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James A. Hanson

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CONTRACTIONARY DEVALUATION, SUBSTITUTION IN PRODUCTION AND CONSUMPTION, AND THE ROLE OF THE LABOR MARKET

James A. HANSON*

Industry Division, World Bank, Washington, DC, USA

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Using a demand determined model involving both consumption goods imports and home goods with imported inputs, this paper shows that the condition under which devaluation reduces demand for home goods, and thus aggregate output if real exports are fixed, basically depends on the sign of 1 plus the weighted sum of the price elasticities of demand for imported consumer goods and of derived demand for imported inputs. This model includes Cooper's and Krugman–Taylor's models as special cases, and shows that substitution substantially lessens the possibility of contractionary devaluation. However, like all Keynesian analyses of devaluation these results are dependent on the assumptions regarding the labor market and monetary policy. If wages are indexed rather than fixed in nominal terms or are determined in a labor market with labor supply dependent on real wages, then output and the balance of payments again become inversely related. In these circumstances devaluation alone cannot cure a balance of payments deficit. A contraction of aggregate demand is required, although this is relative to an unsustainable initial level. The paper then argues that devaluation should be judged in terms of its longer run impact rather than whether it is contractionary. Further, many balance of payments crises result from deliberate reductions in the country's net asset position; in such circumstances recommending increased borrowing to avoid a contractionary devaluation is neither relevant nor feasible, for the country has reached an unsustainable level of aggregate demand and is reducing its net asset position at an unsustainable rate.

1. Introduction

Most theoretical treatments of devaluation conclude that it stimulates economic activity. Recently, this view has been challenged for the case of LDCs in influential papers by Cooper (1971a, 1971b, 1971c) and by Krugman and Taylor (1977) (henceforth K–T). Using a Keynesian framework Cooper argues that the devaluation-induced rise in the domestic currency value of exports is unlikely to offset the corresponding rise in the cost of imports and on balance aggregate demand, and thus output, generally will fall, i.e. given an export price fixed in local currency, the demand for exports would have to be fairly elastic to compensate for the reduction in purchasing

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power produced by an inelastic demand for imports and an initial trade deficit.[1] More recently K–T have developed a more complicated model than Cooper, involving a nontraded goods sector with imported inputs, mark-up pricing and demand determined output.[2] Exports are priced in foreign currency, the now familiar small country assumption, but fixed in supply. The principal conclusion of K–T is that in the short run, ignoring substitution in production, a devaluation from an initial position of deficit *always* raises local currency spending on imports more than the additional income produced by the fixed quantity of exports; thus aggregate demand, home goods production and output must fall.

The new view that devaluation is contractionary in LDCs seems to coincide with the conventional wisdom of practical economic policy-makers. Although the supporting empirical evidence is rather tenuous,[3] the confluence of practice and theory has limited the use of, if not eliminated, the policy of devaluation. However wise this new view, an elimination of the policy option based on devaluation's potential effects on demand is not well founded. As shown in this paper within the context of a simple Keynesian model, which includes the Cooper and K–T models as special cases, more general assumptions regarding substitution in production and consumption make it unlikely that a devaluation will reduce aggregate demand. Indeed, it is likely that a devaluation will both reduce a payments deficit and expand production within the context of generalized versions of these models.

This result, like the K–T and Cooper models, depends crucially on somewhat troublesome assumptions regarding the labor market and monetary policy. More detailed analysis of the behavior of labor market in these models shows that a devaluation is accompanied by falling real wages and rising employment. Furthermore, these models implicitly assume that the real money stock can be maintained at a level at which absorption exceeds production, despite the implied loss of international reserves. As shown in

[1]See also Hirschman (1949).

[2]See Barro and Grossman (1976) for a discussion of demand and supply determined models.

[3]The effect of a devaluation is difficult to discover in cross sections. Cooper (1971c) discusses the impact of a devaluation on aggregate demand but provides evidence only on some of the components of aggregate demand. According to Connolly and Taylor (1976, p. 851): 'On average, real income appears to grow at roughly the same rate following devaluation, independently of the rate of devaluation and the change in domestic credit.' Krueger's (1978) summary of the experience of the ten countries studied in the NBER project is that: 'Overall only three of the twenty-two Phase III episodes — Brazil after 1964, Colombia after 1957 and India after 1966 — can be said to have been followed by a severe recession of prolonged duration. While other countries most notably Chile — also experienced slowdowns in their growth rates, it is different to label them recessions. Moreover, much of the deflationary impact that did result apparently stemmed more from domestic stabilization policies designed to reduce the rate of inflation' (p. 163). Governments, and economic ministers in particular, may be especially sensitive to devaluations because of their impact on the government's position. Cooper (1971c) notes that changes in governments and economic ministers often seem to follow a devaluation. See De Pablo (1980) for some comments on two famous, short-lived Argentine economic ministers who devalued.

this paper, if a more realistic labor market is assumed — either that wages are indexed, or that the real wage reflects labor supply as well as demand — then the short run conflict between the balance of payments and output reappears, but because of supply rather than demand factors.

In these circumstances a balance of payments deficit can be corrected only if the exchange rate, monetary policy and fiscal policy are coordinated to reduce aggregate demand and output. However, such a reduction would be relative to a level which implied a steady loss of reserves — an unsustainable position. Again there is no reason to reject the option of devaluation because it may have a contractionary effect; if we maintain K–T's assumption that exports are fixed in the short run, then any policy which improves the balance of payments must be contractionary. Rather, it is argued that policy packages, including devaluation, should be judged in terms of their potential long-run effects on exports, efficiency, distribution, etc. for a given improvement in the balance of payments. Finally, some comments are made regarding K–T's policy recommendation of borrowing to avoid the necessity of devaluation.

2. The model

Consider an open economy which is a price-taker in markets for its exports (X) and imports (of nominal value IM) and which produces nontraded goods (H) at a price fixed by local producers (p_H). Quantities of nontraded goods and imports are assumed to be demand determined.[4] The imports are of two types: (1) inputs (IMI) and (2) consumer goods (IMC) which are imperfect substitutes for home goods. For simplicity, exports are assumed to be sold only in foreign markets and, as in K–T, their supply is fixed in the short run.

The equilibrium between home goods production and demand is written as:

$$H = H^{\mathrm{D}}\left(H + \frac{ep_X X}{p_H} - \frac{ep_{IMI} IMI}{p_H}, \frac{ep_{IMC}}{p_H}, \frac{M}{p_H}\right) + I + G, \tag{1}$$

where

H^{D} = consumer demand function for home goods, homogeneous of degree zero in nominal income, nominal wealth, and prices;

p_i = the international price of good i multiplied by one plus the equivalent rate of tariff or subsidy, $i = X, IMI, IMC$;

p_H = local currency price of nontraded goods;

[4]It is assumed that aggregate demand is not so large that desired supply, rather than demand, determines output. See Barro and Grossman (1976) for a discussion of this and other points relating to the demand determined output.

e = exchange rate;
M = wealth;
H = equilibrium quantity of nontraded goods produced;
G = real government spending on home goods, assumed to be financed wholly through bond issue;
I = investment demand, assumed negatively related to the interest rate.

It is assumed that imported inputs are used only in the production of home goods. The quantity used, following a CES production function, is

$$IMI = c_0(ep_{IMI}/p_H)^{-\sigma}H, \qquad \sigma > 0. \tag{2}$$

It is also assumed that the price-setting process in the home goods industry can be described by a function that includes the cost of imported inputs and of other factors which are held constant, a formulation consistent with K–T's constant mark-up model:[5]

$$p_H = e^{\pi}C_0, \qquad 1 > \pi > 0. \tag{3}$$

Following K–T we neglect any nonmonetary wealth and assume that the monetary authority pursues a policy of maintaining the interest rate. Notice that this policy implies that, aside from changes in income, any change in spending on one good produced by a change in relative prices will come at the expense of spending on the other good.[6] Mathematically, this implies:

$$H_2^{\mathrm{D}} + IMC(1-\varepsilon) = 0, \tag{4}$$

where H_i^{D} is the partial derivative of H^{D} with respect to the ith argument and

$$\varepsilon = -(\partial IMC/\partial ep_{IMC}/p_H)/(ep_{IMC}/p_H IMC) > 0.$$

Finally, for convenience define the ratios:

$$m_I = ep_{IMI}IMI/IM, \qquad m_C = ep_{IMC}IMC/IM, \qquad m = e(p_{IMI}IMI + p_{IMC}IMC)/Hp_H = IM/p_H H,$$

$$x = ep_X X/p_H H, \qquad H_1^{\mathrm{D}} = \delta.$$

[5]K–T assume mark-up pricing, which also determines the price level in their model since their monetary policy assumption would otherwise make the price level indeterminant. In their model nontraded goods prices increase less than proportionately to a devaluation ($\pi < 1$) because nominal wages are assumed fixed, an assumption examined in more detail in section 3. If the economy also is assumed to import consumer goods, then eqs. (4) and (5) can be shown to be compatible with either the assumption of a maximizing, monopolistic producer of nontraded goods, or the mark-up pricing rule.

[6]See Kemp (1964, pp. 277–281).

In this model a devaluation always has a positive effect on the balance of payments measured in foreign currency, even with the quantity of exports fixed in the short run.[7] The effect of a devaluation on output valued at initial prices, holding exports fixed and assuming home goods production is demand determined, can be evaluated by differentiating (1) with respect to e.[8] Using (2), (3), and (4) and converting to an elasticity expression yields the simple form:

$$\frac{\mathrm{d}H^{\mathrm{D}}}{\mathrm{d}e}\frac{e}{H}=\frac{\delta(1-\pi)}{1-\delta(1-m_I m)}x\left(1-\frac{m}{x}(m_I(1-\sigma)+m_C(1-\varepsilon)/\delta)\right), \tag{5}$$

which is comparable to the usual multiplier expression. In particular, a devaluation will raise, maintain or lower demand for home goods as

$$(m/x)(1-m_I\sigma-m_C\varepsilon+(1-\delta)m_C(1-\varepsilon)/\delta)\lesseqgtr 1, \tag{6}$$

a condition which depends on: (1) the proportionate size of the original trade deficit, (2) the weighted sum of the demand elasticities for imported inputs and consumer goods, and (3) a term, generally small and positive, which corrects for the fact that all of the change in spending on consumer goods imports falls on home goods.

If m_C, $\sigma=0$, $m/x>1$, this reduces to the K–T result. Since imports exceed exports and are a constant fraction of H, a devaluation lowers aggregate demand at the initial value of H by squeezing value added in nontradeables production by more than the value of exports increases. Notice that with $\sigma=0$ imports are a constant fraction of H and thus the balance of payments in foreign currency can only improve if H declines. If m_I, $\pi=0$, then we have a Keynesian expression, similar to Cooper's, for the effect of a devaluation under fixed home goods prices.[9]

[7]The improvement in the balance of payments measured in foreign currency can be seen intuitively by noting that the effect of a devaluation can be divided into (1) the negative, income effect of the initial deficit, which necessarily reduces the quantity of imports demanded and improves the balance of payments, and (2) a price effect, which substitutes local value added for imports on a one-for-one basis. Since the fraction of this rise in local value added which is spent on imports must be less than or equal to the inverse of the multiplier, the net of the decline in imports due to the initial price effect and the rise in import due to the multiplier's effect on income cannot worsen the balance of payments. However, the effect on the balance of payments measured in local currency may be positive or negative.

[8]In K–T imported inputs are a constant fraction of home goods production so an increase in H is sufficient to imply an increase in real local value added. If the ratio of imported inputs to home goods production is a variable, then real value-added measured in initial prices moves in the same direction as home goods production, although in current prices real value added may decline if $\sigma<1$.

[9]Export prices are fixed in foreign currency so the model is not strictly comparable to Cooper's. However, since the quantity of exports is fixed in this model, Cooper's calculations for the case in which the elasticity of demand for exports is equal to one (1971c, p. 508) yield a value of exports in local currency which is equivalent to this model.

Condition (6), under which a devaluation lowers output, is much stricter than K–T's result because it admits the possibility of substitution in production and consumption. For example, in the K–T numerical example m/x is about 1.67, a fairly large deficit. Nonetheless, if we neglect the last term in the parentheses, then a contraction would occur only if the weighted average of demand elasticities is less than 0.4. Furthermore, relaxing the assumption that export supply is fixed weakens the condition still more; in (6) the right-hand side becomes one plus the supply elasticity of exports with respect to their relative price, a non-negative parameter which should increase as time passes. Even in the short run some exports may expand fairly rapidly after a devaluation, producing a positive output effect.

Even if devaluation were contractionary, it would be possible to use fiscal policy to offset the decline in output without returning the balance of payment to its initial level. This can be seen intuitively as follows. A unit increase in government spending on home goods raises home goods production by $1/1-\delta(1-m_I m)$. Thus, increased government spending could be used to offset any deflationary effect of a devaluation and return home goods production to its original level. However, the ratio of imports to home goods production is lower at every level of income because of the devaluation and the relative rise in government spending; thus the balance of payments measured in foreign currency would improve.

3. Neglected aspects — The labor and money markets

The preceding analysis treats the labor and money markets in highly simplified fashion, in keeping with the approach of K–T and most other Keynesian-based models of devaluation. Not surprisingly, the analysis of devaluation changes drastically if these markets are considered in more detail.

The treatment of the labor market is crucial in deriving the less-than-proportional relationship between devaluation and nontraded goods prices, which in turn is responsible for the output and balance of payments effects described above. In K–T's mark-up model prices of nontraded goods are not proportionally related to the exchange rate because nominal wages are assumed constant. In the model of section 2 the nonproportional relationship between foreign exchange costs and other costs, including mark-ups, was simply imposed directly in (4), by assuming $\pi<1$. As shown in (5), the elasticity of output with respect to devaluation depends on $(1-\pi)$; the same holds true for the improvement in the balance of payments.

In fact, wages are likely to be affected by a devaluation. If wages are indexed to a devaluation by government decree and margins remain a constant fraction of costs, then relative prices would be unchanged ($\pi=1$), Given the passive behavior of money, devaluation would have no effect on

either output or the balance of payments. This result falls out of the previous analysis as a result of the homogeneity of the system including the money stock; it is simply a restatement of the well-known point that devaluation will have a real effect only if some nominal variable is not tied to the exchange rate.

Interestingly, the model also indicates that devaluation has no effect on output or the balance of payments if (1) monetary policy maintains the interest rate and (2) wages are assumed to be determined in a labor market in which labor supply depends (positively) on the real wage — where the relevant price is a geometric average of the prices of nontraded goods and imported consumer goods. Within the context of the model this can be seen by equating labor supply and demand functions (ignoring exports which are assumed constant and thus employ a constant amount of labor):

$$L^{S}=C_1(W/p_H^{\gamma}(ep_{IMC})^{1-\gamma})^b=(W/p_H)^{-\sigma}H=L^{D} \tag{7}$$

where L^i=labor supplied (S) or demanded (D), W=nominal wage rate, $b>0$, $0>\gamma>1$, and a CES production function is assumed. Modifying the mark-up equation to include wage costs specifically yields:

$$p_H=C_0[\alpha(ep_{IMI})^B+(1-\alpha)W^B]^{\pi*/B}, \qquad 0<\pi^*\leqq 1, \tag{3'}$$

with equality if mark-ups are proportional to costs. Some manipulation yields:

$$\frac{\mathrm{d}p_H}{\mathrm{d}e}\frac{e}{p_H}=\pi^*\left[C_2+C_3\frac{\mathrm{d}H}{\mathrm{d}e}\cdot\frac{e}{H}\right], \tag{8}$$

where $C_2=1/1+((1-\pi^*)C_4(\sigma+b\gamma)/b+\sigma-C_4(\sigma+b\gamma)), 0<C_3, C_4<1$. Substituting for π in (5) yields the result that nontraded output is invariant to a devaluation if mark-ups are proportional to costs ($\pi^*=1$). Since output and relative prices are unchanged, the balance of payments is also unaffected.

Turning turning to the money market, a closer analysis does not lead to such drastic revisions of the model's conclusions, but does expose some troublesome questions. The model assumes that the monetary authority maintains the interest rate by fixing the money stock at whatever level is desired by households, thus allowing a full working out of the Keynesian multiplier income–expenditure relationships. Such a policy requires a continuous injection of domestic credit, at a rate equal to the loss of international reserves via the trade deficit, in order to maintain the real money stock. Clearly this is a nonsustainable policy in view of the finite size of international reserves.

The most important question relates to the implicit rationale behind a

policy of fixing the interest rate, in particular for the choice of the initial real money stock and thus the initial interest rate.[10] One obvious answer is that since the model is demand determined, more output and employment can be generated by maintaining a money stock which stimulates a level of absorption in excess of the economy's production, at least until reserves are exhausted. As shown in section 2, if output is determined solely by demand and wages are not indexed, then even this passive monetary policy will allow devaluation to improve the flow balance of payments and probably increase output and employment. However, these improvements come at the expense of declining real wages in terms of both nontraded and traded goods.

A somewhat tighter monetary policy would yield even greater reserve gains in the short run. A devaluation will almost certainly increase the nominal stock of money demanded, owing to the combined effect of the rise in prices and the change in income. Thus, the reserve loss temporarily could be slowed even further if the monetary authorities, rather than maintaining the interest rate by sharply increasing the nominal money stock, pursued the somewhat tighter policy of allowing a gradual increase in the nominal money stock through reserve inflow. This policy would result in lower levels of output during the period in which reserves are increasing, owing to the lower real money stock and corresponding lower demand for goods during that period of adjustment.

Policy-making becomes more complicated if the passive monetary policy is used in an economy where labor supply is sensitive to the real wage. If workers are unwilling to accept cuts in real wages without reducing labor supply and nominal wages are determined by demand and supply in the labor market, then output becomes determined by labor supply and can be increased only by policies which raise real wages.[11] Setting the interest rate at a level where absorption exceeds production in such an economy increases not only output but real wages, because nominal wages depend (positively) on the quality of home goods produced but only represent a fraction of total costs.[12] However, as shown above, devaluation produces no improvement in either the balance of payments or output. This is because the monetary policy of maintaining the interest rate implies all nominal variables are indexed and relative prices cannot be changed by a devaluation. In these circumstances and with K–T's assumption of fixed exports, the balance of payments can only be righted by lowering aggregate demand to a level compatible with production. Thus, the conflict between output and the balance of payments reappears, this time because of labor supply rather than K–T's fixed input coefficients.

[10]This section neglects the question of whether the real interest rate can be fixed if capital movements are allowed.

[11]Again see Barro and Grossman (1976, esp. ch. 2).

[12]This can be seen by solving for wages using (7) and (3').

One policy to achieve balance of payments equilibrium would be a devaluation while holding the nominal money stock fixed — this would cut the real money stock, raise the interest rate, and reduce investment. Alternatively, the authorities could cut either the money stock directly or reduce government spending. The general equilibrium effect of any of these policies would be to cut demand for home goods and thus real wages and labor supply. As a result output would fall. At the same time the balance of payments measured in foreign currency would improve because both income and price effects would lower the quantity of imports.

4. Conclusions and policy recommendation

The K–T analysis implied that devaluation in the presence of a trade deficit would produce a decline in aggregate demand and output because it neglected the possibilities of substitution in production and consumption. Once these possibilities are taken into account these is much less likelihood of a contractionary devaluation, even disregarding any response in export supply or capital inflows.[13] A devaluation actually will be expansionary if the product of the ratio of imports to exports and one plus the weighted average of the (negative) elasticities of demand for imported inputs and for imported consumption goods is somewhat less than one. Thus, devaluation will be contractionary only if elasticities are extremely low or trade deficits are large. This result seems in accord with the empirical evidence that not all devaluations have produced contractions and many of the contractionary devaluations have occurred in the Southern Cone of Latin America where the process of import substituting industrialization is well advanced and the weighted elasticity of import demand is low, reflecting the high percentage of inputs in imports. And even if a devaluation were contractionary, its effects could be offset by fiscal policy.

The theoretical possibility of an expansionary devaluation may seem to present a third policy alternative in addition to avoiding balance of payments difficulties or to solving them by contracting aggregate demand, perhaps by devaluation; the country actually could expand by devaluing before the trade deficit exceeded a 'critical' ratio determined by the demand and production parameters. However, such a conclusion would be unwarranted for, as shown in section 3, the output effects depend crucially on the assumptions of passive money and the possibility that a devaluation can reduce real wages without affecting labor supply. If wages are either indexed by decree or determined in

[13]This paper does not treat capital inflows explicitly. If the country is a net debtor in foreign currency so that a devaluation reduces real wealth, or if debt service exceeds capital inflows, then a devaluation may reduce aggregate demand because of its wealth effect. However, counteracting this effect is the possibility that capital flight may reverse itself and thus the flow of capital to the country, net of interest payments and measured in local currency, may increase substantially after a devaluation, thereby raising the demand for home goods.

a labor market, with labor supply and, correspondingly, output dependent on the real wages, then both the output and balance of payment effects of a devaluation will vanish. In such circumstances one might wish to analyze how a country gets into payments difficulties, how to get out of them, and in particular what role devaluation can play.

Since the absorption-elasticity debate, it is well known that a balance of payments deficit implies that a country is seeking to purchase goods and services in excess of its current production plus its net sales of nonreserve liabilities. One general class of causes which could produce such an excess relates to unexpected and/or transitory variations in international prices and capital flows. To avoid a transitory contraction in such circumstances it may be desirable to use international reserves, the IMF's compensatory borrowing facilities or even commercial borrowing until the economy swings into an offsetting payments surplus. If external markets are not likely to produce a future surplus, then some structural adjustment may be necessary.[14] Such adjustment may require a package of policy measures including devaluation, but in such cases any contractionary or expansionary effects of a devaluation are a secondary consideration and could probably be offset.

A second general class of causes of balance of payments deficits is related to conscious policies of expansionary aggregate demand. The K–T deficits seem to fit into this class since, as pointed out in section 3, the real money stock was initially set so that absorption exceeded production at the going real wage. Viewed charitably such a policy may be considered as a means of running down net international reserves which are excessive given the government's time preference; or as the result of an error in estimating capacity given the economy's structural characteristics. Less charitably it may be viewed as an attempt to create a short-lived boom, to raise real wages, or to redistribute purchasing power without the troublesome necessity of explicitly changing taxes. Output and imports may rise temporarily, even in the absence of increases in capacity and with full knowledge of the inflationary policies, because producers and consumers wish to take advantage of 'good' prices and cyclically cheap imports.

The assessment of such policies will depend on one's time preference and one's views of the causes and cures of unemployment and poverty in LDCs; in any case, the policies are unsustainable because of the limitations implied by fixed reserves, lack of aid, and lenders' attitudes in world capital markets. Thus, aggregate demand eventually will have to decline relative to supply and the temptation to measure losses from such an unsustainable peak in output should be avoided, as Krueger (1981) points out. In such circumstances policy-makers should ask what is the optimum combination of monetary and fiscal policy, devaluation, and structural reforms (to raise supply) to achieve

[14]It should be noted that permanent changes in the terms of trade will require a once-and-for-all change in the real value of absorption.

that relative reduction. In other words, a reduction in aggregate demand is generally necessary in such situations and thus there is no reason either to eliminate a devaluation from the policy options because it may be contractionary, or to take offsetting monetary and fiscal actions. The relevant question is rather how to reduce aggregate demand while simultaneously obtaining the best longer-run effects. Finally, K–T's advice to borrow in order to avoid contractionary devaluation ignores the cause of the balance of payments deficit. In such a situation we can presume that the government is already reducing the net asset position of the country as rapidly as it wishes or can, given the constraints imposed by international lenders.

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