues from profit income.

The industrial sector produces a single good, Q_2 (with the dual character mentioned above), and operates under oligopolistic conditions at a price p_2. Production requires capital k_2, intermediate goods and labour L_2 in fixed coefficients. As in the primary sector the capital stock is fixed once it is installed. The equation for full-capacity or potential output is

$$Q_{2\mathrm{f}} = \min(u_{2\mathrm{f}} k_2, b_2 L_{2\mathrm{f}}) \tag{5}$$

where $u_{2\mathrm{f}}$ is capacity output per machine and k_2 is the given capital stock in manufacturing; hence $u_{2\mathrm{f}} k_2$ represents the full-capacity output of the secondary sector. Similarly, $b_2 L_{2\mathrm{f}}$ represents the full-employment output of sector 2. The short-period potential output is the minimum of the full-capacity and the full-employment output.

We will assume that excess capacity exists so that actual output Q_2 does not reach full-capacity output Q_{2f}.

$$Q_2/k_2 < Q_{2f}/k_{2f} \text{ or } u_2 < u_{2f} \tag{6}$$

The fact that actual output (Q_2) is lower than both full-capacity ($u_{2f}k_2$) and full-employment ($b_{2f}L_2$) output must also imply that excess capacity and unemployment of labour coexist simultaneously.

Employment L_2 in industry is related in a fixed proportion b_2 to the level of industrial activity Q_2, i.e.

$$L_2 = Q_2/b_2 \tag{7}$$

Since production here takes place under an oligopolistic environment, mark-up pricing along the lines urged by Kalecki is a plausible behaviour.

$$p_2 = (1+\tau)(W/b_2 + ep_m a) \tag{8}$$

As represented by equation (8), the mark-up τ is defined over 'direct' cost of labour W/b_2 and imported intermediates $ep_m a$, where p_m and a represent the foreign price of intermediate imports and the imported physical component of the industrial product, respectively.

The distribution of income $p_2Q_2 - ep_m aQ_2$ is made up of two categories: wage recipients WL_2 and profit recipients $r_2p_2k_2$.

$$(p_2 - ep_m a)Q_2 = WL_2 + r_2p_2k_2 \tag{9}$$

From (9) we can derive the profit rate (before taxation) of the manufacturing sector, r_2.

Industrial output demand is reflected by

$$p_2Q_2 = (1-\varepsilon)WL + (1-s_c)(1-t_c)p_2(r_1k_1 + r_2k_2) + p_2(\zeta I_2 + x_2 + I_1 + G) \tag{10}$$

Demand is made up of five elements: the no basic component of wage expenditure; that part of total profits that after taxes is not saved under the given capitalist propensity to save (s_c); private investment requirement I_2, which is partly met by domestic production in proportion ζ; global public expenditure $I_1 + G$; and export demand x_2, which is exogenously given.

The following equations (11) and (12) introduce the fiscal sector into our analysis.

$$p_2G + I_1p_2 + J - t_c(r_2p_2k_2 + r_1p_2k_1) = \text{PSBR} \tag{11}$$

$$\text{PSBR} = \text{CF} \tag{12}$$

In (11) the government has a fixed 'unproductive' expenditure requirement p_2G_1, pays interest on the foreign stock of debt J and determines some amount of public investment I_1p_2.[5] The government also obtains tax revenue from direct taxation of profit income rpk coming from all productive activities (we assume that the same tax rate t_c is applied to all sectors). Note from expression (12) that a domestic market for government bonds does not exist and money expansion is not allowed, which leaves foreign capital inflows as the only alternative for financing of government deficits. On the one hand, domestic borrowing may have reached a saturation point (as we may see in several Latin American countries) or non-existent capital markets make it difficult for the government to rely on this source of financing. On the other hand, after the severe inflationary episodes of the 1980s, government borrowing from the central bank faces legal and political constraints in many Latin American countries today. Thus, for a given level of public sector borrowing requirement (given by the foreign capital constraint), a given level of current unproductive expenditure, an exogenous interest payment and a limited tax capacity, public investment becomes the only alternative to force the balance, an assumption that makes sense in highly indebted countries with lack of access to international lending.[6]

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[5] In the context of a growth analysis we may assume, following the lines suggested by Rao (1993), and Dutt (1991), that the primary sector amount of infrastructure is determined by government investment I_1. The level of primary output is therefore constrained by public "productive expenditure" p_2I_1. Vera (2001) presents growth implications of this assumption.

[6] As Roubini and Sachs (1989) note, "in periods of restrictive fiscal policies ... capital expenditures are the first to be reduced (often drastically)". In fact, by analysing the impact of the external debt crisis on the Latin America region, Eyzaguirre (1989) speaks of a dominant fiscal constraint as a situation in which PSBR is fixed and the variable that adjusts is government investment. Easterly (1998) points out that a well-known means of reducing asset accumulation when forced to reduce debt accumulation in LDCs is to reduce public investment. The United Nations Conference on Trade and Development (1989, pp. 90–91) reports that fiscal adjustment during the 1980s involved mainly spending cuts rather than revenue increases, and "the burden fell primarily on capital spending, which was more than halved in a number of countries". Bresser-Pereira (1990, p. 507) remarks that the public sector adjustment of the early 1980s in Brazil "was achieved perversely through the reduction of public sector investment". But this idea that governments in LDCs often cut capital spending in order to achieve fiscal adjustment is not just anecdotal. The 1988 *World Development Report* (p. 113) of the World Bank found that governments cut capital spending by far more (about 35 per cent) than other public sector categories like wages (10 per cent). Hicks (1991) reports this behaviour in a sample that covers 15 LDCs and 11 Latin American countries, using data from the IMF's government finance

We open the economy by introducing commercial transactions and financial transfers. A well-documented amount of work indicates that any increase in the level of income or any growth strategy in a less-developed economy has to face the limitations imposed by the balance of payments. In nominal terms the balance-of-payments surplus is described by the expression

$$X^{\text{nom}} - \text{IM}^{\text{nom}} + \text{CF} - J = \text{BOP} \tag{13}$$

Expression (13) indicates that the trade surplus $X^{\text{nom}} - \text{IM}^{\text{nom}}$ plus the net financial transfers $\text{CF} - J$ should equal the change in international reserves ΔR. On the left-hand side of (13), CF represents the sum of nominal autonomous net capital inflows measured in domestic currency, and J denotes net factor services abroad.[7] Following Arida and Bacha (1987), we consider these flows to be driven by factors outside the control of governments, and few would now dare to prognosticate on this score. Notice that since the economy is credit constrained, and given the configuration of the external sector, adjustment has to come from reserves accommodation.

Nominal exports come from the industrial sector as set up in expression (14), and its respective volume x_2 is determined endogenously by an index of competitiveness.

$$X^{\text{nom}} = p_2 x_2 \tag{14}$$

Nominal imports are considered non-competitive and broken down into two types of goods (entirely used by the industrial sector): intermediate and capital goods.[8]

$$\text{IM}^{\text{nom}} = ep_{\text{m}} aQ_2 + ep_{\text{m}}(1-\zeta)I_2 \tag{15}$$

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statistics databank for the period 1979–85. The study shows that for highly indebted countries the sector that appears to have suffered the most is the infrastructure sector. Serven (1997) found that Latin America public investment fell 2.5 percentage points of GDP from the 1970s to the 1980s, when the region was adjusting (a period of strong international credit rationing). The World Bank (1994) found that when African countries lowered their budget deficits from 1981–86 to 1990–91, "most of the cuts were in capital spending" (p. 47). Harris and Kusi (1992) reach similar conclusions for a selected group of African countries.

[7] We do know in reality that the composition of the net capital inflows account is very heterogeneous. It basically comprises direct foreign investment, portfolio flows, bank credits and official development assistance.

[8] Truncated import substitution industrialization has meant that most of these economies have become dependent on import of intermediate goods, and that the process itself rarely extends to capital goods. Indeed competitive imports represents about 18 per cent of total imports in Latin America (ECLAC (2003, p. 49)).

where e stands for the nominal exchange rate and p_m for the price of imports.

The economy and specifically the public sector is capital constrained in the sense that the amount of net capital inflows is determined by decisions beyond the control of local governments.

$$CF = CF^* \tag{16}$$

3. MARKET CLEARING, EXTERNAL AND FISCAL CONSTRAINTS, AND COMPETING CLAIMS

Basic goods are sold in a competitive market, which implies that the price varies to clear the market. Using expression (3) and knowing that total employment L in the economy is given by the sum of employment in both primary and manufacturing sectors, we may define the excess demand function for the primary sector, ED_1, as

$$p_1 Q_1 = \varepsilon W\left(\frac{Q_1}{b_1} + \frac{Q_2}{b_2}\right) \tag{17}$$

so that

$$p_1 = \varepsilon W\left(\frac{1}{b_1} + \frac{Q_2}{Q_1 b_2}\right) \tag{18}$$

with

$$\left.\frac{\mathrm{d}p_1}{\mathrm{d}Q_2}\right|_{ED_1=0} = \frac{\varepsilon W}{Q_1 b_2} > 0 \tag{19}$$

An increase in industrial output Q_2 increases the demand for basics and thus its market-clearing price.

In order to obtain a similar expression for the manufacturing sector we first introduce profit rates in all sectors. After substitution of (1) and (2) for Q_1 and L_1 in (4), the following expression for the profit rate of basics yields

$$r_1 = \frac{(p_1 - W/b_1)u_1}{p_2} \tag{20}$$

and substitution of (7) and (8) into (9) yields

$$(1+\tau)\left(\frac{W}{b_2}+ep_{\mathrm{m}}a\right)=\frac{W}{b_2Q_2}+(1-t_{\mathrm{c}})r_2\left[(1+\tau)\left(\frac{W}{b_2}+ep_{\mathrm{m}}a\right)\right]k_2 \tag{21}$$

Solving for r_2 and simplifying we get

$$r_2=\frac{\tau}{\tau+1}\frac{Q_2}{k_2} \tag{22}$$

Substitution of r_1 and r_2 into (10) allows us to express the supply and demand balance for the manufacturing sector, ED_2, as

$$\begin{aligned}p_2Q_2=&(1-\varepsilon)WL+(1-s_{\mathrm{c}})(1-t_{\mathrm{c}})\left[\left(p_1-\frac{W}{b_1}\right)u_1k_1+\frac{\tau}{1+\tau}p_2Q_2\right]\\&+\varsigma p_2I_2+p_2I_1+p_2G+p_2x_2\end{aligned} \tag{23}$$

We already know that $L = Q_1/b_1 + Q_2/b_2$. We also know that I_1 depends on r_1 and r_2. Substituting now r_1 and r_2 into (11) we have

$$I_1=\frac{\mathrm{PSBR}}{p_2}-G-\frac{J}{p_2}+\frac{t_{\mathrm{c}}}{p_2}\left[\frac{\tau}{1+\tau}p_2Q_2+\left(p_1-\frac{W}{b_1}\right)u_1k_1\right] \tag{24}$$

Substituting L and the resulting expression for I_1 into (23) and solving for p_1 we have

$$\begin{aligned}p_1=&\left([\varepsilon-s_{\mathrm{c}}(1-t_{\mathrm{c}})]\left(\frac{W}{p_2}\frac{Q_1}{b_1}\right)-\zeta I_2-\frac{J}{p_2}-\frac{\mathrm{PSBR}}{p_2}-x_2\right.\\&\left.+\left\{1-(1-\varepsilon)\frac{W}{b_2p_2}-\left[1-s_{\mathrm{c}}(1-t_{\mathrm{c}})\frac{\tau}{1+\tau}\right]\right\}Q_2\right)\left\{[1-s_{\mathrm{c}}(1-t_{\mathrm{c}})]\frac{Q_1}{p_2}\right\}^{-1}\end{aligned} \tag{25}$$

with

$$\frac{\mathrm{d}p_1}{\mathrm{d}Q_2}_{|\mathrm{ED}_2=0}=\frac{\left[1-(1-\varepsilon)\frac{W}{b_2p_2}-\left[[1-s_{\mathrm{c}}(1-t_{\mathrm{c}})]\frac{\tau}{1+\tau}\right]\right]}{[1-s_{\mathrm{c}}(1-t_{\mathrm{c}})]\frac{Q_1}{p_2}}>0 \tag{26}$$

An increase in the price of basics raises the demand for manufactures, and industrial output grows in response to this excess demand. Macroeconomic equilibrium will exist when supply equals demand simultaneously in both

basics and industry (and savings equals investment). As we shall see below this macroeconomic equilibrium is not necessarily consistent in the model with the balance between foreign exchange receipts and payments.

From expression (13) we can see that foreign exchange receipts from manufacturing exports and capital inflows support imports of intermediate products for industry and complementary capital goods. Since the economy is credit constrained (or capital constrained), the value of CF is determined by decisions beyond the control of the economy. Thus, for a predetermined level of reserves variation (or balance of payments surplus), the output limit in the manufacturing sector will be defined by the availability of foreign exchange. Alternatively, short-run adjustments to trade imbalances can be accomplished through changes in the level of international reserves accumulation. Using (13), (14), (15) and (16) we can drive BOP as

$$\text{BOP} = \Delta R = p_2 x_2 + \text{CF}^* - ep_\text{m} a Q_2 - ep_\text{m}(1-\zeta) I_2 - J \tag{27}$$

While the functioning of the economy and government policies do not exhaust the amount of international reserves, the level of industrial production Q_2 that maintains the external balance is determined as

$$Q_2 = \frac{1}{a}\left[\frac{1}{ep_\text{m}}(p_2 x_2 + \text{CF}^* - J - \Delta R) - (1-\zeta) I_2\right] \tag{28}$$

Thus, industrial output is constrained by industry dependence on imports (ζ and a) and the purchasing power of capital inflows and interest payments.

With regard to the government fiscal account we will speak of a fiscal constraint if the government cannot increase PSBR beyond a certain limit. This can be expressed as

$$I_1 p_2 + p_2 G + J - t_\text{c}(r_2 p_2 k_2 + r_1 p_2 k_1) - \text{PSBR} = 0 \tag{29}$$

Substitution of (21) and (23) into expression (29) yields

$$I_1 p_2 + p_2 G + J - t_\text{c}\left[\frac{\tau}{1+\tau} Q_2 p_2 + \left(p_1 - \frac{w}{b_1}\right) Q_1\right] = \text{PSBR} \tag{30}$$

Government activity affects the equilibrium values of Q_2 and p_1.

$$Q_2 = \frac{1}{t_\text{c}\tau/(1+\tau)}\left[I_1 + G + \frac{i^* D}{p_2} - \frac{\text{PSBR}}{p_2} - \frac{t_\text{c}}{p_2}\left[p_1 - \frac{W}{b_1}\right] Q_1\right] \tag{31}$$

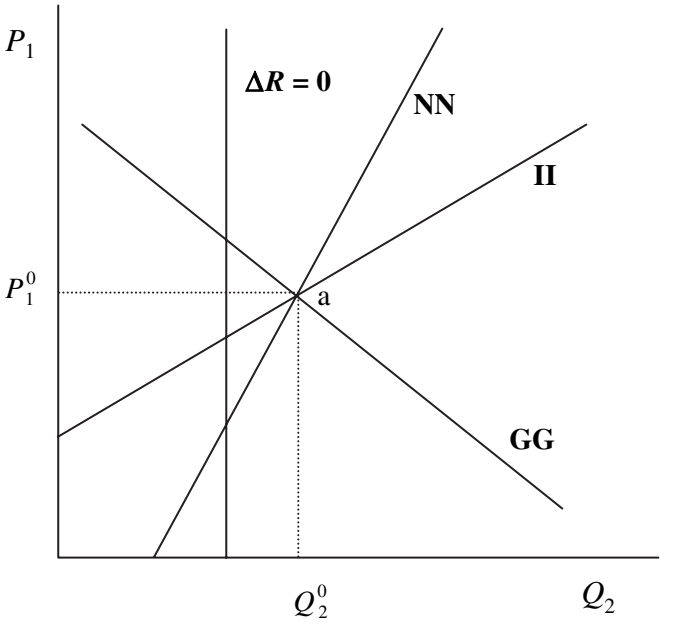

Figure 1. The four schedules in the P_1–Q_2 space.

The fiscal balance (PSBR = PSBR*) is drawn as GG in figure 1 and derives from the expression

$$p_1 = \left(I_1 + G + \frac{i^* D}{p_2} + \frac{t_c W Q_1}{p_2 b_1} - \frac{\text{PSBR}}{p_2} - \frac{t_c \tau}{1+\tau} Q_2 \right) \left(\frac{t_c Q_1}{p_2} \right)^{-1} \tag{32}$$

where

$$\left. \frac{\mathrm{d}p_1}{\mathrm{d}Q_2} \right|_{\text{PSBR=PSBR*}} = \frac{-\tau p_2}{(1+\tau) Q_1} < 0 \tag{33}$$

The partial solution to the model can now be illustrated in figure 1. The slope of the curve NN, which represents equilibrium in the market for basics, is positive. Points to the right of NN represent excess demand for basics and rising equilibrium prices in this market. The slope of the II curve is also positive. Along it, the market for industrial products is in equilibrium. Points to the right of II indicate excess supply of manufactures and falling industrial output. The equilibrium price p_1^0 and output Q_2^0, determined by the intersection of II and NN in figure 1, determine a corresponding equilibrium

variation in reserves. The vertical line labelled $\Delta R = 0$ stands at the level of industrial activity for which the external sector is balanced. Positions to the right of $\Delta R = 0$ represent a balance-of-payments deficit. Finally, the GG curve is shown with a negative slope, indicating that the more favourable the industrial output becomes (higher tax collection), the lower the price in the primary sector must be to maintain fiscal balance (lower tax collection). Positions to the right and above the curve represent fiscal surplus.

In the model competing claims for the distribution of income may potentially generate an inflationary process if the relative price that corresponds to equilibrium in goods markets is inconsistent with the relative price that satisfies workers' claims. Let us define the consumer price index of general price level p as a linear homogeneous function of basics and industrial prices as represented by the expression

$$p = p_1^{\varepsilon} p_2^{1-\varepsilon} \tag{34}$$

We know that ε represents the portion of wages spent on basics. Trivial expressions for the primary sector manufacturing price ratio p_1/p_2 and the effective real wage w are

$$\rho = p_1 / p_2 \tag{35}$$

$$w = W / p \tag{36}$$

A simple version of the target real wage hypothesis is given by[9]

$$W = Tp \tag{37}$$

According to the target real wage hypothesis, aimed at reaching a target real wage T, organized workers have to translate their basic objectives into a money wage objective, for bargaining takes place in money terms.[10]

[9] Instances of the application of the target real wage model to LDCs are still very limited, but the real wage resistance hypothesis has been widely justified and used by structuralists to explain variations in nominal wages (see Diamand (1978), Cardoso (1981), Taylor (1983)). Frenkel (1986) provides a survey of the arguments and the outcomes of several empirical studies on wage formation in Latin American countries. An important common element he found in most studies is the significant impact that institutional factors play in the determination of nominal wages in the private sector. There are, in particular, organizational forms, rules and social norms that indicate that some form of wage resistance prevails in these countries.

[10] It is clear in this case that money wages are not modelled as exogenous or predetermined anymore. However, in the short-run comparative statics that follow we assume w to be fixed and we will relax that assumption for the medium-run dynamics.

Now, it will be useful to express the relative price between basics and manufacturing goods ρ in terms of the effective real wage w. To do so, we use equations (34) and (36) to obtain

$$w = W p_1^{-\varepsilon} p_2^{\varepsilon-1} \tag{38}$$

Dividing (38) by p_2 and rearranging, we get[11]

$$w = \left[\rho^{\varepsilon} \frac{(1+\tau)(Wb_2 + aep_m)}{W} \right]^{-1} \tag{39}$$

which can also be expressed as

$$\rho = \left[\frac{(1+\tau)(Wb + eap_m)}{W} w \right]^{-1/\varepsilon} \tag{40}$$

Equation (40) is similar to that presented by Cardoso (1981), Taylor (1983) and Parkin (1991) but includes the effect of unit costs of intermediate imports. By making the assumption that workers push up money wages to maintain a target real wage T, (40) may be rewritten as

$$\rho^1 = \left[\frac{(1+\tau)(Wb + eap_m)}{W} T \right]^{-1/\varepsilon} \tag{41}$$

[11] Dividing (37) by p_2 and using (34) we get

$$\frac{w}{p_2} = \frac{W}{p_2} p_1^{-\varepsilon} p_2^{\varepsilon-1}$$

Rearranging this expression we have

$$w = \frac{W}{p_2} p_1^{-\varepsilon} p_2^{\varepsilon-1} p_2 = \frac{w}{p_2} \left(\frac{p_1}{p_2} \right)^{-\varepsilon}$$

Now, we know that $\rho = p_1/p_2$; therefore, $w = \rho^{-\varepsilon} W/p_2$, but using (8) for p_2 we get

$$w = \left(\frac{p_1}{p_2} \right)^{-\varepsilon} W[(1+\tau)(wb_2 + aep_m)]^{-1}$$

which is equal to

$$w = \left[\rho^{\varepsilon} \frac{(1+\tau)(Wb_2 + aep_m)}{W} \right]^{-1}$$

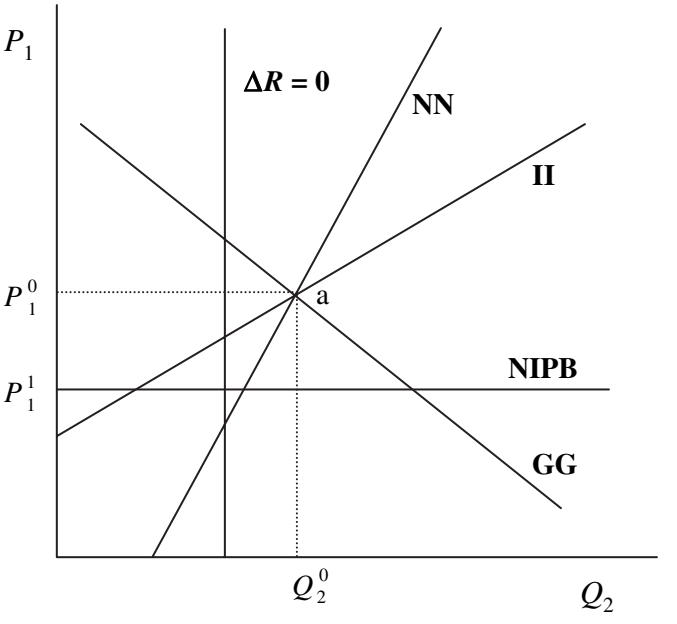

Figure 2. The inclusion of the non-inflationary price of basics schedule.

Equation (41) represents the non-inflationary relative price ρ^1, i.e. a relative price that is compatible with the fixed mark-up set by capitalists and the target real wage of workers. No conflict occurs since both these aspirations are satisfied. Higher mark-ups, higher unit costs or higher desired real wage will cause a decline in ρ^1.

Again (43) can be rearranged and expressed in terms of p_1, so we have

$$\rho_1^1 = \left\{ \frac{W}{T} [(1+\tau)(Wb_2 + aep_m)]^{\varepsilon - 1} \right\}^{1/\varepsilon} \tag{42}$$

The non-inflationary price of basics (NIPB), p_1^1, is plotted as the line NIPB in figure 2.

In figure 2, the line NIPB is shown together with equilibrium in the markets for basic goods and industrial products, represented by NN and II, and the fiscal and external balance schedules. It is obvious that barring the coincidental case in which the whole set of curves meets at a point, there is no equilibrium, i.e. it is not possible for markets to clear and for the aspirations of different classes to be satisfied. We have, then, two prices for basic goods, p_1^1 and p_1^0. If they coincide, a non-inflationary equilibrium in basics and

industrial goods prevails. If, however, as in figure 2, the economy is at point 'a' where goods markets clear but the prevailing real wage is too low to satisfy workers' aspirations (p_1^0 is too high), a price inflation will be sparked off.[12]

4. SHORT-RUN IMPACTS

By summarizing the four equations expressing the relationships between four basic endogenous variables, namely industrial output, the price of basic goods, public investment in the basic goods sector, and reserves variation, we may analyse the short-run impact of policy-induced and parametric changes in the model. Expressions (18) and (25) are fundamental equations of the model. They can be solved simultaneously for the equilibrium output in the manufacturing sector, Q_2, and the equilibrium price of primary goods, p_1. With this we can further solve for the level of reserve variations, ΔR, and the equilibrium level of public investment, I_1.

To simplify the analysis we discuss short-run equilibrium under the assumption that both the primary sector and the manufacturing sector markets clear immediately. Substituting (18) into (25) and simplifying we get

$$Q_2^0 = \frac{(1-\varepsilon)\dfrac{WQ_1}{b_1 p_2} + [1-s_c(1-t_c)]\left[(\varepsilon-1)\dfrac{WQ_1}{b_1 p_2}\right] + \zeta I_2 + x_2 + \dfrac{\text{PSBR}}{p_2} - \dfrac{J}{p_2}}{1-(1-\varepsilon)\dfrac{W}{b_2 p_2} - [1-s_c(1-t_c)]\left(\dfrac{\tau}{\tau+1} + \dfrac{\varepsilon W}{b_2 p_2}\right)} \tag{43}$$

which is a reduced form equation for the manufacturing sector equilibrium output level. The sign of the denominator in equation (43) will be important in the forthcoming analysis. Reasonable assumptions will set the capitalist saving and tax rates to values less than one, with the term $\varepsilon W/b_2 p_2$ being between zero and one. The second term $(1-\varepsilon)(W/b_2)(1/p_2)$ is clearly less than one.[13] With these plausible values the overall result will be unambiguously positive. To calculate the impacts of relevant parameters on endogenous variables, we may simplify (43) and replace both the numerator and the denominator of (43) by δ_1 and δ_2 (where both magnitudes are positive); then we get

[12] We will ignore here how inflation dynamics interact with the equilibrium schedules derived above. A good presentation in a fix-price/flex-price framework can be found in Cardoso (1981).

[13] In fact, the term $(W/b_2)(1/p_2)$ is the ratio of labour cost to manufacturing prices (with values between zero and one).

$$\delta_1 = (1-\varepsilon)\frac{WQ_1}{b_1 p_2} + [1 - s_c(1-t_c)]\left[(\varepsilon - 1)\frac{WQ_1}{b_1 p_2}\right] + \zeta I_2 + x_2 + \frac{\text{PSBR}}{p_2} - \frac{J}{p_2} > 0$$

and

$$\delta_2 = 1 - (1-\varepsilon)\frac{W}{b_1 p_2} - [1 - s_c(1-t_c)]\left(\frac{\tau}{\tau+1} + \frac{\varepsilon W}{b_2 p_2}\right) > 0$$

Substituting (43) into (3) we get a reduced form equation for p_1:

$$p_1^0 = \varepsilon W \frac{1}{b_1} + \frac{\varepsilon W}{Q_1 b_2} Q_2^0 \tag{44}$$

Hence, the equilibrium level of reserves variations and the equilibrium level of public investment occur when

$$\Delta R^0 = p_2 x_2 + \text{CF} - e p_m a Q_2^0 - e p_m (1-\zeta) I_2 - J \tag{45}$$

$$I_1^0 = \frac{\text{PSBR}}{p_2} - G - \frac{i^* D}{p_2} + \frac{t_c}{p_2}\left[\frac{\tau}{1+\tau} p_2 Q_2^0 + \left(p_1^0 - \frac{W}{b_1}\right) Q_1\right] \tag{46}$$

4.1 An external credit crunch

By imposing condition (12) we have assumed that it is only the government that can borrow from abroad and also we have constrained the government's ability to borrow at home. Then, a reduction in the net flow of capital—which is equivalent to a fall in PSBR—makes it difficult to finance imports and government expenditures simultaneously. This is not a question of mere academic speculation since the presence of external and fiscal restrictions at the same time have acquired dramatic overtones in several debt crisis episodes.

This situation of an external credit crunch can happen for several reasons today. For instance, once a financial crisis gets under way in a less developed country (for whatever reason), investors can attack currencies of countries that have quite similar fundamentals and ration credit. Moreover, in periods of extreme turmoil in emerging markets, investment banks and mutual funds sell assets and stop lending in order to raise liquidity in expectation of withdrawals of funds by clients. Under these circumstances the

economy faces problems of financing the balance of payments and the public sector.

Consider the consequences on industrial output of a change in CF, a term that in our model represents net capital flows:

$$\frac{\partial Q_2^0}{\partial \mathrm{CF}} = \frac{1/p_2}{\delta_2} > 0 \tag{47}$$

A fall in the nominal flow of external credit is contractionary for several reasons. First, the sudden stop in capital inflows generates a fiscal crunch and reduces public investment and aggregated demand. But several indirect effects amplify the impact on output as we shall see in a moment. We may see the first round transmission channel by substituting (12) into (46) and differentiating public investment with respect to CF:

$$\frac{\partial I_1^0}{\partial \mathrm{CF}} = \frac{1}{p_2} > 0 \tag{48}$$

A fall in CF will also reduce the price of basic goods, as can be observed from its respective differential:

$$\frac{\partial p_1^0}{\partial \mathrm{CF}} = \frac{\varepsilon W / Q_1 b_2 p_2}{\delta_2} > 0 \tag{49}$$

Since profitability in sectors 1 and 2 reacts to changes in Q_2 and p_1, the fall in profit rates reduces tax receipts. Lower tax receipts put additional pressure on public finances, which generates a reinforcing effect on public investment. But also lower profitability in the primary sector and manufacturing implies a lower capitalist consumption and a lower demand for industrial goods. The layoff of workers in the manufacturing sector further reduces the consumption and output of industrial goods.

The reserves variation response remains ambiguous since $\partial \Delta R^0 / \partial J$ is greater or less than zero, i.e.

$$\frac{\partial \Delta R^0}{\partial \mathrm{CF}} = 1 - \frac{e p_{\mathrm{m}} a / p_2}{\delta_2} \tag{50}$$

In the second term on the right-hand side, the term in the numerator (eap_{m}/p_2), the ratio of intermediate imports unit cost to unitarian price in industry, and the term in the denominator are between 0 and 1. Thus, to sign

the expression we need to evaluate whether or not the whole fraction exceeds unity. Note that a high enough import content in unit cost with respect to prices tends to make $\partial \Delta R^0 / \partial \mathrm{CF}$ negative. Under these circumstances, therefore, it is readily seen that a fall in net capital flows deteriorates the balance of payments and decreases the level of reserves. Hence, external credit rationing deteriorates the external position in economies that are not greatly dependent on intermediate imports.

Figure 3 gives a graphical representation of short-run impacts of lower net capital inflows in the case in which the external transfer effect is lower than the intermediate inputs effect. The leftward shift in the II curve occurs because lower demand for industrial goods coming from the public sector reduces manufacturing output and decreases basic goods prices; this, in turn, lowers capitalist income and consumption of non-essentials, generating a further contraction in output through the multiplier. The conditions in the public sector deteriorate notoriously, and more resources are needed in order to close the fiscal gap. The GG curve does shift leftward since the adjustment in I_1 is greater than the fall in CF. Finally, the $\Delta R = 0$ curve shifts to the right, leaving at point b the level of reserves in a better position.

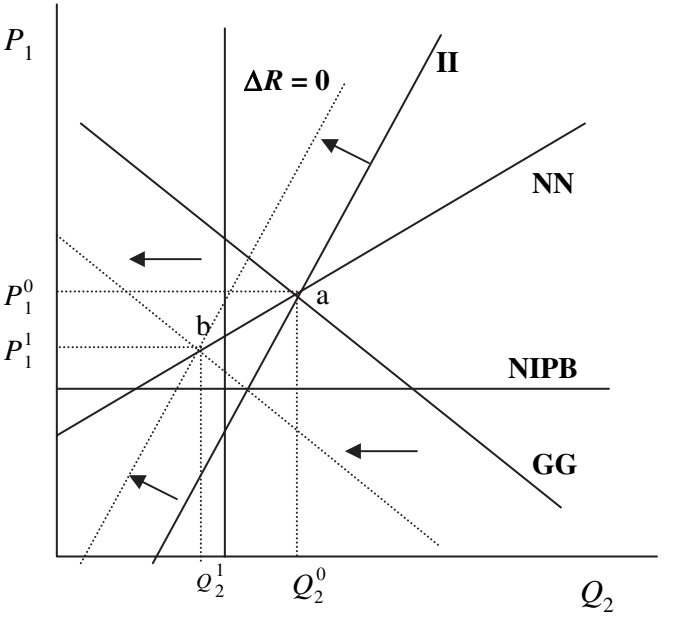

Figure 3. A Sudden stop of capital inflows.

4.2 An increase in income taxes

An economy that presents a chronic fiscal constraint may rely on direct taxation to close the gap. In our model direct taxes are levied on profits. Differentiating (43) with respect to t_c we get

$$\frac{\partial Q_2^0}{\partial t_c} = \left\{ s_c \left[(\varepsilon - 1) \frac{WQ_1}{b_1 p_2} \right] \delta_2 + s_c \left(\frac{\tau}{\tau + 1} + \frac{\varepsilon W}{b_2 p_2} \right) \delta_1 \right\} (\delta_2)^{-2} \tag{51}$$

The impact on output appears to be ambiguous. On the one hand, a higher tax rate t_c implies a lower capitalist consumption and a lower demand for non-essentials. On the other hand, the tax rate increase means extra revenues for the public sector, which in turn expands public sector demand for industrial goods. The latter case is not straightforward in any sense since there is a direct effect of a change in the tax rate upon government revenues and an indirect effect that depends on how capitalist profitability in sectors 1 and 2 reacts to changes in Q_2 and p_1. We may have a case (the expansionary case) in which public investment increases so strongly that it offsets the negative consumption response of capitalists. This is due to the reinforcing effect that capitalist expansion induces in capitalist profit income and to the higher basic goods sector profitability level induced via price.

Of course, if the expansion in industry holds, through (18) the output and employment expansion adds to basic goods demand and exerts an upward pressure on the price of basics. Moreover, the trade deficit increases with the expansion of intermediate imports for industry. The contractionary case will reverse these results, leaving the economy with the paradoxical result of a larger budget deficit (which is adjusted via public investment decline) and a lower price level, industrial output and employment. The effects on reserves variation and primary goods prices are given by

$$\frac{\partial \Delta R^0}{\partial t_c} = -\frac{e p_m a}{(\delta_2)^2} \left[\frac{(\varepsilon - 1) WQ_1}{b_1 p_2} \delta_2 + \left(\frac{\tau}{1 + \tau} + \frac{\varepsilon W}{b_2 p_2} \right) \delta_1 \right] \tag{52}$$

$$\frac{\partial p_1^0}{\partial t_c} = \frac{\varepsilon W s_c}{b_2 (\delta_2)^2} \left[\frac{(\varepsilon - 1) WQ_1}{b_1 p_2} \delta_2 + \left(\frac{\tau}{1 + \tau} + \frac{\varepsilon W}{b_2 p_2} \right) \delta_1 \right] \tag{53}$$

4.3 A balanced budget current government expenditure change

If the economy is below the full-employment level of industrial output (as we have assumed), a government attempt to increase its current expenditure

(an increase in G) will have the very unusual result of having no impact on output. This is due to the particular fiscal sector macroclosure that we use. Initially, the increase in G will have an expansionary effect on manufacturing output, but the dominant fiscal constraint implies a drop in public investment I_1 even greater than the additional government revenue generated by the expansion in output.[14] We may check the response of I_1 to changes in G to get

$$\frac{\partial I_1^0}{\partial G} = -1 \tag{54}$$

which confirms that, in a fiscal-constrained economy, government spending for consumption purposes crowds out government spending for investment purposes.

With no impact on industrial output, the equilibrium price of basics and variations of reserves will remain the same.

4.4 Devaluation

A country that suffers a sudden stop of capital inflows and that pegs the exchange rate to some foreign currency may suffer a gradual decline in foreign reserves. Then at some point, generally well before the depletion of reserves, the government has to do something. Non-market sources of finance (official lending from multilateral agencies) can be used to attend the liquidity problem. But if a concerted-lending strategy is not available, a sudden speculative attack can rapidly eliminate the last of reserves. The government then becomes unable to defend the exchange rate any longer and has to devalue.[15]

Note that in an instantaneous period an increase in the nominal exchange rate will drive up the industrial price level. But the price-increasing impact of nominal devaluation will be less than proportional since changes in nominal wages (and real wage resistance) are not allowed in the short run. Thus the exchange rate elasticity of industrial prices is less than one. In formal notation

[14] Output expansion increases government revenues in two ways: (a) by increasing profits in the industrial sector and (b) by increasing profitability in the basic goods sector through price increases.

[15] Of course, devaluation can be motivated by a variety of reasons, including the desire to improve international competitiveness or attempts to cope with debt servicing.

$$\frac{\mathrm{d}p_2}{\mathrm{d}e} = (1+\tau)ap_{\mathrm{m}} \tag{55}$$

$$\frac{e\mathrm{d}p_2}{p_2\mathrm{d}e} < 1 \tag{56}$$

We will now assume that the volume of industrial exports should respond positively to changes in the real exchange rate, e/p_2. Since condition (56) applies, we expect devaluation to have real effects at least in the short run, i.e.

$$x_2 = x_2\left(\frac{e}{p_2}\right) \qquad \text{with} \qquad \frac{\mathrm{d}x_2}{\mathrm{d}(e/p_2)} > 0 \tag{57}$$

and

$$\frac{\mathrm{d}x_2}{\mathrm{d}e} = \frac{\mathrm{d}x_2}{\mathrm{d}(e/p_2)}\left[\frac{1}{p_2} - \frac{1}{p_2}\left(\frac{e\mathrm{d}p_2}{p_2\mathrm{d}e}\right)\right] = \frac{\mathrm{d}x_2}{\mathrm{d}(e/p_2)}\frac{1}{p_2}\left(1 - \frac{e\mathrm{d}p_2}{p_2\mathrm{d}e}\right) > 0 \tag{58}$$

Before analysing the reserves variation effect of devaluation we need to evaluate the effects on industrial output. This will imply differentiating (43) with respect to e taking into account the effects on the industrial price level and its indirect effect through several endogenous variables. The mechanisms at work here are rather intricate. Devaluation increases exports and aggregate demand. It also may increase profitability, capitalists' consumption and in turn income taxation and government investment. Moreover, if the economy is highly indebted and lacks external financing, as the price of industrial goods increases the sum of the fall in the domestic currency value of the flow of external credit CF/p_2 and interest payments J/p_2 may ease the fiscal restraint. However, as the price of industrial goods increases devaluation lowers workers' real wage and aggregate demand.

After some manipulation, the effect of devaluation on output is

$$\frac{\partial Q_2^0}{\partial e} = \frac{[(1+\tau)(\zeta I_2 + x_2)]ap_{\mathrm{m}}\delta_2 - [1-\tau s_{\mathrm{c}}(1-t_{\mathrm{c}})]ap_{\mathrm{m}}\delta_1}{(\delta_2)^2} \tag{59}$$

We do know that δ_1 is greater than δ_2 but also that $(1 + \tau)(I_2 + x_2)$ is greater than $1 - \tau s_{\mathrm{c}}(1 - t_{\mathrm{c}})$. Then (59) is ambiguous in sign.

If the expansionary effect on output of devaluation prevails, the price level in the primary sector will increase. The converse will therefore happen if output contraction follows devaluation. That is

$$\frac{\partial p_1^0}{\partial e} = \frac{\varepsilon W}{Q_1 b_2} \frac{[(1+\tau)(\zeta I_2 + x_2)]ap_m\delta_2 - [1-\tau s_c(1-t_c)]ap_m\delta_1}{(\delta_2)^2} \tag{60}$$

Now the net change in the balance-of-payments surplus due to devaluation can be calculated from (45) and (57) as

$$\frac{\partial \Delta R^0}{\partial e} = \frac{p_2 x_2}{e}\left(n_{p_2} + n_{x_2}\right) - p_m\left[\left(1+n_{Q_2^0}\right)aQ_2^0 + (1-\zeta)I_2\right] \tag{61}$$

where $n_{p_2} = e\mathrm{d}p_2/p_2\mathrm{d}e > 0$, $n_{x_2} = e\mathrm{d}x_2/x_2\mathrm{d}e > 0$ and $n_{Q2}^0 = e\mathrm{d}Q_2^0/Q_2^0\mathrm{d}e$ are the exchange rate elasticity of export prices, the exchange rate elasticity of exports and the exchange rate elasticity of output, respectively. Inspection of (61) tells us that devaluation can succeed only if the first term on the right-hand side of (61) is higher than the second term. As a result, only if devaluation is to yield an output contraction and the country enjoys a high nominal exchange rate elasticity of industrial prices and a high elasticity of the import bill of intermediate and capital goods will it be able to improve its external position through currency devaluation. Strictly speaking, this condition is different from the well-known Marshall–Lerner–Robinson–Bickerdine condition. The stress is here on the balance between the impact of devaluation on exports and its negative impact on domestic absorption.

5. MEDIUM-RUN DYNAMICS

Observation of the impact of sudden changes in net capital inflows and government demand policies suggests that, by altering the setting of any of the instrumental variables, we should not expect to improve all macroeconomic imbalances. Even debt relief or a financing measure such as an increase in PSBR, in the manner outlined here, improves the fiscal balance and the level of economic activity, but it may also have the unwanted effect of raising the rate of inflation and the trade deficit.

It is important to point out that these relevant trade-offs follow from an analysis in which the time perspective is rather short. Over time, however, some balancing forces in the economy can go to work to moderate the trade-offs. State or predetermined variables in the static model such as the stock of capital in the primary sector, k_1, and the nominal wage W may change in the medium term and so will the stationary equilibrium. We offer an investigation of the medium-run dynamics of the type formulated by Rattso (1989) for a dual economy. The fundamental point here is that any change in the

intersectoral terms of trade, represented here by a change in p_1, is allowed to transmit short-run fluctuations into dynamic adjustments. In our model both the wage formation and the capital accumulation in the basic goods sector are affected by the terms of trade, and in a dynamic process they interact.

We do know that capital accumulation in the primary sector is determined by setting the increase in the capital stock equal to public investment. From (24) we obtain

$$\frac{\mathrm{d}K_1}{\mathrm{d}t} = I_1 = \frac{\mathrm{PSBR}}{p_2} - G - \frac{i^* D}{p_2} + \frac{t_c}{p_2}\left[\frac{\tau}{1+\tau} p_2 Q_2^0 + \left(p_1^0 - \frac{W}{b_1}\right) Q_1\right] \tag{62}$$

Only when

$$\frac{\mathrm{PSBR}}{p_2} + \frac{t_c}{p_2}\left[\frac{\tau}{1+\tau} p_2 Q_2^0 + \left(p_1^0 - \frac{W}{b_1}\right) Q_1\right] = G + \frac{i^* D}{p_2}$$

is the capital stock constant and $\mathrm{d}K_1/\mathrm{d}t = 0$.

We assume that the nominal wage formation reacts to the deviation between the relative price that corresponds to equilibrium in goods markets and the relative price that satisfies workers' claims. A detailed derivation of this formula can be found in the appendix. We have

$$\frac{\mathrm{d}W/\mathrm{d}t}{W} = \varphi\left(p_1 - p_1^1\right) \tag{63}$$

Consequently, the nominal wage has the following stationary solution:

$$\frac{\mathrm{d}W}{\mathrm{d}t} = 0 \qquad \text{when } p_1 = p_1^1$$

The two loci $\mathrm{d}k_1/\mathrm{d}t = 0$ and $\mathrm{d}W/\mathrm{d}t = 0$ are plotted in figure 4. Derivation of system dynamics in the W–k_1 plane is provided in the appendix. The line $\mathrm{d}k_1/\mathrm{d}t = 0$ has a positive slope and the line $\mathrm{d}W/\mathrm{d}t = 0$ is also upward sloping, but it must be less steep than the $\mathrm{d}k_1/\mathrm{d}t = 0$ line to have local stability. It is clear that above the $\mathrm{d}W/\mathrm{d}t = 0$ locus the arrows in the W direction point vertically towards the locus, while the arrows point vertically upwards below the locus. It is easily checked that arrows in the k_1 direction also point towards the $\mathrm{d}k_1/\mathrm{d}t = 0$ locus in the horizontal k_1 direction. The phase diagram in figure 4 shows stability.

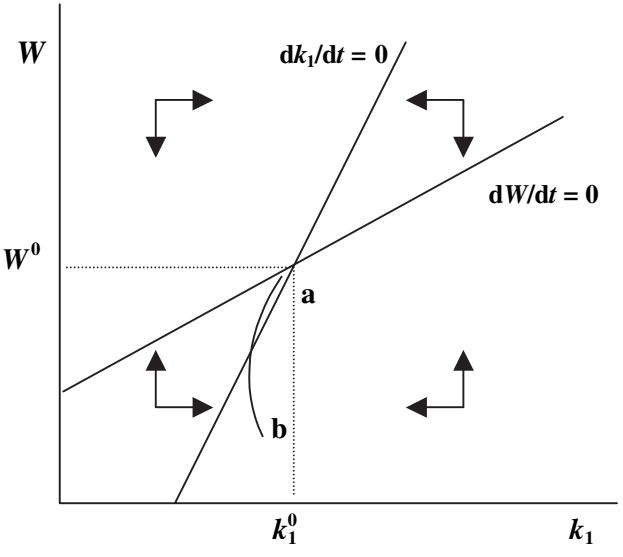

Figure 4

Comparative dynamics analysis can be very useful now. Consider an exogenous shock coming from debt relief or a concerted lending strategy by the rest of the world. In the static (short-run) situation it was concluded that the immediate consequence was a multiplier expansion in industrial output and a shift in p_1 due to excess demand pressure in the primary sector (since $\partial Q_2^0/\partial \mathrm{CF} > 0$ and $\partial p_1^0/\partial \mathrm{CF} > 0$). Now, in the medium term, higher net capital inflows CF (which imply a higher PSBR) will require a higher k_1 for every W to have $\mathrm{d}k_1/\mathrm{d}t = 0$. In other words the $\mathrm{d}k_1/\mathrm{d}t = 0$ schedule in figure 4 will shift to the right. Similarly, the increase in CF (and PSBR) will imply that the $\mathrm{d}W/\mathrm{d}t = 0$ schedule will shift to the right. As is evident from figure 5, k_1 will certainly rise. We have placed W as having remained unchanged.

The whole process is expansionary to begin with, and it is important to notice that public investment increases hand in hand with the increase in PSBR. However, eventually the primary sector price level (and the domestic terms of trade) may go against basic goods as a result of the capacity build-up k_1 compared to the initial situation. As a result, in the medium term debt relief or concerted lending can increase industrial and primary sector output without generating an inflationary spiral.

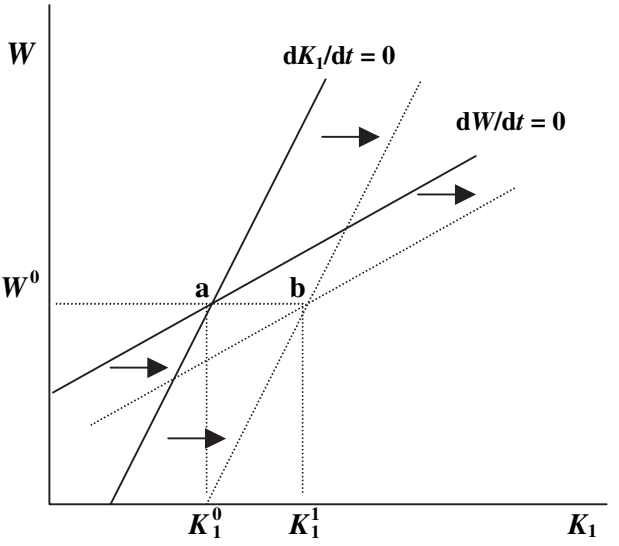

Figure 5

6. CONCLUSIONS

We have constructed a model that offers what we think is a very appropriate approach to the reality of highly indebted semi-industrialized economies with lack of access to international lending and a limited domestic borrowing capacity. The effort appears worthwhile in the context of the importance that sudden stops of capital inflows have acquired in recent years. We have attempted an investigation of government policy options and their effects on output, prices, reserves variation and public investment. The basic structure of the model has several antecedents, most notably Kalecki's (1976) and Taylor (1983) flex-price/fix-price approach, which capture the sectoral distinctions between agriculture and industry. Among the novelties, however, we have introduced both external and fiscal closures that resemble very much the contemporary experience of Latin American countries. While foreign reserves variation adjusts the external balance, within the public sector balance PSBR is fixed and government investment is the adjustment variable.

Our strategy for deriving an equilibrium representation of the basic model was to construct five schedules in P_1–Q_2 space. In this way we have combined a simple but rich economic structure where the primary sector supply

constraint, the low capacity utilization in industrial units, the fiscal and external constraints, and the inflationary aspiration gap threw light on some of the most important issues relating to macroeconomic stabilization. Even though we restrict ourselves to the evaluation of government policy, in general, we may perceive that any shock to the system will reveal conflicting objectives. The basic assumption on which we have based our analysis is that a reduction of external financing has given rise to severe constraints in the external sector and the public sector balance.

The sudden stop in capital inflows generates a fiscal crunch and reduces public investment and aggregated demand. But several indirect effects amplify the impact on output. The fall in aggregate demand generates a fall in profit rates, which in turn reduces tax receipts. Lower tax receipts put additional pressure on public finances, which generates a reinforcing effect on public investment.

In short, since lack of financing results in external, fiscal and output problems, we can draw some relatively general policy conclusions. Higher direct taxes levied on profits may increase or decrease industrial output but a relevant trade-off always appears between industrial output and the price of necessities. If the expansionary case prevails the trade deficit increases with the expansion of intermediate imports for industry. A government attempt to change current expenditure will have the very unusual result of having no impact on output, prices and reserves variation. Government spending for consumption purposes crowds out public investment and aggregate demand. Devaluation may also have undefined impacts upon relevant target or endogenous variables. Therefore, in the short run, it must be handled with enormous caution, attending to the specificities of each case. Again if devaluation is expansionary the price of basics and inflation will be sparked off.

A financing measure such as debt relief or external credit concessions, in the manner outlined here, improves the fiscal balance, public investment and economic activity, but it may also have the unwanted effect of raising the rate of inflation and the trade deficit. But these relevant trade-offs follow from an analysis in which the time perspective is rather short. In the medium run, capital-augmenting public investment may increase the supply of basics goods and reduce their prices. Thus, real income of workers increases in both sectors and capacity utilization rises in the industrial sector. Then by releasing the primary sector supply constraint, external financing or debt relief stimulates aggregate demand and industrial output without necessarily inducing a change in the domestic terms of trade and inflation. Consequently, our present emphasis on improving the net transfer of resources from abroad points in the right direction.

APPENDIX

1. Nominal wage adjustment

First, it is clear that in the primary sector the price p_1 adjusts as per excess demand for basics, i.e.

$$\frac{\mathrm{d}p_1/\mathrm{d}t}{p_1} = \Psi\left(\frac{\varepsilon WL}{p_1} - Q_1\right)$$

Workers' indexation rule can be formalized as follows:

$$\frac{\mathrm{d}W/\mathrm{d}t}{W} = \varphi(T - w)$$

When the effective real wage w is below the target T, workers will react, pushing up nominal wages. The coefficient ψ describes the speed of adjustment.

The negative impact of an increase in the price of basics will make workers react. Assuming a constant mark-up and that capitalists do not have an anticipatory behaviour with respect to possible losses in real income caused by an increase in the price of basics, firms will pass on the increase in production cost by raising industrial prices. That is

$$\frac{\mathrm{d}p_2/\mathrm{d}t}{p_2} = \omega\left(\frac{\mathrm{d}W/\mathrm{d}t}{W}\right) = \omega\varphi(T - w) = \omega\varphi\left(p_1 - p_1^1\right)$$

which implies that

$$\frac{\mathrm{d}W/\mathrm{d}t}{W} = \varphi\left(p_1 - p_1^1\right)$$

2. Derivation of system dynamics in the W–k_1 plane

It is clear from expressions (62) and (63) that p_1 has a central role in system dynamics since it affects both k_1 and W. It is natural, therefore, to seek to understand the dependence of p_1 on k_1 and W.

A higher nominal wage means higher real consumption expenditure when savings rate out of profits, s_p, is higher than the savings rate out of labour income, s_w. This creates an excess demand situation in the primary sector and p_1 will tend to go up.

When k_1 goes up, so does output in the primary sector. This should lead to a drop in p_1.[16] Hence we write

$$p_1 = p_1(k_1, W) \qquad \text{where } \frac{\mathrm{d}p_1}{\mathrm{d}k_1} < 0 \text{ and } \frac{\mathrm{d}p_1}{\mathrm{d}W} > 0$$

Using the above expression in the dynamic relations (62) and (63), we get

$$\frac{\mathrm{d}K_1}{\mathrm{d}t} = G_1\left(\bar{k}_1, \overset{+}{W}\right)$$

$$\frac{\mathrm{d}W}{\mathrm{d}t} = G_2\left(\bar{k}_1, \overset{+}{W}\right)$$

Let us now study these dynamic equations in the W–k_1 plane. Totally differentiating $G_1(\bar{k}_1, \overset{+}{W}) = \mathrm{d}k_1/\mathrm{d}t = 0$ gives

$$\frac{\partial G_1}{\partial k_1}\mathrm{d}K + \frac{\partial G_1}{\partial W}\mathrm{d}W = 0$$

or

$$\left.\frac{\mathrm{d}W}{\mathrm{d}k_1}\right|_{\mathrm{d}K/\mathrm{d}t=0} = \frac{-\partial G_1/\partial k_1}{\partial G_1/\partial W} > 0$$

Thus this schedule is upward sloping in the W–k_1 plane.

Totally differentiating $G_2(\bar{k}_1, \overset{+}{W}) = \mathrm{d}W/\mathrm{d}t = 0$ we have

$$\frac{\partial G_2}{\partial k_1}\mathrm{d}K + \frac{\partial G_2}{\partial W}\mathrm{d}W = 0$$

or

$$\left.\frac{\mathrm{d}W}{\mathrm{d}k_1}\right|_{\mathrm{d}W/\mathrm{d}t=0} = \frac{-\partial G_2/\partial k_1}{\partial G_2/\partial W} > 0$$

which is upward sloping also.

[16] The higher production in the primary sector can stimulate industrial demand sufficiently to drive the relative price up. We assume, however, that the first direct effect dominates.

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