

Price and Income Elasticities of Consumer Goods Imports of Pakistan

KHWAJA SARMAD and RIAZ MAHMOOD*

I. INTRODUCTION

Estimation of disaggregated import elasticities for developing countries presents a formidable data-handling problem. The available studies on the subject are concerned mostly with the estimation of income and price elasticities of imports at a disaggregated level corresponding to the one-digit level of the Standard International Trade Classification (SITC), see, e.g., Khan [1], Melo and Vogt [4], Nguyen and Bhuyan [5]. Consequently, they apply a common elasticity estimate to all commodity sub-groups.

The lack of disaggregated estimates of import elasticities is a serious constraint on the efforts to quantify the effects of policy measures on the volume of imports and economic welfare in general. In this study an attempt has been made to overcome this limitation by estimating price and income elasticities of the consumer goods imports of Pakistan at the three-digit level of the SITC. Consumer goods imports have also been distinguished by functional classes, viz. consumer goods and raw materials for consumer goods.

In this study the importance of changes in relative prices, customs duties and an income variable as explanatory variables determining the quantity of consumer goods imports of Pakistan, has been investigated for the period from 1969-70 to 1979-80. During this time there was a growing structural concentration of imports in favour of consumer goods, which, by the end of the Seventies, accounted for around 60 percent of the total imports. There is also evidence of concentration between different products of the same industry, which suggests that some benefit can be gained by studying imports on a disaggregative basis, in particular by using information at the three-digit SITC level as the basic data. The fact that this is also the decision level for tariff policy provides additional cause for a disaggregative approach.

The required data on quantity and value of imports were generated by aggregating the six-digit series available in the *Foreign Trade Statistics* [6]. Prices for

*The authors are, respectively, Senior Research Economist and Staff Economist at the Pakistan Institute of Development Economics (PIDE), Islamabad. They are grateful to Prof. Syed Nawab Haider Naqvi, Director, PIDE, for his constant encouragement in completing this study. They also thank Mr Masood Ashfaq for computing assistance.

domestic substitutes were obtained from Government of Pakistan publications [8], [9], [10] and [11]. The division of consumer imports into functional classes was made according to the methodology outlined in [3]. The value of the selected commodities in the categories of consumer goods and raw materials for consumer goods accounts for 68 percent and 59 percent respectively of the total imports in these categories. Together they account for 35 percent of the total imports of Pakistan during the period from 1969-70 to 1979-80.

II. THE IMPORT FUNCTION

The following import demand function is estimated:

$$\log M_{it}^d = e_{0i} + e_{1i} \log(1 + CD_i) P_{im}/P_{di} + e_{2i} \log Y_t + u_{it} \quad \dots (1)$$

where

M_i^d = quantity demanded of the i th import commodity;

P_{im} = price of the i th import commodity;

P_{di} = price of a domestic substitute;

CD_i = custom duty on the i th commodity;

Y_t = real income variable — the proxies used are real consumption expenditure for consumer goods imports, and real value added in the manufacturing sector for imports of raw materials for consumer goods; and

u_i = random disturbance term.

The specification of the import function in logarithms allows the import elasticities to be obtained directly from equation (1). The underlying assumptions for estimating the import equations are as follows: (i) importers are always in equilibrium ($M_i^d = M_i$); and (ii) real private consumption expenditure, real value added in the manufacturing sector, the price of the imported commodity P_{im} and that of the domestic substitute are exogenously determined. In general, the adjusted relative price elasticities (e_{1i} s) are expected to be less than zero and the income elasticities

(e_{2i} s) greater than zero. Negative values for the income elasticity can also be justified, when domestic production increases more than consumption with a rise in the level of income.¹

III. RESULTS

The estimates of the parameters of equation (1) were obtained for various commodity groups and are reported in Table 1. The table also reports the t -value in parentheses, the value of $\bar{R}^2$, the Durbin-Watson (D.W.) statistic, and the Standard Error (S.E.) of the estimated equation.

For a number of cases, code-numbered 051 (Fresh Fruits), 074 (Tea), 211 (Waste and Used Leather), 231 (Crude Rubber), 422 (Palm Oil), 512 (Acids and Compounds) and 561 (Urea), there was evidence of first-order autocorrelation in the residuals, u_t .

The results in Table 1 show that out of 26 cases the price elasticity estimates are statistically significant at the 95-percent level for thirteen groups of imports; for three cases the estimates are statistically significant at the 90-percent level; and for another five cases the estimates are statistically significant at the 80-percent level. For almost half the cases the price elasticities have the expected negative sign.²

IV. AGGREGATION BIAS

To obtain estimates of price and income elasticities for aggregate imports on the basis of disaggregate estimates, Khan [1] has suggested that the estimates be adjusted by the "distribution elasticities" which, if not accounted for, would bias the aggregate estimates. To investigate the aggregation bias we have calculated the price and income elasticities for consumer goods imports at the one-digit level of the SITC directly and on the basis of disaggregated import elasticities.

The distribution elasticities are calculated from the following equation and are reported in Table 2:

$$\Delta \log P_{it} = \beta_i \Delta \log P_t + v_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots (2)$$

¹ Given that import demand is excess demand, very little can be said in general about the properties of the import demand function other than that it is homogeneous of degree zero in absolute prices. As such there can be no *a priori* presumptions about the elasticities without additional assumptions.

² Kreinin [2] and Price and Thornblade [12] have suggested that a positive price elasticity may be due to the high level of disaggregation.

Table 1
Estimates of Import Equations

Commodity Group	PSTC Equivalent	Price Elasticity	Income Elasticity	R ²	D.W.	S.E.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Consumer Goods</i>						
Food Products	0	1.040 (1.824)	1.217 (1.319)	0.407	2.149	0.527
Milk and Cream	022	-1.408 (-4.592)	4.209 (7.200)	0.861	1.559	0.366
Milk Food for Infants	099	0.031 (0.035)	5.852 (5.733)	0.756	2.572	0.647
Milk, Cream and Milk Food	002 + 099	-1.351 (-4.354)	4.267 (7.929)	0.878	1.684	0.338
Wheat, unmilled	041	1.191 (2.553)	0.422 (0.436)	0.500	2.282	0.503
Fresh Fruits	051	-0.908 (-4.104)	1.379 (3.667)	0.800	1.327	0.229
Tea	074	0.588 (0.164)	5.935 (1.325)	0.294	0.838	1.673
Spices	075	0.452 (1.222)	1.596 (1.592)	0.644	2.203	0.379
Petroleum	332	0.677 (0.377)	4.507 (1.854)	0.587	1.955	0.836
Cleansing Preparations	554	-1.576 (-2.131)	1.484 (2.702)	0.417	1.527	0.332
<i>Raw Materials for Consumer Goods</i>						
Crude Materials	2	0.508 (4.090)	1.745 (6.795)	0.932	1.931	0.091
Waste and Used Leather	211	0.114 (0.616)	1.610 (2.195)	0.392	1.175	0.238
Crude Rubber	231	0.351 (1.168)	0.319 (0.416)	0.524	1.170	0.142
Wool	262	-0.489 (-1.268)	-1.585 (-1.343)	0.372	1.756	0.419
Worn Clothings	267	0.411 (1.394)	3.432 (6.439)	0.814	1.652	0.229
Crude Petroleum	331	-0.200 (-3.288)	1.785 (5.009)	0.712	2.048	0.091
Animal and Vegetable Oils	4	-0.286 (-0.878)	4.601 (3.812)	0.680	1.900	0.347
Animal Tallow	411	-0.661 (-1.969)	2.017 (3.346)	0.479	2.758	0.212
Soyabean Oil	421	-0.788 (-2.194)	3.591 (3.360)	0.484	2.536	0.374
Palm Oil	422	1.682 (1.426)	9.893 (2.588)	0.721	1.127	1.167
Chemicals	5	-0.736 (-0.721)	4.216 (1.762)	0.137	1.495	0.743
Acids and Compounds	512	-0.131 (-0.517)	1.810 (4.748)	0.676	1.290	0.161
Dyes and Coal Tar	531	0.891 (4.306)	-5.140 (-10.496)	0.924	1.788	0.211
Urea	561	0.603 (2.066)	2.970 (1.830)	0.380	1.179	0.699
Plastic Moulding Powder	581	-1.051 (-3.265)	3.090 (3.639)	0.546	1.751	0.250
Manufactures	6	0.976	4.104	0.571	2.210	0.480

where

$$P_i = P_{im}/P_{di} \text{ and}$$

$$P_t = \sum_i P_i;$$

β_i s are the distribution elasticities; and

v_t is a random disturbance term.

Table 2
Distribution Elasticities

Commodity Group	PSTC Equivalent	Distribution Elasticity
<i>Consumer Goods</i>		
Milk and Cream	022	0.400
Milk Food	099	0.203
Wheat, unmilled	041	1.070
Fresh Fruits	051	1.695
Tea, Black	074	0.069
Spices	075	0.906
<i>Raw Materials for Consumer Goods</i>		
Waste Leather	211	1.396
Crude Rubber	231	0.417
Wool	262	1.075
Worn Clothing	267	0.566
Animal Tallow	411	0.469
Soyabean Oil	421	1.263
Palm Oil	422	1.100
Acids and Compounds	512	0.615
Dyes and Coal Tar	531	1.342
Urea	561	2.279
Plastic Moulding Powder	581	1.127

On the basis of the distribution elasticities reported in Table 2, the derived elasticities have been obtained, using average shares of individual commodity groups

in the total of the aggregate imports (one-digit level) for the entire period from 1969-70 to 1979-80. The directly estimated elasticities and the derived estimates are reported in Table 3.

The results in Table 3 show that the elasticities derived from disaggregated estimates diverge significantly from those obtained directly from aggregate import equations reported in Table 2. The direction of aggregation bias is upward for the price and income elasticities of Food Products (0) and for the price elasticities of Crude Materials (2) and Animal and Vegetable Oils (4). The other commodity groups show a downward bias.

Table 3

Directly Estimated and Derived Elasticities for Imports

Commodity Group	SITC Equivalent		Direct Estimate		Derived Estimate	
	Price Elasticity	Income Elasticity	Price Elasticity	Income Elasticity	Price Elasticity	Income Elasticity
<i>Consumer Goods</i>						
Food Products	0	0	1.040	1.217	0.696	0.378
<i>Raw Materials for Consumer Goods</i>						
Crude Materials	2	2	0.508	1.745	0.072	0.709
Animal & Vegetable Oils	4	4	-0.286	4.601	0.279	6.755
Chemicals	5	5	-0.736	4.216	1.021	4.638

V. CONCLUSIONS

On the basis of the data for the period from 1969-70 to 1979-80 we estimate import elasticities at a disaggregation level corresponding to the three-digit level of the PSTC for nine different sub-groups in the Consumer Goods category and thirteen different sub-groups in the Raw Materials for Consumer Goods category. Price and income elasticities were also obtained for aggregate imports, corresponding to the one-digit level of the PSTC.

The results showed that relative price, adjusted for customs duties and an income variable, were enough to explain a large proportion of the variation in the imports of individual commodity groups as well as in aggregate imports. For several sub-groups the price elasticities were significant and had the expected signs. The income elasticities are on the higher side. There were some cases in which the relative-price variable turned out to be statistically insignificant. In a few other instances the relative-price variable was significant but positive. In these cases there is a need to specify additional factors which can influence import demand.

The derived estimates of import elasticities were lower than those obtained directly from the equations estimated for aggregate imports, corresponding to the one-digit level of SITC, implying a downward aggregation bias. The important exceptions were the price and income elasticities for the imports of Animal and Vegetable Oils and Chemicals, which were biased upward.

REFERENCES

1. Khan, M. S. "The Structure and Behaviour of Imports of Venezuela". *Review of Economics and Statistics*. Vol. LXII, No. 2. 1975.
2. Kreinin, M. "Disaggregate Import Demand Functions — Further results". *Southern Economic Journal*. Vol. 40, No. 1. 1973.
3. Mahmood, Riaz. *Growth and Structure of Imports of Pakistan (1959-60 to 1978-79)*. Islamabad: Pakistan Institute of Development Economics. 1980. (Statistical Paper Series No. 3).
4. Melo, O., and Michael G. Vogt. "Determinants of the Demand for Imports of Venezuela". *Journal of Development Economics*. Vol. 14, No. 3. 1984.
5. Nguyen, D. T., and A. R. Bhuyan. "Elasticities of Export and Import Demand in Some South Asian Countries. Some Estimates". *Bangladesh Development Studies*. Vol. V, No. 2. 1977.
6. Pakistan. Central Statistical Office. *Foreign Trade Statistics of Pakistan*. Karachi. (Various Issues)
7. Pakistan. Central Statistical Office. *Pakistan Standard Trade Classification. Revision 1, (PSTC)*. Karachi. July 1966.
8. Pakistan. Finance Division. Economic Adviser's Wing. *Pakistan: Basic Facts*. Islamabad. (Various Issues)
9. Pakistan. Finance Division. Economic Adviser's Wing. *Pakistan Economic Survey*. Islamabad. (Various Issues)
10. Pakistan. Ministry of Food, Agriculture and Cooperatives. Food and Agriculture Division (Planning Unit). *Agricultural Statistics of Pakistan*. Islamabad (Various Issues)

11. Pakistan. Statistics Division. *Pakistan Statistical Yearbook* Karachi. (Various Issues)
12. Price, J. E., and J. B. Thornblade. "U.S. Import Demand Functions Disaggregated by Country and Commodity". *Southern Economic Journal*. Vol. 39, No. 1. 1972.

Comments on "Price and Income Elasticities of Consumer Goods Imports of Pakistan"¹

I share the authors' assertion that disaggregated import demand functions are hard to come by for the Third World countries. They should be commended for their efforts to fill this void. My comments are intended to raise a few conceptual points and should not be construed as a criticism of the authors' professional competence.

1. Data

Use of Pakistan's trade data on functional classification on commodities into consumption goods and raw materials for consumption goods begs for a reconciliation with a classification of commodities based on the economic characteristics of a commodity. The apparent arbitrariness in Pakistan's trade data is best removed in an input-output framework where a clear distinction between intermediate use and final demand use of commodities is maintained. I assume that the authors had an access to PIDE's input-output tables for 1975-76. I wonder why they did not modify the functional classification of commodities into meaningful categories based on the economic characteristics.

A related point is that of the use of prices of domestic substitutes. What if there is no imaginable domestic substitute available? What kind of prices would one use? Palm oil or crude rubber are good examples of this issue. It may be that an industry in question needs these items which are imported, and without whose availability their outputs cannot be produced. It would be, in my opinion, desirable to distinguish between competitive and non-competitive imports.

2. Model Specification

My comments refer to the choice of real income as an explanatory variable. A correction is required in the explanation of the symbol y_t : real consumption expenditure for consumer goods should be read as real private consumption expenditure, as it is clearly stated in the assumptions listed by the authors.

¹Comments by the discussant are based on the paper distributed and presented in the meeting and not on the revised version of the paper. (Editor)

Firstly, there are problems in using Pakistan's National Accounts data on total consumption expenditure. These aggregate data in the Accounts are obtained residually. Then, I assume, some other ad hoc basis is used to disaggregate it further into private and government consumption expenditure.

Secondly, the choice of deflators to transform the current-prices data into constant prices needs to be carefully examined. It is not made explicit in the paper what the base-year is of the prices that have been used to transform the data. If I recall the PIDE's Macro-econometric Model, 1959-60 was the base year. I noticed from the Model's series of private consumption that there were two or three years when the observed consumption expenditure exceeded the observed income. The unreliable nature of data on this variable is clearly evident.

Thirdly, I would like to know the deflators used for determining real value added in manufacturing. How does one deflate various components of the value added such as wages, salaries and profits? Is it fair to assume that 100 percent of the profit income earned by industries is spent? It must be remembered that profits are not the only component of the value added.

Suppose the choice of real private consumption expenditure as a proxy for real income is a good one. This appears as an explanatory variable in the equation. How can one digest the fact that while consumption is usually a function of income it has been used here as a dependent variable which is a function of itself. It is then used to explain the behaviour of another dependent variable — in this case, demand for an imported commodity.

3. Interpretation of Results

Invariably, the estimated price and income elasticities have been compared with the results obtained from other studies — e.g., the one by Khan for Venezuela. In the absence of any description of these other studies with respect to the choice of variable, estimation methods used, size of the sample period, functional forms, etc., it is rather arbitrary to draw any comparative inferences.

In my opinion, such a comparison is unwarranted: for, as the authors claim, many of these other studies are not as disaggregated as their own. The authors further claim that increase in the magnitude of income elasticities over time increases the degree of "openness" of an economy. I do not quite understand this point. Does it relate to import liberalization as a function of rising income levels or what? Do the facts surrounding import policy as an allocative instrument of resources in Pakistan justify this prescription.

Senior Analyst

Input-Output Division,
Statistics Canada,
Ottawa (Canada)

Dr Aftab A. Syed