Notes & Comments

A Note on Growth and Structural Change in Pakistan's Manufacturing Industry 1954-1964

by

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Lewis and Soligo studied the growth and structural change in Pakistan's manufacturing using a simple analysis of patterns of manufacturing growth [3]. Then, employing their results to re-examine the generally accepted view of Pakistan's industrial growth, they found that import substitution had not been largely confined to consumer-goods industries [3, p. 108] and concluded that it would be difficult to accept the widely held hypothesis that distortions in industrial growth had resulted from the protectionist policies pursued [3, p. 111]. More specifically, they rejected the hypothesis of Power and Radhu that the greater protection accorded the consumer-goods industries would encourage the growth of domestic consumer-goods production using imported capital goods and raw materials [3, p. 96].

I argue in this note that the Lewis-Soligo statistical method overestimates the relative size of the import-substitution figure in the more rapidly growing industries. In the Pakistan case this particularly increases the measure of import substitution in intermediate- and capital-goods industries. Also, the Lewis-Soligo analysis of value added does not test the Power-Radhu hypothesis. Hence the method used fails to support the conclusions reached.

1. Import Substitution in Value of Outputs

The Lewis-Soligo method is designed to apportion the growth in domestic output to: *a*) the growth in demand (on the assumption that a constant proportion of the total supply is imported); and *b*) the change in the ratio of imports to total supply, which is called import substitution. However, their method

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includes in import substitution a component, often very large, which results from both import substitution and demand growth; this component is not "due" to either one or the other change alone.

The Lewis-Soligo method is as follows. Total intermediate- and final-goods supply (Z) equals domestic gross output (X) plus imports (M). Total supply is identically equal to total demand, which equals domestic final demand (D), domestic intermediate demand (W), and export demand (E). Therefore,

$$\triangle X + \triangle M = \triangle D + \triangle W + \triangle E.$$

"Given the change in total demand, the change in domestic output, which would have taken place if there had been no import substitution, is given by:

$$u_1(\triangle D + \triangle W + \triangle E)$$

where $u_1 = X_1/Z_1$, *i.e.*, the ratio of total domestic production to total supply in the base period" [3, p. 103].

"The change in domestic output ascribed to import substitution is measured by the change in domestic output implied by the actual change in proportion of total supply imported, when total demand is held constant. The total increase in output is given by:

$$(6) \quad \triangle X = u_1\triangle(D + W) + u_1\triangle E + (u_2 - u_1) Z_2$$

where $u_2 = X_2/Z_2$, the ratio of domestic output to supply in the latter period. The change in domestic output has now been broken into three parts: expansion of *i*) domestic and *ii*) export demand, where the ratio of imports to total supply is held constant at its base period level, and *iii*) import substitution" [3, p. 104].

Lewis and Soligo use the last term in the above expression, $(u_2 - u_1) Z_2$, as their measure of import substitution. But this term is

$$(u_2 - u_1) (Z_1 + \triangle Z) = \triangle u(D_1 + W_1 + E_1) + \triangle u(\triangle D + \triangle W + \triangle E).$$

It is only the first term, $\triangle u(D_1 + W_1 + E_1)$, that is "the change in domestic output implied by the change in proportion of total supply imported when total demand is held constant". The second term is an interaction term, the product of two finite changes, which results from the coexistence of both import substitution and demand growth; it is, therefore, not properly attributable to either demand growth or import substitution alone[1]. If one is comparing the relative

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[1]For a similar criticism in the application of this statistical method to the analysis of world trade trends, *see* [1, p. 56]. Lewis and Soligo adopted their method from Chenery [2, p. 641]. Chenery lumps the "interaction term" into "import substitution" on the specious ground that in the absence of import substitution there would be no interaction terms; however, this same ground could be used to add the interaction term to demand growth since in the absence of demand growth there would be no interaction term.

importance of demand on growth and import substitution as "sources" of output growth, the Lewis-Soligo formulation makes the results more favourable to import substitution; adding the interaction term to the demand growth terms has the opposite effect; the form presented here takes a middle ground.

The Lewis-Soligo formulation seriously biases their results concerning the comparative growth of consumption, intermediate, and capital-goods industries. Including the interaction term in import substitution increases the relative size of the latter by amounts which vary directly with the size of the increases in demand. Industries which had relatively high rates of demand growth therefore have relatively inflated measures of growth due to import substitution[2]. For the Pakistan data this means that the measures of growth due to import substitution are particularly inflated for the capital-goods and intermediate-goods industries where domestic plus export demands in 1963/64 were 578 per cent and 413 per cent of 1953/54 demands respectively; for consumption goods the figure was "only" 294 per cent.

A comparison of the Lewis-Soligo results with those of the method suggested here is given in Table I: Column (4) gives import substitution as defined in this note; Column (5) gives the Lewis-Soligo measure.

Lewis and Soligo called attention to some of their results which, with now required modification, are as follows:

(1) "Import substitution was of equal importance (about 15 per cent) for both consumer-goods and investment-goods industries and was a source of almost a quarter of the growth of the intermediate-goods industries" [3, p. 107] over the whole period studied. We now see that import substitution was only one-third as important in investment goods as in consumer goods, and accounted for only 7 per cent, not 25 per cent, of intermediate-goods growth.

(2) "In the period 1954/55 to 1959/60 import substitution was as important in investment-goods industries as it was in consumption-goods industries in percentage terms and there was some import substitution in intermediate goods as well" [3, p. 107]. We now see that in this period import substitution was only one-half as important in investment goods as in consumer goods, and accounts for only 3 per cent of growth in intermediate goods.

(3) In the second period a large amount of growth in intermediate goods was attributable to import substitution [3, p. 107]. This amount is now reduced from 31 per cent to 18 per cent of total growth.

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[2]Chenery measures demand growth as deviations from a balanced growth path [2, p. 641]. Hence all the demand-growth terms and the interaction term are relatively small compared to the Lewis-Soligo method which measures demand growth from the absolute levels of demand in base year.

TABLE I

**SOURCES OF OUTPUT GROWTH BY SUBGROUPS OF INDUSTRIES
AGGREGATED FROM INDIVIDUAL INDUSTRY STATISTICS
(SOURCES AS PERCENTAGE OF OUTPUT GROWTH)**

(1)	Domestic demand (2)	Export demand (3)	Import substitution (4)	Import substitution and interaction term (5)
I. 1954/55 to 1963/64				
Consumption goods	76.9	7.1	7.5	15.9
Intermediate goods	38.2	37.5	6.9	24.3
Investment goods	84.1	1.0	2.6	15.0
Total of 26 industries	69.5	12.9	6.3	17.7
II. 1954/55 to 1959/60				
Consumption goods	55.7	16.5	18.1	27.8
Intermediate goods	34.0	57.9	2.9	8.1
Investment goods	71.8	1.0	10.6	27.2
Total of 26 industries	53.8	24.0	13.1	29.9
III. 1959/60 to 1963/64				
Consumption goods	110.0	—1.1	—3.5	—8.9
Intermediate goods	47.6	21.8	18.0	30.6
Investment goods	108.5	1.2	—3.8	—9.6
Total of 26 industries	95.7	4.6	—0.1	—0.3

Sources: Columns (2), (3), and (5) from [3, p. 106, Table III]
Column (4) calculated from data in [3].

Notes: Column (2) $= u_1(\triangle D + \triangle W)$
Column (3) $= u_1(\triangle E)$
Column (4) $= \triangle u(D_1 + W_1 + E_1)$
Column (5) = Column (4) plus $\triangle u(\triangle D + \triangle W + \triangle E)$

(4) "For the entire period . . . most of the intermediate- and investment-goods industries had a higher per cent of growth 'explained' by import substitution than was true for the total of all manufacturing industries" [3, p. 107]. The figure now falls—with half having more, half less, than the avarage.

(5) While it is true that the greatest opportunities for further import substitution exist in intermediate-goods and investment-goods industries, it is incorrect to say that there has been little or no import substitution in these industries to-date. In fact, the rapid growth rates of these industries were to a significant exent due to import substitution [3, p. 108]. Now we see that import substitution alone accounts for much less growth than the Lewis-Soligo figures showed. At best it can be said that import substitution was maintained in conjunction with growing home and foreign demand which, of course, is no small achievement.

II. Analysis of Value Added

Lewis and Soligo also attempted to examine the Power-Radhu hypothesis by an analysis of value added changes. They used the formula

$$\triangle V = r_1 \left[u_1 \triangle (D + W) + u_1 \triangle E + (u_2 - u_1) Z_2 \right] + (r_2 - r_1) u_2 Z_2$$

where V is value added and r is the ratio of value added to value of output for each industry [3, p. 105]. The first term is simply the previously discussed partitioning of changes in value of output (within the square bracket) multiplied by r_1, the average ratio of value added to value of output in the first period; the value added ratio merely serves as a weighting factor when the individual industry results are summed. This first term thus adds little to the results discussed in Section I above.

The second term is the change in the value added ratio times the value of output in the second period (since $u_2 Z_2 \equiv X_2$). Lewis and Soligo wrote: "The last term measures the effect on value added of changes in the ratio of value added to domestic output. The term is essentially a residual, as it measures, among other things, the effect of intra-industry changes in composition of domestic output as well as changes in technical efficiency. These factors are grouped together and called "technical change" [3, p. 105].

The Lewis-Soligo analysis implicitly assumes that, for each industry, changes in the ratio of value added to value of gross output (which depend on changes in the composition of domestic output) are independent of the "sources" of gross output growth, *i.e.*, of the relative importance of import substitution versus home and export demand growth. By extension, they assume that the existing ratio (used as a weighting factor as noted above) is independent of the sources of growth in previous periods. But the assumption of independence is challenged by the Power-Radhu hypothesis being examined.

The Power-Radhu hypothesis is that the system of priorities in Pakistan tariffs and foreign-exchange controls encouraged domestic production of final consumer goods using imported capital goods and materials [3, p. 96]. This hypothesis need not be limited to the *inter*-industry changes in the composition of domestic output where the rather aggregative industries such as "cotton and other textiles" or "metal products" are classified as producing predominantly "consumer", "intermediate", or "investment" goods. The hypothesis may also predict *intra*-industry changes in the composition of output since many of these industries include products representing various stages of intermediate processing as well as final goods and since tariff protection was not uniform among all products of an "industry"[3]. In other words, *intra*-industry changes in the composition of gross output will not be independent of the "source" of growth, and hence neither will the ratio of value added to gross output be independent of the "source" of growth. This result is important since if there is a systematic relation between the source of growth and changes in the ratio of value added to gross output, then measures of contribution to gross output growth are biased indicators of contribution to growth of value added. And it is value added, *i.e.*, national income, that most often concerns us.

Each "source" of gross output growth would have different effects on the ratio of domestic value added to gross output, *ceteris paribus*. Note that the ratio of domestic value added to gross output can be separated into two factors: the ratio of domestic value added to final demand, and the ratio of final demand to gross output. The first factor is a measure of the import content of final demand (or supply). The second factor is a measure of the degree of vertical integration in the industry being studied since intermediate products within an integrated firm are not recorded in the gross output statistics. In the absence of some definite hypothesis[4], one may assume that growth of demand is neutral with respect to both ratios. In contrast import substitution was defined as a reduction in the import content of gross output; this requires a reduction in the import content of final goods and an increase in the ratio of domestic value added to final demand and to gross output unless there is a systematic relation between import substitution and the second factor, the ratio of final demand to gross output. It will call the absence of such relation "neutral" import substitution.

In contrast consider the case predicted by the Power-Radhu hypothesis. If imported intermediate goods plus local finishing are substituted for imported final goods, then the value of domestic gross output increases by the full value of the goods finished locally, while the value of final demand is unchanged. Hence, the ratio of final demand to gross output falls and the ratio of domestic

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[3]For example, Radhu cites intra-industry differences in levels of tariff protection [4, p. 534, Table IV and p. 548].

[4]For example, Adam Smith's division of labour hypothesis as developed by Stigler [5].

value added to gross output may also fall even though the ratio of imports to gross output has fallen[5].

In summary, the argument is that the ratio of value added to value of gross output is systematically related to the "sources" of change in value of gross output. Where the growth of gross output is "due" to growth of demand no change in the ratio is expected. Where growth is "due" to "neutral" import substitution the ratio would be rising. And where import substitution has the biased pattern hypothesized by Power and Radhu, the ratio of domestic value added to gross output may be falling.

A host of difficulties were concealed under the camouflage net of "ceteris paribus". There are other reasons for changes in the ratio of value added to gross output which should be examined, *e.g.*, changes in the structure of final demand or economies and diseconomies of scale. The structure of the protective system is only one such reason. It is suggestive, however, that the value added/gross output ratio fell for a somewhat higher proportion of consumption-goods industries than investment- or intermediate-goods indutries, and that the ratio fell for consumption-goods industries as a whole in the 1954/55 to 1959/60 period and for intermediate-goods industries in the 1959/60 to 1963/64 period, the two cases of the greatest growth of gross output "due" to import substitution [3, p. 109, Table V].

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[5]This pattern of import substitution creates serious problems for the partitioning analysis applied in Section I which assumes that demand growth and import substitution are independent. This need not be the case when the analysis is applied to gross output. Interdependence can result from a tariff structure biased in the direction of increased intermediate transactions. The measured import substitution is large not only because imports decrease but also because domestic gross output is inflated by the full value of finished products incorporating largely imported intermediate products. On the demand side we have an apparent growth due to increased intermediate demand but this change is in fact only a change in the degree of vertical integration induced by the particular form of tariff policy.

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