DEVALUATION AND THE TRADE BALANCE: A NOTE

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IN SPITE of extensive literature on the subject, one point in the formal theory of foreign exchanges still needs clarification: the effect of devaluation on the trade (or current account) balance when total imports (current payments) are not equal to total exports (current receipts).

Marshall was first to point out that devaluation might produce an unfavorable effect on a balance of trade in equilibrium on the condition that "the total elasticity of demand of each country be less than unity, and on the average be less than one half. . . ." He added that "nothing approaching this has ever occurred in the real world: it is not inconceivable, but it is absolutely impossible." Lerner has restated this theorem in his Economics of Control. The theory was considerably amplified by A. J. Brown who added the elasticities of supply, the marginal propensities to import, and several other factors to the demand elasticities as determinants of the trade balance upon devaluation. The starting point of Brown's investigations remained, however, a trade balance in equilibrium.

This assumption was discarded by Joan Robinson who derived the correct formula for the effect of devaluation on a trade balance which is not in equilibrium, but only for the case of the balance expressed in domestic currency; she ignored the fact that a different expression obtains for the usually more important balance in terms of foreign currency. Since attention will be focused here on the effect of devaluation for varying positions of the trade balance, the following analysis will be made only in terms of demand elasticities. To the reader of Brown and Robinson this will mean that the elasticities of supply are assumed to be infinite, i.e., that exports and imports are supplied at constant costs within the relevant range. This, however, need not be the case if the analysis is made in terms of elasticities of demand for foreign exchange rather than for the volume of imports from abroad. A short digression may be in order to explain this distinction.

The study of the effect of devaluation on the trade balance can start by considering the demand and supply curves for foreign exchange which have been made familiar by the writings of Bresciani-Turroni, Viner, and Machlup. These curves result from a transposition of Marshall's curves for E- and G-bales, so as to make the ordinate represent the ratio of interchange between E- and G-bales and the abscissa either E- or G-bales. From here it seems quite natural to pass to the foreign exchange diagram in which the abscissa represents quantities of foreign (domestic) currency, while the ordinate denotes the rate of exchange expressing the number of units of domestic (foreign) currency that have to be yielded to acquire one unit of foreign (domestic) currency.

Great care must be exercised, however, in making this transition. For the new demand and supply curves for foreign exchange and the Marshallian curves as transposed by Viner will coincide precisely only on the assumption of constant costs for the production of both E- and G-bales. Only in this case will a change of the exchange rate result in an exactly equivalent change of the terms of trade. If the

1 The author is an economist with the Board of Governors of the Federal Reserve System; the views expressed in this note are not necessarily those of the Board. Thanks are expressed to Alexander Gerschenkron and George Jaszi for thorough discussion and criticism.


3 New York, 1944, p. 378.


elasticiies of supply of E- or of G-bales are
not infinite so that prices rise in the devaluing
country and/or fall in the rest of the world,
the change in the terms of trade will be smaller
than the change of the exchange rate.

In the following note we shall operate with
demand curves for foreign exchange which
will be so defined as to take account of supply
and cost conditions. If, for example, the shape
of the demand curve for foreign exchange
indicates at a certain point that the demand
will be reduced by 10 per cent as the result of
a rise in the price of the foreign currency by
10 per cent, this does not involve any definite
assumption as to the foreign supply elasticity.
Such a situation may result from a decrease
of 10 per cent of the quantity purchased abroad
at constant prices or from a decrease of only
10 per cent of the quantity purchased combined
with a fall of foreign prices by 10 per cent or
from many other combinations of fall in foreign
prices and fall in demand. The same considera-
tions hold for foreigners' demand for the
domestic currency and, therefore, for the sup-
ply of foreign exchange. It is clear, therefore,
that an analysis taking into account only the
elasticiies of demand for foreign exchange —
as distinct from elasticiies of demand for
imports and exports in volume terms — does
not necessarily rest on the assumption of con-
stant costs or of infinite supply elasticiies.

We adopt the following notation:

\begin{align}
I & \text{ and } E, \text{ are the values of imports and of ex-
ports of the devaluing country expressed in for-
eign exchange.} \\
I' & \text{ and } E', \text{ are the same imports and exports expressed in
domestic currency.} \\
r & \text{ is the rate of exchange giving the num-
ber of units of domestic currency necessary to acquire one unit
of foreign currency.} \\
r' & = \frac{1}{r} \text{ is the number of units of foreign
currency necessary to acquire a unit
of domestic currency.}
\end{align}

We can then define (a) the downward sloping
demand functions for foreign exchange (im-
ports) and domestic currency (exports)

\begin{align}
(1) & \quad I = f(r) \\
(2) & \quad E' = g(r')
\end{align}

and (b) the corresponding demand elasticiies

\begin{align}
(3) & \quad t_I = -\frac{dI}{dr} \cdot \frac{r}{I} = \frac{dI}{dr} \cdot \frac{r'}{I} \quad \text{for imports, and} \\
(4) & \quad t_E = -\frac{dE'}{dr'} \cdot \frac{r'}{E'} = \frac{dE'}{dr'} \cdot \frac{r}{E'} \quad \text{for exports.}
\end{align}

We also have

\begin{align}
(5) & \quad I' = I \cdot r = r \cdot f(r) \\
(6) & \quad E = E' \cdot r' = r' \cdot g(r')
\end{align}

We shall now express the changes in imports
and exports upon a small change in the ex-
change rate in terms of the elasticiies.\footnote{Since we can write \( \frac{dl}{dr} = \frac{dl}{dr'} \cdot \frac{dr'}{dr} = \frac{dl}{dr'} \cdot \left[ -\frac{1}{r^2} \right]. \)} First, in foreign exchange, we obtain by differenti-
ating (6)

\begin{align}
(7) & \quad \frac{dE}{dr'} = r' \cdot \frac{dE'}{dr'} + E' \\
& = E' \left( \frac{dE'}{dr'} \cdot \frac{r'}{E'} + 1 \right) \\
& = E \frac{r'}{r} (1 - t_E) \text{ and, from (3)}
\end{align}

\begin{align}
(8) & \quad \frac{dI}{dr'} = \frac{I}{r'} \cdot t_I
\end{align}

Similarly, in domestic currency, we obtain by differen-
tiating (5)

\begin{align}
(9) & \quad \frac{dI'}{dr} = r \cdot \frac{dI}{dr} + I \\
& = I \left( \frac{dI}{dr} \cdot \frac{r}{I} + 1 \right) \\
& = I (1 - t_I) \text{ and, from (4)},
\end{align}

\begin{align}
(10) & \quad \frac{dE'}{dr} = E \cdot t_E
\end{align}

From expressions (7) to (10) it is quite clear
that, provided the demand curves are nega-
tively sloped, an unfavorable effect of devaluation on
the foreign balance\footnote{The second equation of (4) is explained analogously.} can originate only from

\footnote{As point elasticiies will be used, our results will be
strictly derived only for the case of an infinitesimal de-
valuation. However, the author has convinced himself
that the use of the proper arc elasticiies leaves the results
unchanged for the case of finite devaluation, but makes
necessary rather unwieldy algebra.}
inelastic exports while an unfavorable effect of devaluation on the domestic balance can only stem from an inelastic domestic demand for imports.

For the foreign balance to improve upon devaluation, the certain decrease in imports must be larger than the possible decrease in exports: $$\frac{dI}{dr'} > \frac{dE}{dr'}$$; while the domestic balance will improve upon devaluation as long as the certain increase in exports is larger than the possible increase in imports: $$\frac{dE'}{dr} > \frac{dI'}{dr}$$.

Substituting from our previous result, we obtain

$$t_I \cdot \frac{I}{E} > \frac{E}{F} (1 - t_R)$$ or

$$\frac{I}{E} \cdot t_I + t_B > 1$$

as the condition for the foreign balance to improve upon devaluation, and

$$E \cdot t_B > I (1 - t_I)$$ or

$$t_I + \frac{E}{I} \cdot t_B > 1$$

as the corresponding condition for the domestic balance.

A third inequality is yielded by the condition that the ratio of exports to imports be increased by devaluation. This condition, which is the same whether trade is expressed in domestic or foreign currency, is fulfilled when we have

$$\frac{dE'}{dr} \div \frac{dI'}{dr} > \frac{E'}{I'}.$$ Substituting from (9) and (10), we obtain

$$\frac{E \cdot t_B}{I (1 - t_I)} > \frac{E'}{I'}$$ or

$$t_B + t_I > 1$$

as the condition for the ratio of exports to imports to increase upon devaluation.

Our results permit the following conclusions:

(a) The “Marshall-Lerner” condition for devaluation to have a favorable effect on the trade balance (sum of the two elasticities larger than unity) holds only when imports are equal to exports. Only in this case do the two first conditions coincide with the third. When this is not the case, the formula expresses the condition for the ratio of exports to imports to improve.

(b) When imports and exports are not equal, two different conditions obtain, one for the balance expressed in foreign exchange, another for the balance expressed in domestic currency. In the case of an import (export) surplus, the sum of the two elasticities can be considerably below (above) unity and a favorable (unfavorable) effect on the trade balance as expressed in foreign exchange might still obtain. The exactly opposite proposition holds for the balance expressed in domestic currency.

(c) When elasticities are considered as given, the effect of devaluation on the trade balance expressed in foreign exchange will be the more favorable, the greater the relative import surplus before devaluation. The opposite holds for the effect of devaluation on the trade balance expressed in domestic currency. When imports exceed exports, the more stringent condition for a favorable effect of devaluation is the one relating to the balance expressed in domestic currency; when exports exceed imports, the more stringent condition is the one relating to the balance expressed in foreign exchange.

(d) It follows from the previous point that when imports exceed exports it is possible for devaluation to have a favorable effect on the foreign exchange balance, but an unfavorable effect on the domestic currency balance; this is intuitively evident, but we can now state precisely when this will happen.

Since (12), the condition for a favorable effect of devaluation on the domestic balance, can also be written

$$\frac{I}{E} t_I + t_B > \frac{I}{E}$$,

the necessary and sufficient condition for an unfavorable effect on the domestic balance simultaneously with a favorable effect on the foreign balance is

$$\frac{I}{E} t_I + t_B > 1$$
which obviously can take place only when there is an import surplus. Similarly, the condition for devaluation having an unfavorable effect on the foreign balance and a favorable effect on the domestic balance is

$$\frac{E}{I} > t_t + \frac{E}{I} t_B > 1$$

which can be true only when there is an export surplus.

e) The condition for the export-import ratio to improve upon devaluation is intermediate between the two export-import balance conditions since we have necessarily

$$\frac{I}{E} t_t + t_B \leq t_t + t_B \leq t_t + \frac{E}{I} t_B,$$

the upper signs applying when imports are smaller than exports and vice versa. Thus it is possible for the domestic balance to deteriorate upon devaluation, for the foreign balance to improve while, at the same time, the export-import ratio would remain unchanged, as shown in the following example:

<table>
<thead>
<tr>
<th></th>
<th>Domestic</th>
<th>Foreign</th>
<th>Export-Import Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imports</td>
<td>Exports</td>
<td>Balance</td>
<td>Balance Ratio</td>
</tr>
<tr>
<td>Before devaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in both domestic</td>
<td>150</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>and foreign currency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After devaluation</td>
<td>120</td>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>in foreign currency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After devaluation</td>
<td>180</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>in domestic currency</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**ECONOMIC IMPLICATIONS**

The conditions which have been derived test the success or failure of devaluation in different fields. There are at least two tasks which devaluation might be and has been called upon to accomplish: to solve balance-of-payments problems and to stimulate domestic income.

It is only the balance expressed in foreign exchange that matters when devaluation is undertaken to meet typical balance-of-payments problems. The habit of evaluating the success of devaluation in this respect by comparing trade or current account balances before and after devaluation in domestic currency can be seriously misleading. It is also reassuring to point out that, insofar as balance-of-payments problems are concerned, the greater the disease (i.e., the pre-devaluation relative import surplus), the likelier it is that devaluation will provide at least a partial cure.

The ratio of exports to imports can serve as a first and very rough approximation to the size of the long-run adjustment problem faced by a country with a chronic balance-of-payments deficit. For the same absolute import surplus will generally be more difficult to eliminate if it represents one-half than if it represents one-tenth of total imports.

While the postwar predominance of balance-of-payments problems requires watching of the balance expressed in foreign exchange and, secondarily, of the ratio of exports to imports, the movements of the balance in domestic currency are not without significance. Income effects of the trade balance depend on its size as measured in domestic currency. An increased import surplus in domestic currency due to devaluation will ceteris paribus decrease incomes in the devaluing country, even though the trade balance in terms of foreign exchange might have been improved. It may be noted that in this case, considering two countries A and B, domestic trade balances would become more unfavorable in both A, the devaluing country, and B, the country in whose currency A's balance has become more favorable (and B's own balance therefore more unfavorable). In spite of the improvement of A's foreign exchange position, devaluation would therefore have all-round deflationary income effects.

Expression (12) above shows that inflationary income effects from devaluation are most likely to occur in countries with a surplus on current account. It is true that, because of the availability of more direct and effective devices, devaluation is seldom undertaken merely for its income-generating effect. But when it was so undertaken, the direction of the trade balance again favored the chances for its success: the balance of payments of the one country that has depreciated its currency almost exclusively for purposes of internal pump-priming—the United States in 1933–34—showed a surplus on current account before depreciation.