CHAPTER VI

Evolving an import function for measurement of trade restrictiveness
The prime objective of this Chapter is to evolve an import function for the measurement of trade restrictiveness on cotton woven fabrics. It is intended to measure the restrictiveness of the quantitative limitations placed on the exports of developing countries as a whole and India and Hong Kong in particular.

This Chapter is divided into three sections. Section I deals with the scope of the present analysis particularly in respect of products and related aspects. In Section II, an attempt is made to assess the various methodologies for estimating the restrictiveness of the quantitative barriers. An import function for cotton woven fabrics is sought to be evolved in Section III.

I

PRODUCTS AND RELATED ASPECTS

The analysis is addressed to a single sub-sector of cotton textiles, namely woven fabrics. It illustrates the restrictive effects of quantitative import barriers in the main importing countries like the U.K., the U.S. and West Germany. The above mentioned markets have been selected mainly because of their importance to the developing countries, particularly India and Hong Kong.
For purposes of this analysis cotton woven fabrics are defined as comprising: ¹

**SITC No:**

652  Cotton fabrics, woven, not including narrow or special fabrics.

652.1  Cotton fabrics, woven, grey (unbleached), not mercerized.

652.2  Cotton fabrics, woven, other than grey (bleached, dyed, printed or otherwise finished).

These items are relatively homogeneous and comparable in terms of quality. Again these are directly affected by the quantitative import restrictions as applied to cotton textiles in general. The volume of international trade in this product group is, indeed, significant. In 1974, the developed countries imported woven cotton fabrics (SITC 652) worth $2,824 million of which $1,569 million worth were from the developing countries, ² as compared to the developed countries' imports

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¹ The category of SITC 652 includes:

<table>
<thead>
<tr>
<th>SITC No.</th>
<th>BTN No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>652.1(1)</td>
<td>55.07(A)</td>
<td>Cotton gauze, unbleached</td>
</tr>
<tr>
<td>652.1(2)</td>
<td>55.08(A)</td>
<td>Terry fabrics of cotton, unbleached</td>
</tr>
<tr>
<td>652.1(3)</td>
<td>55.09(A)</td>
<td>Other cotton fabrics, woven, unbleached</td>
</tr>
<tr>
<td>652.2(1)</td>
<td>55.07(B)</td>
<td>Cotton gauze, bleached, dyed, etc.</td>
</tr>
<tr>
<td>652.2(2)</td>
<td>55.08(B)</td>
<td>Terry fabrics of cotton, bleached, dyed, etc.</td>
</tr>
<tr>
<td>652.2(3)</td>
<td>55.04(A)</td>
<td>Pile &amp; chenille fabrics of cotton</td>
</tr>
<tr>
<td>652.2(9)</td>
<td>55.09(B)</td>
<td>Other cotton fabrics, woven, bleached, dyed etc.</td>
</tr>
</tbody>
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² Data includes OECD countries, Australia, Canada and Japan.
of $429 million in 1960 of which those from developing countries were $113 million worth. The substantial increase (from 26.34 per cent to 55.56 per cent) in the share of the developing countries in the total imports of the developed countries demonstrates the striking improvement in their competitive position.

World production of cotton woven fabrics during 1960 to 1975 has remained more or less stagnant. While the output in the developed countries has declined - as have their exports - it has effectively been offset by a corresponding increase in output and exports of developing countries.

A shift in production in the developing countries away from low-value-added cotton fabrics towards higher value-added items has been the main source of additional gain. There has been, as a result, a decline in the proportion of grey cotton woven fabrics (SITC 652.1) exports and an increase in the exports of woven cotton fabrics other than grey (SITC 652.2) within the product group. A similar trend has been more or less evident in all importing markets, although, the emergence of this trend has been rather slow as the developing countries still lack the modern technology in bleaching, dyeing, mercerising and painting etc. Constraints relating to
quality and marketing have been the other important retarding factors.

In brief, it should be noted that the production of woven cotton fabrics, is highly suited to manufacturing conditions as they exist today in the developing countries. In spite of a comparatively stagnant overall demand in the advanced countries, the continuing competitive structural shifts favour an increasing share of the total demand being met by the developing countries. Combined with the growing internal demand, this renders woven cotton fabrics a highly desirable field of specialisation for the developing countries from the standpoint of growth. At the same time, the developed countries who became non-competitive did not show signs of disengagement from this sector. Instead they made an attempt to protect this field from external competition. The existing complex of quantitative import restrictions bearing on woven cotton textiles is symptomatic of an inability or reluctance to make the requisite structural readjustments. Further, the progress in this respect will depend on fundamental policy shift in favour of a national allocation of production at the international level.

Virtually all developed countries restrict imports of cotton textiles in one way or another. Tariffs, and
quantitative import controls represent the most frequently applied and unquestionably the most significant restrictive device. In recent years there has been both a proliferation and intensification of these controls. This is particularly so because of the emerging capability of low-labour cost developing countries to supply cotton textiles to the international market in high volume and adequate quality.

II

METHODOLOGY OF ESTIMATING TRADE RESTRICTIVENESS

The estimation of trade restrictiveness requires,
(a) delineation of the behaviour of imports of cotton woven fabrics from the selected countries for an extended period of time, as also the enumeration of the factors affecting the trade on the supply and demand side;
(b) illustration of the various restrictions imposed by the importing countries on imports of cotton woven fabrics, which affect the exports of these products from the developing countries. They include both tariff barriers and other quantitative restrictions which have a bearing on the imports of cotton woven fabrics as also factors affecting imports of inputs into the spinning and weaving industries and the competing synthetic fabrics; and
(c) estimating the volume of the trade there might have been, in the absence of quantitative restrictions, taking
into account the historical developments and other operative elements affecting the demand and supply in that sector.

Although, there are several techniques for deriving such estimates, the present analysis employs a nominal market access framework. This method is not only simple but is best suited for assessing the nominal impact of any specific non-tariff barrier applied by any specific importing country, particularly, when the availability of data is very much limited. Like all methodologies, this technique provides an answer to the question, "what would have been the case had there not existed non-tariff barriers?" However, it does not take into account the effective protection accorded to the product in the developed countries.

It is possible to calculate on the demand side, an additional imports of cotton woven fabrics which might have taken place in the absence of existing quantitative restrictions with the help of a partial-equilibrium static analytical framework. It can be done by assuming that the producers in exporting countries were in a position to supply the importing market without limit at a constant price. The other assumptions in this regard will be: (a) perfectly elastic import supplies; (b) perfectly in
elastic import competing supplies; (c) perfect homogeneity of products; (d) effective competition in the internal and external markets, and (e) a constant elasticity demand function over the relevant price changes.

The following variables are considered for this purpose.

\[ S_d + M_0 = \text{Observed Domestic supply + observed imports of product } J \]

\[ Q_A = \text{Actual quantity demanded (} Q_A = S_d + M_0 \text{) of product } J \]

\[ Q'_H = \text{Hypothetical quantity demanded of product } J \text{ without any import barriers on } J \]

\[ Q_H = \text{Hypothetical quantity demanded of product } J \text{ without tariff on } J \]

\[ P_I = \text{Observed internal market price for product } J \]

\[ P_0 = \text{Observed c.i.f. price of product } J \]

\[ t = \text{Ad-valorem rate of duty applied to imports of product } J \]

\[ P_I - t(P_0) = \text{Observed internal market price of product } J \text{ adjusted for import duty } J \]

\[ D_d = \text{Estimated domestic demand function for product } J \]

\[ X_d = \text{Observed exports of product } J \]

\[ B_d = \text{Observed domestic production of product } J \]

\[ e_J = \text{Estimated elasticity of demand for product } J \]

\[ S_w = \text{Import supply function} \]

\[ b_J = \text{Observed proportion of imports of product } J \text{ originating in developing countries.} \]
Now, we have

\[ Q_A = S_d \cdot M_0 \]
\[ S_d = R_d - X_d \]
\[ Q_A = R_d - X_d + M_0 \]

we also know

\[ P_i, P_0 \text{ and } t \]

we have to find

\[ Q_H \text{ and } Q'_H. \]

Using the arc form of elasticity equation

we can have

\[
\varepsilon_j = \frac{Q_H - Q_A}{Q_H + Q_A} \frac{(P_i - tP_0) - P_1}{(P_i - tP_0) + P_1} \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1a)
\]

\[
\varepsilon_j = \frac{Q'_H - Q_A}{Q'_H + Q_A} \frac{P_0 - P_1}{P_0 + P_1} \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (1b)
\]

Solving for \( Q'_H \) and \( Q_H \), we have

\[
Q'_H = Q_A \left[ \frac{P_0 + P_1 + \varepsilon_j (P_0 - P_1)}{P_0 + P_1 - \varepsilon_j (P_0 - P_1)} \right] \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2a)
\]

and
\[ Q_H = Q_A \left[ \frac{2P_1 - t(P_0)(1+e_j)}{2P_1 - t(P_0)(1-e_j)} \right] \]  (2b)

\[ Q_H' - Q_A \] is an estimate of additional imports in the absence of the tariffs and quantitative restrictions. \( Q_H - Q_A \) estimates an additional imports in the absence of the tariff alone. This \( Q_H' - Q_H \) indicates how much larger the imports might be in the absence of the non-tariff barriers only. The resultant values, expressed in quantities are derived in the absence of import-competing supply response implicit in the inelastic \( S_d \) function - assuming perfectly elastic \( S_W \).

It is further assumed that foreign suppliers are in a position to sell unlimited amounts to the importing country at price \( P_0 \). The values, thus arrived at can be converted into revenues by \( P_0(Q_H' - Q_A) \), \( P_0(Q_H - Q_A) \) and \( P_0(Q_H' - Q_H) \), respectively.

This analysis would yield one set of trade restrictive effect of the quantitative restrictions, assuming that import supply is perfectly elastic, for the period selected. But it would not provide the trade restrictive impact vis-a-vis the developing countries. If we assume, the constant market shares, then the trade restrictive impact of the quantitative restrictions on developing country supplies is \( b_j(Q_H' - Q_H) \) and in value terms the same would
be $b_j P_o (Q'_H - Q_H)$. These estimates of trade restrictiveness can be used as a gauge of possible trade expansion upon removal of quantitative restrictions, although the historical trends shown by $b_j$ may well decline if supply elasticities in developing countries are lower than supply elasticities of the developed country competitors.

The above represents static partial equilibrium technique which is more reliable as it is based on a single demand elasticity value, and is relatively stable and empirically obtainable. The estimate of the import elasticity of demand can be developed, which embodies both the response of import-competitive supply and domestic demand to import-induced changes in price. If we assume a constant elasticity import demand function incorporating both domestic demand and supply elasticities, we must have the following additional variables also:

\[ M_d = \text{Import demand function for product j} \]
\[ e_m = \text{Import elasticity of demand j} \]
\[ M_A = \text{Observed import volume of product j} \]
\[ M'_H = \text{Hypothetical import volume of product j at price } P_o \]
\[ M_H = \text{Hypothetical import volume of product j without tariffs on j} \]

Then we will be having
\[ M'_H = M_A \left[ \frac{P_0 + P_1 + e_m (P_0 - P_1)}{P_0 + P_1 - e_m (P_0 - P_1)} \right] \]  \hspace{1cm} (3a)

and

\[ M_H = M_A \left[ \frac{2P_1 - t (P_0) (1 + e_m)}{2P_1 - t (P_0) (1 - e_m)} \right] \]  \hspace{1cm} (3b)

This is derived in the same manner as above. The effect of the quantitative restriction in terms of trade volume is \( P_0 (M'_H - M_H) \). This gives us a near actual value as opposed to a probable smaller value provided by the earlier derivation (assuming infnite foreign supply elasticities) and hence more desirable. The impact on the developing countries suppliers is \( b_j (M'_H - M_H) \) in quantity terms and \( b_j P_0 (M'_H - M_H) \) in value terms, with the same provisos regarding possible differences in supply elasticities.

The feasibility of both the methodologies rest on the possibility of estimating the relevant elasticity values viz. the domestic price elasticity of demand and the import elasticity of demand. The validity of the results in turn rests on the reliability of the requisite elasticity estimates. In both instances, the reliability of these critical parameters are, however, not altogether unquestionable.

Another technique which can be employed for assessing the impact of quantitative restrictions is a time-series analysis. This method again is equally questionable.
However, a time trend may be fitted to import data for a selected period of time, prior to the imposition of the quantitative restriction. For this purpose the following equation can be used:

\[ M_T = M_o + b(t) \]  \hspace{1cm} (4)

where,

- \( M_T \) represents the estimated imports of woven cotton fabrics at time \( T \);
- \( t \), the number of time period involved;
- \( b \), the calculated average annual rate of growth in the pre-quantitative restriction period; and
- \( M_o \) imports of cotton woven fabrics during a selected base period.

The parameter \( b \) can be estimated both for imports from developing countries and for total imports (\( b' \)). The hypothetical import values for a selected post-quantitative restriction period can be extrapolated on that basis.

For total imports of woven cotton fabrics (\( F \)) and imports from developing countries (\( F' \)) the restrictive effect of the quantitative restriction would thus be:

\[ F = (M_o - M_A) + b(t_R \leftrightarrow n - t_R) \]  \hspace{1cm} (5)

\[ F' = (M'_o - M'_A) + b'(t_R + n - t_R) \]  \hspace{1cm} (6)

- \( M_A \) actual total imports of cotton woven fabrics during the terminal year for which the estimates are made;
- \( M'_A \) actual imports of cotton woven fabrics from developing countries during the terminal year for which the estimates are made;
the estimated impact of non-tariff barrier on suppliers in developing countries and competing developed countries would appear in the ratio $F'/F$ and in calculated shifts in relative import shares.

This analysis rests on many ceteris paribus assumption regarding supply conditions in the importing and exporting countries - as well as other variables affecting trade in woven cotton fabrics. Moreover, the application of the non-tariff barriers must be identifiable in time. For this purpose it is essential to have sufficient data on either side of $t_R$ including sufficient data relating to volume of trade in the absence of the quantitative restrictions.

Time series analysis is appropriate to consider the historical perspective. Again assuming that the imposition of a given quantitative barrier is fixed in time, it is possible to estimate what imports might have been if the barriers had been imposed at some earlier point in time. A time trend is fitted to import data (both total and imports from developing countries) for the pre-quantitative restriction period $(t_0 - t_R)$ and post-quantitative restriction period $(t_R - t_n)$. It takes the linear form
presented in equation 4.

\[ M_R = M_o + b(t_1) \quad \text{(Pre-non-tariff barrier)} \quad \ldots \quad (7) \]

\[ M_T = M_R + b'(t_2) \quad \text{(Post-non-tariff barrier)} \quad \ldots \quad (8) \]

The post quantitative restriction trend is then super-imposed on the pre-non-tariff barrier period such that

\[ M_R' = M_o + b'(t_4) \quad \ldots \ldots \ldots \ldots \ldots (9) \]

Comparison of \( M_R' \) and \( M_R \) indicates the differences, if quantitative restrictions would have been imposed on imports at the pre-quantitative restriction period itself.

A cross-sectional analysis may also be made use of to estimate the impact of a given importing country's quantitative restriction as applied to imports of cotton woven fabrics. For instance, if a certain import behaviour, which is broadly applicable to a variety of non-quantitative restrictions of the importing country can be identified then it should also be possible to work out hypothetical imports for other countries, applying quantitative restrictions as well. These cross-sectionally derived hypothetical import values might be compared with the actual import figures and the degree of restrictiveness gauged. Such cross-country estimates can also be compared with estimates derived from other methods, to determine whether they represent the same order of magnitudes or not.
It is also possible to proceed with two or more products which are close substitutes. To estimate the restrictiveness of quantitative barriers on imports one has to assume that where one product is subject to quantitative restrictions, and the other is not. For example, imports of products A and B could be determined either on the basis of time-series or import function analysis in certain manner during a period before the imposition of the quantitative restrictions. Under this situation restraints are imposed on product A but not on product B. From the corresponding behaviour of imports of both the products in the post-quantitative restriction period, it may be possible to infer certain things about the behaviour of A that might have obtained had there been no non-tariff distortion.

However, the development of an import function for each of the three developed market economies is a complex problem. For each country, it is essential to specify variables, which are considered to have a significant bearing on the imports of woven cotton fabrics.

In the first instance, an attempt is being made to estimate the trade restrictiveness in the UK markets for the cotton woven fabrics imports. The following variables need to be considered for this purpose
\[ M_{it} = \text{Volume of cotton woven fabrics imports, in metric tonnes.} \]
\[ C_d = \text{Apparent domestic consumption (Production + imports - Exports) cotton woven fabrics in metric tonnes.} \]
\[ P_{im} = \text{Unit value of cotton woven fabrics imports, in £.} \]
\[ M_{FP} = \text{Domestic production of man-made fibres in metric tonnes.} \]
\[ M_{NC} = \text{Mill consumption of man-made fibres, in metric tonnes.} \]
\[ Y_d = \text{Per capita disposable income in constant £.} \]
\[ M_P = \text{Price index of man-made fibres, 1954-56 = 100.} \]
\[ C_P = \text{Price index of domestically produced cotton products, 1954-56 = 100.} \]
\[ C_P/M_P = \text{Price index of domestically produced cotton ÷ price index of man-made fibres, 1954-56 = 100.} \]

For analysing trade restrictiveness to the imports from the developing following variables have been added, in addition to the above explanatory variables.

\[ M_{dit} = \text{Quantity of cotton woven fabrics imported from developing countries, in metric tonnes.} \]
\[ P_{dim} = \text{Unit value of imports from developing countries in U.K. £.} \]

For imports from India following variables have been added

\[ M_{it} = \text{Volume of cotton woven fabrics imports from India, in metric tonnes.} \]
\[ P_{im} = \text{Unit value of imports from India in £.} \]
For imports, from Hong Kong following variables have been added:

\[ H_{it} = \text{Quantity of cotton woven fabrics imports from Hong Kong in metric tonnes.} \]

\[ P^{H}_{im} = \text{Unit value of imports from Hong Kong, in \$}. \]

On the above enumerated variables the time-series data for 1954 to 1975 has been collected.\(^3\)

For estimating the trade restrictiveness in the U.S. market for cotton woven fabrics imports following variables have been considered.

\[ Q_{it} = \text{Volume of cotton woven fabrics imports in metric tonnes and million square yards (in most cases later data has been used)} \]

\[ D_{c} = \text{Apparent domestic consumption of cotton woven fabrics in metric tonnes.} \]

\[ V_{l} = \text{Unit value of imports in \$.} \]

\[ I_{m} = \text{Production of man-made fibres in metric tonnes.} \]

\[ L_{c} = \text{Mill-consumption of man-made fibres in metric tonnes.} \]

\[ D_{l} = \text{Per capita disposal income in cotton dollars} \]

\[ S_{p} = \text{Index of synthetic products prices (1957-59=100).} \]

\[ P_{c} = \text{Index of domestically produced cotton cloth prices (1957-59 = 100)} \]

\[ P_{c}/S_{p} = \text{Index of domestically produced cotton cloth prices over Index of synthetic product prices (1957-59=100).} \]

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3. For the description of each of the variables considered for the analysis, see Annexure 6.A and 6.B.
For analysing trade restrictiveness to imports from the developing countries, India and Hong Kong following variables have been added,

\[ Q^d_{it} = \text{Volume of cotton woven fabrics imports from developing countries in million sq. yards.} \]

\[ V_m = \text{Unit value of import in \$}. \]

\[ Q^I_{it} = \text{Volume of cotton woven fabrics imported from India in million square yards.} \]

\[ V^I = \text{Unit value of imports from India in \$.} \]

\[ Q^H_{it} = \text{Volume of cotton woven fabrics imported from Hong Kong in million sq. yards.} \]

\[ V^H = \text{Unit value of imports from Hong Kong in \$.} \]

On the above mentioned variables, the time series data has been collected from 1957 to 1975.\(^4\)

Similarly, for estimating trade restrictiveness of imports of cotton woven fabrics into West Germany following variables have been considered.

\[ G^m = \text{Volume of imports of cotton woven fabrics in metric tonnes.} \]

\[ U_v = \text{Unit value of imports in U.S. \$.} \]

\[ C_i = \text{Apparent domestic consumption of cotton woven fabrics, in metric tonnes.} \]

\[ F_i = \text{Production of man-made fibres in metric tonnes.} \]

\[ N_i = \text{Per capita income in U.S. dollars, in constant.} \]

Following variables have been included for analysis of trade restrictiveness for imports from the developing countries, India and Hong Kong.

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\(^4\) For details, see Annexure 6.C and 6.D.
$$G^d_m = \text{Volume of imports of cotton woven fabrics from developing countries in metric tonnes.}$$

$$U^d_v = \text{Unit value of import quantity of the developing countries cotton woven fabrics in US \$}.\)$$

$$G^I_m = \text{Volume of imports of cotton woven fabrics from India, in metric tonnes.}$$

$$U^I_v = \text{Unit value of imports of cotton woven fabrics from India in US \$.}$$

$$G^H_m = \text{Volume of imports of cotton woven fabrics from Hong Kong, in metric tonnes.}$$

$$U^H_v = \text{Unit value of imports of cotton woven fabrics from Hong Kong, in US \$.}$$

For this purpose time-series data for the years 1954 to 1975 have been collected. 5

For the market study of the U.K. and the U.S., the variables examined are nine each and in the case of West Germany it is five. The examined variables are less in the case of West Germany, on account of the non-availability of required data.

The imports of cotton woven fabrics into the above stated markets have been tested with the specific variables in linear and log-linear relations. For example, the linear relation function could be written:

$$M_{1t} = B_1 + B_2 C_d + B_3 P_{1m} + B_4 M_{FP} + B_5 M_{MC} + B_6 Y^d$$

$$+ B_7 M_P + B_8 C_P + B_9 C_p/M_P + U_1 \ldots \ldots \ldots (10)$$

Where, \(U_1\) Stochastic disturbance term.

5. For details see Annexure 6.E.
If we assume that imports of cotton woven fabrics represent a log-linear function, it could be written as,

\[
\log N_{it} = B_1 + B_2 \log C_d + B_3 \log P_{im} + B_4 \log M_{PP} + B_5 \log M_{MC} + B_6 \log y^d + B_7 \log M_{p} + B_8 \log C_p + B_9 \log C_p/M_p + U_i \quad \ldots \quad (11)
\]

On the basis of pre-quantitative restriction time-series data the relevant parameters could be estimated and the same assumed to hold true for the post-quantitative restriction period also. The hypothetical volume of imports for any year would be calculated from the estimating equation. Using the actual values for a given post-quantitative restriction year, or those parameters shown to be significant, and compared with actual imports volumes to find out the necessary restrictiveness of estimates.

The difficulty with using a fitted pre-quantitative restriction regression equation as an estimating technique is that the equation is likely to be non-linear. This may be due to rapid increase in imports just prior to imposition of the quantitative restriction. Hence, this element will have to be taken note of in the import projections. On the other hand, it might be possible to compare pre-quantitative restriction and post-quantitative restriction multiple regressions to detect downward shifts in the import
function itself, which may be attributable to the imposition of quantitative restrictions. Import function analysis and projections do have the advantage of not being based on elasticities and, if the specification of variables is reliable, represent a marked improvement over simple time-series analysis.

These are some of the methodological approaches which might be applied to an analysis of the restrictive effects of quantitative restrictions imposed by the developed countries on the imports of woven cotton fabrics. During the course of the research, it became evident that the availability of data severely limits the applicable choice of techniques. At the same time it also reduces the reliability of any methods that might be employed to assess the restrictiveness of quantitative import restriction as applied to this product group.

III

Evolving an Import Function

Application of partial-equilibrium and import function methodologies depends on the possibility of estimating the relevant elasticity values and establishing a reliable relationship between imports of cotton woven fabrics and a variety of other determining economic variables. Both these objectives would be served by a
multiple regression analysis of woven cotton fabrics imports on a number of elements thought to be determining ones. In fact, both linear and linear-logarithmic functions were employed. The preliminary analysis has been confined to linear function to analyse the time series data. In order to find out the best predictor explanatory variable, which affects the cotton woven fabrics imports, the step-wise regression method has been followed for all the three importing countries, namely, the United Kingdom, the United States and West Germany. Consequently in order to derive the import demand price elasticity, the important variables such as the unit value of the cotton woven fabrics imports and the per capita disposable income has been included in the multiple regression analysis.

(A) **Factors Affecting the Import Demand for Cotton Woven Fabrics (SITC 652) in the U.K. Market**

The dependent variable \(X_1\) is defined as the quantity of cotton woven fabrics imported per year from all sources. The independent variables used to explain fluctuations in \(X_1\) are:

\[
\begin{align*}
X_2 &= \text{Domestic consumption of cotton woven fabrics in the United Kingdom, in metric tons.} \\
X_3 &= \text{Domestic production of man-made fibres, in metric tons.} \\
X_4 &= \text{Mill-consumption of man-made fibres, in thousand metric tonnes.}
\end{align*}
\]
\[X_5 = \text{Unit value of cotton woven fabrics imports \& £.}\]
\[X_6 = \text{Per capita disposable income in constant \&.}\]
\[X_7 = \text{Index of man-made fibre product prices, 1954-56=100.}\]
\[X_8 = \text{Index of the UK produced cotton products prices, 1954-56 = 100.}\]
\[X_9 = \text{Index of the UK produced cotton products prices, 1954-56 = 100 \div \text{Index of man-made fibre product prices, 1954-56 = 100.}}\]

In addition to the above specified independent variables, dummy variables have also been assigned as and when necessary.

(8) **Factors Used in the Analysis**

The analysis is based on the time-series data for the years 1954 to 1975. These years were selected because of the reasonably normal post-war economic conditions in the cotton textile industry and trade in general. It is also because of the availability and continuity of data for this period.

Because of the high inter-correlations between some of the independent variables, the first part of the analysis was to select the best predictor variables from the groups that demonstrated high inter-correlations. The preliminary analysis showed that there was high inter-correlations between the following sets of independent variables: \(X_3\) and \(X_4\), \(X_7\) and \(X_9\) and \(X_8\) and \(X_9\). Between \(X_3\) and \(X_4\), \(X_3\) and in
the latter group \( X_9 \) was found to be the best predictor of imports of cotton woven fabrics into the United Kingdom. So, in the preliminary round \( X_4, X_7 \) and \( X_8 \) have been omitted. Further, in the course of the research, it was found that the multi-collinearity exist between \( X_2 - X_9 \) and \( X_3 - X_9 \). The stepwise regression correlation indicated that the ratio indices of domestic prices of the UK produced cotton products and man-made fibres have relatively little bearing on the import demand of cotton woven fabrics into the United Kingdom market as compared to the apparent domestic consumption of cotton woven fabrics (\( X_2 \)) and the production of man-made fibres (\( X_3 \)). As a result, it was decided to omit \( X_9 \) in further analysis.

In the summary, the preliminary analysis has reduced the independent variables to the following:

\[
\begin{align*}
X_2 &= \text{Apparent domestic consumption of cotton woven fabrics, in metric tonnes.} \\
X_3 &= \text{Production of man-made fibres, in metric tonnes.} \\
X_5 &= \text{Unit value of cotton woven fabrics in £.} \\
X_6 &= \text{Per capita disposable income in constant £.}
\end{align*}
\]

During the research it became evident that the demand for cotton woven fabrics imports may depend on two substitution effects. There was a high degree of technical substitutability between import of cotton woven fabrics and domestically produced cotton cloth. Also the domestic
textile manufacturers had the production facilities to substitute man-made fibres for cotton fibres. The increase in the production of cotton and synthetic fibres blend in several end-uses is an obvious factor.

First, apparent domestic consumption ($X_2$) is taken for explaining variations in imports to cotton woven fabrics, particularly in changes in imports due to changes in the consumption of cotton woven fabrics. Similarly, the production of man-made fibres ($X_3$), the unit value of imports ($X_5$) and per capita disposable income ($X_6$) indicate variations in imports due to changes in the rate of substitution, price and income respectively. The step-wise regression-correlation technique is employed for selecting explanatory variables in the order of the importance. Linear as well as Log functions have been used in the process. In order to find out the time-trend, the time variable ($t$) was included in dependent and independent variables. The following linear regression was employed.

$$X_{1t} = B_1 + B_2 X_{2t} + B_3 X_{3t} + B_4 X_{5t} + B_5 X_{6t} \quad \ldots \quad (12)$$

This form of equation failed to explain properly the variations in imports of cotton woven fabrics. The residual errors were large in the case of both dependent and independent variables. In the next step, dummy variables were introduced for the apparent domestic consumption
(X₂). This step was adopted because the imports into
the UK of cotton woven fabrics from the developing coun-
tries were subject to quantitative restrictions since 1961.
This import restriction has considerable impact on the
domestic consumption of cotton woven fabrics. However,
this procedure also failed to provide a satisfactory solu-
tion. In this context, it could be stated that the linear
form of function given by eq. (12) is inadequate to explain
the variations in the import of cotton woven fabrics into
the UK.

As a result, the log-linear function was adopted
to find out the variations in the imports of cotton woven
fabrics into the UK. The equation being as follows:

\[
\log X_{1t} = B_1 + B_2 \log X_{2t} + B_3 \log X_{3t} + B_4 \log X_{5t} +
B_5 \log X_{6t} \ldots \ldots \ldots (13)
\]

The step-wise regression procedure was adopted to
find out the best predictors of imports of cotton woven
fabrics. The apparent domestic consumption of cotton
woven fabrics (X₂) was found to be the most important
predictor. The equation is given below:

\[
\log X_{1t} = -9.632 + 1.607 \log X_{2t} \quad R^2 = .982526 \quad (14)
\]

The student 't' is significant at 1% level for both.
The second best variable selected according to this procedure was the unit value of imports of cotton woven fabrics ($X_5$) which is included in the following equation:

$$\log X_{1t} = -7.108 + 1.304 \log X_{2t} - 0.210 \log X_{5t} \tag{15}$$

$$R^2 = 0.992904$$

$$F = 1192.18$$

The student 't' is significant at 1% level for the constant ($B_1$) and other two independent variables. Addition of $\log X_{5t}$ did increase the $R^2$ by 0.009609. Finally, to estimate the demand elasticity of price for cotton woven fabrics, the theoretically important variables such as the per capita disposable income ($X_6$) and the production of man-made fibres ($X_3$) were included into the import function equation (16) and the result is as follows:

$$\log X_{1t} = -8.716 + 1.440 \log X_{2t} - 0.054 \log X_{3t} - 0.226 \log X_{6t} \tag{16}$$

$$\log X_{5t}$$

$$R^2 = 0.992717$$

$$F = 579.32$$

The student 't' is significant at 1% level for $X_{2t}$ and 5% level for $X_{5t}$.

The multiple correlation coefficient is very close to 1.00. The domestic consumption of cotton woven fabrics
(X_2) and the production of man-made fibres (X_3) indicates the correct sign as predicted by the theory, though 't' is not significant in the case of (X_3). The variable (X_5) appears to be a significant determinant of cotton woven fabrics imports and evidences the correct sign. The value of 't' is also significant at 5 per cent level. The income factor, that is the disposable per capita income (X_6) indicates the correct sign and shows that the income elasticity of demand is very low. However, the 't' is not significant. Nevertheless, it is present here to indicate a possible approach to the problem and the results of that approach.

It should be noted that the derived price elasticity of demand is -0.468, which is consistent with the UNCTAD study result of -0.58 in the case of selected developed countries.\(^6\) This import demand price elasticity is being applied to derive the magnitude of tariffs and quantitative restrictions in the UK market for cotton woven fabrics.

**Imports Cotton Woven Fabrics from the Developing Countries**

The step-wise regression method stated above was employed in the linear and log-linear form to evolve import

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functions cotton woven fabrics from the developing
countries also. It was found that the log-linear method
provided better results. So, this method was retained
for deriving the import demand price elasticity.

The following two variables were introduced in
place of $X_4$ and $X_5$.

$X_7 = \text{Imports of cotton woven fabrics from the developing}
\text{countries, in metric tonnes (dependent variable).}$

$X_8 = \text{Unit value of imports from the developing countries,}
in \mathcal{E}.$

Hence, the equation takes the following form:

$$\log X_{7t} = B_1 + B_2 \log X_{2t} + B_3 \log X_{3t} + B_4 \log X_{8t}$$
$$+ B_5 \log X_{6t} \quad \ldots \ldots \ldots \ldots \ldots \quad (17)$$

The step-wise regression selected the following
independent variables in the order of importance. In this
case, they are, $X_2$, $X_8$ and $X_3$. The equation is as follows:

$$\log X_{7t} = -11.849 + 1.8165 \log X_{2t}$$
$$\quad + 0.295 \log X_{3t} - 0.317 \log X_{8t} \quad \ldots \ldots \ldots \quad (18)$$

$$R^2 = 0.990678$$
$$F = 637.66$$

The 't' value is significant at 1 per cent level
in the case of $X_2$ and $X_8$ and significant at 5 per cent
level for $X_3$. 
All the independent variables indicate the correct sign as theoretically predicted. The derived import demand price elasticity of \(-0.317\) has been made use of in calculation.

**Imports of Cotton Woven Fabrics From India**

The step-wise linear and log-linear method has been employed to estimate the imports of cotton woven fabrics from India into the UK market. The problem of imports from India differs essentially from the earlier two cases, because of the quantitative restrictions on India, since 1961. This should be taken into account in the multiple-step-wise regression analysis. India did fulfil the fixed quota in the years 1963, 1964, 1968 and 1973 in the quota period. Perhaps, India had the capability to increase her cotton woven fabrics imports into the UK market in these years, but it was restricted by the quotas. In this situation the necessity of dummy variable becomes essential.\(^7\)

In order to estimate the import price elasticity of demand, the dummy variable has been specified and introduced into the analysis. The following variables have been added.

\[ X_9 = \text{Imports of cotton woven fabrics from India, in metric tonnes (dependent variable).} \]

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\[ X_{10} = \text{Unit value of cotton woven fabrics, imports from India, in £.} \]

\[ X_{11} = \text{Dummy variable, which takes zero for the years when the quota is fulfilled, otherwise one for the other years. This variable has been used with } X_2. \]

So, the equation takes the following form:

\[ X_{9t} = B_1 + B_2 X_{2t} + D X_{11t} + B_3 X_{3t} + B_4 X_{10t} + B_5 X_{6t} \quad (19) \]

The step-wise regression method selected the following variables in the order of importance, \( X_2, X_{11}, X_3, X_6 \) and \( X_{10} \). Finally, the following equation was the result:

\[ X_{9t} = 40532.83 + .196 X_{2t} - .187 X_{3t} - 19.759 X_{10t} \]
\[ + 31.926 X_{6t} - .463 X_{11t} \quad \ldots \ldots \ldots \ldots (20) \]
\[ (111409.95) \quad (.033) \quad (.048) \quad (5.537) \]

\[ r^2 = .921446 \]
\[ F = 37.53 \]

The 't' values are significant at 1 per cent level for all the independent variables, except the constant term, which is insignificant. However, the independent variables indicate the correct sign. The constant \((B_1)\), \(X_6\) and \(X_{10}\) show very high errors. Besides, the residual errors are also very high. This explains the inadequacy of the linear function, which is not quite suited to explain variations in the imports cotton woven fabrics from India.

So, the log-linear method was employed. The equation obtained is as follows:
\[ \log X_{9t} = 110.387 + 1.991 \log X_{2t} - 0.513 \log X_{3t} \]
\[ (4.539) \quad (4.938) \quad (2.94) \]
\[-0.224 \log X_{10t} + 0.874 \log X_{6t} \quad \ldots \ldots \ldots \quad (21) \]
\[ R^2 = 0.951649 \]
\[ F = 83.649 \]
\[ (D.W. = 1.56) \]

The 't' value for \( X_2 \) is significant at 1 per cent level and \( X_3, X_6 \) and \( X_{10} \) at 5 per cent level. These statistics indicate a high precision. On the basis of the above estimate the price elasticity of the import demand for imports for cotton woven fabrics has been -0.224. This value is being made use of to estimate the imports of cotton woven fabrics from India to the UK market.

**Imports of Cotton Woven Fabrics from Hong Kong**

The linear and log-linear step-wise regression is employed here also for estimating the import demand price elasticity for the imports of cotton woven fabrics from Hong Kong into the UK market. The dummy variable is being used to take care of the quota fulfilment years. Hong Kong did hit the quota level in 1963, 1964 and 1973, for these years the variable dummy value assigned is zero and for rest of the years it will be one. The following variables are included in this analysis.
\( X_{12} = \) Imports of cotton woven fabrics from Hong Kong, in metric tonnes (dependent variable).

\( X_{13} = \) Unit value of cotton woven fabrics imported from Hong Kong in £.

\( X_{14} = \) Dummy variable, used with \( X_2 \)

The linear form equation is as follows:

\[
X_{12t} = B_1 + B_2 X_{2t} + \gamma (\text{D} X_{14t}) + B_3 X_{3t} + B_4 X_{6t} + B_5 X_{13t} \quad \ldots \ldots \ldots \ldots \quad (22)
\]

The step-wise linear regression selected \( X_2, X_3 \) and \( X_{14} \) in the order of importance. Finally, following equation was derived:

\[
X_{12} = -76203.71 + .096 X_{2t} + .042 X_{3t} + .199 X_{14t} \quad \ldots \quad (23)
\]

\[
(36949.06) \quad (0.15) \quad (0.013) \quad (0.092)
\]

\[
R^2 = .946816 \quad F = 106.81
\]

The 't' value for \( X_2 \) and \( X_3 \) is significant at 1 per cent level and \( X_{13} \) at 5 per cent level. The residual errors are high. The variable \( X_3 \) indicated an opposite sign (contrary to the expectation), so it is a conceptual error. To improve the estimate, the log-linear method was employed. The estimated equation:

\[
\log X_{12t} = -16.642 + 2.18 \log X_{2t} + .15 \log X_{3t} \quad \ldots \quad (24)
\]

\[
(4.065) \quad (4.63) \quad (4.30)
\]

\[
\log X_{6t} - 0.332 \log X_{13t} \quad \ldots \ldots \quad (24)
\]

\[
(0.558) \quad (0.357)
\]

\[
R^2 = .975756 \quad F = 171.06 \quad D.W. = 1.742
\]
The 't' value is significant at 1 per cent for $X_2$ and insignificant for other variables. It should be noted that the variable $X_3$ remained in contrary to the theoretical belief. The derived import demand price elasticity being -0.332, which can be made use of in estimating the trade restrictions for imports of cotton woven fabrics from Hong Kong into the UK market.

**ANALYSIS OF THE UNITED STATES MARKET**

**Factors Affecting the Import Demand for Cotton Woven Fabrics in the US Market**

The dependent variable $Y_1$ is defined as the quantity (in million sq. yards) of cotton woven fabrics imported from all sources during the year $(t)$. The independent variables used in the analysis are as follows:

- $Y_2$ = Apparent domestic consumption of cotton woven fabrics into the US in metric tonnes.
- $Y_3$ = Production of man-made fibres in metric tonnes.
- $Y_4$ = Mill-consumption of man-made fibres in thousand metric tonnes.
- $Y_5$ = Unit value of imports in $\$$.
- $Y_6$ = Per capita disposable income in constant dollars.
- $Y_7$ = Index of the synthetic prices 1957-59 = 100.
- $Y_8$ = Index of the US produced cotton cloth prices, 1957-59 = 100.
- $Y_9$ = $(Y_8 \div Y_7) \times 100.$
- $Y_{10}$ = Index of import unit value, 1957-59 = 100 $\div$ Index of US produced cotton cloth prices 1957-59 = 100.
Dummy variables have also been used, besides the above specified variables.

Variables used in the Analysis

The analysis is based on the time-series data for the years 1957 to 1975. This period has been selected because of the availability of comparable data for the selected variables. In the preliminary analysis itself some independent variables have been dropped due to high inter-correlations, and the rest of the variables have been retained. Left out variables are $Y_4$, $Y_7$ and $Y_8$. In order to avoid inter-correlation problems among the selected variables step-wise linear regression method has been tried. The step-wise linear regression did reveal that $Y_6$ and $Y_5$ are the most dominant variables in explaining the variations in the import of cotton woven fabrics into the US market. $Y_6$ alone indicated $R^2$ to the extent of .8552 and $Y_5$ by .0715 variations in imports. These variables also exhibited the correct sign as conceptually predicted by the economic theory. However, the linear method indicated large residual errors with respect to the constant term and in other two variables. So, the log-linear step-wise regression was tried by converting $Y_1$, $Y_2$, $Y_3$, $Y_5$ and $Y_6$ into index numbers by fixing the base at 1957-59 = 100. This was done because other variables such as $Y_9$ and $Y_{10}$
were non-convertible into absolute quantities. The step-wise log-linear regression selected \( Y_6, Y_5, Y_{10} \) and \( Y_9 \) in the order of importance in explaining the variations in \( Y_2 \). The equation being as follows:

\[
\log Y_{1t} = -1.176 + 1.471 \log Y_{6t} - 0.340 \log Y_{5t} \\
-0.806 \log Y_{10t} + 0.909 \log Y_{9t} \ldots \ldots \ldots (25)
\]

\[
R^2 = 0.98899 \\
F = 315.394 \\
D.W. = 1.699
\]

The 't' value for \( Y_6 \) and \( Y_{10} \) is significant at 1 per cent and 5 per cent level respectively.

However, in order to estimate the reliable import demand price elasticity in the next step \( Y_9 \) and \( Y_{10} \) have been eliminated by which the following equation is obtained.

\[
\log Y_{1t} = -1.193 + 2.103 \log Y_{6t} - 0.855 \log Y_{5t} \ldots (26)
\]

\[
R^2 = 0.985639 \\
F = 549.101 \\
D.W. = 1.696
\]

The 't' value for \( Y_5 \) and \( Y_6 \) is significant at 1 per cent level. The derived import demand price elasticity of -0.855 is reliable. This being used, to estimate
the import trade projections, thereby the import restrictiveness in the US market for cotton woven fabrics.

**Imports of Cotton Woven Fabrics from the Developing Countries**

By introducing the following two variables, an analysis was carried out to estimate the import demand price elasticity for the imports of cotton woven fabrics from the developing countries into the US market. The time-series data used refer to the period 1959 to 1975. The variables introduced are:

\[ Y_{11} = \text{Imports of cotton woven fabrics from the developing countries, in million square yards.} \]

\[ Y_{12} = \text{Unit value of imported cotton woven fabrics from the developing countries in $\$.} \]

\[ Y_{13} = \text{Unit value index of cotton woven fabrics (1959-61 = 100) imported from the developing countries ÷ the index of US produced cotton cloth prices (1959-61 = 100).} \]

The equation used is as follows:

\[
\log Y_{11t} = B_1 + B_2 \log X_{6t} + B_3 \log Y_{12t} + B_4 \log Y_{13t} + B_5 \log Y_{9t} \quad \ldots \quad (27)
\]

The equation obtained is:

\[
\log Y_{11t} = -2.608 + 0.988 \log Y_{6t} + 0.125 \log Y_{12t} - 0.736 \log Y_{13t} + 1.104 \log Y_{9t} \\
(6.803) (0.998) (0.584) (0.839) (1.131)
\]
\( R^2 = .968901 \)
\( F = 93.467 \)
\( D.W. = 1.871 \)

The 't' value is not significant for all the variables. The independent variable \( Y_{12} \) - is indicating the opposite sign which is in conceptual error. To derive the import demand price elasticity log-linear equation was fitted with \( Y_6 \) and \( Y_{12} \) in the order of importance. The following equation is the result:

\[
\log Y_{11t} = -1.983 + 1.694 \log Y_{6t} - .319 \log Y_{12t} \quad \cdots (28)
\]

\( R^2 = .966231 \)
\( F = 200.292 \)
\( D.W. = 2.013 \)

The 't' value is significant at 1 per cent and 5 per cent level respectively for \( Y_6 \) and \( Y_{12} \). The derived import demand price elasticity is \(-.319\). This could be made use of in projecting the hypothetical imports and thereby import restrictions on cotton woven fabrics, from the developing countries into the US market.

Imports of Cotton Woven Fabrics from India

The time-series data used for the analysis refers to 1959 to 1975 period. Prior to this period, imports of cotton woven fabrics from India to the US had been insignificant both in quantum and value. Imports from India into
the US increased just prior to the imposition of quantitative restrictions. India did fulfill the allotted import quota in the year 1964, 1965, 1966, 1972 and 1973. India would have increased her imports to the US in the absence of quantitative restrictions during these years. To isolate this effect, the dummy variable has been included in the linear equation. However, the linear method failed to explain the variations in imports, so the log-linear method was resorted to. The following variables have been included.

\[ Y_{14} = \text{Imports of cotton woven fabrics from India in million sq. yards.} \]

\[ Y_{15} = \text{Unit value of cotton woven fabrics imported from India, in US \\} \\]

\[ Y_{16} = \text{Unit value index of cotton woven fabrics imported from India (1959-61 = 100) \over \text{The Index of the US produced cotton cloth prices (1959-61 = 100).}} \]

\[ Y_{17} = \text{Dummy variable, when the allotted quota is fulfilled for that year the dummy takes zero value, otherwise it is one.} \]

The linear-step-wise regression with dummy variable failed to explain the variations in the imports of cotton woven fabrics from India. The variables such as \[ Y_{15} \text{ and } Y_{16} \] indicated the wrong sign, the error terms also showed high values. In the light of these facts, the following log-linear method has been employed. The step-wise log-linear selected the following variables in the order of importance in explaining the variations in the
Imports of cotton woven fabrics from India, they are $Y_6$, $Y_{15}$, $Y_{16}$ and $Y_9$ in order of importance. By employing these variables, the following equation has been obtained.

$$\log Y_{14t} = -0.132 + 2.836 \log Y_{6t} - 0.517 \log Y_{15t}$$

$$+ 0.292 \log Y_{16t} - 1.562 \log Y_{9t} \quad \ldots \ldots \quad (29)$$

$$R^2 = 0.875907$$
$$F = 21.175$$
$$D.W. = 1.774$$

The 't' values are not significant at 5 per cent level, however, this is being the best estimator in estimating the import demand price elasticity. The derived import demand price elasticity of $-0.517$ has been used in calculating the possible volume of import from India into US market.

**Imports of Cotton Woven Fabrics from Hong Kong**

The data used for the analysis relates to the period 1959 to 1975. The reasons stated in the case of India in this context are valid for Hong Kong also. During the quota period the Hong Kong was able to hit the quota ceiling 8 times. This indicates that she would have been able to increase her exports to the US more than what the data for those period indicates. To isolate this effect, the dummy variable has been introduced into the regression equation. The linear-regression did not provide
better fit and also fails to explain the variations in imports.

The log-linear method fitted well. The following variables have been employed on the basis of step-wise regression method.

\[ Y_{18} = \text{Imports of cotton woven fabrics from Hong Kong in million square yards.} \]

\[ Y_{19} = \text{The unit value of imports of cotton woven fabrics from Hong Kong, in US $.} \]

\[ Y_{20} = \text{Unit value index of cotton woven fabrics imported from Hong Kong (1959-61 = 100) ÷ the index of the US produced cotton cloth prices (1959-61 = 100).} \]

The following log-linear multiple regression equation has been obtained.

\[
\log Y_{18t} = 2.280 + .015 \log Y_{6t} - .566 \log Y_{19t} \\
- 1.42 \log Y_{20t} + 2.476 \log Y_{9t} \ldots \ldots \ldots (30)
\]

\[ R^2 = .969185 \]
\[ F = 274.415 \]
\[ D.W. = 1.955 \]

The 't' value for \( Y_{19} \), \( Y_{20} \) and \( Y_{9} \) is significant at 5 per cent level. The obtained equation indicates a high level of precision. The estimated import demand price elasticity is -.566 which seems to be more reliable, by indicating the correct sign. The above estimated import demand price elasticity has been used in calculating the hypothetical imports from Hong Kong to the US.
Analysis of the West Germany's Market

The analysis of the West Germany's import demand for cotton woven fabrics poses several serious problems. The most important among them are: (i) restrictions were imposed on imports according to the "Noordwijk agreement" as early as in 1950s, so, the import data available do not reflect the probable imports at any point of time in the absence of restrictions, and (ii) imports from the EEC countries and its associate members are liberal and further, no restrictions were imposed on them. This policy of the West Germany severely limited the imports from the developing countries. Besides, the availability of the time-series data is also extremely limited. The independent variables used for the analysis has been limited to four. They are:

\[ W_1 = \text{Imports of cotton woven fabrics, in metric tonnes (dependent variable).} \]

\[ W_2 = \text{Apparent domestic consumption of cotton woven fabrics in metric tonnes.} \]

\[ W_3 = \text{Production of man-made fibre, in metric tonnes.} \]

\[ W_4 = \text{Unit value of imports, in US \$}. \]

\[ W_5 = \text{Per capita income, in US \$ in constant (1970 prices).} \]

The time-series data selected for the analysis refer to the period 1954 to 1975. The step-wise multiple linear regression and log-linear multiple regression method has been employed to select the dependent variables in the
order of importance. The step-wise multiple linear regression selected $w_5$ and $w_3$ and log-regression indicated $w_5$ and $w_2$ as important variables. To find out the import demand price elasticity both the methods have been tested with the above mentioned independent variables. It became evident that the linear method fitted well. So, the following equation has been adopted.

$$W_{it} = -3.252 + 13.697 w_5 t - 1.535 w_4 t$$

$$R^2 = .988687$$
$$F = 369.468$$
$$D.W. = 2.324$$

The 't' value for $w_5$ is significant at 1 per cent level and for other variables insignificant, variable $w_3$ in conceptual error. However, it explains .988 variations in the import of cotton woven fabrics into the West Germany. Derived import demand price elasticity of -1.535 has been made use of in deriving the possible imports of cotton woven fabrics into West Germany.

**Imports of Cotton Woven Fabrics from the Developing Countries**

A similar method has been applied to derive the import demand price elasticity for the imports of cotton woven fabrics from the developing countries. The log-linear
method fitted well for this group of time-series data. The following variables are included:

\[ W_6 = \text{Imports of cotton woven fabrics imported from the developing countries, in metric tonnes.} \]

\[ W_7 = \text{Unit value of imports of cotton woven fabrics from the developing countries, in US \\$.} \]

The step-wise regression selected \( W_7, W_2, W_5 \) and \( W_3 \) in the order of importance in explaining the variations in the imports of cotton woven fabrics from the developing countries. The derived equation is as follows, with the inclusion of time-factor.

\[
\log W_{6t} = -1.333 - 0.913 \log W_{7t} - 1.065 \log W_{2t} \\
(0.476) (0.665) (1.101)
\]

\[
+ 0.800 \log W_{5t} + 0.280 \log W_{3t} \ldots \ldots \ldots (32) \\
(0.823) (0.512)
\]

\[ R^2 = 0.925847 \]
\[ F = 53.064 \]
\[ D.W. = 2.024 \]

The 't' value is significant for \( W_7 \) at 5 per cent level, for other variables it is insignificant. Derived import demand price elasticity \(-0.913\) seems to be valid in the experiences of many developing countries. However, it should be noted that \( W_2 \) and \( W_3 \) are showing opposite signs which are contrary to the theoretical belief.
Imports of Cotton Woven Fabrics from India

The time-series data used for the analysis refer to the period 1958 to 1975. A similar method of step-wise regression has been employed. The dummy variable is used in the step-wise linear regression for the years in which India fulfilled the allotted quota in the West Germany market. However, the linear regression function did not fit well. Hence, the log-linear regression method has been fitted, including following variables.

\( W_8 \) = Imports of cotton woven fabrics from India in metric tonnes.

\( W_9 \) = Unit value of cotton woven fabrics imported from India, in US $.

The following equation has been derived.

\[
\log W_{8t} = -21.809 + 1.581 \log W_{5t} - 1.35 \log W_{9t} \\
( .410 ) \quad ( .886 ) \quad ( .666 ) \\
+ 1.839 \log W_{2t} + .054 \log W_{3t} \quad \cdots \quad (53) \\
( .738 ) \quad \quad ( .049 )
\]

\( R^2 = .918856 \)

\( F = 36.802 \)

\( D.W. = 1.797 \)

The 't' value for \( W_5 \) and \( W_9 \) is significant at 5 per cent level.
The variable \( W_3 \) indicates an opposite sign. However, the derived import demand price elasticity seems to be valid and is being utilised to derive the hypothetical imports of cotton woven fabrics from India into the West Germany's market.

**Imports of Cotton Woven Fabrics from Hong Kong**

The data used for the analysis refer to the period 1958 to 1975. The method used for the analysis of imports from India has been employed here also. However, the log-linear method fitted well. The following two variables are introduced, thereby obtaining the equation 34.

\[
W_{10} = \text{Imports of cotton woven fabrics from Hong Kong in metric tonnes.}
\]

\[
W_{11} = \text{Unit value of cotton woven fabrics imported from Hong Kong in US \$.}
\]

\[
\log W_{10t} = 13.363 + 2.195 W_{5t} - 0.999 \log W_{11t}
\]

\[
(0.386) \quad (0.845) \quad (0.535)
\]

\[
- 1.522 \log W_{2t} + 0.309 \log W_{8t} \cdots (34)
\]

\[
(1.267) \quad (0.980)
\]

\[
R^2 = 0.741398
\]

\[
F = 9.317
\]

\[
D.W. = 1.220
\]

The 't' value for \( W_5 \) and \( W_{11} \) is significant at 5 per cent level. However, the derived import demand
price elasticity of -.999 could be made use of in estimating the hypothetical imports of cotton woven fabrics from Hong Kong into West Germany.

However, in applying these estimated equations to the 1974 and 1975 data for each of the three importing countries, imports from the developing countries, India and Hong Kong show that their actual imports fall below the level of hypothetical imports. This in a large measure is because the equations do not take into account the salient features on the supply side, nor differences in the quality of traded -product sub-groups, data for which are unavailable. Besides these constraints, the log-linear method do not capture the quota effect on the import demand. The imposition of quota itself distorts the domestic prices, relative prices of substitutes vis-a-vis import competing products. These kinds of considerations, and non-availability of required data on various other factors which influence the imports of cotton woven fabrics, restricts the validity of the analysis and precludes its use as a reliable estimating technique.

Test of Auto-Correlation

One of the official assumptions of the least square estimation procedure used here is the serial independence of the disturbance term. If the successive disturbances
are auto-correlated, the resulting variances of the regression estimates may be understated, which means that the tests of the hypothesis may not be valid at the specified criterion of significance. The cause of auto-correlation may be the omission of important explanatory variables which introduce a cyclic or secular trend in the regression residual.

To test serial correlation in the disturbances, the Derbin-Watson test statistic is made use of and auto-correlation is found to be present in equations Nos. (21), (24), (29) and (34). Since the calculated Derbin-Watson Statistics fell in between the critical values, the null-hypothesis was not rejected. Therefore, the test for serial-correlation in the regression disturbance term, is inconclusive in the above mentioned equations. In other valid equations, the calculated Derbin-Watson Statistic fell outside the critical values and so the null-hypothesis has been accepted. The test for serial-correlation in the regression disturbance term, therefore, is conclusive.
## Table: Variables Used in the Multiple Regression and Correlation Analysis - Relating to the U.S. Market

| Year (adj) | H_1 | C_d | P_d | H_P | H_WC | T_G | H_P | C_P | H_P | H_WT | P_1n | N_1n | P_1n | N_1n | P_1n | N_1n | P_1n | N_1n | P_1n | N_1n |
|-----------|-----|-----|-----|-----|------|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|
| 1950      | 35673 | 243397 | 513.30 | 122900 | 11.00 | 232 | 100.30 | 101.72 | 191.99 | 43.52 | 16757 | 786.75 | 3346 | 451.83 |
| 1955      | 41079 | 282356 | 513.83 | 121900 | 12.00 | 257 | 97.39 | 99.49 | 92.57 | 213.19 | 16896 | 100.07 | 401.66 | 201.16 |
| 1960      | 43757 | 271803 | 516.68 | 229000 | 22.00 | 289 | 97.39 | 98.47 | 91.11 | 208.16 | 127.99 | 16513 | 408.42 | 916.22 |
| 1965      | 26610 | 224235 | 531.21 | 131200 | 33.00 | 234 | 100.50 | 99.69 | 92.29 | 208.84 | 12666 | 115.13 | 12104 | 478.84 |
| 1970      | 56452 | 214755 | 509.14 | 303000 | 31.00 | 238 | 100.90 | 98.86 | 95.98 | 426.10 | 141.81 | 16947 | 97.38 | 20222 |
| 1975      | 78732 | 236032 | 591.23 | 390000 | 39.40 | 311 | 102.30 | 94.55 | 89.67 | 55797 | 39.26 | 23252 | 777.23 | 20978 |
| 1980      | 10361 | 238339 | 585.46 | 610000 | 65.00 | 324 | 112.33 | 105.49 | 93.91 | 77478 | 65.00 | 33067 | 426.93 | 18029 |
| 1985      | 10406 | 236512 | 608.01 | 662000 | 63.50 | 338 | 114.64 | 108.44 | 94.29 | 51350 | 473.97 | 25253 | 428.58 | 18103 |
| 1990      | 89215 | 202104 | 568.69 | 829000 | 72.80 | 355 | 113.13 | 98.47 | 87.04 | 50970 | 49.28 | 23838 | 376.11 | 21910 |
| 1995      | 94763 | 202733 | 575.94 | 102900 | 92.20 | 425 | 116.43 | 93.94 | 89.70 | 57002 | 45.76 | 26799 | 402.38 | 18412 |
| 1996      | 110069 | 241102 | 565.01 | 115290 | 112.90 | 433 | 113.03 | 105.54 | 90.72 | 69997 | 40.65 | 31665 | 420.52 | 17744 |
| 2000      | 90507 | 210575 | 551.50 | 115600 | 137.00 | 462 | 116.24 | 105.51 | 91.63 | 51651 | 471.44 | 22908 | 441.38 | 19866 |
| 2001      | 84361 | 199560 | 573.03 | 118000 | 155.80 | 488 | 117.75 | 108.23 | 92.24 | 53167 | 423.26 | 20657 | 422.72 | 23340 |
| 2002      | 93589 | 182994 | 585.00 | 803995 | 162.40 | 507 | 116.75 | 107.62 | 93.79 | 58078 | 45.43 | 22653 | 433.02 | 21078 |
| 2003      | 100936 | 197973 | 673.10 | 112855 | 235.80 | 539 | 118.35 | 120.04 | 101.43 | 61812 | 52.96 | 24625 | 579.16 | 19970 |
| 2004      | 77395 | 166974 | 752.11 | 121335 | 259.80 | 570 | 120.96 | 129.9 | 105.64 | 48140 | 560.66 | 16882 | 570.79 | 17506 |
| 2005      | 67028 | 147119 | 792.08 | 124823 | 270.90 | 622 | 126.67 | 139.37 | 110.35 | 40292 | 777.02 | 12803 | 577.13 | 18159 |
| 2006      | 89206 | 193300 | 853.42 | 102608 | 88.60 | 652 | 133.19 | 142.91 | 114.16 | 56308 | 612.86 | 15587 | 546.70 | 17900 |
| 2007      | 74500 | 13100 | 1026.44 | 117970 | 318.70 | 793 | 135.03 | 155.97 | 109.05 | 43167 | 638.35 | 12971 | 546.48 | 13263 |
| 2008      | 95700 | 134400 | 1080.70 | 90938 | 400.30 | 911 | 165.98 | 165.98 | 100.88 | 61401 | 726.97 | 31224 | 686.88 | 26856 |
| 2009      | 78899 | 122379 | 1566.06 | 118651 | 365.50 | 1077 | 221.96 | 270.49 | 181.45 | 47970 | 124.77 | 17151 | 112.64 | 2298 |
| 2010      | 77587 | 125650 | 1511.64 | 132078 | 355.50 | 1377 | 246.62 | 355.46 | 107.64 | 44254 | 399.37 | 8621 | 1471.91 | 14612 |

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### Notes:
1. Col. No. 1, 10, 12, 14 = Data from U.S. Customs Trade Statistics, corrected D of various years.
2. Col. No. 3, 11, 13, 15 = Values and quantities obtained from UN Commodity Trade Statistics, corrected D of various years. To derive the unit value in $, the value (in dollars) was divided by quantity (in metric tons) and then it was converted into £ by the respective year's exchange rate. The exchange rate data used was obtained from the Annual Abstract of Statistics for Great Britain (Government Statistical Office, London, of various years).
3. Col. No. 6, 7, 8 = Data collected from Annual Contract of Statistics (Government Statistical Office, Great Britain, London) for various years.
4. Col. No. 2, 4, 8 = Data from OECD, Textile Industry in OECD countries (OECD, Paris) for various years.
5. Col. No. 5 = Data from Cotton World Statistics Quarterly Bulletin of International Cotton Advisory Committee (Washington D.C.) for various years.
6. Col. No. 9 = Derived from Col. No. 3 + Col. No. 7 X 100.
### The Data Used for the U.K. Harvey Analysis

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**Sources:**
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- $A_5$ and $A_6$ calculated on the basis of consumption $G(t)$.

**Note:** $A_7$ and $A_9$ are not shown in the table.
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**DATE SOURCES:**

| 1 | Obtained from the U.S. General imports, Schedule A, commodity by country, FT 135, U.S. Bureau census (Washington DC) for concerned years, and compared with U.S. commodity Trade Statistics Series D and cotton-world statistics, quarterly bulletin of International Cotton advisory committee (Washington DC). |
| 2 | OECD, The Textile Industry (Paris) for concerned years (the apparent domestic consumption = production + imports - exports). |
| 3 | 10 to 15 is referred to 1, 3, 11, 13, and 15 calculated by obtaining total import volume and value data, unit value refer to per sq. yard. |
| 4 | OECD, The Textile Industry (Paris) for concerned years. |
| 5 | Cotton-world statistics (as referred above). |
| 6 | Census, 7 and 8 | Federal reserve bulletin of various years (Washington DC). |
| 9 | Calculated. |
### ANEXE 6-D.

**THE DATA USED FOR THE US MARKET ANALYSIS**

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### NOTES:

- **B_1** Quantum index of cotton woven fabrics (SITC 5-9) imported from India in the US base 1959-61 = 100.
- **B_2** Unit value index of cotton fabrics imported from India in the US base 1959-61 = 100.
- **B_3** Quantum index of cotton woven fabrics imported from Hong Kong in the US base 1959-61 = 100.
- **B_4** Unit value index of cotton woven fabrics imported from Hong Kong in the US base 1959-61 = 100.
- **B_5** 
  
  \[ \frac{1}{100} \times B_5 \times 100 \]  
  base 1959-61 = 100.
- **B_6** 
  
  \[ \frac{1}{100} \times B_6 \times 100 \]  
  \text{US} \text{dollars}.
- **B_7** 
  
  \[ \frac{1}{100} \times B_7 \times 100 \]  
  \text{US} \text{dollars}.
- **B_8** 
  
  \[ \frac{1}{100} \times B_8 \times 100 \]  
  \text{US} \text{dollars}.
- **B_9** 
  
  \[ \frac{1}{100} \times B_9 \times 100 \]  
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Index of per capita income (in constant dollars in 1958 prices) of the U.S. 1959-61 = 100.
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* In 1970 Prices.

**DATE SOURCES:**

1, 6, 8, and 10 - U.S. Censal Yearbook statistics, series B of Concerned Years.

2, 7, 9, and 11 - Value data obtained from above sources and unit value for metric tons has been calculated.

3, and 4 - USGS, The Textile Industry (Facts) for Concerned Years. (2) Calculated (Production + Imports - Exports.)