Devaluation, Fiscal Deficits, and the Real Exchange Rate

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This article examines the use of fiscal policies to sustain the effects of a nominal devaluation on the real exchange rate. It is shown that the magnitude of the change in the real exchange rate depends not only on the size of the devaluation and the degree of fiscal adjustment but also on the means by which the fiscal deficit is reduced. The change in the nominal exchange rate necessary to maintain the depreciation of the real exchange rate will depend on whether the fiscal deficit is eliminated by increasing taxes or by reducing government expenditures on traded and nontraded goods. The required depreciation of the domestic currency will be larger if the fiscal deficit is reduced by increasing taxes than it will be if the deficit is cut by lowering government expenditures. Further, the depreciation would be smaller if the cuts in expenditure fell on traded rather than nontraded goods. This result implies that the authorities must ensure consistency between exchange rate action and policies to reduce fiscal imbalances in order to achieve a desired level of the real exchange rate necessary to attain balance of payments equilibrium.

The real exchange rate represents a key relative price in the economy and policies to change it are often the centerpiece of adjustment programs designed to improve international competitiveness and shift resources toward the production of tradable goods. Consequently, it is critical for policymakers to have some idea of the magnitude and time path of the likely response of the real exchange rate to nominal exchange rate action. It is a well-accepted proposition, however, that a nominal devaluation will only have a transitory effect on the real exchange rate. In the long run domestic wages and prices will rise by the full amount of the devaluation and the real exchange rate will return to its original level. To alter the real exchange rate on a permanent basis, therefore, devaluation has to be supplemented by policies that restrain the increase in domestic factor costs that results from a devaluation.

Generally speaking, the effects of a devaluation on the real exchange rate can be decomposed into two separate effects. First, there is the short-run response...
that reflects the initial increase in the domestic price level. This “first-order” effect has been shown to depend on the share of traded goods in total expenditure, and the relative price elasticities of the demand and supply of nontradable goods. As a first approximation, assuming that the price of nontraded goods is constant in the short run, the impact of a devaluation on domestic prices can be estimated as simply the product of the exchange rate change and the share of traded goods in total expenditures. The depreciation in the real exchange rate would therefore be equal to the nominal devaluation adjusted for the increase in domestic prices. Second, there is the longer-run response of the real exchange rate which would depend on how prices of nontraded goods respond to shifts in resources away from the nontraded sector. The more rapid is the increase in nontraded goods prices, other things being equal, the more quickly would the effects of a devaluation on the real exchange rate be dissipated.

This two-stage response of the real exchange rate to devaluation has been discussed in a number of theoretical studies, and it is clear from these that a sustainable change in the real exchange rate requires policies that bring about a change in real macroeconomic aggregates (see, for example, Dornbusch 1974; Krueger 1974; Connolly and Taylor 1976; Rodriguez 1978; Blejer 1979; and Edwards 1985). Since overvaluation of the exchange rate and the accompanying balance of payments problems can typically be traced back to imbalances in the government budget, measures to reduce the fiscal deficit are one example of policies that can have a long-run effect on the real exchange rate. Generally speaking, the extent to which a devaluation will affect the real exchange rate, as well as the length of time over which the effects persist, will be a direct function of the supporting fiscal policies that are put in place (see Berglas and Razin 1973 and Montiel 1986).

The purpose of this article is twofold. First, it examines the relationship between nominal and real exchange rates. This is done by formulating a relatively simple theoretical model that combines several arguments that have been made on the subject into one convenient framework. With this model it is possible to determine the real exchange rate response to a devaluation in both the short and long run. Second, we use this model to analyze the effects of a reduction in the fiscal deficit on the real exchange rate. It is shown that the effects will depend on how the fiscal deficit is reduced—whether through increases in taxes or reductions in expenditures. Finally, one can also ascertain the effects of combining devaluation with deficit-reducing measures within this relatively simple framework. Devaluation speeds up the process of adjustment and thus reduces the loss of reserves that would typically accompany policies that focused exclusively on eliminating fiscal deficits. Our general results point clearly to the need for close coordination between exchange rate and fiscal policies in any attempt to alter the real exchange rate in a predictable fashion and to achieve balance of payments equilibrium.

In the following section we describe the model and use it to determine the effects on the real exchange rate of devaluation and policies to reduce the fiscal
deficit. We also briefly discuss the case where the two types of policies are combined, as they would be in any real situation. The concluding section discusses some of the policy implications of the exercise.

I. Framework of Analysis

In this section we start by formulating a simple two-good, dependent economy model that has come to be used extensively in the study of open-economy macroeconomic issues (see, for example, Dornbusch 1974; Rodriguez 1978; and Liviatan 1979). We then trace out the effects of a devaluation in isolation on the real exchange rate and the domestic price level. Here we are essentially interested in reproducing the main theoretical results obtained in previous work on the subject. The role of policies designed to reduce the fiscal deficit are then examined. The final part of this section deals with the joint effects of devaluation and fiscal policies on the real exchange rate and the balance of payments.

**Theoretical Model**

Consider an economy that produces and consumes traded and nontraded goods. The domestic currency price of traded goods, $P_T$, is equal to the foreign currency price of these goods in the world market, $P_T^F$, times the nominal exchange rate, $E$, defined as the domestic currency price of foreign currency. Since the economy is assumed to be small, it does not affect world market prices. The assumption that the terms of trade are given to the country allows us to aggregate importable and exportable goods into a single composite traded good. Assuming also that world prices are constant, units can be chosen so that $P_T^F = 1$. Thus, the domestic currency price of traded goods is equal to the nominal exchange rate, $E$. The domestic currency price of nontraded goods, $P_N$, conversely, is endogenously determined by the condition of equilibrium in the nontraded goods market. The relative price between traded and nontraded goods, $E/P_N$ will be referred to as the "real exchange rate" and denoted by $e$. An increase in $e$ represents a real depreciation, and vice versa.

It is assumed that the supply of factors of production is fixed and that factor prices are flexible. Because of this perfect price flexibility, full employment is always maintained. These assumptions imply that production of traded and nontraded goods, $Y_T$ and $Y_N$, respectively, depends only on the real exchange rate $(e)$:

\[ Y_T = Y_T(e) \quad Y_N = Y_N(e) \quad \frac{dY_T}{de} > 0; \quad \frac{dY_N}{de} < 0 \]

Private sector consumption of traded and nontraded goods, $C_T$ and $C_N$, respectively, depends on the real exchange rate and on the real stock of wealth, $a$, which is measured in terms of the domestic currency price of traded goods, $E$. 

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Public sector total expenditure, \( g \), and taxes, \( t \), are defined in terms of traded goods. Allocation of total government expenditures between traded goods, \( g_T \), and nontraded goods, \( g_N \), is exogenous and given as

\[
g_T + g_N = g
\]

There are only two assets in the economy, namely, domestic money, \( M \), and foreign money, \( f \). Traded goods producers earn foreign exchange when production, \( Y_T \), is greater than domestic consumption, \( C_T \), and government purchases, \( g \). Neither domestic nor foreign money is assumed to be interest bearing, and we assume that individuals do not acquire physical assets or bonds. All savings, therefore, is in the form of domestic and foreign money. The real stock of domestic money in terms of traded goods, \( M/E \), will be denoted by \( m \). Therefore, total real wealth is given by:

\[
a = m + f
\]

Private sector domestic money holdings are a fraction, \( \lambda \), of total assets, determined by the expected rate of depreciation of the nominal exchange rate, which is assumed to be exogenous and is denoted by \( \hat{E}^* \). (The symbol "" over a variable signifies a percentage change, \( \hat{x} \equiv \Delta x/x \).)

\[
m = \lambda(\hat{E}^*)a
\]

with \( d\lambda/d\hat{E}^* < 0 \) and \( 0 < \lambda(\hat{E}^*) < 1 \).

The sign restrictions imply that the higher the expected rate of depreciation of the domestic currency, the smaller will be the fraction of wealth that is held in the form of domestic money. Since it is assumed that the nominal exchange rate is fixed by the central bank, changes in the expected rate of depreciation of the domestic currency cause the private sector to exchange foreign money for domestic money, and vice versa. The transactions take place with the central bank at the fixed exchange rate, thereby affecting the composition but not the level of private sector real wealth.

The short-run position of the economy is determined by the condition of equilibrium in the nontraded goods market:

\[
Y_N(e) = C_N(e, a) + eg_N
\]
Equation 6 is represented by the downward sloping curve, NN, in Figure 1. The higher the level of real wealth, the greater is the private sector demand for nontraded goods, and thus the lower must be the real exchange rate (that is, the relative price of traded goods) in order to reduce demand and increase the supply of nontraded goods so as to maintain equilibrium. Similarly, a reduction in real wealth lowers the demand for nontraded goods and this requires a higher real exchange rate.

The nontraded goods market is always in equilibrium; that is, the economy is always on curve NN. In the short run the level of real wealth is predetermined and curve NN indicates the resulting real exchange rate. In the steady state, however, the level of real wealth is endogenous. Hence, it is necessary to examine the evolution of real wealth in order to determine the steady-state equilibrium. From equation 4, we can obtain the rate of change of wealth,

\[
\dot{a} = m + \dot{f}
\]
where a dot over a variable indicates its derivative with respect to time. As long as there is no change in the nominal exchange rate, we have

\[ \dot{m} = \frac{M}{E} \]

From the balance sheet of the banking system, the change in the nominal stock of domestic money will be

\[ \dot{M} = \dot{R} + \dot{D} \]

where \( \dot{R} \) is the change in the stock of international reserves, measured in terms of domestic currency, and \( \dot{D} \) is domestic credit creation. The change in the stock of international reserves is described by

\[ \dot{R} = E[Y_T(e) - C_T(e, a) - g_T] - E\dot{J} \]

where the first term on the right hand side is the current account of the balance of payments, and the second term is the capital account reflecting the fact that an increase in private sector holdings of foreign currency will draw down central bank reserves. We assume that the government cannot finance its deficit by borrowing from the nonbank public or from abroad. We further assume that there is no credit extended to the private sector, although introducing this variable into equation 11 would not affect the analysis. Domestic credit creation is used exclusively to finance the public sector budget deficit, so

\[ \dot{D} = E(g_N + g_T - t) \]

Using equations 10 and 11 to replace \( \dot{R} \) and \( \dot{D} \) in equation 9, and then using the resulting expression and equation 8 to substitute for \( \dot{m} \) in equation 7, we obtain

\[ \dot{a} = Y_T(e) - C_T(e, a) + g_N - t \]

Equation 12 describes the evolution of real wealth. For the economy to be in equilibrium, the level of wealth must be constant, which requires that

\[ Y_T(e) - C_T(e, a) = t - g_N \]

Equation 13 is represented by \( \dot{a} = 0 \) in Figure 1. To the left of curve \( \dot{a} = 0 \), \( C_T \) is lower and savings is positive so that real wealth increases (\( \dot{a} > 0 \)). Correspondingly, to the right of \( \dot{a} = 0 \) savings would be negative and real wealth would be declining (\( \dot{a} < 0 \)). Therefore, for any given initial level of real wealth, the economy moves along curve NN as indicated by the arrows until it reaches the intersection with the \( \dot{a} = 0 \) curve at point A, where equilibrium would be achieved.

Point A in Figure 1 represents a short-run (quasi) equilibrium of the economy. Whether this position is sustainable or not depends on the size of the country's reserve holdings. At point A there is a balance of payments deficit and the country is losing reserves; obviously there is a limit to the amount of reserves a country can lose. In equilibrium, the capital account of the balance of payments
(equation 10) is in balance, since a constant level of real wealth implies a constant desired stock of foreign money, unless there is a change in the expected rate of depreciation, $\hat{E}^*$, which will change desired relative holdings of $m$ and $f$. In other words, once the level of real wealth is constant ($\hat{a} = 0$), then persistent capital outflows ($\hat{f} > 0$) require an ever increasing expected rate of depreciation to induce an offsetting decline in $\hat{m}(\hat{E}^*)$. Conversely, persistent capital inflows require an ever increasing expected rate of appreciation.

Since we are interested in identifying sustainable long-run equilibrium positions, we assume that in such positions the expected rate of depreciation is equal to zero. Therefore, we need to focus only on the current account of the balance of payments, denoted by $CA$:

\begin{equation}
CA = Y_T(e) - C_T(e, a) - g_T
\end{equation}

Equilibrium in the current account requires

\begin{equation}
Y_T(e) - C_T(e, a) = g_T
\end{equation}

Equation 15 is represented by curve $CA = 0$ in Figure 1. To the left of this curve there is a current account surplus, and to the right of this curve there is a current account deficit. Comparing equations 13 and 15, it is clear that the position of the curve $CA = 0$ with respect to the curve $\hat{a} = 0$ depends on whether $g_T$ is higher or lower than $(t - g_N)$, that is, on whether there is a government budget deficit or surplus. In Figure 1 it is assumed that the budget is in deficit to start with, and therefore the curve $CA = 0$ is to the left of curve $\hat{a} = 0$. Hence, at point A the current account, and therefore the overall balance of payments, is in deficit. Using equation 13, which holds at point A, to replace $(Y_T - C_T)$ in equation 14, it follows that

\begin{equation}
CA = t - g_N - g_T
\end{equation}

Therefore, at point A, the current account deficit, and thus the overall balance of payments deficit, is equal to the deficit in the government budget. The long-run stationary equilibrium of the economy would be reached when the two curves $\hat{a} = 0$ and $CA = 0$ collapse into one curve, which implies equilibrium in both the fiscal and balance of payments accounts.

2. Note that as we have assumed that services flows are zero, the current account balance is identical to the trade balance.

3. If the exchange rate were crawling, instead of being fixed, the long-run rate of inflation would be positive and equal to the rate of crawl. As a result, the current account (and thus the overall balance of payments) deficit at the stationary equilibrium would be equal to the public sector budget deficit minus the inflation tax. This also implies that changes in the expected rate of devaluation would affect the balance of payment not only in the short run due to the immediate change in portfolio composition but also in the long run due to the change in the inflation tax.

4. In this model with a zero fiscal deficit and a positive growth rate, the debt-income ratio would steadily fall.
Effects of Devaluation

The effects of a devaluation can be examined with the aid of Figure 1. A nominal devaluation reduces the real stock of domestic money, and thus the level of real wealth. This causes a decline in demand, which in turn requires a depreciation of the real exchange rate to increase the demand and reduce the supply of nontraded goods so as to maintain equilibrium. For example, starting from point A, a devaluation would reduce the level of real wealth from $a_0$ to $a_1$, causing a depreciation of the real exchange rate from $e_0$ to $e_1$. After this initial impact, however, real wealth increases with reserves until it returns to $a_0$, while the real exchange rate appreciates steadily until it comes back to $e_0$.

The effect of a devaluation on the real exchange rate can be obtained from equations 5 and 6. Since the nominal stock of domestic money is predetermined at the time of the devaluation, the real stock of domestic money, $(M/E)$, declines by the amount of the devaluation. Therefore, as a fraction of wealth, $\lambda(E^*)$, is held in the form of domestic money, the change in real wealth is given by:

$$\dot{a} = -\lambda(E^*)\dot{E}$$

(17)

where $\dot{E}$ is the actual rate of devaluation. In Figure 1, equation 17 would determine the extent of the decline in real wealth shown here as the movement from $a_0$ to $a_1$. The magnitude of the depreciation of the real exchange rate (the rise from $e_0$ to $e_1$) is found from equation 6, which defines the curve $NN$. Differentiating equation 6 and using equation 17 to substitute for $\dot{a}$, we obtain

$$\dot{e} = \lambda(E^*)\frac{\beta\eta_N}{\epsilon_N + \beta\eta_N + (1 - \beta)}\dot{E}$$

(18)

where

$\eta_N$ = nontraded goods demand elasticity with respect to real wealth (positive)
$\eta_N$ = nontraded goods demand elasticity with respect to the real exchange rate (positive)
$\epsilon_N$ = nontraded goods supply elasticity with respect to the real exchange rate, defined to be positive ($\epsilon_N = -dY_N/de \cdot e/Y_N$)
$\beta$ = share of the private sector in total consumption of nontraded goods, $(C_N/Y_N)$.

As indicated in equation 18, there are several factors that affect the initial depreciation of the real exchange rate. Other things being equal, the higher the share of domestic money in real wealth, the larger is the decline in real wealth resulting from a devaluation, and therefore the larger must be the real depreciation that is necessary in order to maintain equilibrium in the nontraded goods market. Similarly, the larger the demand elasticity of nontraded goods with respect to wealth, the larger is the decline in the demand for nontraded goods

5. This equation is obtained by differentiating equation 4 with respect to $E$ and then using equation 5 to replace $m/a$. 
brought about by the reduction in real wealth, and thus the greater is the real depreciation that is required to maintain equilibrium. Conversely, the higher the supply elasticity and the relative price demand elasticity of nontraded goods, the smaller is the real depreciation that is needed to maintain equilibrium.

As mentioned above, after the initial effect, the real exchange rate appreciates steadily until it returns to its original level. The long-run neutrality of the real exchange rate with respect to a nominal devaluation follows from equations 6 and 13, which determine the long-run stationary equilibrium. Since both equations are independent of the level of the nominal exchange rate, the long-run real exchange rate does not change as a result of a devaluation. The evolution of the real exchange rate \( (e) \) through time after a devaluation is described in Figure 2, and most of the models in the literature imply a path for the real exchange similar to one described here (see, for example, Dornbusch 1974; Krueger 1974; Boyer 1977; Rodriguez 1978; Blejer 1979; Liviatan 1979; and Montiel 1986).

There are some studies, however, that yield different results for the effect of devaluation described by equation 18. For example, Jones and Corden (1976) show that in a Heckscher-Ohlin model with wages kept constant, a devaluation may produce a real appreciation if traded goods are labor-intensive. They also

Figure 2. Behavior of the Domestic Price Level and the Real Exchange Rate
show that this result cannot arise in a capital-specific model, and they then argue that a capital-specific model is better suited for the analysis of a devaluation. Lapan and Enders (1978), using a two-country model, show that a devaluation in the home country may appreciate its real exchange rate if the share of home country wealth held in home currency is lower than the share of the foreign country wealth held in the home country currency. Under these conditions, a devaluation of the home currency would redistribute wealth in the “wrong” direction, namely from the foreign country to the home country, leading to an appreciation of the real exchange rate in the home country.6 Kyle (1978), using a model with money and bonds in the utility function, shows that it is possible for a nominal devaluation to produce a short-run real appreciation due to substitution effects between bonds, goods, and money in the utility function. Finally, Stockman (1983), using an equilibrium two-period model, shows that a devaluation has no effect on the real exchange rate since the reduction in private real wealth arising from the “tax” on domestic money is compensated by the increase in the interest-bearing reserves of the government. Generally speaking, however, the results obtained here are consistent with those obtained by the majority of papers on the subject.

The effect of the devaluation on the price level can also be derived from our previous results. Assume that the price level is defined as:

\[ P = E^{\alpha_T} P_N^{\alpha_N} \]

where \( \alpha_T \) and \( \alpha_N \) are the respective shares of traded and nontraded goods in total expenditures, \( \alpha_T + \alpha_N = 1 \). Therefore,

\[ \dot{P} = \alpha_T \dot{E} + \alpha_N \dot{P}_N \]

but we know that

\[ \dot{e} = \dot{E} - \dot{P}_N \]

In order to obtain the effect of a devaluation on the price level, we use equation 21 to substitute for \( \dot{P}_N \) in 20 and then use 18 to substitute for \( \dot{e} \) in the resulting expression and obtain

\[ \dot{P} = \left\{ \alpha_T + \alpha_N \left[ 1 - \lambda (\dot{E}_N) \frac{\beta \eta_k}{\epsilon_N + \beta \eta_N + (1 - \beta)} \right] \right\} \dot{E} \]

If the expression in square brackets is less than one, the price level initially increases proportionally less than the exchange rate. This implies that the nominal price of nontraded goods either increases proportionally less than the rate of devaluation or declines.7 From equation 22 the effect on the price level is larger,

6. This result is valid only in the case of a large economy.
7. The nominal price of nontraded goods declines if the expression in square brackets in equation 22 is negative. Models that allow for this possibility include Krueger (1974), Connolly and Taylor (1976), Boyer (1977), and Blejer (1979). An initial decline in the nominal price of nontraded goods could theoretically result in an initial decline in the price level. However, this case is not plausible since it would require unusual values for the various parameters.
the higher are the share of traded goods in the price index \((\alpha_T)\), the nontraded goods supply elasticity \((\varepsilon_N)\), and the nontraded goods demand elasticity with respect to the real exchange rate \((\eta_R)\); and the lower are the nontraded goods demand elasticity with respect to wealth \((\eta_W)\) and the share of domestic money in real wealth \((\lambda)\).

After the initial impact, as real wealth rises, domestic prices increase steadily until they reach a new long-run level which is higher than the initial one by the same proportion as the nominal devaluation. Formally, the long-run effect on the price level can be obtained by using equation 21 to replace \(\hat{P}_N\) in 20, and then setting \(\hat{e} = 0\), a condition that was shown to hold in the long run. As a result, we obtain \(\hat{P} = \hat{E}\), and the price level rises in the same proportion as the nominal exchange rate. Figure 2 shows the evolution of the price level following a devaluation.

Clearly the time path of the price level does not accord with the idea that a devaluation produces a once-and-for-all increase in the price level equal to the share of traded goods in the price index times the rate of devaluation. This would be the effect only if the price of nontraded goods does not change with a devaluation, which is equivalent to assuming that the various price and income elasticities in equation 18 (or the expression in brackets in equation 22) are equal to zero. Furthermore, as shown in Figure 2, following the initial jump the price level keeps rising for a period of time before it reaches a new stationary level.

Another implication of this model is that the effectiveness of a devaluation in producing a (transitory) real depreciation, and thus a (transitory) improvement in the current account of the balance of payments, depends on the extent to which the devaluation was anticipated. The higher the expected rate of depreciation, the lower the share of wealth held in domestic money, and thus the smaller the reduction in real wealth brought about by the devaluation. In the limit, if the private sector holds its entire portfolio in foreign currency, a devaluation would be immediately reflected in a proportional increase in all prices without any effect on the real exchange rate. These results can be obtained formally in equations 18 and 22 by setting \(\lambda(\hat{E}^*)\) equal to zero.\(^8\)

Effects of Reducing Fiscal Deficits

Since a devaluation by itself produces only a transitory depreciation of the real exchange rate and a transitory improvement in the balance of payments, other policies are needed in order to make these effects permanent. As was shown above, under the assumption of this model the long-run steady state balance of payments deficit is equal to the public sector budget deficit. Therefore, a perma-

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8. Since most of the early models included only domestic money, the expected rate of depreciation played no role (see, for example, Dornbush 1974; Krueger 1974; and Connolly and Taylor 1976). Isard and Porter (1977) stress the need to take into account the anticipatory actions of the private sector diversification of portfolios. Models that do incorporate foreign assets include, among others, Boyer (1977) and Lapan and Enders (1978).
ment improvement in the balance of payments necessarily requires a reduction in
the public sector deficit, and in particular, long-run balance of payments equilib-
rium requires government budget equilibrium.

This result can also be illustrated by using Figure 1. Recall that the initial
equilibrium of the economy is determined by the intersection of curves \(NN\) and \(\dot{a} = 0\), and that long-run balance of payments equilibrium only holds for points on
the \(CA = 0\) curve. Therefore, unless \(NN\) and \(\dot{a} = 0\) intersect at some point on
the \(CA = 0\) curve, the initial equilibrium will be inconsistent with balance of
payments equilibrium. Curve \(\dot{a} = 0\) is defined by equation 13, while curve \(CA = 0\)
is defined by equation 15. If the public sector deficit is eliminated, the right
hand side in both equations will be the same, and curves \(\dot{a} = 0\) and \(CA = 0\) will
collapse into one curve. Under this condition, the intersection of curves \(\dot{a} = 0\)
and \(NN\) will necessarily be at a point on the curve \(CA = 0\).

Although the objective of long-run balance of payments equilibrium is at-
tained with the elimination of the fiscal deficit, irrespective of the specific fiscal
policies used, the mix of fiscal policies is important for the determination of the
long-run real exchange rate. Different combinations of increases in taxes and
reductions in public sector expenditure on traded and nontraded goods, all of
which create long-run balance of payments equilibrium, will imply different
values for the long-run real exchange rate. This can be shown in the framework
of Figure 3, which reproduces the original curves \(NN\), \(\dot{a} = 0\), and \(CA = 0\).

Let us assume first that the fiscal deficit is eliminated entirely by increasing
taxes. From equations 6, \(YN(e) = CN(e,a) + eN\), and 15, \(YT(e) - CT(e,a) = gT\), it is clear that curves \(NN\) and \(CA = 0\) do not shift, while equation 13, \(YT(e) - CT(e,a) = t - gN\), indicates that curve \(\dot{a} = 0\) shifts to the left. From our
previous results we know that curve \(\dot{a} = 0\) will collapse into the curve \(CA = 0\).
Thus, the new long-run equilibrium will be at a point such as \(B\), where the \(NN\)
and the new \(\dot{a} = 0\) curves intersect. Therefore, if the fiscal deficit is eliminated by
increasing taxes, real wealth will decline from \(eA\) to \(eB\) and the real exchange rate
will depreciate from \(eA\) to \(eB\).

Alternatively, let us assume that the fiscal deficit is eliminated entirely by
reducing public sector expenditure on traded goods. From equations 6 and 13,
curves \(NN\) and \(\dot{a} = 0\) do not shift, while from equation 15 it follows that curve
\(CA = 0\) shifts to the right until it collapses into curve \(\dot{a} = 0\). Thus, the new long-
run equilibrium will be point \(A\), which is the same as the previous equilibrium.
Therefore, eliminating the fiscal deficit by reducing public sector expenditures
on traded goods does not require either a reduction of wealth or a depreciation
of the real exchange rate.

Finally, let us assume that the fiscal deficit is eliminated by reducing public
sector expenditures on nontraded goods. Equation 15 indicates that curve \(CA = 0\)
does not shift, while equations 6 and 13 indicate that curve \(NN\) shift upward to
\(NN'\) and curve \(\dot{a} = 0\) shifts upward until it collapses into curve \(CA = 0\).
Since curve \(\dot{a} = 0\) shifts more than curve \(NN\), the new intersection point \(C\) must
be to the northwest of point A. Therefore, eliminating the public sector deficit by reducing public sector expenditures on nontraded goods implies a decline in real wealth from \(a_A\) to \(a_C\) and a depreciation of the real exchange rate from \(e_A\) to \(e_C\).

9. The upward shift in curve \(\alpha = 0\) is obtained by differentiating equation 13 with respect to \(g_N\) while keeping \(\alpha\) constant. The result is

\[
\frac{de}{dg_N} = \left( \frac{dy_T}{de} \frac{\partial C_T}{\partial e} \right)^{-1}.
\]

Following the same procedure with equation 6, the upward shift in curve NN is

\[
\frac{de}{dg_N} = \left( \frac{\partial C_N}{\partial e} \frac{1}{e} \frac{\partial y_N}{\partial e} + \frac{g_N}{e} \right)^{-1}.
\]

Since producers' profit maximization implies \(dy_N/\partial e = -e \cdot dy_T/\partial e\), and consumers' utility maximization implies \(\partial C_N/\partial e = -e \cdot \partial C_T/\partial e\), it follows that curve \(\alpha = 0\) shifts up by more than curve NN.
The various means of eliminating the fiscal deficit have different implications regarding the level of wealth and the real exchange rate for the following simple reason. In each case the current account (and balance of payments) deficit is eliminated, which can be done either directly through a reduction in public sector expenditures on traded goods or indirectly through a reduction in wealth and a depreciation of the real exchange rate, which would reduce private sector demand and increase supply of traded goods. If the deficit is eliminated directly through a reduction in public sector expenditures on traded goods, there is no need for changes in relative prices and wealth that would change the behavior of the private sector. If the deficit is eliminated in some other way, however, a combination of reduction in real wealth and depreciation of the real exchange rate is required. The elimination of the deficit through a reduction in public sector expenditures on nontraded goods leads to a larger real depreciation (and a smaller reduction in real wealth) than an increase in taxes because in the former case the exogenous reduction in demand falls entirely on nontraded goods, which requires a larger decline in its relative price.  

Obviously, combinations of the three policies examined above could also be used to eliminate the deficit. For example, a combination of a reduction in public sector expenditure in traded and nontraded goods would imply a new equilibrium along the segment AC in Figure 3. A combination of an increase in taxes and a reduction in public sector expenditure on traded (nontraded) goods would produce a new equilibrium along the segment AB (BC). Finally, a combination of the three policies would imply a new equilibrium somewhere within the triangle ABC. In other words, for each combination of the three policies mentioned above there is a corresponding long-run equilibrium position in triangle ABC. This implies that when setting targets for a reduction in the fiscal deficit.

10. Other researchers have also examined the relationship between fiscal policy and the real exchange rate and have reached similar conclusions (see, for example, Berglas and Razin 1973; Bruno 1976; and Greenwood 1984). Berglas and Razin note that restrictive fiscal policy may lead to an appreciation of the real exchange rate if nontraded goods are inferior goods. This could also happen in our model, since inferior nontraded goods imply a positively sloped NN curve. However, we do not consider the case of inferior nontraded goods because it also has some fairly implausible implications. For example, a nominal devaluation by itself would cause a transitory real appreciation—see equation 18 with a negative $q_t$. For the same reason, an exogenous increase in the money supply would cause a real depreciation. Furthermore, if the NN schedule becomes steeper than curve $a = 0$, the system is divergent; if the economy is not in point A, it will move continuously away from A. Kapur (1981), using a growth model, shows that changes in government expenditures on traded capital goods may affect the steady state real exchange rate since this would change the steady state stock of capital per capita. Capital accumulation is not allowed for in our model. Kimbrough (1985) examines the relationship between fiscal policy and real exchange rates for countries under freely floating exchange rates.

11. It is also possible to obtain a long run equilibrium position outside the triangle ABC if the policy package that eliminates the fiscal deficit includes some expansionary policy. For example, if the policy package includes an increase in taxes but also a (smaller) increase in public sector expenditure in traded goods so that the fiscal deficit is eliminated, the long-run equilibrium position would be located on the NN curve to the northwest of point B, outside the triangle ABC. The consideration of this type of policy packages does not affect the main conclusions of the article.
deficit and a real depreciation in order to attain a given balance of payments improvement, the target for the real exchange rate cannot be set independently from the specific way in which the fiscal deficit is to be reduced.

**Combining the Effects of Devaluation and Fiscal Adjustment**

We have shown that long-run balance of payments equilibrium can be attained by eliminating the fiscal deficit, which generally implies a reduction in real wealth and a depreciation of the real exchange rate. For this reduction in real wealth and depreciation of the real exchange to take place, it is not necessary to devalue the domestic currency. If the fiscal deficit is eliminated, but the domestic currency is not devalued, there will be an adjustment period that will endogenously bring about the necessary changes in real wealth and the real exchange rate. For example, if the fiscal deficit is eliminated entirely by increasing taxes, the economy will adjust from point A to point B along the NN curve, causing a gradual reduction in real wealth and a gradual depreciation of the real exchange rate. If the deficit is eliminated entirely by reducing the expenditure on non-traded goods, the real exchange rate will jump from A to D, and then both the real exchange rate and real wealth will adjust gradually along the NN curve until they reach point C. If the deficit is eliminated entirely by a reduction in public sector expenditure in traded goods, however, there is no need for an adjustment process and the economy will attain a long-run equilibrium position immediately at the same point A. Combinations of the three types of fiscal policies will produce an initial jump in the real exchange rate, followed by a gradual depreciation.

Although the new long-run equilibrium can be attained without a devaluation of the domestic currency, the process of adjustment in which the real exchange rate depreciates gradually is accompanied by balance of payments deficits until the economy reaches the new long-run equilibrium. A devaluation of the domestic currency, however, can make the economy reach the new long-run equilibrium immediately, thereby preventing the loss of international reserves during the process of adjustment. Furthermore, in models that assume rigidities in prices and wages, a devaluation also helps to prevent unemployment, since a real depreciation without a devaluation would require a decline in the price of non-traded goods. If nontraded goods prices are sticky, output will decline and unemployment may result (see, for example, Dornbusch 1974 and Bruno 1978).

The magnitude of the devaluation that is required to immediately reach a new long-run equilibrium depends on the new equilibrium point; that is, it depends on the specific policies that are used to eliminate the fiscal deficit. For example, if only an increase in taxes is used, the magnitude of the devaluation must be such that real wealth falls from \( a_A \) to \( a_B \). Conversely, if only a reduction in public sector expenditure in nontraded goods is used, real wealth must fall from \( a_A \) to \( a_C \), which requires a smaller devaluation. In general, the lower the level of real wealth in the new long-run equilibrium, the larger is the devaluation needed to attain equilibrium immediately. This implies that the greater the reliance on
increasing taxes with respect to reducing public sector expenditures, the greater the needed devaluation. Conversely, the larger the reliance on reducing public sector expenditure on traded goods relative to the other policies, the smaller the required devaluation.

A devaluation that moves the economy immediately to equilibrium causes a once-and-for-all effect on the price level. The magnitude of this effect depends on the specific policies that were used to eliminate the fiscal deficit. From equation 20 and the definition of the real exchange rate, it follows that

\[ \hat{P} = \hat{E} - \alpha_N \hat{\delta} \]

Equation 23 and Figure 3 can be used to compare the effect of the various policies on the price level. For example, the price level increases by more if the deficit is eliminated by increasing taxes, rather than reducing public sector expenditure in nontraded goods, under the assumption that both policies are accompanied by the devaluation required to attain long-run equilibrium immediately. This follows because to move from A to B (when increasing taxes) requires both a larger devaluation and a lower real depreciation than when moving from A to C (when \( g_N = 0 \)) in Figure 3.

II. Conclusions

One of the familiar results that is captured in the framework of this paper is that devaluation by itself is not sufficient to achieve a real exchange rate objective, except perhaps in the very short term. Devaluation does have an initial effect on the real exchange rate, with the size depending on the substitution elasticities between traded and nontraded goods in consumption and production, and the share of domestic money in real wealth. The effects can only be sustained if supporting policies, such as measures to reduce the fiscal deficit and control of the growth of money, are adopted. These results are well known and what we have done here is to provide a unified treatment of the relationships between devaluation, fiscal deficits, and the real exchange rate.

The analysis in this article also highlighted a further aspect of the policy combination that is not as well-appreciated in the literature. That is, the magnitude of the nominal devaluation necessary to attain real exchange rate and balance of payments targets will depend on whether the fiscal deficit is reduced by increasing taxes, or by cutting government expenditures on traded and nontraded goods. In broad terms, the required depreciation of the domestic currency will be larger if the fiscal deficit is reduced by increasing taxes than by lowering government expenditures. Furthermore, the required nominal devaluation will be smaller if the cuts in expenditure fall on traded goods rather than nontraded goods.

The results here have an obvious bearing on the design of policy packages that are aimed at improving international competitiveness and the external balance of trade. It is shown that the size of the nominal devaluation and the way the
fiscal deficit is reduced cannot be considered as independent policy measures. The authorities have to ensure that consistency is maintained between the two types of policies to achieve a desired depreciation of the real exchange rate. If this is not done then the level of the real exchange rate and thus the impact on wealth would be indeterminate, even though the balance of payments deficit is eliminated. Simply proposing that the fiscal deficit should be reduced when devaluing the exchange rate is not enough to achieve a particular real exchange rate target; one also has to spell out the combination of methods by which the fiscal deficit is to be reduced.

REFERENCES


