FISCAL DEFICIT REDUCTION PROGRAMS IN DEVELOPING COUNTRIES: STABILIZATION *VERSUS* GROWTH IN THE PRESENCE OF CREDIT RATIONING *

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Resumen: Este artículo analiza los conflictos potenciales entre efectos a corto plazo sobre el producto y el empleo y efectos a mediano plazo sobre el crecimiento de varias políticas fiscales. En el modelo, las empresas y los hogares son optimizadores intertemporales; la inflexibilidad en el corto plazo de los salarios junto con el control sobre las tasas de interés generan desequilibrios macroeconómicos. El análisis se centra en las consecuencias de varias políticas de gasto público y de reducción del déficit.

Abstract: This paper presents a model for analyzing potential conflicts between short-run output and employment effects and medium-run growth effects of various fiscal actions. In the model, both firms and households are intertemporal optimizers; short-run wage stickiness and interest rate controls generate macroeconomic disequilibrium. The analysis focuses on the consequences of various government expenditure or deficit reduction policies.

In the 1980s, many developing countries initiated fiscal deficit or government expenditure reduction programs –either at their own initiative or as part of IMF Standby Agreements or World Bank adjustment programs. The Baker Initiative (of 1985) renewed interest in the *medium-term* growth consequences of these policies, which had been over-shadowed by short-run stabilization objectives as the debt crisis emerged in the early 1980s.

The purpose of this paper is to present a stylized model for analyzing potential conflicts between short-run output and employment effects and medium-run growth effects of various fiscal actions in LDCs suffering from classical unemployment and credit rationing. In the model, financial intermediation occurs via a regulated banking system rather than bond and equity markets. Both firms and households are intertemporal optimizers who understand the future consequences of current policy changes. Short-run wage stickiness and interest rate controls on both borrowing and lending rates (coupled with high reserve requirements) generate macroeconomic disequilibrium. The analysis here focuses on the disequilibrium regime where there is *credit rationing* and *classical* (rather than Keynesian) *unemployment.*

In addition to domestic credit rationing, the country is assumed to face a foreign borrowing constraint. Any available foreign credit goes to the government sector.[1]

From an analytical standpoint, our framework contains a number of noteworthy features. First, credit market distortions cause debt and tax finance of a given level of government spending to have different effects. That is, Barro-Ricardian debt neutrality does not hold in our model, even though the household's intertemporal budget constraint can be written in a form usually thought to imply Ricardian equivalence. Second, the model provides an additional way of introducing money into a "microfoundations" macro model so that both money-financed and debt-financed fiscal deficits can be considered. Standard approaches put money directly into households' utility functions or impose a cash-in-advance constraint on household purchases. Our set-up assumes that *commercial banks*, not households, have a demand for high-powered money due to the minimum reserve requirements imposed by bank regulators.[2]

Third, the paper incorporates Erling Steigum's (1983) insight that classical unemployment, characterized by a *notional* excess demand for goods, can prevail even if the price of current output is assumed to be flexible upwards.[3] He showed that classical unemployment occurs in intertemporal disequilibrium models when the current real wages are fixed too high and the real interest rate is fixed below its market-clearing level.[4] Classical unemploy-

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[1] The model is unchanged if the country does not face a foreign borrowing constraint but instead its government imposes controls on capital account transactions.

[2] Ideally, the model should be extended to incorporate both household and commercial bank demands for high-powered money.

[3] Some critics of the fix-price regimes described by Barro and Grossman (1976) or Malinvaud (1977) conclude that classical unemployment is likely to be uncommon in practice because it presumes that current output prices that fail to *rise* in response to an excess demand for goods. They find *upward* stickiness of prices much less plausible than downward stickiness.

[4] Steigum's model is a barter model. Ours allows for money holdings.

ment in this set-up is associated with a shortage of capital, a common situation in many developing countries.

Section 1 specifies the behavior of the banking sector, households, firms, the government, and the foreign sector. The economy's equilibrium conditions for the non-Walrasian equilibrium (or "disequilibrium") regime where there is short-run classical unemployment and credit rationing are presented in Section 2.[5] The equilibrium is illustrated using a simple diagram to facilitate (comparative static) policy analysis. Section 3 analyzes the short-run effects of various fiscal policy changes on credit availability, prices, output, and employment, as well as their medium-term effects on future output via saving and investment. Policy effects on national welfare are considered in Section 4. Section 5 concludes.

1. Analytical Framework

The analytical framework used here is the familiar two-period set-up where disequilibrium exists in the short-run (represented by period 1) due to wage and interest rate rigidities, while Walrasian equilibrium prevails in the long run (i.e. period 2).[6] Both households and firms optimize over the two-period horizon under the assumption of perfect foresight.

1.1. Households

Households maximize an intertemporal utility function that depends on current and future consumption and separably on government expenditures: $U(C, C') + v(G, G')$. Throughout the paper, the prime ($'$) superscript denotes second-period variables. Households receive income from three sources: $i)$ labor employment, $ii)$ firms' profits, which are distributed in the period when earned, and $iii)$ interest on bank deposits and profits from banks' period-1 lending activity, π_B. These profits are distributed to households at the beginning of period 2 when loans are repaid. Nominal wealth, therefore, equals:

$$W = (pY - T) + (1 + i_d)^{-1} [p' Y' - L_p(1 + i) + \pi_B - T'] . \qquad (1.1)$$

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[5] Other regimes exist, as the literature on disequilibrium macroeconomics makes clear; see Cuddington *et al.* (1984) for a review and detailed discussion of open-economy disequilibrium models. To avoid being taxonomic, this paper focuses on a particular regime, which is especially relevant in many LDCs.

[6] This set-up is similar to other two-period models in the literature; see, e.g., Persson (1982), Neary and Stiglitz (1983), and Cuddington-Viñals (1986a,b). Compared to a multi-period, infinite-horizon framework, it has the advantage of analytical tractability.

where pY and $p'Y' - L_p(1 + i)$ represent the firms' total wage and profit income in periods 1 and 2, net of the cost of repaying loans in the second period. T and T' are current and future taxes. All household savings are assumed to be held in the form of bank deposits, which yield the regulated (sub-market) interest rate i_d. So $1 / (1 + i_d)$ is the nominal discount factor.

Utility maximization yields a standard demand for current consumption:

$$C = C(p, p' / (1 + i_d), W) \tag{1.2}$$

where $C_p < 0$, $C_p > 0$, $0 < C_w < 1$. The consumption function is homogeneous of degree zero in the nominal arguments. The signs of the partial derivatives assume that current and future output are gross substitutes. For convenience, $\delta_d = p' / (1 + i_d)$ is taken as the households' numeraire and set equal to unity in what follows. The demand for bank deposits, i.e. nominal saving, equals:

$$D = pY - T - pC(p, W) . \tag{1.3}$$

1.2. Firms

Firms choose employment E and investment I to maximize the present value of cash flows, using the prevailing loan rate of interest i as the discount rate. In the *absence of credit rationing*, this yields standard labor and investment demand functions:

$$E = E(w / p), \quad E' < 0 \tag{1.4}$$

$$I = I(p / \delta), \quad I' > 0 \tag{1.5}$$

where w is the sticky nominal wage in period 1 and $\delta = p' / (1 + i)$ present-value price of second-period output from the firms' perspective.[7] Substituting these factor demands into the first and second-period production functions yields output supply functions in periods 1 and 2 respectively:[8]

$$Y = Y(w / p) \tag{1.6}$$

$$Y' = Y'(p / \delta) . \tag{1.7}$$

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[7] For simplicity, w is assumed to be fixed. The analysis below goes through if w is a positively related to the price level, i.e. $w = w(p)$, as long as the elasticity is less than unity.

[8] Assuming full employment and an inelastic supply of labor in the second period obviates the need to treat the labor market at $t = 2$ explicitly. Alternatively, the assumption of full wage indexation in the long run would accomplish this.

Assuming all investment is financed by bank loans,[9] the firm's notional demand for credit is derived directly from investment demand (2.5):

$$L_p = pI(p/\delta) . \tag{1.8}$$

1.3. Credit Rationing Case

In situations where firms face a binding credit constraint $\bar{L}$, private investment is limited to:

$$\tilde{I} = \bar{L}/p . \tag{1.9}$$

The tilde ($\sim$) on I denotes the *effective* (as opposed to notional) demand for investment goods, given the borrowing constraint $\bar{L}$, which is endogenously determined below. The presence of credit-rationing causes the effective level of future output $\tilde{Y}$ to lie below the unconstrained profit-maximizing level:

$$\tilde{Y}' = \tilde{Y}'(\tilde{I}) < Y'(I(p/\delta)) . \tag{1.10}$$

This implies that the present value of firms' profits (i.e. the value of the firm) depends positively on credit availability and hence on effective investment.[10]

1.4. The Public Sector

The government purchases output in each period (G, G') and finances these expenditures by some combination of : *i)* lump-sum taxation in each period, T and T', *ii)* loans from the banking system in period 1, denoted L_g, *iii)* foreign borrowing (F, in foreign currency units), to the extent that foreign loans are available, and *iv)* issuing non-interest-bearing debt to the central

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[9] It would be interesting to allow for retained earnings as a way of financing investment. In fact, there is a clear incentive for firms to use retained earnings: when the deposit rate is fixed below the rate firms are willing to pay for loans, both firms and households can be made better off if firms retain and reinvest earnings. This presumes, of course, that firms and households can avoid the government-distorted banking system altogether. Furthermore, it ignores the question of how retained earnings of various firms get (efficiently) allocated among firms with profitable investment projects.

[10] In the absence of credit rationing, the firm chooses the optimal level of I. The envelope theorem insures that the partial derivative of the value of the firm with respect to I is zero in this case.

bank, which in turn issues high-powered money, H. Hence, the government's financing constraints are:

$$pG = T + L_g + H + p(F / p^*) \qquad (1.11a)$$

$$p'G' = T' - L_g(1 + i) - p'F(1 + i^*) / p^{*'} . \qquad (1.11b)$$

Note that printing money in the second period (H') is not an option; the only demand for high-powered money arises in the first period when commercial banks are carrying out financial intermediation and must meet legal reserve requirements. In period 2, when no saving or investment occurs, banks are unwillingly to accept high-powered money from the government.

In the comparative static analysis below, current and future taxes are treated as endogenous. The government chooses real spending, borrowing, and money creation; the financing constraints in (1.11) are then used to solve out for T and T' in the households' wealth constraint (1.1). This yields:

$$W = p(Y - G - I) + \delta_d(Y' - G') + \beta F , \qquad (1.12)$$

where

$$\beta = \frac{p}{p^*} - \frac{p'}{1 + i_d} \frac{1 + i^*}{p^{*'}} .$$

The asterisks (*) on p and i indicate foreign-currency prices and interest rates. Note that apart from the last term in (1.12),[11] which of course disappears when $F = 0$ or $\beta = 0$, the expression for wealth takes the familiar form found in two-period models exhibiting Ricardian equivalence between (lump-sum) tax finance and debt finance of a given level of government spending. Nevertheless, it is shown below that there is a breakdown of Ricardian equivalence in the present model when credit rationing occurs.[12]

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[11] The last term reflects the welfare gain (loss) on foreign borrowing by the government when the real interest factor on foreign borrowing $p^{*'} / p^*(1 + i^*)$ is less (greater) than the real domestic interest factor $p' / p(1 + i_d)$. When the open interest parity condition holds, $\beta = 0$.

[12] The fact that wealth can be written as (1.12) even though Ricardian debt neutrality does not prevail suggests that empirical tests of the proposition based on the sign and significance of $(Y - G)$ and $(Y' - G')$ in the aggregate consumption function may be invalid.

1.5. The Foreign Sector

It is assumed that the country under consideration faces credit rationing not only in the domestic market (as a result of the interest rate controls it imposes), but also in the international market. The country faces a foreign borrowing constraint F and all available credit goes to the government. The country's international budget constraint then implies a net export surplus of $F(1 + i^*) / p'^*$ in the future in order to service the debt. (The possibility of debt repudiation in ignored.)

To simplify the characterization of goods market equilibrium below, it will be assumed that domestic and foreign goods are perfect substitutes. In the absence of restrictions on international transactions in goods and financial capital, arbitrage would insure that the law of one price held in each period; i.e. $p = ep^*$ and $p' = e'p^{*'}$ where e is the exchange rate. p^* and p'^* are exogenous foreign prices, reflecting our small country assumption. Although such arbitrage is assumed to occur in the long run so that $p' = e'p^{*'}$, foreign exchange constraints prevent arbitrage in the short run. Via the balance of payments accounting identity, the foreign borrowing constraint in effect places a quantitative limit on net imports IM in period 1:

$$IM = F / p^*$$

The country would like to import more if more foreign credit was available. Thus, in the absence of arbitrage the domestic price of current output p will lie above the price on the world market p^*. p / p^* can be interpreted as the shadow exchange rate. In this situation, economic rent accrues to those who are allowed to import goods at price p^* for resale in the domestic market at price p. In deriving (1.11) above, it was assumed that the government secures this rent by selling import licenses. In the second period, the government repays the foreign currency loan by supplying/exporting real goods equal to $F(1 + i^*) / p^{*'}$ to foreign creditors.

1.6. The Banking Sector

Banks collect deposits, D, from households in period 1 and make loans to private firms and the government, whose demands for credit are denoted L_p and L_g respectively. Several regulatory constraints affect banks. First, the interest rate on deposits i_d is assumed fixed and banks must accept all deposits forthcoming from households at that rate. Second, there are legal reserve requirements that banks hold a fraction α of total deposits (D) in the form of non-interest-bearing reserves. This creates a banking sector demand for high-powered money in period 1 equal to:

$$H^d = \alpha D \tag{1.13}$$

In period 2, households do no saving and hence hold no bank deposits. Consequently, banks (as well as nonbanks) have no demand for high-powered money. To close the present two-period model, it is assumed that banks hold forever the reserves required in period 1 (i.e. they are never distributed to households). This, of course, affects the cost of doing business in period 1.[13] Banks' objective is to choose the level of loans L so as to maximize profits after accounting for the cost of the reserves, H:

$$\pi_b = [(1 + i)L^s + H - (1 + i_d)D] - H$$

subject to their balance sheet constraint $(L + H = D)$ and the (1.13).

Assuming banks continue to operate even if they make losses (which would occur if $(1 + i)(1 - \alpha) < (1 + i_d)$), banks will wish to remain fully loaned up.[14] Therefore, the notional supply of loans is:[15]

$$L^s = (1 - \alpha)D , \tag{1.14}$$

yielding profits equal to:

$$\pi_B = [(1 + i)(1 - \alpha) - (1 + i_d)] D . \tag{1.15}$$

These profits are distributed to households at the beginning of period 2.

The nature of the credit market disequilibrium when interest rates are administratively fixed depends on the gap lending and deposit rates and the size of reserve requirements, among other things. This paper focuses on the common situation where there is credit rationing or a "capital

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[13] An alternative but mathematically equivalent way to close the model is to assume that the government buys back high-powered money in the last period so that its period 2 financing constraint in (1.11b) becomes: $p'G' + H = T' - L_g(1 + i) - e'F(1 + i^*)$. In this case, bank profits equal $\pi_B = (1 + i)L^s + H - (1 + i_d)D$. The resulting expression for wealth is exactly the same as that specified in (1.12), so the comparative static results are identical to those reported in the text.

[14] This assumes that free exit from the banking sector is not permitted in the case where profits turn negative. It is not uncommon for governments –and not just LDC governments– to absorb bank losses in order to keep insolvent banks afloat.

[15] The notional loan supply is relevant as long as banks face an excess demand for loans. The discussion below makes clear that is possible to have fixed interest rate equilibria where banks have an excess *supply* of loans.

shortage"[16] and government demand for credit is satisfied first. The remaining credit is available for private firms:

$$\bar{L} = L^s - L_g .$$ (1.16)

This will imply direct crowding out of private investment when government demand for credit from the financial system is increased. Different rationing rules would, of course, lead to different conclusions.

Even though both deposit and lending rates are fixed, credit rationing need not prevail. In order to get a credit rationing equilibrium, the gap between i and i_d must be positive, but not "too large". The intuitive reason for this can be shown using the partial equilibrium perspective of Figure 1. If the deposit rate is fixed at i_d, the demand for deposits (saving) by households (1.3) will result in banks supplying loans of $\bar{L}$ (from (1.14) and (1.16)) to the private sector. As long as the lending rate i is fixed at a level below i^{**}, the demand for loanable funds by firms will exceed $\bar{L}$, leading to credit rationing.

Figure 1
Credit Rationing: A Partial Equilibrium Perspective
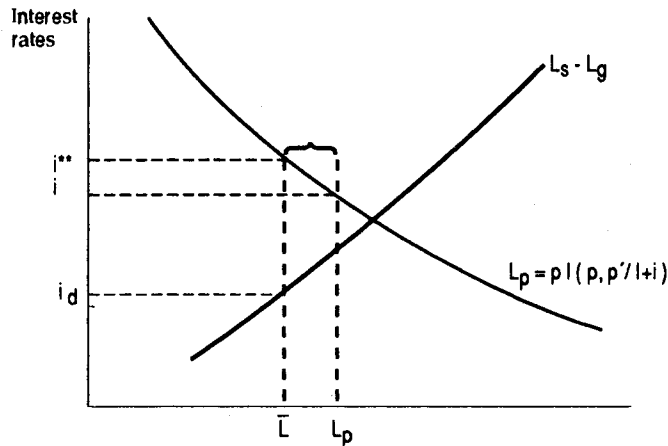
[16] It is, of course, possible to use the model to study the situation where the lending rate is allowed to adjust freely to equate demand for loans to the credit-constrained supply. This rate is shown by i^{**} in Figure 1. As long as the deposit rate is fixed by regulators, the equilibrium loan rate $(1 + i)$ need not equal $1 + i_d) / (1 - \alpha)$. The latter would be the competitive equilibrium loan rate in the presence of reserve requirements when *both* deposit and loan rates are free to adjust. π_B equals zero in this case, as (1.15) readily confirms.

If, in contrast, i is fixed *above* i^{**} and banks are not allowed to refuse deposits at i_d, they would be unable to make enough loans to remain fully loaned up. Actual reserves would exceed the legally required level in (1.13). This particular financial market disequilibrium regime is not discussed further here.

2. Short-Run Unemployment Equilibrium

This section provides a tractable characterization of the case where there is credit rationing coupled with classical unemployment. The impacts of various policy changes on short-run employment/output and growth (via saving and investment) are then determined.[17]

Equating the policy-determined supply of high-powered money, H, to the derived demand for reserves by commercial banks yields the *money market equilibrium* condition:

$$H = \alpha D \tag{2.1}$$

where D is defined in (1.3).

In the present model, commercial banks act solely as a conduit between household saving and aggregate (private plus public) demand for credit. Furthermore, only commercial banks demand high-powered money. Hence, the money market equilibrium condition can be replaced by a *credit market equilibrium condition*. This is done by using the commercial bank balance sheet identity and the demand for base money in (1.13) to write the supply of loans in (1.14) as a function of base money:

$$L^s = (1 - \alpha)D = [(1 - \alpha) / \alpha]H \ . \tag{2.2}$$

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[17] To facilitate an intuitive understanding of the model, it may be helpful to consider what happens in the neoclassical case where prices, wages, and *both* deposit and loan rates of interest are flexible, so that continuous market-clearing prevails. In this case, wage-price flexibility keeps output Y at its (exogenous) full-employment level and the goods market equilibrium condition alone determines the *real* interest factor $p' / p(1 + i) = (1 - \alpha)p' / p(1 + i_d)$. The wedge between the deposit and lending rates reflects the distortion caused by reserve requirements. Using the equilibrium real interest rate, the bank credit market equilibrium condition or more typically (but equivalently) the money market equilibrium condition –determines the price level. The fact that p is determined recursively indicates that the classical dichotomy prevails in this version of the model. When the wage rate and the deposit rate are sticky, on the other hand, the classical dichotomy breaks down: the real interest factor $p' / p(1 + i)$ and the price level p must be determined simultaneously.

When interest rate ceilings on deposits depress national saving relative to the demand for loans at the regulated lending rate, an excess demand for credit results. Given our assumption that government demand for credit gets priority, the *credit market equilibrium in the presence of rationing* equals:

$$p\tilde{I} = \bar{L} = [(1 - \alpha) / \alpha]H - L_g \ . \tag{2.3}$$

As both I and p are endogenous, (2.3) determines the credit-constrained level of nominal investment expenditure by firms as a function of the various policies impacting credit availability: α, H, and L_g.

Given the stickiness of interest rates and wages, output prices are assumed to adjust to equate the effective aggregate demand for output to output supply. Hence, the *goods market equilibrium under rationing* is:

$$Y(w, p) = C(p, \tilde{W}) + \tilde{I} + G - F / p^* \ . \tag{2.4}$$

Because $\tilde{I}$ is *effective* demand, wealth is reduced below the level it attains when investment is not credit-constrained:

$$\tilde{W} = p(Y - G - \tilde{I}) + \delta_d[\tilde{Y}'(\tilde{I}) - G'] + \beta F \ . \tag{2.5}$$

Together (2.3), (2.4), and (2.5) determine the price level p and the effective level of investment $\tilde{I}$.

The credit-rationed, underemployment equilibrium is depicted diagrammatically in Figure 2. The LL locus is the rectangular hyperbole showing $(p, \tilde{I})$ combinations that satisfy the credit constraint (2.3) for given values of H, α, and L_g. Increases in H and decreases in α or L_g cause an increase in the supply of credit, shifting the LL locus to the right. The GG locus denotes goods market equilibrium found by substituting (2.5) into (2.4). (Appendix 1 confirms that the slope of GG is unambiguously positive.) Intuitively, an increase in $\tilde{I}$ raises aggregate demand, both directly and indirectly via its positive wealth effect on consumption. These increases in $\tilde{I}$ must be accompanied by higher output prices *ceteris paribus* to maintain goods market equilibrium. Increases in G shift the GG locus downward to the right, reflecting the fact that, at any arbitrarily chosen level of $\tilde{I}$, an increase in government spending necessitates a rise in output prices to restore goods market equilibrium.

Besides characterizing the equilibrium $(p, \tilde{I})$, Figure 2 clearly shows potential trade-offs or complementarities between policies' short-run stabilization effects and their effects on medium-term growth. Stabilization impacts are proxied by p, on the horizontal axis, because increases (decreases) in p raise (lower) current output $Y(w, p)$ and, hence, employment. Medium-

term growth objectives are captured by $\tilde{I}$, on the vertical axis, because higher investment leads directly to higher future output, $\tilde{Y}'(\tilde{I})$.

Figure 2
Credit Rationing Equlibrium
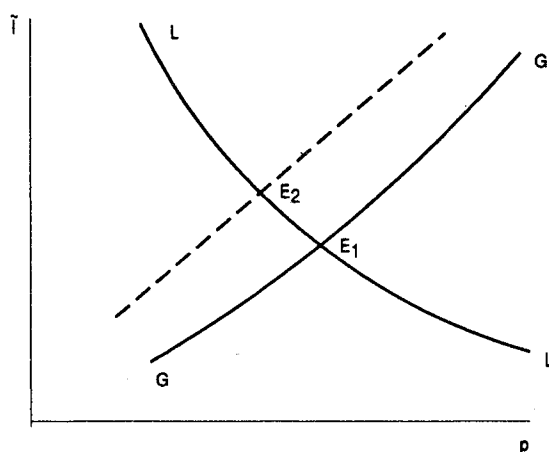
3. Government Expenditure and Deficit Reduction Programs

The foregoing model can be used to analyze the short and medium-term consequences of various government expenditure or deficit reduction programs in developing countries where unemployment and credit rationing prevail. Below, the following policy options are considered:

   i) a reduction in current .government spending accompanied by equal reduction in taxes,

   ii) announcements of *future* expenditure cuts, but no immediate cut,

   iii) postponement rather than cancellation of major expenditure programs,

   iv) a reduction in inflationary finance, i.e. government demand for credit from the central bank, made possible by an increase in taxes,

   v) a reduction in government credit from the commercial banking system, financed by a tax increase.

An analysis of the last policy allows us to demonstrate the failure to Ricardian equivalence (between government borrowing from the private sector and taxation) in our model –an implication that seems reasonable in the presence of unsophisticated financial systems. The effects of each policy on the price of

current output (and hence the level of output and employment), credit availability, and investment (and hence future output or "growth"), which are discussed in turn below, are summarized in Table 1 for ease of comparison.

Table 1
*The Shord and Medium-Term Impact of Fiscal Policies in the
Presence of Unemployment and Credit Rationing:
Summary of the Text Discussion*

	$\frac{dp}{DY}$ DE (Short-term impact)	$\tilde{L}$	$\tilde{Y}'(\tilde{I})$ (Medium-term Impact)
Balanced-Budget Reductions in Government Spending			
$dG < 0$, (Option 1)	-	0	+
$dG' < 0$, (Option 2)	+	0	-
Postponing Government Spending			
$dG < 0$ with $dG' = -dG$ (Option 3)	-	0	+
Tax Increases			
$dT = -DLg > 0$ (Option 4)	-	-	-
$dT = -dLg > 0$ (Option 5)	+	+	+
Changing the Method of Deficit Finance			
$dH = -dL_g > 0$	+	+	+

Notation Summary:
   G , G' = current/future government spending
   T , T'= current/future lump-sum taxes
   H = high-powered money; issued as the central bank extends credit to the government
   L_g = government credit from the commercial banking system
   p = price of current output
   $Y(w , p)$current output
   $E(w , p)$ = current employment
   L = constraint on available credit
   $\tilde{I}$ = amount of capital investment
   $\tilde{Y}$ = future output; proxying for economic growth

Option 1: A Balanced-Budget Reduction in Current Government Spending

Consider, first, a temporary reduction in government expenditure accompanied by an equal tax reduction. From (2.4), it is clear that a cut in G (but not G') causes a reduction in aggregate demand, implying that p must fall to restore equilibrium in the goods market. The GG curve in Figure 2 shifts to the left. Parenthetically, the reduction in G causes a less than peso-for-peso reduction

in aggregate demand because of the positive effect of lower current-period taxes on private wealth in (2.5). Both current consumption and saving for future consumption to rise, presuming that consumption in both periods are normal goods so that $\partial C / \partial W < 1$.

The fall in p as GG shifts to the left increases the real supply of bank credit $\tilde{I}/p$ in (2.5), thereby relaxing the credit-constraint on firms' capital investment. (The economy moves up along the LL curve in Figure 2). The new equilibrium is at point E_2. The reduction in G causes a fall in p and a rise in investment. The fall in p implies a reduction in current output and employment. The rise in investment, on the other hand, causes the policy's medium-term growth impact to be favorable. Policy makers contemplating a reduction in spending accompanied by tax increases must confront the trade-off between the adverse short-run employment effect and the favorable long-run effect on economic growth.[18]

Option 2: Announcing Future Expenditure Cuts

Announcements of future government expenditure (G') cuts have a very different effect than the immediate but transitory cuts analyzed above. The impact effect of an anticipated reduction in G' is to *increase* private wealth and hence private consumption; the GG curve shifts to the right. As p rises in response to the increase in aggregate demand, the real credit constraint (2.3) becomes tighter. Thus, the crowding-out of private investment intensifies, reducing medium-term growth.

Comparing Options 1 and 2, it is clear that the effects on current and future output are reversed when the government announces future spending cuts rather than (temporarily) cutting expenditure today. Policy makers might consider announcing changes in future government spending at the same time that they cut current expenditures in an attempt to achieve an appropriate balance between short-run employment and medium-term growth objectives. Needless to say, the more beneficial effects of future relative to current government spending and tax cuts rely on households being convinced that the government will actually follow through and cut spending in the future.

Option 3: Postponing Current Government Expenditure

Typically, governments resist permanent expenditure cuts. Instead they try to postpone current expenditures and make up for the austerity with higher

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[18] One possible way to assess the attractiveness of this trade-off is to calculate the overall impact of the short and medium-term aspects of the policy on the representative household's utility index. This is pursued briefly in Section 4.

expenditure in the future when the economic situation improves. Assuming this policy leaves the *present value* of government spending unchanged, its adverse short-term employment consequences (as p is forced down) will be more severe than those following the temporary cuts discussed in Option 1 above. The reason for this is the following: the reduction in G still reduces aggregate demand, but there is no longer the partially offsetting increment to aggregate demand via private consumption, because private wealth remains constant under the present policy. Although the short-term unemployment costs of this policy are higher than the temporary spending cut above, the beneficial medium-term growth impact is more favorable.

Option 4: Reducing Central Bank Credit to the Government while Increasing Taxes

When a government increases taxes, the need to borrow either from the central bank (i.e. "printing money") or the commercial banking system in order to fund a given level of government spending is reduced. The macro effects of the two options involving tax hikes are very different. If the government reduces high-powered money creation as taxes are increased, there are both short and long-run costs: current output and employment fall, as does capital investment and hence future output. To confirm these effects, note that the fall in H reduces the credit available for private investment $\bar{L}$ in (2.3), shifting the LL curve to the left. As aggregate demand falls, due to the impact of the credit crunch on investment, prices and hence current output and employment decline to restore goods market equilibrium.

Option 5: Reducing Commercial Bank Credit to the Government while Increasing Taxes

In contrast to the above analysis where the government was monetizing the deficit, a reduction in government borrowing from the commercial banking sector (L_g) –facilitated by tax increases– will increase the bank credit available to private firms. This induces a *rise* in capital investment, as the LL curve shifts to the right. Both the rise in $\tilde{I}$, itself, and the resulting positive wealth effect on consumption cause aggregate demand to rise. Hence p must rise to restore equilibrium in the output market. In sum, if commercial bank credit to the government is reduced when taxes are raised, current output and future output will both *rise*.[19]

Unlike the other alternatives considered above, the fiscal reduction strategy that increases taxes so as to rely less heavily on commercial bank

[19] The favorable short-run output effect is exactly the opposite of the standard textbook conclusion based on *ad hoc* macro models which ignore intertemporal considerations and financial market distortions).

credit is "expansionary". It raises current and future output.[20] Thus, the Barro-Ricardian debt neutrality proposition does not hold in the present economic environment where banks face reserve requirements and regulated deposit rates.

4. Welfare Analysis

The policy analysis in the previous section discusses impacts on short-run stabilization –i.e. output and employment in period 1– and medium-term growth –measured by period 2 output. In some instances policies have favorable short-run effects but an adverse medium-term effects, or vice versa. In order to judge whether such policies are indeed welfare improving, one might consider the impact of policies on the utility index $U(C, C') + v(G, G')$ of a representative household whose expenditure function takes the form:

$$E = E(p, \delta_d, G, G', U) . \tag{4.1}$$

G and G' are policy-chosen levels of government goods supplied at a zero price to the private sector. Setting expenditure equal to wealth $\widetilde{W}$ and recalling that equilibrium values of $(p, \widetilde{I}, \widetilde{W})$ are determined by (2.3), (2.4) and (2.5), it is possible to solve for the impact of each policy on utility.

Begin by totally differentiating the national budget constraint:

$$E(p, \delta_d, G, G', U) = p(Y - \widetilde{I} - G) + \delta_d(\widetilde{Y}' - G') + \beta F. \tag{4.2}$$

After noting that F / p^* and, by market clearing, $(Y - G - I + IM) = 0$, this yields:

$$E_u dU = (dY / dp)dp + [\delta_d \, dY' / d\widetilde{I} - p]d\widetilde{I}$$

$$- [(p + E_g)dG + (\delta_d + E_{g'})dG'] + \beta dF \tag{4.3}$$

The first term reflects the short-run stabilization impact of policies via their effect on the equilibrium price of domestic output. The second term picks up the impact on investment or "growth." Note that as credit market

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distortions become more severe, $[\delta_d d \tilde{Y}' / d\tilde{I} - p]$ has a greater positive value, reflecting the welfare gain from additional investment.[21] The third term in (4.3) reflects the cost or benefit to households of increases in government spending. It is a property of quantity-constrained expenditure functions (see Neary and Roberts, 1980) that the partial derivative of the expenditure function with respect to the quantity-constraint, i.e. E_g, equals the prevailing (disequilibrium) price of a good (G) whose supply to households is quantity-constrained minus its shadow value to households. In the present context where G and G' are public goods, the prevailing prices are zero, so E_g and $E_{g'}$ are just the negatives of the shadow values of publicly provided goods. The terms ($p + E_g$) and ($\delta_d + E_{g'}$) are therefore equal to the social cost of public goods minus their social benefit. When the optimal level of government spending is chosen, of course, these terms equal zero.

The fourth term reflects the potential benefit/cost of additional foreign borrowing (instead of taxation) as a means of financing government spending. Provided the real cost of foreign borrowing is less than the real deposit rate (n.b. not the real lending rate, which the government might [incorrectly] be using to decide where to borrow), β will be positive so that additional foreign borrowing raises national welfare.

Scrutinizing (4.3), it becomes clear that it is generally impossible to resolve the conflict between policies that have favorable short-run impacts but unfavorable medium-term impacts (or vice versa) by calculating changes in national welfare using a utility index. The growth factor will receive very high incremental welfare weight in highly distorted economies, but it approaches zero as the credit market approaches complete efficiency. The weight on the stabilization term depends on the responsiveness of current output to reductions in the real wage resulting from rising domestic prices (in an environment where nominal wages are sticky in the short-run).

Thus, policy options 1, 2 and 3 have indeterminate welfare impacts, because their short and long-run consequences work in opposing directions (recall the results in Table 1). This is not the case, however, for options 4 and 5. Option 4 –raising taxes while cutting monetary base creation– reduces welfare in the presence of credit rationing. In contrast, raising taxes while cutting government borrowing from the banking system (Option 5) unambiguously raises national welfare in the present model.

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[21] Even in the absence of credit rationing, the existence of reserve requirements causes this expression to be positive. Unconstrained profit-maximization by borrowing firms implies that $\delta dY'/dI - p = 0$. With reserve requirements, the deposit rate of interest will exceed the lending rate (i.e. $\delta < \delta_d$), so $\delta_d dY'/dI - p > 0$.

5. Conclusion

This paper has developed a simple intertemporal optimization model with
money and credit rationing to study the potential conflicts between short-
run output/employment effects and medium-run growth effects of
various fiscal policy actions in LDCs. The conclusions from the compara-
tive static analysis, which is discussed in Section 3, were summarized in
Table 1. It was shown that a temporary balanced-budget reduction in
government spending stimulates growth via higher investment, but it
does so at the cost of higher short-run unemployment. (Option 1 in the
Table). Announcements of *future* spending cuts (Option 2), on the other
hand, have the opposite effect. By increasing private wealth they stimulate
consumption demand, thereby reducing the saving available to fund
capital investment.

   If the government elects to postpone current expenditures until the
future, rather than merely reducing them (Option 3), the short-run loss in
output is more severe than it was under Option 1. On the other hand, the
longer term growth impact via investment is more favorable.

   The analysis of tax increases (Options 4 and 5) shows that the short and
medium-term effects of this deficit reducing policy depend critically on
whether the government's reduced financing leads to a reduction in the rate
of r oney creation or government borrowing from the banking system. In the
former case, the effects on both current output/employment and future
output investment are unfavorable. In the latter, in contrast, both are
favorable. In non-hyperinflationary environments, at least, this suggests
that governments might focus on reducing its credit from the banking
system as tax revenue increases. This "crowds in" private investment,
thereby stimulating aggregate demand and reducing the policy's short-
run adjustment costs. Furthermore, the higher level of investment supports
future output growth.

   Although the foregoing analysis suggests possible ways of designing
"growth oriented" macroeconomic stabilization policies in developing
countries, it remains to be seen how robust the conclusions are to alternative
model specifications. Possible extensions include: *i*) allowing households to
accumulate other assets besides bank account balances, *ii*) introducing
"productive" government spending on public goods or infrastructure invest-
ments, and *iii*) considering non-competitive banking systems and direct credit
allocation programs that discriminate among various productive sectors of
the economy.

Appendix 1

Technical Details of the Model

The Wealth Expression

Equation (1.12) claims that wealth in the present model can be written as:

$$W = p(Y - G - I) + \delta_d(Y' - G') + \beta F \, , \qquad (A.1)$$

where $\beta = p / p^* - (p' / (1 + i_d)) ((1 + i^*) / p^{*'})$. This expression is used in calculating comparative static results reported in the text.

To derive (A.1), take the definition of wealth in (2.1) of the text:

$$W = (pY - T) + (1 + i_d)^{-1}[\, p'Y' \overset{\shortmid}{-} L_p(1 + i) + \pi_B - T'\,] \, . \qquad (A.2)$$

Using the government financing constraints (1.11) to eliminate T and T', and the firms' financing constraint that $(pI - L_p) = 0$, (A.2) be rewritten as:.

$$W = p(Y - G) - (pI - L_p) + L_g + H + F(p / p^*)$$

$$+ (1 + i_d)^{-1}[p'(Y' - G') + \pi_B - L_p(1 + i) - p'F(1 + i^*) / p^{*'}]$$

$$= p(Y - I - G) + \delta_d (Y' - G') + \beta F$$

$$+ \{(L_p + L_g) + H + \delta_d [\pi_B - (L_p + L_g)(1 + i)]\} \, .$$

It can be shown that the terms in the brackets { } equals zero. Substitute for π_B using (1.15) and use the banking sector's balance sheet constraint $D = L^s + H$ and the market clearing condition that $L^s = L_p + L_g$. The result is the household wealth constraint as written in (A.1).

In the presence of credit rationing, investment is at the effective level $\tilde{I}$ defined by (1.9) in the text. In this case, the derivatives of wealth $\tilde{W}$ equal:

$$\frac{d\tilde{W}}{d\tilde{I}} = -p + \delta_d \frac{\partial Y'}{\partial \tilde{I}} > 0 \, ; \qquad (A.3)$$

$$\frac{d\tilde{W}}{d\tilde{I}} = 0 \, , \quad \frac{\partial \tilde{I}}{\partial i} = 0 \, ; \qquad (A.4)$$

$$\frac{d\tilde{W}}{di_d} = \frac{-p}{(1+i_d)^2} \ (Y'-G') < 0; \qquad (A.5)$$

$$\frac{d\tilde{W}}{dp} = (Y+IM-G-\tilde{I}) + \frac{\partial Y}{\partial p} + [\delta_d \frac{\partial Y'}{\partial I} - p]\frac{\partial \tilde{I}}{\partial p} > 0 \ . \qquad (A.6)$$

(A.6) is positive, provided that the welfare distortion reflected in the last term is less than the total amount of current output available for private consumption, $Y+IM-G-\tilde{I}>0$. This is a weak assumption.

The Slope of the GG Locus in Figure 2

The *GG* locus in Figure 2 denotes goods market equilibrium. It is defined by (2.4) after substituting for wealth using (2.5). The slope of *GG* is unambiguously positive:[22]

$$\frac{d\tilde{I}}{dp}\Big|_{GG} = \left(\frac{\partial y}{\partial p} - \frac{\partial C}{\partial p} - \frac{\partial C}{\partial W}\frac{d\tilde{W}}{dp}\right)\left(1 + \frac{\partial C}{\partial W}\frac{d\tilde{W}}{d\tilde{I}}\right)^{-1} > 0 \ . \qquad (A.7)$$

Intuitively, increases in $\tilde{I}$ raise aggregate demand, both directly and indirectly via the induced positive wealth effect on consumption. Hence increases in $\tilde{I}$ must be accompanied by increases in p *ceteris paribus* to maintain goods market equilibrium. *GG* indeed has a positive slope.

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[22] The dynamic stability condition for the goods market requires that the numerator be positive. If (A.6) is positive, this condition necessarily holds, as can be seen by using the Slutsky decomposition on $\partial C / \partial p$.

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