Journal of International Economics 8 (1978) 445–456. © North-Holland Publishing Company

CONTRACTIONARY EFFECTS OF DEVALUATION

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Received November 1976, revised version received February 1977

A simple model is developed to illustrate a number of contractionary effects of currency devaluation, some of which have been noted previously. In a Keynesian model, it is shown that depreciation can lead to a reduction in national output if (i) imports initially exceed exports; (ii) there are differences in consumption propensities from profits and wages; (iii) government revenues are increased by devaluation, e.g. when there are significant export taxes. Similar effects are also shown to exist in monetarist models, via reductions in both real balances and the nominal money supply. A numerical example illustrates the results for an economy 'typical' of semi-industrialized countries.

1. Introduction

Theoretical treatments of currency devaluation generally conclude that it stimulates economic activity. The initial increase in the price of foreign goods relative to home goods is presumed to produce an excess demand for home goods. Models differ on how the system reacts, but in general home goods output, domestic prices, or both rise. The possibility that price movements caused by devaluation will create enough losers in real terms to cause an initial excess *supply* of home goods is almost always left out.

This oversight persists, even though there is substantial empirical evidence suggesting that devaluation often reduces aggregate demand (vide Cooper (1971a)). Even a few theorists like Hirschman (1949), Diaz-Alejandro (1963), Cooper (1971b) and others have suggested that falling output and employment after devaluation are quite frequently to be expected.[1] These analyses, however,

*The authors are grateful to the referees and to Rudiger Dornbusch, Jagdish Bhagwati, Edmar Bacha and members of the M.I.T. Trade and Development Workshop for comments on previous drafts.

[1]The possibility that devaluation will produce a fall in output has been known to international economists for many years, but theoretical treatments are rare. In the model developed by Meade (1951), which was the basis of most theoretical analyses of devaluation until the mid-60s, devaluation could produce contraction only if the Marshall–Lerner condition were not satisfied, something which was ruled out by assumption. Hirschman (1949) had pointed out earlier that the Marshall–Lerner condition must be modified when trade is not initially in balance, and he argued that this made a contractionary effect from devaluation more likely starting from an initial deficit. This point was later confirmed in a general equilibrium model by

have had little impact on thinking about exchange rates. The prevailing view is clearly presented in the recent summary by Johnson (1976) of approaches to devaluation: devaluation can be expected to raise output if there are unemployed resources; to raise domestic prices if there aren't.

Our aim in this paper is to establish the plausibility of a third outcome – a fall in output. We attempt to do this by combining and extending the results of previous authors in one simple, pedagogically appealing model. The model is designed to bring out clearly the income effects suppressed in conventional approaches – for neglecting the contractionary impacts of devaluation amounts to ignoring income effects, especially those transferring real purchasing power toward economic actors with high marginal propensities to save. By redirecting income to high savers, devaluation can create an excess of saving over planned investment ex ante, and reductions in real output and imports ex post. The three most important circumstances are the following:

(i) When devaluation takes place with an existing trade deficit, price increases of traded goods immediately reduce real income at home and increase it abroad, since foreign currency payments exceed receipts. Within the home country the value of 'foreign savings' goes up ex ante, aggregate demand goes down ex post, and imports fall along with it. The larger the initial deficit, the greater the contractionary outcome.

(ii) Even if foreign trade is initially in balance, devaluation raises prices of traded goods relative to home goods, giving rise to windfall profits in export and import-competing industries. If money wages lag the price increase and if the marginal propensity to save from profits is higher than from wages, ex ante national savings goes up. The magnitude of the resulting contraction depends on the difference between savings propensities of the two classes.

(iii) Finally, if there are ad valorem taxes on exports or imports, devaluation redistributes income from the private sector to the government, which has a saving propensity of unity in the short run. Once again, the final outcome is reduction in aggregate demand.

Casual empiricism suggests that all three circumstances prevail in many countries, especially the less developed ones. In these countries a deflationary

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Cooper (1971b). Diaz-Alejandro (1963) advanced another argument for contraction following devaluation, arising from the redistribution of income from wages to profits. We are not aware of any papers analyzing the contractionary role of what we call the 'fiscal effect' of devaluation.

A word should also be said about the extensive recent work on the 'monetary approach' to devaluation, of which Dornbusch (1973) is a good example. This approach does argue for a sort of contraction from devaluation – reduced real expenditure via the effect of devaluation on real balances. Since these models assume full employment of resources, however, no implications are drawn about the consequences for output and employment.

impact from devaluation is more than a remote possibility; it is close to a presumption.

2. A macroeconomic model

In this section we develop a simple Keynes–Kalecki model of an open economy with the following characteristics:

(i) There are two distinct sectors, an export sector producing for the world market and a home goods sector producing for domestic demand.
(ii) Prices of exports and imports are fixed in foreign currency; home goods prices are determined by a markup on direct costs of labor and imported inputs required to sustain production (think of petroleum in an oil-short country).
(iii) The wage rate is fixed in domestic currency.
(iv) In the short run, substitution responses of both exports and imports to price changes are negligible. Export volume is determined by available capacity, while imports enter with fixed coefficients into domestic production.
(v) Interest rates are kept constant by action of the monetary authority, so that we need only consider income-expenditure relationships.

Assumptions (i)–(v) are chosen for analytical convenience, but they appear to correspond fairly well to the stylized characteristics of many partially industrialized countries. In these countries most export earnings come from an agricultural or mining sector producing for world markets. Domestic industry has been built up by import substitution via protection, so that the remaining imports are noncompetitive, chiefly intermediate goods and raw materials, for which little substitution is possible in the short run.

The assumption of an accommodating monetary policy is made temporarily in order to allow us to focus on the income effects of devaluation. We will return to monetary analysis in a later section. We begin with an equation for the price of home goods:

$$P_H = (a_{LH}w + a_{MH}P_M)(1+z), \tag{1}$$

where a_{LH}, a_{MH} are input coefficients of labor and imports respectively into home goods, w is the wage rate, P_M the home domestic price of imports, and z a markup factor.

Prices of imports and exports are determined by world prices, taxes, and the exchange rate:

$$P_X = e(1-t_X)P_X^*, \tag{2}$$

$$P_M = e(1+t_M)P_M^*, \tag{3}$$

where e is the exchange rate of domestic currency for dollars, t_X and t_M the rates of ad valorem tax on exports and imports, and P_X^*, P_M^* the dollar prices of exports and imports on world markets. Notice that (1)–(3) imply that a change in the exchange rate changes traded goods prices relative to the wage rate and the price of home goods, but does not affect the terms of trade.

Recipients of income may be divided into two classes: those who receive wages and those who receive profits or rents. The nominal income of each class is determined by the equations

$$Y_W = (a_{LH}H + a_{LX}X)w, \tag{4}$$

$$Y_R = z(a_{LH}w + a_{MH}P_H)H + (P_X - a_{LX}w)X. \tag{5}$$

Here H and X are outputs of home goods and exports, a_{LX} is the input of labor per unit of exports.

For simplicity of exposition, it will be assumed that all imports are inputs into home goods production, i.e. that there is no *direct* final demand for imports. This implies that P_H is the proper deflator if we want to measure real income of workers or capitalists. We will assume separate consumption functions for the two groups, so the demand side of the model may be written

$$H = C_W(Y_W/P_H) + C_R(Y_R/P_H) + I(r) + G, \tag{6}$$

$$M = a_{MH}H. \tag{7}$$

Here, M stands for real imports, r is the interest rate, which we assume to be held fixed, I is real investment, and G is real government consumption.[2] For convenience, define $\partial C_W/\partial(Y_W/P_H) = \gamma_W$, $\partial C_R/\partial(Y_R/P_H) = \gamma_R$.

When the exchange rate is held fixed, equations (4)–(7) make up a standard Keynesian open-economy model. It is a simple matter to compute multipliers on home goods production and imports. The multiplier effects of a change in government expenditure, for example, are

$$\frac{\mathrm{d}H}{\mathrm{d}G} = \frac{1}{D}, \qquad \frac{\mathrm{d}M}{\mathrm{d}G} = a_{MH}/D,$$

where $D = 1 - \gamma_W a_{LH}w/P_H - \gamma_R z/(1+z) > 0$.

So far this is familiar ground; the unfamiliar results appear when the exchange rate changes, shifting the values of multipliers along with itself. The model excludes, by assumption, substitution and monetary effects of devaluation, leaving only income effects. The next section will examine just these.

[2]We abstract from stock changes. In practice, a good part of the response to devaluation we are about to sketch would take place via inventory adjustment. Again, the unfailingly messy details are omitted for simplicity.

3. Income effects of devaluation

Even when devaluation does not change a country's terms of trade, it has a number of other income effects. Unless the trade account is initially balanced, a devaluation changes the real income of the country as a whole. Within the country it produces redistribution from workers to capitalists, and from the private sector as a whole to the government. These real income adjustments do not take place independently – they interact, and there is no way to decompose the impact of a devaluation into separable components. In order to study the different income effects of devaluation individually, it is necessary to consider special cases in which only one of them is operating. That will be the procedure followed in this section.

3.1. Devaluation from an initial trade imbalance

Hirschman (1949) and Cooper (1971b) have shown – though with little impact on other theoretical work – that devaluation from an initial trade deficit reduces real national income and may lead to a fall in aggregate demand. The argument is straightforward. Devaluation gives with one hand, by raising export prices, while taking away with the other, by raising import prices. If trade is balanced, and the terms of trade are not changed, these price changes offset each other. But if imports exceed exports, the net result is a reduction in real income within the country.

The income loss can be quantified using the model of this paper by considering a special case. Let $\gamma_R = \gamma_W = \gamma$, eliminating within-country distribution effects, and let $t_X = t_M = G = 0$, eliminating fiscal effects. After a good deal of manipulation we can derive the elasticity of home goods output with respect to the exchange rate (the result is given as an elasticity because the economic meaning of the expression is clearer in that form):

$$\frac{\mathrm{d}H}{\mathrm{d}e} \cdot \frac{e}{H} = K \cdot \frac{P_X X - P_M M}{P_H H},$$

where $K = (\gamma/D)\,(1-(P_M M/P_H H)\,(1+z))$.

Since $P_M M(1+z) < P_H H$ from equations (1) and (7), K is positive. Therefore, output of home goods – and hence total output, employment, and imports – will rise or fall depending on whether trade is initially in surplus or deficit. Since countries which devalue are usually in deficit at the time, there is contraction. Its magnitude for a given percentage devaluation is proportional to the ratio of the initial trade deficit to domestic production.

3.2. Distributional effects

Devaluation redistributes income from wages to profits and rents, for two reasons. First, if money wages are rigid in the short run, devaluation lowers the

real wage as home goods prices go up in response to increased intermediate import costs. Secondly, domestic currency export receipts also go up, producing windfall profits from the second term of equation (5). If, as is widely believed, the marginal propensity to save out of profits is larger than the marginal propensity to save out of wages, this change in income shares will reduce aggregate demand and therefore imports, as pointed out by Diaz-Alejandro (1963). We again demonstrate by considering a special case of the model. Suppose trade is initially balanced, $P_X^* X = P_M^* M$, so there is no trade balance effect, and also that $t_X = t_M = G = 0$. We assume $\gamma_W > \gamma_R$. We can solve, once again, for the elasticity of home goods output with respect to the exchange rate, which after some substitutions becomes

$$\frac{dH}{de} \cdot \frac{e}{H} = \frac{\gamma_I - \gamma_W}{D} \cdot \frac{Y_W}{Y} \cdot \frac{P_M M}{Y} \cdot (1+z),$$

where $Y = Y_W + Y_R$ is total private income. Thus the elasticity of output (and imports) with respect to devaluation is proportional to the difference in marginal propensities to consume, to the share of wages in income, and to the share of imports in income. It is also an increasing function of the markup. If consumption propensities are equal, devaluation has no short-run effect on output, employment or trade, but merely shifts income from wages to profits. The traditional reluctance of leftist governments to devalue may have something to do with this fact.

3.3. Fiscal effects of devaluation

Theoretical models of the balance of payments ordinarily ignore the government budget, but the fiscal implications of devaluation may be of great practical importance. There are a number of possibilities: if the government budget is not initially balanced, there is an income effect comparable to the income effect of devaluation via the trade deficit; if there are progressive income taxes, or higher taxes on profits than on wages, the government claims an increased share of income; finally, if there are ad valorem taxes on exports or imports, higher traded goods prices will redistribute income to the goverment. One way of looking at this last point is to say that the private sector pays more for imports than it earns from exports, even though trade is balanced for the country as a whole, so we get another version of the trade balance effect already discussed.

To illustrate how fiscal reactions can make a devaluation deflationary, consider the case of an export tax and assume $t_M = 0$, $\gamma_R = \gamma_W = \gamma$. Further assume that both the trade account and the government budget are initially balanced, so that $P_X^* X = P_M^* M$ and $Y_W + Y_R = eP_X^* X + P_H H - eP_M^* M$. Then we can solve

for the result

$$\frac{\mathrm{d}H}{\mathrm{d}e}\cdot\frac{e}{H}=-t_X\cdot\frac{1}{D}\cdot\gamma\cdot(P_M M/P_H H).$$

The devaluation elasticity is proportional to the tax rate on exports and the share of imports in income. Although the model assumes a proportional tax function, what is relevant in general is the marginal rate, which may be very high. In one fairly common case, where agricultural exports must be sold to the state at fixed prices, the marginal tax rate is one, so the fiscal drag from devaluation is quite strong.

4. A numerical example

It seems worthwhile to provide a numerical example at this point, for two reasons. First, an effort to treat the general case of the model analytically produces very complicated algebra. Second, an example may help persuade the reader that the effects we have been considering are in fact important, not merely curiosities.

To produce a computable model requires some, though not much, specialization of the functional forms. Assume that workers and capitalists have proportional consumption functions with constant consumption shares γ_W and γ_R respectively. Then (6) may be writen in the special form

$$H=\gamma_W(Y_W/P_H)+\gamma_R(Y_R/P_H)+I+G \tag{6'}$$

The equations (1)–(7) then form a solvable system.

The assumed values of parameters and exogenous variables are given in table 1. The numbers chosen are arbitrary, though they are meant to fall within a 'reasonable' range for semi-industrialized countries.[3]

Devaluation increases the value of e while leaving all of the other parameters and exogenous variables unchanged. Suppose the currency is devalued by 25 percent. We can assess the effects by computing the values of some important quantities for both $e = 1.0$ and $e = 1.25$. The results are shown in table 2.

Before devaluation the economy has a trade deficit of 8.4 percent of GDP – large, but by no means uncommon. It exhibits all of the features that we have seen can make a devaluation deflationary – initial deficit, differential savings behavior, ad valorem taxes on traded goods – but none to an unusual degree. When the currency is devalued, there is a substantial deflation. Real GDP and

[3]For application of similar models in practice, see the papers by Abel et al. (1976) on Portugal and Taylor (1974) on Chile. The example here abstracts from much detail on tax systems, differential tariffs and export subsidies and so on, but its results are broadly similar to those from the country studies.

Table 1

Assumed values of parameters and exogenous variables.

a_{LH}	0.75	w	1
a_{MH}	0.25	$P_M{}^*$	1
a_{LX}	0.25	$P_X{}^*$	1
γ_W	1.0	I	20
γ_R	0.5	G	10
t_X	0.5	X	15
t_M	0.2	e	1.0
z	0.4		

Table 2

Effects of a devaluation.

	$e = 1.0$	$e = 1.25$	% change
Nominal *GDP* at factor cost	127.7	124.5	−2.5
GDP at constant prices	127.7	119.8	−6.2
Price of home goods	1.47	1.575	+7.1
Output of home goods	102.7	96.0	−6.5
Trade balance in dollars	−10.7	−9.0	+15.9
Trade balance in domestic money	−10.7	−11.2	−4.7

the output of home goods fall, while the trade balance improves in dollar terms because imports decrease along with output. The loss in real *GDP* of 7.9 might in practice be offset by some export responsiveness to devaluation. However, even on our unrealistic assumption that the import content of exports is nil, the relevant elasticity would have to be close to two in the short run to restore *GDP* in initial prices to its pre-devaluation level. In a semi-industrialized country, such a responsive export industry is unlikely.

Finally, note that aggregate measures behave quite differently in real and nominal terms. The fall in current price *GDP* is less than half the fall in constant prices, while the trade balance actually worsens when measured in domestic currency. The difference between real and nominal movements [also pointed out by Hirschman (1949) and Cooper (1971b)] has obvious importance for monetary analysis of devaluation, to which we now turn.

5. Monetary effects of devaluation

The analysis of previous sections, with its purely Keynesian approach, may seem dated and largely irrelevant to economists accustomed to the 'monetary approach' to the balance of payments. It might be argued that the income effects of devaluation would be unimportant if the monetary authority, instead of

pegging the interest rate, were to keep some monetary aggregate constant. However, if the possibility of unemployment is permitted in lieu of the usual monetarist assumptions of full employment and flexible price level, our analysis agrees qualitatively with the usual models. Devaluation, by raising prices, increases the demand for nominal money at any given level of output and employment. The impact effect is contractionary, either more or less so than when interest rates are held constant.

To illustrate the contractionary effect on the monetary side, suppose we were to adopt an extreme quantity theory position, under which there is a strictly proportional relationship between some monetary aggregate and income:

$$A = k(Y_W + Y_R), \tag{8}$$

where A is a monetary aggregate fixed in the short run. Using equations (1)–(5) and (8), we can derive the result

$$\frac{\mathrm{d}H}{\mathrm{d}e} \cdot \frac{e}{H} = -k(P_X X + zP_M M)/(A - kP_X X),$$

which will always be negative. Thus devaluation is deflationary in the short run in monetarist as well as in Keynesian models.

Another numerical example may be in order. Suppose that the initial state of the economy is the same as in the last section, but that now, because the central bank holds M2 (say) constant, nominal *GDP* does not change following devaluation. The results of a 25 percent devaluation are displayed in table 3.

Table 3

Effects of devaluation holding nominal income constant.

	$e = 1.0$	$e = 1.25$	% change
Real *GDP*	127.7	122.9	−3.8
Output of home goods	102.7	98.6	−4.0
Trade balance in dollars	−10.7	−9.7	+9.3
Trade balance in domestic currency	−10.7	−12.1	−13.1

In this case the contraction resulting from devaluation under monetarist assumptions is less than under Keynesian assumptions, but is still substantial.

All of this has assumed that the monetary authority really can determine monetary aggregates, something which is not necessarily so. In many countries open-market operations are not available, and the government must rely on its own deficit and – in rare instances – a balance of payments surplus to create new monetary base. The identity in the absence of open-market operations (and

substitutes such as rediscount and overdraft) is base creation = government deficit + balance of payments. Now we have already observed that devaluation will often increase government revenues through its effect on indirect taxes. We have also seen that devaluation can cause the trade deficit to worsen in domestic currency although it improves in dollars [as noted also in Cooper (1971b)]. So it is possible, even likely, that devaluation will lead to a *reduction* in the rate of growth of the monetary base – an additional deflationary influence. This result is exactly the opposite of what comes out of orthodox 'monetary approach' models, like that of Johnson (1972).

6. Implications for policy

The purpose of this paper has been to argue that, in the short run at least, devaluation may not work the way we usually assume; that taken by itself it is quite likely to have the presumably undesirable effects of shifting the income distribution against labor and reducing employment and output. What does this do to our recommendations to countries with balance of payments problems? Should we abandon devaluation as a prescription because of its undesirable side effects?

The theorist's answer – and he has a point – would be that the effects of devaluation on aggregate demand are irrelevant. Governments have other tools with which they can manage demand. If they don't like the demand effects of devaluation, let them compensate with fiscal or monetary policy, leaving devaluation to accomplish its primary purpose of inducing substitution.

Practical men would answer that matters are not that simple. Governments, especially in less-developed countries, are not sufficiently flexible to fine-tune their economies. Thus one cannot take it for granted that devaluations will be accompanied by appropriate stabilization measures, and one therefore cannot dismiss devaluation's demand effects.

There is a reasonable argument which starts from this point and continues as follows:

(i) In the short run the balance of payments deficit is 'structural' – that is, both imports and exports are not very sensitive to price changes for a given level of domestic output.

(ii) As a consequence, any favorable short-run effects of devaluation on the trade balance come primarily through economic contraction rather than substitution.

(iii) Devaluation not only reduces output and employment, but redistributes income from labor to capital as well.

(iv) Thus devaluation is a costly cure, and a devaluation big enough to reduce the balance of payments deficit substantially in the short run may be unacceptable. In such a case, the government should beg or borrow to meet

the short-term deficit and work toward eliminating its structural difficulties by expansion of traded goods production in the medium run.[4]

The question is how one goes about correcting structural problems. In economics which are closely tied to the world market, direct government investment is not likely to be too helpful. Governments can build and manage roads, dams, and even steel plants; but there are few countries where they can effectively produce wigs, or false teeth, or cosmetics, or peasant agricultural products; yet these may be precisely the goods that the country has much chance of exporting or substituting for imports. So a policy designed to expand the capacity of the traded goods sector will probably have to rely on encouragement of private investment. This can be accomplished with a variety of tools: subsidies, tariffs, preferential credit, multiple exchange rates. It can also be accomplished, without the microeconomic distortions that these measures create, by devaluation, which increases profitability in traded goods production. Perhaps, then, one should think of devaluation as a measure designed to rectify balance of payments difficulties in the medium rather than the short run.

In challenging the established view of the effects of devaluation on aggregate demand, then, this paper does not deny its usefulness as a policy tool. It is important, however, that policymakers be aware of its contractionary effects. Normally, devaluation is regarded as an 'expenditure-switching' measure, which should be combined with an offsetting 'expenditure-reducing' policy. What we have seen is that devaluation itself may have an expenditure reducing effect. A stabilization plan which, say, combines devaluation with tax increases may thus be piling deflation on deflation, and the government may find itself confronted with a steeper decline in output than it wanted. Devaluation should in many cases be accompanied by measures to *increase* demand.

In any case, it is not the purpose of this paper to give policy advice valid for all countries at all times. The important point is that devaluation may be deflationary and one should be on the alert for that possibility.

[4]If one grants the proposition that in the short run there is little that less-developed countries can or should do to reduce the balance of payments deficit, one must also grant an important corollary about the appropriate fiscal policy when the external deficit is large. With investment limited by all the factors which development economists sum up under the rubric 'absorptive capacity constraint', at full employment the government is forced to run a deficit to satisfy the identity: investment + balance of payments = private saving + government current surplus, because the foreign deficit is so large. Far from being 'inflationary finance', a government deficit in such circumstances supports demand for home goods against unavoidable leakages of purchasing power abroad through the trade gap.

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