The Short-Run Impact of Development on the Cost of Production

by

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INTRODUCTION

The purpose of the present note is to illustrate that although our knowledge of the consequences of devaluation is too limited to warrant reliable policy recommendations, it is well within the competence of the economist to build simple models illuminating certain aspects of the devaluation problem. We shall concentrate on only one aspect, the increase in costs of production which results from a price increase of imports. The question posed is: what increases in cost of production will occur if Pakistan decides to devalue its currency by 50 per cent? It will be shown in the next section that, on certain assumptions, this question can be solved easily with an input-output model. In Section II some implications of our calculations will be given. Finally, in Section III some conclusions will be drawn.

I. THE INPUT-OUTPUT MODEL[1]

Generally input-output models are used to determine the indirect changes in production requirements which result from an autonomous change in production. Usually this problem is solved under the assumption of fixed prices. The problem we want to solve is exactly the opposite. Assuming no change in level and composition of output and no substitution of domestic for foreign inputs, we want to determine the price changes which result from an increase in prices of imported inputs due to devaluation. Input-output analysis has not often been applied to this type of problem, although input-output models are as appropriate for this problem as for the usual input-output problem.

As a result of devaluation the costs of production in each industry will increase because higher prices have to be paid for imported intermediate goods. This can be called the direct effect of devaluation on the cost of production. The total increase in costs of production will be higher than this however, for—as

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[1] After I wrote this model down I discovered that it was not a very original approach after all. Benjamin Cohen has formulated earlier than I have practically the same type of model for the Columbian Economy [1].

a result of the direct increase of cost of production—also the prices of domestically produced inputs increase. This can be called the indirect effect of devaluation on the cost of production. This can be written down in a set of equations:

$$p^h = \sum_{h'} a^{h'h} p^{h'} + \sum_{h'} m^{h'h} p_m^{h'} \quad \ldots\ldots (1)$$

in which:

p^h = the increase in price of commodity h

$a^{h'h}$ = a technical coefficient depicting the amount of commodity h' required per unit of output in sector h

$m^{h'h}$ = a technical coefficient depicting the amount of imports of commodity h' required per unit of output in sector h

$p_m^{h'}$ = a given increase in price of the imported commodity h'

With the aid of equations (1) we can easily find the total increase in cost of production resulting from an autonomous change in prices of imports. It should be noted however that this set of equations does not allow for changes in value added, as they assume that value added does not change as a result of changes in prices for intermediate products.

One way in which one could also take changes in value added into account is to make the assumption that value added is a fixed proportion of total costs of production. In equations:

$$y^h = a^h p^h \quad \ldots\ldots (2)$$

in which:

y^h = the increase in value added in sector h

a^h = the value added coefficient of sector h depicting value added as a constant portion of gross output.

In this case the total increases in costs of production can be calculated from set of equation;

$$p^h = \sum_{h'} a^{h'h} p^{h'} + \sum_{h'} m^{h'h} p_m^{h'} + a^h p^h \quad \ldots\ldots (3)$$

With the aid of the Tims-Stern table for 1963/64 and using equations (1) and (3) we now can calculate the increases in costs of production which would result from a devaluation of the Pakistani rupee with 50 per cent. The results of these calculations are given in Table I. In this table, Column (1) gives the direct increase in prices caused by higher costs of imported inputs due to devaluation,

Column (2) the total increase in prices if value added remains constant, and Column (3) the total increase in prices if value added is a constant portion of total costs. For the calculation of the price increases it was throughout assumed that indirect taxes and import duties are unaffected by the devaluation. The table is self-explanatory, and does not need a detailed discussion. Note should however be taken to the difference in price increases between Columns (2) and (3). It is not easy to determine whether the values in Column (2) or those in Column (3) are more appropriate as a forecast of price increases resulting from devaluation. Most probably a reliable forecast would be somewhere in between. All one can say with the limited knowledge available is that it depends on the market structure whether the figures of Column (2) or of Column (3) are more appropriate.

TABLE I

DIRECT AND TOTAL PRICE INCREASES IN PER CENTS AS RESULT OF A DEVALUATION OF 50 PER CENT

Sector number	Sector	Direct price increase	Total price increase if V.A. does not change	Total price increase if V. A. remains constant portion of total costs
0101	Jute growing	0.0	0.0	11.0
0102	Cotton growing	0.5	0.5	7.5
0103	All other agriculture	0.0	0.5	11.0
0200	Mining and quarrying	1.0	1.0	13.5
0301	Canning and preserving	11.0	11.5	18.0
0302	Grain milling (except rice)	31.5	37.0	38.5
0303	Rice milling	0.5	1.0	10.5
0304	Bakery products	1.5	7.0	16.0
0305	Sugar refining	0.0	0.5	9.5
0306	Edible oils and fats	3.5	4.5	12.0
0307	Tea	0.5	0.5	9.0
0308	Salt	0.5	0.5	2.5
0309	Alcoholic beverages	0.5	1.5	7.0
0310	Non-alcoholic beverages	4.0	4.0	8.0
0311	Cigarettes and tobacco products	2.0	2.5	8.0
0401	Cotton textiles	2.0	3.0	9.5
0402	Woollen textiles	9.5	10.0	21.0
0403	Jute textiles	2.0	2.5	12.0

(continued)

TABLE I (*Contd.*)

Sector number	Sector	Direct price increase	Total price increase if V.A. does not change	Total price increase if V.A. remains constant portion of total costs
0404	Silk and artsilk	8.5	9.0	18.0
0405	Dyeing, printing of textiles	3.0	5.0	12.5
0406	Knitting	1.5	3.0	11.5
0407	Thread and threadball making	2.0	4.0	12.0
0408	Footwear	1.5	4.0	13.0
0409	Wearing apparel	12.0	12.5	20.0
0500	Wood, cork and furniture	2.5	3.0	10.5
0601	Manufacture of paper and board	5.5	6.5	14.5
0602	Articles of paper and board	2.5	4.0	12.0
0603	Printing and publishing	6.0	7.0	17.0
0701	Tanning and leather finishing	4.5	5.5	14.5
0702	Leather goods manufacturing	5.0	6.0	13.5
0800	Rubber and rubber products	10.0	10.5	20.5
0901	Chemical fertilizers	1.0	2.0	18.5
0902	Paints and varnishes	10.5	11.0	20.0
0903	Perfumes, cosmetics and soaps	13.5	14.0	22.0
0904	Matches	0.5	1.5	7.0
0905	Pharmaceutical products. *nec.*	6.5	7.5	17.5
1000	Coal and petroleum products	4.0	4.5	8.5
1100	Non-metallic mineral products	3.0	3.5	12.0
1200	Basic metals	17.5	18.0	30.5
1300	Metal goods	12.0	12.5	22.0
1400	Non-electrical machinery	8.5	11.5	24.5
1500	Electrical goods	9.0	10.5	22.5
1600	Transport equipment	9.0	11.0	15.5
1701	Photographic and optical goods	4.5	7.5	20.5
1702	Plastic products	12.0	13.0	27.5
1703	Sports goods	0.5	1.0	11.0
1704	Manufacture of ice	1.5	2.5	13.5
1705	Cotton ginning	0.5	1.0	8.0
1706	Jute pressing	0.0	0.0	10.5
1707	Pens, pencils and related products	1.5	3.0	15.0
1800	Construction	6.5	7.5	21.0
1921	Small scale industries	2.0	2.5	12.5
2200	Electricity, gas, water	3.5	4.0	18.0
2330	All other services	0.5	0.5	8.0

II. IMPLICATIONS OF OUR CALCULATIONS

Although our calculations do not warrant a detailed discussion of their implications, it is of some interest to show what would happen with such macro-economic variables as national income, price level of consumer and investment goods. It is also interesting to see in some detail what the consequences of devaluation are for export prices. Table II gives the changes in value added, consumer prices and investment costs. These changes were calculated with the aid of

TABLE II

PERCENTAGE INCREASE IN VALUE ADDED, CONSUMER PRICES AND INVESTMENT COSTS AS A CONSEQUENCE OF DEVALUATION

	No change in V.A. (1)	V.A. a constant portion of total costs (2)
Increase in value added	0	10.7
Weighted average price increase of domestically produced consumer goods	2.4	11.6
Weighted average price increase of all consumer goods	3.3	12.3
Weighted average price increase of domestically produced investment goods	8.6	20.6
Weighted average price increase of all investment goods	18.1	26.0
Price increase of imported consumer and investment goods	50.0	50.0

the final demand figures given in the Tims-Stern input-output table. The sectoral consumption and investment figures provided the weights for the calculations involved. As can be seen easily from the table, price increases are severe especially for investment goods. Price increases for consumption goods are much milder: 3.3 per cent if devaluation is not followed by increases in wages and profits and 12.3 per cent if value added is a constant fraction of total costs. In this latter case, however, value added increases with 10.7 per cent, meaning that the price increase for consumer goods only exceeds the increase in value added by 1.6 per cent. The increases in costs of production for export products are not included in Table II. The reason for this is that the increase in rupee price is relatively uninteresting. It is much more interesting to see what happens with the dollar price of exports if the increase in domestic price is passed on to the foreign buyer.

If no change in production costs would take place a devaluation of the rupee by 50 per cent would mean a 33.3 per cent decrease in export prices (in dollars), that is, if export prices depend only on costs of production. However, the actual price decrease is bound to be less due to the increase in production costs. Under the assumptions made before the decrease in dollar export prices for commodity h

is:

$$1 - \left(\frac{1+p^h}{1} \times \frac{2}{3} \right) \qquad (4)$$

The price decreases of export products in dollars are given in Table III. As it might be expected that the elasticities of export demand vary widely between different commodities it does seem profitable to calculate the weighted average price decrease. As will be noticed the impact of higher costs of production on the new dollar price level of exports is of minor magnitude only if devaluation is not accompanied by higher money wages and profits. If, however, value added is a constant fraction of value of gross output, the increase in costs of production in some cases takes away a large portion of the direct price decrease resulting from devaluation. In this latter case, for instance, the price decrease in dollars for plastic products is only 15 per cent, for raw cotton exports 18 per cent and for non-electrical machinery also 18 per cent . The highest price decrease under these assumptions occurs in the cotton textiles industry, 27.6 per cent, but even in this case 5.7 per cent of the price decrease resulting from devaluation is taken away by the increased cost of production.

TABLE III

PERCENTAGE DECREASE IN US $ PRICES OF PAKISTANI EXPORTS AS RESULT OF DEVALUATION

Sector	No change in V.A.	V.A. as constant portion of costs	Sector	No change in V.A.	V.A. as constant portion of costs
0103	33.0	26.0	0800	26.0	20.0
0200	33.0	24.5	0901	31.5	21.0
0301	25.5	21.0	0902	26.5	20.0
0304	28.5	22.5	0903	24.5	19.0
0305	33.0	27.0	0905	28.5	21.5
0306	30.0	25.5	1000	30.5	27.5
0401	31.5	27.6	1100	31.0	25.0
0402	27.0	19.5	1300	25.0	19.0
0403	32.5	25.5	1400	25.5	17.0
0405	30.0	25.0	1500	26.5	18.0
0406	31.5	25.5	1600	26.0	23.0
0407	30.5	25.5	1701	28.5	19.5
0408	30.5	24.5	1702	25.0	15.0
0409	25.0	20.0	1703	33.0	26.0
0601	29.0	24.0	1705	32.5	18.0
0602	30.5	25.5	1706	33.0	24.5
0603	29.0	22.0	1707	31.5	23.5
0701	30.0	24.0	1921	32.0	25.0
			2330	33.0	18.0

CONCLUSIONS

An exercise as the one given above does not warrant conclusions recommending or rejecting devaluation as a means to improve the balance of payments. It does, however, lead to some insight in the effects of devaluation. One conclusion one can safely draw is that any discussion on devaluation should pay attention to price increases resulting from higher costs of production. Due to these increases, the decrease in export prices (in terms of dollars) is smaller, and in some cases much smaller, than one would expect from the degree of depreciation. Projections of exports after devaluation which do not take into account changes in costs of production will be seriously misleading.

In order to avoid misunderstanding, let me finally make clear once more, that it was not the intention of this note to show what the indirect effects of devaluation are. For this purpose our knowledge and information is much too limited. All we intended to accomplish was to show, by using different assumptions, what the short run increases in costs of production might be. The words "short run" in this are fundamental, as the assumptions regarding non-substitution of domestic intermediate products for imported intermediate products and invariant levels and composition of output are only valid in a short-run argument.

REFERENCE

1. Benjamin J. Cohen, "Measuring the Short-Run Impact of a Country's Import Restrictions on Its Exports", *Quarterly Journal of Economics*, August 1966.