CHAPTER II
REVIEW OF LITERATURE

2.1 Introduction

There are numerous studies examining the behavior of trade flows both for India and abroad. These studies covered both manufactured goods and primary commodities at aggregate and disaggregate levels. The context of the studies and methodology adopted is diverse which makes it difficult to have comparisons of the studies in their entirety and on the basis of common criteria. Still an examination of the outcomes will help to identify significant trends. Keeping in view the scope of the present study some of the relevant empirical studies were reviewed in this chapter so as to have a strong base for the present study. These studies have been categorized under the following headings:

1) Studies on Trade Modeling.
2) Studies on Determinants of Indian Exports
3) Studies on Determinants of Indian Agricultural Exports.
4) Studies on Indian Spices Exports
5) Studies on export instability.
6) Studies on export instability related to India.

The various observations from the review of the above mentioned studies are summarized in section 2.2 and the rationale for the study is explained in section 2.3.

2.2 Studies on Trade Modeling

Modeling the behaviour of foreign trade flows was one of the most active areas of empirical investigation in the field of International Economics during the last four and
half decades. Availability of relevant data, familiar theoretical framework, and policy relevance of the estimates are some of the reasons for this unusual degree of attention. Foreign trade flows behaviour is generally investigated by estimating trade equations. By trade equations, we mean equations for the time-series behavior of quantities and values of merchandise imports and exports. What follows is a brief review of some of the important empirical studies that appeared in this area of research.

Early (1936-57) estimates of income propensities and price elasticities have been surveyed and evaluated by Cheng ¹ (1959) and by Prais ² (1962). Five reasons for elasticity pessimism was given by Orcutt ³ (1950), and the problem of simultaneous equation bias is one of them. Leamer and Stern ⁴ (1970) disapproved the elasticity pessimism of Orcutt based on the post war elasticity estimates. Their book also provides among other things, a lucid discussion of the time-series estimation of import and export demand relationships. Taplin ⁵ (1973) examined early world trade models. An exhaustive analysis of methodological and empirical issues in trade modeling is provided in Magee’s Trade Survey ⁶ (1975) and more recent multi country trade models have been gauged by Deardorff and Stern ⁷ (1977).

Khan ⁸ (1974), has investigated for the period 1951-1969, the various determinants of exports employing annual data for individual countries using the following specification for export demand function:

$$\log X^d_{it} = b_0 + b_1 \log (PX_i/ PW_t) + b_2 \log W_t + v_t$$

where,

- $X_i$ is the quantity of exports of country $i$,
- $PX_i$ is the unit value of exports of country $i$,
PW is world price level, and W is the real world income (proxied by OECD real GNP). Since each variable is defined in logarithmic terms, the estimated coefficients are the elasticities of exports with respect to the corresponding variables. Having estimated these functions using OLS, Khan reported that the prices did play an important role in the determination of exports of developing countries validating the Marshall-Lerner Condition. Warner and Kreinin (1983) have also employed a similar model, but their approach is different from Khan in that there are two distinct investigation periods, the periods of fixed and flexible exchange rate regimes. The export demand equation of Warner and Kreinin was described by:

\[ \ln X_i = a_0 + a_1 \ln Y_{Wi} + a_2 \ln P_{X_i}^{LC} + a_3 \ln E_i + a_4 \ln E_i^p + a_5 \ln P_{comp}^{FC} + u_i \]

where,

- \( X_i \): is the volume of the country's exports,
- \( Y_{Wi} \): is the weighted average GDP of 23 major importing countries facing country \( i \),
- \( P_{X_i}^{LC} \): is the export unit value index of the country \( i \) \((1974=100)\),
- \( E_i \): is the effective exchange rate index of country \( i \)'s currency \((1975=100)\),
- \( E_i^p \): is the expected rate of change in the exchange rate, which is proxied by \( E^p = [0.7(\log E_t - \log E_{t-1}) + 0.3(\log E_{t-1} - \log E_{t-2})] \)
- \( P_{comp}^{FC} \): is the average export price of 64 competing countries expressed in foreign currencies, weighted by each competing country's exports into each of the markets. Having estimated the demand for exports using OLS technique, Warner and Kreinin reported that the exchange rate and the export price of competing countries are found to be powerful determinants of a country's exports.

A detailed discussion of the specification of foreign trade equations and their theoretical foundations was given by Winters (1984). A universal assumption of
models allocating a country's imports among suppliers is that demand is separable over foreign and domestic sources. Nearly as common are the assumptions that export demands are homothetic and mutually separable. This paper explores the theoretical implications of these assumptions and then tests them, applying to U.K. data on manufactures covering 1952–1979. It uses Lagrange Multiplier tests. Both homogeneity and separability are overwhelmingly rejected. A model of export demand without these restrictions is introduced which, while not entirely satisfactory, suggests a direction for future research

Goldstein and Khan (1985) in their survey article tried to update and expand upon the methodological issues as they proposed two general models of trade: Imperfect Substitute Model and the Perfect Substitutes Model. The fundamental assumption underlying the imperfect substitutes model is that neither the imports nor the exports are perfect substitutes for the domestic products. Perfect substitutes model on the other hand, assumes perfect substitutability between domestic and foreign goods and is typically used in case of homogeneous goods. Since, under the key assumptions of perfect substitutes model each country would be only an exporter or an importer of a traded good and not both, which is not observed in real world this model has attracted much less attention in the empirical literature than the imperfect substitutes model. These two models are usually perceived as competitors, but Goldstein and Khan suggest their possible coexistence. One should be applied in case of differentiated products and the other in case of highly homogeneous products. The framework of the imperfect substitution model as formalized by the authors can be written as follows:
\[
X_d = F (Y_w, P_x, P_w) \quad (1)
\]
\[
X_s = F (P_x, P_d) \quad (2)
\]
\[
X_d = X_s \quad (3)
\]

Where,

\[X_d = \text{export demand, } X_s = \text{export supply.}\]
\[P_x = \text{export price, } P_w = \text{average price of competing commodities.}\]
\[Y_w = \text{weighted average of Incomes of countries trading partners,}\]
\[P_d = \text{domestic price of exports.}\]

(expected signs are given in parentheses)

In the above model, export demand is hypothesized to vary positively with world income, inversely with export price and positively with export price of competing commodities (eqn—(1)). While export supply is expected to have positive link with export price and a negative link with domestic price of exports (eqn—(2)). The equilibrium condition is represented by the third equation. The implicit hypothesis is that prices move in order to equate export demand \((X_d)\) with export supply \((X_s)\) over time. This theoretical framework formed the basis for a number of subsequent empirical works. The authors also discussed various econometric issues in trade modeling and presented updated consensus estimates of income and price elasticities.

Bahmani-Oskooee \(^{12}\) (1986) used quarterly data for 1973-1980 period and provided the estimates of aggregate export demand functions for seven developing countries. They also provided estimates of price and exchange rate response patterns by introducing a
distributed lag structure on the relative prices and on effective exchange rate, applying the Almon procedure. Since the dynamics of the determination of the trade flows are involved, the authors presented a more realistic setup. The export demand equation used in this study is of the form:

\[
\ln X^d_t = a + b \ln YW_t + c \ln (PX / PXW)_t + d \ln E_t + \nu_t
\]

where,

- \(X\) is the quantity of exports,
- \(YW\) is the weighted average of real GNP of a country's trading partners,
- \(PX\) is the export price,
- \(PXW\) is the weighted average of the export prices of a country's trading partners, and
- \(E\) is the export-weighted effective exchange rate.

Having introduced the lags, the export demand equation becomes:

\[
\ln X^d_t = a + b \ln YW_t + \sum_{i=0}^{n1} c_i \ln (PX / PXW)_{t-i} + \sum_{i=0}^{n2} d_i \ln E_{t-i} + \nu_t
\]

Based on the estimates of these models, Orcutt's earlier conjecture that trade flows adjust differently to different price stimuli was supported. That is according to Bahhamani and Oskooee, trade flows are more responsive to changes in the relative prices than to changes in the exchange rates in the long-run.

Riedel (1988) questions the low elasticity estimates of various empirical studies on the ground that they suffer from a simultaneity bias. He notes that researchers commonly assume, incorrectly, that the elasticity of supply of exports is infinite which makes the price exogenous and allows them to estimate the demand equations independently of supply. Riedel drops this assumption, models the supply equation explicitly and then estimates the elasticity of demand for Hong Kong's exports. He reaches the dramatic
conclusion that the elasticity of demand for Hong Kong’s exports is infinity. This result is seriously questioned by a number of authors on the ground that infinite elasticity can result from statistically significant and non-zero coefficients of import quantities in Riedel’s specification. The work of Riedel is significant in that it raises the fundamental methodological problems in trade modeling.

In his paper, Lukonga 14 (1994) analyzed the factors underlying the dismal performance of Nigeria’s non-oil exports and estimated the supply price elasticity of these exports for both short run and long run during the period 1970-90. A distinguishing feature of the analysis is the incorporation of the effect of domestic demand in the export supply equation for agricultural commodity exports. The short run supply function for Nigeria’s exports in log-linear form is specified by the author as below:

\[ \log X_t = \beta_0 + \beta_1 \log (P_x / P_d) + \beta_2 \log Y^*_t + \beta_3 \log D_d + \beta_4 \log D_u \]

where,

- \( X_t \) = quantity of exports supplied
- \( P_x \) = price of exports.
- \( P_d \) = domestic price index.
- \( Y^*_t \) = an index of domestic capacity
- \( D_d \) = domestic demand
- \( D_u = 0 \) for years prior to policy change.
- \( D_u = 1 \) for years after policy change.

The supply function is specified independently of an export demand function, on the premise that Nigeria is a price taker in world markets and primary commodities which constitute a large proportion of Nigeria’s exports, are generally homogenous in quality.
and are sold in perfectly competitive markets. The long run supply function for Nigeria’s exports is specified as below:

$$\log X_t = c_0 + c_1 \log \left( \frac{P_x}{P_d} \right) + c_2 \log Y^*_t + c_3 \log D_d_t + c_4 \log Dum + c_5 \log x_{t-1}$$

The determinants of Nigeria’s export performance were estimated for three commodities only: cocoa, palm kernels and rubber. OLS estimation procedures were used to obtain the estimates. Where there was evidence of autocorrelation, the Maximum Likelihood iterative technique and Cochrane-Orcutt iterative technique were used to correct for auto correlation in the long run and short run models respectively. The empirical results of the study generally support the view that domestic market conditions strongly influenced the export behaviour. Nigeria’s supply of commodity exports is sensitive to relative price changes, even though the magnitude of response is fairly low, while export promotion measures generally accelerate the export growth rate. This study is interesting in that it modeled export supply function independent of export demand function.

Hooper, Johnson and Marquez $^{15}$ (1998) estimated and tested the stability of income and price elasticities derived from the conventional trade equations for the Group of Seven (7) countries during 1990-99. Their analysis used the conventional treatment of trade flows as a function of real incomes and relative prices. Thus, their model assumes that domestic and foreign products are imperfect substitutes and, that price homogeneity holds and that elasticities with respect to income and relative prices are constant over time.
The long run system used to explain exports ($x_t$), foreign economic activity ($y_t$) and relative export prices ($\pi x_t$) in logarithmic form is expressed as follows:

$$
\Delta z_{xt} = k + \sum \Gamma_{zt} \Delta z_{xt-1} + \Gamma_{zt} z_{xt-1} + \varepsilon_{xt}, \quad \varepsilon_{xt} \sim N(0, \Omega_x)
$$

where,

$$
z_{xt} = \{ x_t, y_t, \pi x_t \}
$$

To estimate long run elasticities the authors used the Johansen's cointegration method which recognizes simultaneity among income, prices and trade and for estimation of short run elasticities ECM (error correction mechanism) technique was utilized. The study suggests three findings. First, conventional trade equations and elasticities are stable enough, in most cases, to perform adequately in forecasting and policy simulations. Equations for German trade, as well as equations for French and Italian exports are an exception. Second, income elasticities of U.S. trade have not been shifting in a direction that will tend to ease the trend toward deterioration in the U.S. trade position. The income-elasticity gap for Japan found in earlier studies was not confirmed in this analysis. Finally, the price channel is weak, if not wholly ineffective, in the case of continental European countries. This study is sound in both theory and empirical methodology.

Catao and Falcetti (1999) extended the theoretical framework of Goldstein and Khan (1985) by including more explanatory variables in trade equations. In an effort to identify the determinants of fluctuations in foreign trade balance of Argentina during 1991-98, they estimated export demand and export supply functions in a simultaneous equation framework. Thus,
\[ X_{dt}^d = \gamma_0 + \gamma_1 (1+t^*) \frac{P_{xt}}{P_t^*} + \gamma_2 Y_t^* + \nu_t \]
\[ X_{st}^s = \rho_0 + \rho_1 P_{xt} + \rho_2 K_t - \rho_3 C_t - \rho_4 \sigma_{RER_t} + \nu_t \]

Where,
- \( X_{dt}^d \) = export demand, \( X_{st}^s \) = export supply.
- \( P_{xt} \) = relative price of exports,
- \( Y_t^* \) = real GDP of trading partners
- \( t^* \) = tariff rate, \( P^* \) = foreign price index
- \( \sigma_{RER_t} \) = real exchange rate volatility.
- \( C \) = domestic absorption.
- \( K \) = aggregate net capital stock
- \( \gamma_0, \gamma_1, \gamma_2 \) and \( \rho_0, \rho_1, \rho_2, \rho_3, \rho_4, \rho_1 \) are coefficients.

The above model is estimated by employing cointegration technique and Error Correction Mechanism (ECM). Estimation results show that Argentina's exports are extremely sensitive to world prices in the long run and also they are highly elastic to net aggregate investment. Domestic consumption is found to have negative impact on Argentina's exports. This study is significant in that it used a considerably large set of indicators of export performance than the previous studies.

The paper by Senhadji and Montenegro 17 (1999) estimates export demand elasticities for a large number of developing and industrial countries, using time series technique that account for non-stationarity in the data. The dynamic export demand equation as specified by the authors is as follows:

\[ \log (x_t) = \gamma_0 + \gamma_1 \log (x_{t-1}) + \gamma_2 \log (p_t) + \gamma_3 \log (gdpx_t^*) + \epsilon_t \]
where,

\[ x_t = \text{real exports of home country} \]

\[ p_t = \text{export price of home country relative to} \]

\[ \text{the price of it's competitors.} \]

\[ gdp_{t}^\ast = \text{real GDP minus real exports of trading partners} \]

Estimation results indicate that long-run price and income elasticities of the export demand functions for 53 industrial and developing countries have the expected signs and in most cases are statistically significant. The average price elasticity is close to zero in the short run but reaches one in the long run. The authors conclude that developing countries show in general, lower price elasticities than industrial countries and Asian countries have significantly higher price elasticities than both industrial and developing countries. Furthermore, Asian countries benefit from higher income elasticities than the rest of the developing world, corroborating the general view that trade has been a powerful engine of growth in that region. Africa in contrast faces the lowest income elasticities. This study generated trade elasticities for a large number of countries and therefore is extremely useful for cross country comparisons.

Sangita Prasad (2000) developed a single equation model of exports to identify some of the main determinants of export of Fiji during the period 1968-98. The underlying conceptual framework is an imperfect substitution model, in which the key assumption is that exports are not perfect substitutes for domestic goods in importing countries. The explanatory variables considered are trading partner's income and relative prices and real effective exchange rate. A distinguishing feature of this study is the
incorporation of the effects of agricultural supply-side shocks in the export equation. The long run specification of the model is as follows:

\[ \Delta X_t = \beta_1 S_{t-1} + \beta_2 \Delta \text{REER}_{t-1} + \beta_3 \Delta Y_{t-1} + c1 X_{t-1} + c2 Y_{t-1} + \nu_t \]

Where, \( X \) is the logarithm of real exports, \( S \) is the sugar cane production per hectare (a supply side shock variable), \( Y \) is the logarithm of trading partner income, \( \text{REER} \) is the logarithm of real effective exchange rate and \( \nu \) is an error term. The model is estimated using an unrestricted error correction model (ECM). Estimation results show that in the log run, trading partner income largely drives the movements of Fijian exports. In the short run, exports are mainly influenced by changes in factors which affect the output capacity of agricultural production, such as weather conditions and industrial disputes as well as relative prices and changes in foreign demand. This study is significant in that the results are in line with the standard export model and consistent with results in overseas studies. The inclusion of supply shocks as an explanatory variable in trade equations of a developing country is realistic and interesting.

In his study of the role played by income and prices in the determination of Russian exports, Algeiri 19 (2004) implemented an extended version of Imperfect Substitution Model. Income and price elasticities for Russian exports without oil component were estimated within a cointegration framework using the Error Correction Mechanism (ECM). The author derived the standard export demand function of economic imperfect substitutes model by maximising the intertemporal utility function of a representative consumer subject to his budget constraint, which is expressed as follows:
\[ \log x_t^* = c_0 + \frac{\alpha}{\beta} \log w_t - \log p_t + \log y_t + \log \text{reer}_t + v_t \]

where,

- \( x \) = Russia's export demand,
- \( w_t \) = real income index of trading partners
- \( p_t \) = index of relative prices.
- \( y_t \) = Russian national income
- \( \text{reer}_t \) = real effective exchange rate.
- \( v_t \) = error term.

The above equation is estimated using monthly data ranging from December 1993 to November 2001. Results show that Russian exports are sensitive to changes in relative prices and domestic and world income. In line with the literature, price elasticity and income elasticities are statistically significant and they have expected signs. The author claims that real devaluation has a significant impact on Russian exports and suggests that careful attention should be paid to price elasticity in order to determine exchange rate movements, which in turn are useful to evaluate international competitiveness of Russia.

This paper is significant in that it is based on a sound theoretical framework. The familiar 'small country' assumption of the imperfect substitution model was tested empirically by Warr and Wollmer (1996) in their paper by focusing upon the long-run international demand for Thailand's rice exports and drawing upon contemporary developments in the statistical analysis of economic time series data. They have tested whether, Thailand is a small player in international market for rice by estimating the following trade equation which is re-normalized in price of exports:
log \( P_x^t \) = c_0 + c_1 \log X'_d + c_2 \log P_{xw}^t + c_3 \log Y'_w

Where,

\( X'_d \) = quantity of exports demanded at time \( t \).
\( P_x^t \) = price of exports.
\( P_{xw}^t \) = export price of competing commodities.
\( Y'_w \) = weighted average of real incomes of the country's trading partners

The above equation is estimated by Phillips and Hansen procedure which is a 'Fully Modified' OLS using quarterly data from 1976 (i) to 1990(iv). A relatively robust long-run price elasticity of demand for rice is obtained, at between -1.2 and -1.9. The small country hypothesis is rejected using the specification of a price normalized demand equation. Thus the authors say that the issue of normalization may not be important in the case of primary commodity exports where an exporting country possesses a certain degree of monopoly power. The study is significant in that it tested empirically the basic assumption of the imperfect substitution model.

As exports can be a driving force for growth, Luisa Streb 21 (2004) attempted to estimate an export demand function for Argentina. The author tries to gauge the reaction of Argentina’s exports to relative prices and trading partner’s income. An attempt is also made to assess the impact of real devaluation on the export performance. An Auto Regressive Dynamic Linear Regression (ARDL) model is used to specify the export demand function, where the variable was lagged by three periods. The model is as follows:

\( lx = f (c, lx_{-j}, lgdp_{-j}, lp_{-j}, lvarer_{-j}) \)
where,
\[ lx = \log \text{ of total exports,} \]
\[ lgdp = \log \text{ of the weighted average of country's trading partners.} \]
\[ lvarer = \log \text{ of real exchange rate volatility.} \]
\[ lp = \log \text{ of relative price of exports.} \]

The above ARDL model was estimated by both OLS and 2 SLS methods for quarterly data of 1990 (i) to 2003 (iii). Estimation results show that Argentina’s exports are very responsive both in the short run and long run to the trading partner’s income although not to prices. This suggests that the trading partner’s growth contributes to the rise of Argentina’s exports but on the other hand the impact of real devaluation would not necessarily improve the performance of the Argentina’s exports. The results of this study clearly show the price inelasticity of primary goods exports.

The paper by Kim 22 (2005) reviews the existing methodologies for estimating price and income elasticities for export and import quantities and suggests an improved methodology. The author suggests that the assumption of infinite supply elasticity for estimating export demand equation may be problematic. In that regard, if the problem is of short run nature, four variable vector error correction mechanism (VECM) can be constructed by adding the real exchange rate to separate short run demand and supply functions. If the assumption is problematic even in the long run, the four variable model with the real exchange rate added can be constructed from the scratch. This paper provides an excellent summary of existing methodological issues in estimating trade equations and shows the way for extensions and future works in this area.
2.3 Studies on Determinants of Indian Exports.

Indian exports have received considerable empirical attention in the past. Two distinct strands of research are evident. The first one compares Indian export performance with that of other Asian countries, with respect to growth rates, commodity composition, terms of trade, price competitiveness, world market shares etc. The focus is on evaluating performance of India given her trade potential. The studies covered periods of flourishing trade and economic activity as well periods of turbulence and slow growth. The broad conclusion is that, our performance is improved after 1980s and the domestic factors are mainly responsible for this. The second strand of research, concentrated on the determinants and of exports and estimation of elasticities of exports with respect to world income, price changes, exchange rate depreciation etc. Here we shall concentrate on the second strand of research studies, which were relevant for our study.

The empirical study of Murthy and Sastry 23 (1950) attempted to analyze the relationship between India’s exports and the hypothesized determinants like export price, world real income and domestic industrial activity for the period 1930-50. They found that Indian exports are price and income sensitive. Besides estimating elasticities for Indian exports at the aggregate level they have also computed demand elasticites for a few individual export items.

In his study to explain the nature of elasticities of demand for Indian exports, during the period 1952-62, Da Costa 24 (1965) estimated the following linear export demand function by OLS method.
\[ Y_t = b_0 + b_1 X_{1t} - b_2 X_{2t} + \varepsilon_t \]

Where,  
\( Y_t \) = Volume of exports,  
\( X_{1t} \) = World real income,  
\( X_{2t} \) = export price,

In the above specification export price are indicated by unit values of exports. The world income is the weighted average real income of selected trading partners. The average elasticity of demand for exports with respect to export price was found to be 0.48 and with respect to world real income 0.20 indicating the inelastic nature of Indian exports with respect to the price and income during the estimation period. Standard errors were found to be low, thus explaining that the two variables are significantly explaining the demand for Indian exports.

The empirical study of Houthakker and Mages (1969) on elasticities of demand for exports for India and other selected countries for the period 1951 – 66 by fitting log linear regression model by OLS, shows that the size and sign of price and income elasticities of exports are on expected lines. They used the following model:

\[ \log Y = \log b_0 + b_1 \log X_1 - b_2 \log X_2 \]

where,  
\( Y \) = World demand for a given country’s aggregate exports  
\( X_1 \) = Real World income  
\( X_2 \) = Ratio of Unit value of exports to Export price index of the other country
The estimated price elasticity for Indian exports is $-0.23$ and income elasticity is $0.54$. These results displayed theoretically expected signs and confirms the inelastic nature of Indian exports with respect to relative prices and world demand.

In his study on elasticities of demand for India’s exports and imports Wadwa (1974) examined the various determinants of India’s exports and identified world real income, relative prices, production capacity and domestic demand pressure as important determinants. He then estimated the Multiple Linear Regression model by OLS technique for the period 1950-72 and found that both production capacity and world real income are statistically significant explanatory variables. While other variables considered yielded expected signs but are not statistically significant. The main purpose of the study is to evaluate the impact of 1966 devaluation of Indian Rupee on exports. He concludes from his findings that devaluation did not have any impact on Indian exports.

Khan (1974) estimated income and price elasticities of exports and imports for 15 developing countries including India for the period 1951-69. His methodology is similar to that of Hothakker. The impact of supply side factors along with quantitative restrictions on exports were analyzed in a simultaneous equation framework using 2SLS technique. The author concludes that relative prices play a major role in export performance.

In a comprehensive study Riedel, Hall and Grawe (1984) investigated quantitatively the determinants of export performance of India on the basis of time-series analysis over the period 1968-1978. The study analyses the effects of relative price of
exports, relative domestic demand and domestic profitability on export performance. The dependent variable used is the ratio of indexes of constant price exports to industrial production. Exports are expressed as a ratio to output in order to account for the effect of expansion of production capacity. The results support the view that domestic market conditions strongly influence export behaviour. The variable measuring domestic profitability or relatively domestic demand is found to be statistically significant in explaining export behavior in 23 of 30 sectors. Relative price, incorporating export policy incentives and the exchange rate turn out to be statistically significant in only 10 of the 30 sectors. However, relative prices tended to be significant in those sectors where comparative advantage is presumed to be strongest. The estimates of the study may not be reliable as the time period considered is short.

Arize (1990) estimated export demand and supply functions for 7 Asian Countries including India, using quarterly data for the period 1973 – 85. He used simultaneous equation framework for his analysis. The export demand function is not assumed to be perfectly elastic because given the tariffs and other restrictions in 7 export markets of developing countries, the author is of the view that it is unlikely that they can sell all they want at given prices. But since such restrictions exist for developing countries as a whole and not for specific developing countries only, and if the exports of the developing countries are homogeneous in each category, and they are all small players in the market, a fall in the price of any one developing countries products would imply a large substitution away from other developing countries products, giving an elastic demand for their products. The demand and supply functions in the study are specified as follows:
\[
\ln X_t^d = \alpha_0 - \alpha_1 \ln PX_t + \alpha_2 \ln PX_{wt} + \alpha_3 \ln X_{wt} + \mu_t \\
\ln X_t^s = \gamma_0 - \gamma_1 \ln(PX_t*E/\ln Pd_t) + \gamma \ln TY_t + \eta_t
\]

Where,
- \(X_d\) = volume of exports demanded
- \(X_s\) = volume of exports supplied
- \(PX\) = export unit value in US dollars
- \(PX_{wt}\) = alternative price faced by prospective buyers of the country's exports measured as weighted average of export prices of the country's trading partners and competitor countries.
- \(X_{w}\) = weighted average of real income of country's trading partners.
- \(P_d\) = price of domestic inputs in domestic currency
- \(E\) = exchange rate (number of units of domestic currency per US dollar)
- \(TY\) = an index of domestic capacity

The broad conclusions of the study are that supply side factors play a major role in the export performance of developing countries.

Joshi and Little (1994) estimate structural as well as non-structural equations for aggregate exports, for the period 1961-87. Their aggregate demand and supply functions are of the form:

\[X_d = f(PX/PW, WY)\]
\[X_s = g(PX/P, DD, trend)\]

where,
- \(PX\) = Indian export prices
- \(PW\) = price of exports of competitor countries.
WY = world income.

P = domestic wholesale price index.

DD = a measure of pressure of domestic demand.

Two separate measures of pressures of domestic demand are used:

i) TFE, defined as the total final expenditure as a proportion of GDP at market prices, and

ii) exD₃ₜ or exRD₃ₜ, which measure the excess of monetary growth (the R prefix indicates a real variable) over growth rate of real GDP and are defined as:

\[ exD₃ₜ = ΔM₃ - ΔYₜ \]

\[ exRD₃ₜ = Δ(M₃/P)ₜ - ΔYₜ \]

where, \( M₃ \) = broad money.

\( Y \) = real GDP of India.

\( P \) = domestic wholesale price index.

and GFD, which is the consolidated government fiscal deficit as a proportion of GDP at market prices. The time trend is included to capture trended movements not modeled explicitly.

The single equation models are of the form:

\[ X = f (RERₘₐ, GDPW, DD) \]

where,

\( X \) = India’s non-oil exports.

\( RERₘₐ \) = real effective exchange rate adjusted for export incentives.
DD = a measure of pressure of domestic demand, defined as above.

GDPW = World demand for Indian exports.

Estimation of these equations yield price elasticity of supply of total exports for India equal to about 0.7 in the short run and 1.1 in the long run with over 80 per cent of the long run effect coming through within a year. The price elasticity of demand for exports is about 1.1 in the short run and about 3 in the long run with 80 per cent of the long run effect coming through in 2 years.

Krishnamurty and Pandit (1996) model the behaviour of imports and exports, distinguishing between demand and supplies for four groups of products (comprised of SITC categories 0-9). They take a 'small country view' of India and estimate the following model for export and import demand and supply for different categories of exports for the period 1970-71 to 1990-91. Only 20 observations and OLS with Cochrane-Orcutt procedure rather than 2SLS or 3SLS are used, but the authors are optimistic about the robustness of the estimates because the model is large.

Export demand:

\[ ZEX_t = \alpha_0 + \alpha_1 ZGDPW - \alpha_2 \frac{EXUV_t}{(RSUS \times WEUV)} + \alpha_3 (ZEX)_{t-1} \]

Export supply:

\[ EXUV(1 + S_{it}) = \beta_0 + \beta_1 ZEX_t - \beta_2 \frac{ZGDP}{ZGDP} + \beta_3 WP_t + \beta_4 (EXUV)_{t-1} \]

Where,

\( ZGDP = \text{total real GDP (a proxy for overall demand) and for each category i,} \)

\( ZEX = \text{volume of exports,} \)
The Z prefix denotes real values. The term \( \Delta \text{EXUV}_i(1+ S_i) \) reflects incentive to export rather than sell in the domestic market.

This specification however assumes the impact of GDP\(_i\) and GDP to be equal in magnitude but opposite in sign. No justification is given in the study for imposing this additional constraint. Estimates of these equations reveal a negative relationship between growth rates of GDP in manufacturing and an increase in price of manufactured exports Kantawala\(^{32}\) (1996) estimated demand functions for Indian exports(Commodity group of food, live animals, beverages and tobacco) for the period 1969-70 to 1989-90. He has used the following model for estimation:

\[
\log Y = \log b_0 + b_1 \log X_1 + b_2 \log X_2
\]

where,

\[Y = \text{export quantity index.}\]

\[X_1 = \text{ratio of unit value index of exports of a country to the unit value index of world exports}\]

\[X_2 = \text{index of world real income}\]
The estimation of these equations yields price elasticity of demand and income elasticity of demand for the commodity group specified above equal to – 0.42 and 0.53 respectively. The signs of coefficients are theoretically correct and their absolute value less than unity show the inelastic nature of the commodities exported.

Srinivasan 33 (1998) estimated a non-structural, eclectic model of India’s export performance during 1963 to 1994. He measured export performance in two ways for each year. The values of India’s exports in US dollars and India’s share in world exports. He considered relative prices, real GDP and real effective exchange rate as the determinants and also a time trend variable to capture the impact of policy changes on exports. The author concludes that Indian exports are price competitive and real GDP has a significant positive impact on exports. Further, he claims that appreciation of real effective exchange rate reduces export demand.

In his exhaustive survey, Panchamukhi 34 (2001) attempted to present at one place a broad overview of the various quantitative methods of analysis used in the field of international economics with reference to India. The survey covers select themes such as analysis of comparative advantage, trade behaviour models, structural analysis of trade flows, analysis of foreign direct investment, evaluation of trade policies and exchange rate policies. The section on selected trade models has presented a profile of some of the results of trade equations (export demand and export supply functions) dealing with aggregate trade flows and also sectoral trade patterns. The section on structural analysis of trade flows has dealt with the question of instability analysis, and measure of export and import intensities. The survey has throughout given importance to presentation of
the methodological analysis and empirical results and policy inference from them have been presented to illustrate applications of the methodologies. The author laments that applications for the Indian data have been very scanty and incomplete, where as methodologies have been developed dealing with the various issues in the world trade literature.

The paper of Sharma \(^{35}\) (2001) investigates exports determinant of India using annual data for 1970-98. The study uses simultaneous equation framework and estimates were made using the two-stage least squares procedure (2SLS). The results of study suggest that demand for Indian exports increase when its export price falls in relation to world prices. Furthermore, the real appreciation of the rupee adversely affects Indian exports. Exports supply is positively related to the domestic relative price of exports and higher domestic demand reduces export supply. Foreign investment appears to have statistically no significant impact on export performance, although the coefficient of FDI is positive.

Roy \(^{36}\) (2002), analyzed the determinants of India’s manufactured exports during the period 1960 - 61 to 1990 - 91 using a Error-Correction Mechanism model. The study establishes the importance of demand factors such as world income and real effective exchange rate in the determination of India’s exports as against the relatively weak relevance of supply side determinants like production capacity, export prices, domestic demand pressure etc. The author suggests that the performance of manufactured exports of India can be enhanced by improvements in efficiency, removing structural impediments in terms of provision of better infrastructure, simplification of trade
procedures etc. This paper is methodologically and technically sound in analyzing the various determinants of persistence of manufactured exports of India.

Mehtha and Madhur 37 (2004) made an attempt to develop a framework towards a short-term forecasting model for India’s export by countries and commodities. Individual country/commodity analysis takes into account the country/commodity wise characteristics such as non-tariff barriers, language differences, location/distance differences, preferential and other trading arrangements etc. Apart from the above mentioned country/commodity specific characteristics export performance may be affected by the demand conditions, differences in the degree of the sensitiveness of prices, which cannot be captured at an aggregate level. The general framework of the econometric model for forecasting of India’s export by selected destinations and its selected commodities at the 6-digit HS classification level is developed in the first half of the paper. The econometric analysis of the framework rests on panel data. The primary factors taken to be influencing India’s exports at a disaggregated level are total imports of the destination country and relative prices reflecting the level of competitiveness of India’s exports in the destination country. The entire model constitutes of around 280 variables for the purpose of forecasting. For illustration purposes, the estimation of econometric sub-model for India’s export to USA is stated. This model building exercise is a very useful guide for analyzing and forecasting the export performance of India by country and commodity.

Nagesh Kumar 38 (2005) attempted to map the different factors that are likely to shape the pattern and magnitude of India’s exports over the coming two decades. According to
him the factors that affect the demand for exports are: growth performance of World
Economy and key trading regions, WTO agreements, Preferential Trade Arrangements,
exchange rates etc. The factors that affect the supply of exports are: infrastructural
bottlenecks, growth of domestic demand, foreign direct investment, technological up
gradation, tariff and non-tariff barriers.

2.4 Studies on Determinants of Indian Agricultural Exports

Bhagavati and Srinivasan 39 (1976) analysed the export performance of three
traditional Indian export items: Jute, Tea and Cotton textiles for the period 1966-74 in the
context of policy changes of 1966. Export equations for jute and cotton are specified to
be dependent on domestic output and domestic demand whereas tea exports are
hypothesized to be determined by relative price and time trend variables. Double log
form is utilized to estimate the equation by the method of OLS. For jute and cotton the fit
is quite good and the coefficients of output and domestic demand have expected signs.
However, the fit for tea is rather poor and price variable has an insignificant coefficient
with right sign. Time variable has a significant negative coefficient. They conclude that
due to droughts of 1965-66 and 1966-67 output of raw jute and cotton has declined,
which lead to fall in their exports. Regarding tea exports, results show price effect is of
the right sign but not significant, indicating it’s price inelastic nature and drought seems
to have no serious impact on it. They claim that Trend factors associated with policy
changes of 1966 have a positive impact on tea exports.

Da Costa and Gaddamwar 40 (1988) investigated the determinants of exports of ten
agricultural commodities at both aggregate and disaggregate levels. Food items exported
were found to be influenced by domestic production, the pull of domestic market and by
the various government measures. Raw material exports were affected by the world
economic conditions, relative prices and by policy decisions.

The paper by Reddy and Narayanan (1992) provides a good insight into the
analysis of net export supply behaviour for dominant agricultural commodities. The net
export supply of a commodity is considered to be a function of internal and external
prices, domestic production and availability, country's balance of trade position and
exchange rate. The functional form is as follows:

\[ X_{i}^s = \gamma_0 + \gamma_1 \frac{P_{E_i}}{P_{D_i}} + \gamma_2 D_{P_i} + \gamma_3 P_{C_{A_i}} + \gamma_4 GDP + \gamma_5 BT + \gamma_6 ER \]

where,

- \( X_{i}^s \) = net exports (exports - imports) of the \( i^{th} \) commodity, which is
defined in terms of quantity as well as value.
- \( P_{E_i} \) = export price of the \( i^{th} \) commodity
- \( P_{D_i} \) = domestic price of the \( i^{th} \) commodity
- \( D_{P_i} \) = total domestic production of the \( i^{th} \) commodity.
- \( P_{C_{A_i}} \) = per capita availability of the \( i^{th} \) commodity, \( i \) ranging from
  1 to 7, referring to the following commodities (1) rice (2) wheat
  (3) sugar (4) tobacco (5) cotton (6) jute and (7) tea.
- \( GDP \) = India's gross domestic product at factor cost.
- \( BT \) = overall balance of trade position of the country, i.e. net total
  exports of the economy as whole.
- \( ER \) = exchange rate in terms of rupees per dollar.
An unrestricted auto-regressive system distributed log formulation is also considered for empirical analysis in which lagged dependent variables and independent variables are introduced. Box-Pierce-Ljung Portman-teau statistic is applied to choose the appropriate model for interpretation from among the alternative specifications. Empirical result of alternative specifications for seven agricultural commodities, namely, rice, wheat, sugar tobacco, cotton, jute and tea are presented. The broad inference drawn from the empirical analysis, that import substitution policies still dominate the agricultural trade scenario and that internal factors like production, per capita availability etc, play an important role in explaining the variations in exports. On the other hand, external factors like prices and foreign exchange rate appear to be less important.

Another interesting study in analyzing the supply factors of exports is that of Dass 42(1991) in which the behaviour of exports of different varieties of coffee to the quota and non-quota markets is analyzed. The author has used the following specification:

\[ Q_t = O_t b_1 Y_t b_2 P_t b_3 e_t \]

Where, \( Q_t \) = export of coffee in year \( t \)

\( O_t \) = index for domestic production of coffee for the \( i^{th} \) year.

\( Y_t \) = per capita net national product at 1970-71 prices for the \( i^{th} \) year.

\( P_t \) = real export price index of coffee, i.e. unit value index for coffee exports deflated by the corresponding domestic wholesale price of coffee.

\( e_t \) = error term. 

\( b_1, b_2, b_3 \) are the export elasticities with respect to domestic production, per capita income and relative export price, respectively. Estimates were made for the period 1972-73 to
1965-86 by OLS method. The author concludes that the real export price had a negative impact and domestic production has positive influence on the quantum of coffee exports. He advocates a concerted strategy of expansion of domestic production of coffee to meet the export demand and the increasing domestic demand. He also argues that the Arabica variety of coffee should be allotted relatively more area since its unit value realization in the export market is more than that of Robusta variety of coffee. The author's use of suitable model for export supply analysis makes this paper very useful.

Virmani's study 43 (1991) of demand and supply factors in India's trade for the period 1970-71 to 1985-86 has provided useful insight into the role of the export-import price levels, exchange rates, domestic inflation rate, supply side constraints etc on the volume of primary products exports. His trade model consists of export supply function, export demand function and import demand function. Supply function is postulated as inverse supply in which export price is considered as a function of export quantity, domestic wholesale price index, GDP and other supply factors. Thus,

$$ PX = G (QX, PH, Y, Z) $$

Where, $ PX = $ Export price index,
$ QX = $ Export quantity index,
$ PH = $ domestic wholesale price index.
$ Y = $ GDP.
$ Z = $ other supply factors like rainfall, capacity, etc.
All the specifications are in terms of growth rates. If prefix GR denotes growth rate, then the supply equation is postulated as;

\[ \text{GRPXM} = a_1 \text{GRQXM} + a_2 \text{GRPH} + a_3 \text{GRGDPM} + a_4 \text{GRZ} + \varepsilon \]

This specification has no constant term. This form is expected to give identical results to estimates based on log-difference of variables. In this formulation, each coefficient of a variable gives the elasticity of the variable implied in the dependent variable with respect to the corresponding independent variable.

Rai and Singh (1994) examined the performance of agricultural trade during the period 1970-92. In order to quantify the determinants of agricultural exports, a dynamic log linear export turnover function is being estimated. Estimation results shows that domestic production and net national product has a positive impact on export performance where as relative prices' impact was significant only in case of tea. These results are in conformity with the earlier studies.

Senthilnathan and C. Ramaswamy (1996), attempted to estimate an export equation for Indian sugar as part of domestic sugar market for the period 1971-91 in a simultaneous equation framework. In this system total supply of sugar is hypothesized to be a function of domestic price, recovery percentage of sugar and a dummy variable to capture the influence of previous years export. The demand side is expected to be influenced by domestic price of sugar, quantity of sugar exported, quantity of gur consumed, population of the country and GDP. The export equation of sugar is specified.
as dependent on world sugar price, domestic price, domestic consumption and total supply. The system of behavioural equations with expected signs is specified as:

\[ \text{SUP}_t = a_0 + a_1 \text{REC}_t + a_2 \text{DPR}_t + a_3 \text{DUM} \]
\[ \text{EXP}_t = b_0 + b_1 \text{WPR}_t - b_2 \text{DPR}_t + b_3 \text{SUP}_t \]
\[ \text{DOMC}_t = c_0 - c_1 \text{EXP}_t - c_2 \text{DPR}_t - c_3 \text{GURC}_t + c_4 \text{POP}_t + c_5 \text{GDP}_t \]

where, \( \text{SUP}_t = \) Total supply in lakh tones, \( \text{REC}_t = \) Average sugar recovery.
\( \text{DPR}_t = \) Domestic price of sugar in Rs/quintal.
\( \text{EXP}_t = \) Export quantity of sugar, \( \text{WPR}_t = \) World price of sugar
\( \text{DOMC}_t = \) Domestic consumption of sugar,
\( \text{GURC}_t = \) Quantity of gur consumed, \( \text{POP}_t = \) population of India
\( \text{GDP}_t = \) Gross Domestic Product at constant prices.

\( \text{DUM} = 1 \) if there is export in previous year
\( = 0, \) otherwise.
\( t = 1, 2, \ldots, 20, \) representing years

The system of equations was estimated by using 2SLS method. It was found that domestic price and domestic consumption have negative influence on sugar exports and supply of sugar and world sugar price has appositive impact on sugar exports. The increase in sugar export is found to reduce domestic consumption by 55 per cent and increase in domestic consumption on the other hand reduces export by 10 per cent. It was recommended that excess supply of sugar in the country has to be exported without effecting the domestic price.
In the context of the post-GATT international trading conditions and liberalisation of India's hitherto restricted agricultural exports, Jeromi 46 (1997) examines the determinants of India's agricultural exports during 1970-71 to 1994-95. The study undertakes empirical estimation of export demand and export supply equations for total agricultural exports and for the principal commodities, namely, Coffee, Fish, Tea, rice, Oilcakes, Pepper, and Tobacco in a simultaneous equation framework. The major factors considered for determining the export of these commodities are world exports, international prices, export prices, domestic prices, the exchange rate of the currency in question, domestic production and absorption. The first three of these variables account for demand side and the rest supply side. The system of simultaneous equations are specified in an Imperfect Substitutes Trade model framework as below:

\[
\begin{align*}
\log(X_{it}^D) &= b_0 + b_1 \log WX_{it} + b_2 \log(EP/WP)_{it} \\
\log(X_{it}^S) &= b_0 + b_1 \log (ED/DP)_{it} + b_2 \log R_{it} + b_3 \log ER_t
\end{align*}
\]

Where, \(X^D\) = Quantity of export demanded by the rest of the world.

\(WX =\) World agricultural exports at constant prices.

\(EP =\) India's export price in US $.

\(X^S =\) Quantity of export supplied.

\(EP =\) Export price,

\(DP =\) Domestic price.

\(R =\) Rainfall index.

\(ER =\) Nominal Exchange rate for Indian Rupee.

\(i = 1^{th}\) commodity, \(t = \) time.
The simultaneity between the quantity and the price of exports has been accounted by specifying the export supply equation in inverted form and expressed as price function as follows:

$$\log EP_t = b_0 + b_1 \log X^S + b_2 \log DP_t + b_3 \log R_t + b_4 \log ER_t$$

Dynamic counterparts of export supply and demand equations are also specified to understand the long run behaviour. All the equations are then estimated for all agricultural commodities in aggregate as well as for major commodities by Two Stage Least Square (2SLS) method. Results indicate that the demand for India's agricultural exports is influenced by the Growth of World Exports. The relative prices were found to be favourable for coffee, fish, oilcake and pepper, they were against in case of tea, rice and tobacco. Export supply is found to be price inelastic in the short-run. While the domestic absorption puts pressure on export supply, improvements in supply conditions has a positive impact on the same. It was suggested that in the context of WTO agreements the prospects to boost agricultural exports depend on the improving in the yield levels which requires substantial investment in agriculture and also vertical integration of the supply of commodities to meet the specific overseas demand requirements. This study is extremely useful both from methodological and policy perspectives.

Export demand equations for Indian tea exports for eleven importing countries were estimated by Unneen Kutty (1999) in order to analyze the factors influencing tea exports and assess the competitive power of India Tea in some principal markets of the world. The major determinants influencing Indian tea were listed and only two of these were considered for estimation purpose, namely: the comparative export price (relative price)
and real income of the importing country. Two different specifications of export demand functions were estimated for 20 year period from 1978 to 1997 for the eleven importing countries under consideration, which are as under:

\[ XD_1 = \alpha + \beta_1 \log \left( \frac{P_i}{P_w} \right) + \beta_2 \log Y + \varepsilon \text{ (log-linear)} \]

\[ XD_1 = \alpha + \beta_1 \left( \frac{P_i}{P_w} \right) + \beta_2 Y + \varepsilon \text{ (linear)} \]

Where,

- \( XD_1 \) = Volume of tea exports from India.
- \( P_i \) = International price of Indian tea in US dollars.
- \( P_w \) = International average prices of all teas in US dollars.
- \( Y \) = Real Gross Domestic Product in US dollars.
- \( \alpha, \beta_1, \beta_2 \) are the coefficients to be estimated.

A priori the expected signs are \( \beta_1 < 0 \) and \( \beta_2 > 0 \).

Estimation results show that in five of the eleven importing countries Indian tea is facing stiff competition as the price coefficient turned out to be negative. In the remaining markets, the author claims there is absence of competition as the price coefficient turned to be positive. Regarding impact of importers real GDP on Indian spice exports, it is positive in most of the cases. Only two of the eleven countries reduced tea imports from India as their real incomes improved, indicating a shift in consumer's preference in favour of substitutes, claims the author. This study is incomplete in that it failed to consider the supply side factors, which plays a crucial role in export availability of tea.

In an effort to analyze the pattern of coffee consumption in various countries importing Indian coffee, Unneen Kutty \(^{48}\) (2000), used an extended version of his earlier model as
described above by considering more theoretical determinants of export performance. The extended model considered for estimation for the period 1978 to 1997 is as below:

\[
\log I_c = \alpha + \beta_1 \log P + \beta_2 \log Y + \beta_3 \log PO + \beta_4 \log RP + \varepsilon \quad (\text{double-log form})
\]

\[
I_c = \alpha + \beta_1 P + \beta_2 Y + \beta_3 PO + \beta_4 RP + \varepsilon \quad (\text{linear form})
\]

Where, \( I_c \) = Import Volume of Coffee, \( P \) = Real price of coffee in US dollars.

\( Y \) = Real Gross Domestic Product in US dollars, \( PO \) = Population.

\( RP \) = Relative Prices (ratio of coffee price to tea price).

and \( \alpha, \beta_1, \beta_2, \beta_3, \beta_4 \) are the coefficients to be estimated.

A priori the expected signs are \( \beta_1 < 0, \beta_2 > 0, \beta_3 > 0 \) and \( \beta_4 < 0 \).

Estimation results indicate that real price has a negative influence and real income has a positive impact on coffee imports for most of the countries under consideration. Similarly the author concludes that population growth has led to spread in coffee drinking in these countries as \( \beta_3 > 0 \) for most of the importing countries. The author also hypothesizes that there is a change in customer preference in some countries for tea over coffee as \( \beta_4 > 0 \) for these countries. The author concludes that India has no market power and cannot influence the world coffee market and therefore it can increase coffee exports only by reducing its export prices.

Sarada, Ravishankar and Krishnan 49 (2005) used the ‘Imperfect Substitutes Trade’ model to specify and estimate the demand functions for Indian seafood exports to USA and Japan. They have used the following export demand function:
\[ Y_t = f ( \text{POP}_t, \text{RGDP}_t, \text{X}_\text{Rat}_t, \text{TFP}_t, \text{UV}_t, \text{TIME}_t) \]

Where,
\[ Y_t = \text{Quantity of sea food exported}, \]
\[ \text{RGDP}_t = \text{Real Gross Domestic Product at constant prices}. \]
\[ \text{X}_\text{Rat}_t = \text{Nominal exchange rate}. \]
\[ \text{TFP}_t = \text{Total Sea Food production}. \]
\[ \text{UV}_t = \text{Unit Value realized}. \]
\[ T = \text{Time trend}. \]

They have estimated demand functions of sea food exports for the period 1970 to 2000 by step wise regression technique to avoid the problem of multicollinearity. The conclusions from the study are that Indian seafood exports are price sensitive and their income elasticity is positive in both US and Japanese markets. It was also reported that total seafood production and population has positive impact, whereas nominal exchange rate has a negative influence on Indian seafood exports to USA and Japan. It was recommended that, strategies like competitive pricing, value added products, product diversity and innovative marketing strategies hold the key to the success of Indian sea food in the above two markets.

2.5 Empirical Studies on Indian Spices Exports

Only a limited number of studies are available in this area which are reviewed here. The analysis of the various factors which are influencing the India Coriander exports was the main theme of the paper by Raju (1990). He used the following dynamic model for estimation purpose:
\[ ECI_t = a + b_1 Q_{t-1} + b_2 EP_{t-1} \]

where,
- \( ECI \) = export of coriander from India.
- \( Q \) = output of coriander.
- \( EP \) = export unit value of coriander

The above specification is estimated for the period 1970 to 1988 by OLS method and the author concludes that output and unit price has a positive influence on coriander exports of India. However, the author points out that exports growth of coriander is not in tune with production growth.

Jaromi and Ramanathan \(^5\) (1993) analyzed growth and instability in world pepper market and performance of India and found that Indian pepper enjoyed price premium over other countries but the quantum of this premium is declining in recent years.

Sandhu \(^6\) (1993) analyzed the price elasticity of pepper exports to USA and USSR during the period 1960 to 1987. His study revealed that pepper exports are price inelastic and domestic factors play a major the determinants of the export performance. However, his study is subjected to two criticisms. First, pepper exports to USSR were subjected to bilateral trade agreements during the study period, where quantity and prices for each year is agreed upon. Second, while calculating the relative price of Indian pepper exports, only Brazil’s export price is considered and prices of other competitors ignored.

Jeromi and Nagarajan \(^7\) (1996) attempted to quantify the price competitiveness of pepper exports from India vis-à-vis major competitors viz., Malaysia, Indonesia and Brazil. Pepper’s
export performance is hypothesized to be dependent on price competitiveness which is measured in terms of relative prices of exports. Two specifications were considered or Indian pepper exports: one, pepper export function is specified to be dependent on export price of pepper and the other dependent on relative price of exports. Using double log form these equations were estimated for the period 1965-91 using OLS method. It was concluded that, export price of Indian pepper has positive influence on quantum of exports and relative prices of exports have a negative influence but have low explanatory power. Indonesia is found to be the main competitor for Indian pepper exports. This, study however considered only price and omitted the other determinants of export performance like domestic supply, domestic consumption etc., which play a vital role in pepper exports. Also taking export price as exogenous in the export equation is questionable.

In his study, Raju (2000) attempted to identify some of the important factors which are influencing the pepper exports from India by fitting the following specification:

\[ EPI = F\{ Q, IPN/DP, LPN/IPN, EB/WE, EI/WE, T\} \]

where,

- **EPI** = Export of Pepper from India.
- **Q** = Production of pepper in India.
- **LPN** = Price of Lompong Pepper in New York.
- **IPN** = Price of Malabar Pepper in New York.
- **EB** = Export of pepper from Brazil.
- **EI** = Export of pepper from Indonesia.
- **ME** = Malaysian exports of pepper.
WE = World exports of pepper.
DP = Domestic price of pepper.
T = time trend.

OLS regression estimates for the period 1970 to 1998 reveal that production of pepper has got a significant influence on the export of pepper from India. Domestic price negatively influences the pepper exports, whereas competitors' prices have statistically no significant influence on Indian pepper exports. The author concludes that low productivity of pepper is affecting the pepper exports and measures to improve productivity and product diversification may tend to provide long-term solution to the fluctuating pepper export performance of India. This study is based on the standard theoretical framework but the empirical methodology is weak in that it may suffer from the problems of multicollinearity and non-stationarity, which makes the estimates unreliable.

Ouseph 55 (2005) has estimated double log linear OLS equations to find the interrelationship among variables affecting the export demand of two of the major spices exports from the State of Kerala, namely pepper and cardamom for the period 1980-81 to 2000-01. The specification of the export demand equation is as follows:

\[
\log Q_t = a_0 + a_1 \log (\text{PIOECD})_t + a_2 \log (\text{INQT})_t \\
+ a_3 \log (\text{WEX})_t + a_4 \log (\text{RMIP})_t + \log (T) + U_t
\]

Where, Q is the quantity of pepper exported, PIOECD is the per capita income of OECD countries, INQT is the domestic production of pepper, WEX is the total international exports of pepper, RMIP is the relative price of Malabar pepper to
international price, $T$ is the time trend. Estimation results shows positive coefficients for PIOECD and INQT and negative coefficients for WEX, RMIP and time trend but the coefficients for RIMP and time trend are not statistically significant indicating the price inelastic nature of Indian pepper exports. Results of the Granger's causality test shows that the causation of independent variables on pepper exports is very weak. This study is significant in that it took into account the non-stationarity issue of time series data while estimating regression equations.

2.6 Empirical Studies on Export Instability

During the 1950s and the early 1960s, instability in export earnings of the developing countries was highlighted as it was believed that export instability is more severe for the typical developing country than for a typical developed country. The reasons for such instability of developing countries exports are supposed to be their:

i) Specialisation in the production and export of primary commodities.

ii) Concentration on a small range of commodities, i.e., commodity concentration.

iii) Concentration on a small group of traditional export markets, i.e., geographical concentration.

iv) Low income and price elasticities of the demand for their products.

It has been argued that such instabilities have serious adverse impact on growth, investment, balance of payments and planning in developing countries. The problems of fluctuations in export markets and the impact of these fluctuations on countries producing primary products were analysed by Department of Economic Affairs, UN (1952). The
study concluded that the source of export instability for majority of countries is the concentration on a narrow range of products for exports. Policies were recommended to iron out such instabilities to help underdeveloped countries in attaining higher growth. During the 1960s some of the above hypotheses were tested to find out their empirical validity. Most of these empirical studies have cast considerable doubt about the validity of the hypothesis. Thus, Coppock \textsuperscript{56} (1962) by using a log-variance index of instability (which comprises the dispersions from the trend line given by the first and last observations and thus makes it vulnerable to the specific period chosen for research) for exports of eighty three countries between 1946 and 1958 has found that export instability is mainly correlated with price, terms of trade, volume of exports and imports. However the statistical significance of these variables has not been mentioned. The interesting aspect of this study is that export instability as measured by Hirschman's index is found to be negatively related to geographical concentration. However, Michaely's \textsuperscript{57} (1962) study of thirty six countries for the period between 1948 and 1958 shows positive and statistically significant association between commodity concentration and export price instability. It is interesting to note that Michaely has tried to explain changes in export prices rather than export earnings. On the other hand, for about the same period for the same number of countries, Massell \textsuperscript{58} (1964) did not found a significant relationship between instability and commodity concentration and geographical concentration. Further by using data of Coppock and Michaely, Macbean \textsuperscript{59} (1966) shows the absence of a significant difference between the levels of export earnings for developing and developed countries. Macbean then uses the indices of geographic and commodity concentration as well as the proportion of primary exports to total exports to account for
the divergences in instability among different countries. His conclusions are: 'such theoretically proposed general factors as specialization in primary products or commodity concentration per se may have some slight instability, but their explanatory value in particular cases is very small (Macbean, 1966). This view is also supported by Kingston (1976).

Macbean’s study has been questioned by others (e.g., Sundrum 1967, Voivodos 1973). When differences in time horizons are considered, the divergences in levels of instability tended to increase (Erb and Schiavo-Campa 1969). Massell (1970) found that the different levels of instability have been strongly influenced by the index of commodity concentration. Also, he observes that there is a slight suggestion that developing countries tend to experience greater instability than developed countries net of other variables. The study of Knudsen and Parnes (1975) revealed that an increase in commodity concentration results in increase instability, with the implication that commodity concentration has direct impact on instability. The association between export instability and geographic concentration is found to be weak by Naya (1973). Voivodas (1973) questioned and even refuted some of the empirical studies. However, the study of Lee (1975) regarding the contribution of several factors to export instability in Peninsular Malaysia shows that export instability is a direct function of nation’s concentration on few commodities. He also concludes that export instability is directly proportional to the share of a particular country in world market for a commodity.
Some of the recent studies like that of Murray 68 (1978), Love 69 (1985), Paudyal 70 (1988) and Tegegne 71 (2000), Campa 72 (2004) found that apart from the export concentration, export instability is associated with variables like per capita income, openness of the economy, ratio of food and raw material exports to total exports etc. Mullor – Sebastian 73 (1988) argues that studies which lump together the exports of all goods are misleading because export instability of a given product is influenced by the characteristics of the individual product and degree of development of the exporting country.

Some analysts point out that most of the above studies concentrated on cross country regression with some measure of export instability as the dependent variable. This cross country analysis implicitly assumes a unique relationship between a given explanatory variable and the degree of export instability across the countries. Thus, estimates using cross section data to find average relationships does not provide much information on behaviour of producers of specific commodities in chosen countries. Only a few studies such as Love (1985, 1992), Sinha 74 (1999), Tegegne(2000), Campa(2004)used time series analysis on an individual country basis. But most of these studies do not address the issue of non-stationary nature of the data. Hence the estimates of these studies may not be reliable because of the possibility of spurious regression.

Thus, it is clear from the above review that the empirical evidence on the link between export instability and its alleged determinants is inconclusive because of paucity of well established theoretical framework and appropriate empirical methodology.
2.7 Studies on Export Instability Related to India

Charan \(^75\) (1984) made an inter-period comparison of instability in total export earnings of India and at the same time examined whether a change in export concentration between different periods has caused a direct change in instability in export earnings of the country. He used exponential trend method to compute instability indices for two quinquennial periods: 1961-62 to 1965-66 and 1975-76 to 1979-80. Gini Concentration coefficient was used to measure the concentration of exports. He considered both primary and manufactured commodities for the study. Results of the study show the existence of instability in India’s export earnings, with traditional commodities showing higher levels of instability which is due to volatility in their prices and volumes. The study did not find any linkage between export concentration and export instability for India. The author recommends that government should focus on non traditional items for export promotion and feels that export diversification measures may not be relevant.

Kumar and Singhal \(^76\) (1989) have used the Coppock’s measure of instability and estimated these indices for traditional commodities and non-traditional commodities separately for the period of 1970 to 1980. They observe that fluctuations in export earnings of jute manufactures, tea, cashew, handicrafts, and iron ore and concentrates have a tendency to neutralize the fluctuations in the export earnings of other commodities and thus would have some sort of stabilization effect on overall position in the export earnings.
Another interesting study of export instability is that of Pranob Sen (1989). He considers the time-series of exports of India to USSR for the period 1970-85 and has taken up the analysis of the relationship between growth and instability. Indian exports are characterized by high growth and also by high instability. The experience of high growth may induce new investments and capacity creation. On the contrary, high instability could frustrate the advantages of capacity creation and thus increase the cost in the export sector. This study is extremely useful in the analysis of the link between growth and instability of exports.

In his paper Suresh Pal (1991) examined the magnitude of growth, instability and causes of instability in export earnings of Indian agricultural sector during the period 1970 to 1989. Annual compound growth rates and coefficients of variation were computed to examine the trends in growth and instability. Analysis of results shows that export of agricultural products was constrained by the increasing domestic demand. Further, the volatile world prices and policy changes have induced a very high degree of instability in the export earnings of major agricultural products. The author finds link between export diversification and instability in export earnings for both agricultural and non-agricultural exports. It was suggested that increase in productivity of agricultural sector is vital to generate enough surplus for exports.

In the context of growing trade deficit in India during the 90s and the importance of agriculture in foreign trade of India, Ramesh Chand and Tiwari (1991) attempted to analyse the temporal changes in commodity composition of the agricultural sector and to estimate the commodity wise growth and instability of exports and imports. Growth rates
and instability indices are measured by fitting exponential time trend to the data from 1970 to 1988. The study showed that changes had taken place in the commodity composition of agricultural exports and imports. For most of the agricultural commodities exports showed less instability than imports.

Narinder Kaur (1995) studied the performance and instability of Indian exports during the period 1970 to 1990. It is intended to examine specifically the relationship between instability in the value of exports and a set of variables such as quantity, value and price. The instability indices - commodity wise and country wise have been worked out with the help of linear and exponential trend lines and with the help of ordinary least square method. Moreover, to know the impact of structural variables in generating fluctuations in export earnings (quantity, value and per unit value) and to examine the validity of ranking of the countries for each commodity, Spearman's rank correlation have been estimated. Estimation results show that India suffered instability in its exports earnings during 1970s, 1980s and for the entire period of 1970 to 1990. Non-traditional exports have shown highest degree of instability followed by traditional exports during 1980s and for the entire period under study.

Chandkhan and Shalandar Kumar (1998) in their study on growth and instability of Indian agricultural commodities used compound growth rates and exponential trend based instability indexes for the period 1970–1995. They found that the total agricultural exports increased at an annual compound growth rate of about 18% during 1970 – 1995. During this period Coffee, Oil Cakes, Tea, Tobacco, Raw Cotton, Rice and Spices exhibited high volatility in exports.
Sinha's (1999) study was one of the first time-series econometric exercises that examined the relationship between export instability, investment and economic growth in nine Asian countries. The study found a negative relationship between export instability and economic growth for Japan, Malaysia, Philippines and Sri Lanka and established a positive relationship for South Korea, Myanmar, Pakistan and Thailand. In the case of India, the results were mixed, as an identification problem arose due to two cointegrating vectors.

In their study, S.K. Goyal, et al. 82 (2000) attempted to examine the temporal changes, growth and extent of instability in exports of major agricultural commodities for the period 1970 – 1998. They have estimated compound growth rates and instability indices for major agricultural commodities. Their conclusions is that growth rate of agricultural exports is higher in the nineties compared to the eighties and seventies. However the volatility in export earnings increased during the nineties for most of the commodities. The authors suggest that supply needs to be tuned to effective domestic as well as export demands of the commodities under consideration.

Kaushik and Paras 83 (2000) attempted to statistically verify the growth, variability, source of variability and the impact of export instability on economic growth and environment in the context of Trade liberalization in India. To this end they have estimated growth rates and instability indices using exponential trend method for the period 1984 to 1997. The major findings of the study are that trade liberalisation has substantially improved the export performance of India and instability in export earnings
is mainly due to volume instability. The authors conclude that export instability showed a negative and a statistically significant impact on economic performance of the country.

Panchamukhi 84 (2001) has conducted export instability analysis of Indian exports and imports for the period 1981-94. Based upon the data for 20 countries, instability indices were estimated using log linear trend equations. He worked out the rank correlation coefficients between instability indices on the one hand and on the other per capita GDP of the trading partner, as also export share and import share of the trading partner. Results show that India is able to have lower instability in regards to its trading partners, who are having relatively larger export share in India’s export performance. Similarly, countries ith larger imports share in the Indian market are able to maintain greater stability in India’s market place. This paper contains an extensive survey of quantitative tools useful for modeling of various trade related issues.

In their paper, Sarada, Ravisankar, Krishnan, and Anandanarayanan 85 (2006), investigated the commodity concentration and geographical spread of the seafood exports and the important factors that are affecting the sea food exports from India. In the empirical analysis of Indian seafood exports instability function, cointegration and error correction modeling approaches have been used. For sea food exports, instability in exports is found to be cointegrated with commodity concentration and geographical concentration, fisheries GDP, non fisheries GDP and shrimp production. The long run estimates suggests that all the variables have positive impact except the commodity concentration. This is the one study that addressed the issue of non-stationarity of the data and therefore the estimation results seems to be reliable.
The study of Kaundal and Sharma⁸⁶ (2006) on growth and instability of agricultural exports of India for the period 1991–2002 using annual compound growth rates and logarithmic variance instability indexes for both export value and export quantity revealed some broad trends. It is concluded that the levels of India’s exports of principal agricultural products have shown variations in exports due to compound results of fluctuations in export demand, variations in domestic production and varying international prices of these commodities. The authors observed that for majority of the commodities, supply fluctuations have been a more important cause of earnings instability than demand fluctuations.

2.8 Summary and Observations

The empirical investigation of export functions has been one of the most active research areas in international economics. On the whole, the empirical literature on determinants of exports is characterized by two general models: the imperfect substitutes model and the perfect substitutes model. The fundamental assumption underlying the imperfect substitutes model is that neither the imports nor the exports are perfect substitutes for the domestic products. Perfect substitutes model on the other hand, assumes perfect substitutability between domestic and foreign goods. An overwhelming majority of empirical studies are based on the imperfect substitutes model, because there is ample empirical support for it. These studies tried to gauge the determinants of exports mostly at aggregate level and occasionally at individual sector or industry level.
The major determinants of quantum of exports according to these studies from the demand side are real income of trading partners which has a positive impact, the relative price (ratio of export price to competitor's price) which has a negative impact and real effective exchange rate having a negative impact. The supply of exports is determined positively by relative price (ratio of domestic price to export price) and domestic output and negatively by domestic demand pressure. Studies specifically with reference to developing countries included supply side shocks in their models. Coming to econometric methodology of these studies, most of them estimated either export demand or export supply function by single equation methods even though the relationship between quantities and prices is at least in theory simultaneous. Thus, the results of these studies may be subject to simultaneous equation bias as pointed out by Orcutt (1950). In the context of recent developments in time-series econometrics most of the contemporary empirical studies adopted cointegration framework to avoid the problem of spurious regression. Further majority of the studies that are reviewed above used a static framework. On the whole estimation results of the these studies indicate that while developing countries show in general, lower price elasticities than industrial countries, Asian countries have significantly higher price elasticities than other developing countries. Furthermore, Asian countries benefit from higher income elasticities than the rest of the world, confirming the general view that trade has been a powerful engine of growth in the region. Africa in contrast faces the lowest income and price elasticities.

Empirical Studies on determinants of Indian exports have also generally adopted the imperfect substitution model framework with emphasis on supply side factors because it is believed that Indian exports performance is fundamentally supply constrained.
Estimation results of these studies reveal that Indian exports are generally price and income inelastic and the impact of exchange rate on them is inconclusive. However, domestic capacity and domestic demand are found to have strong impact on their performance, especially for agricultural exports. Studies on spices exports, though very limited, yielded similar results. Regarding empirical methodology of these studies, failure to address the issue of stationarity of the data makes the statistical significance of the estimates skeptical. Some of the recent studies however tried to overcome this problem by adopting the cointegration framework but the estimation results of these studies are not much different from the earlier ones.

The review of various empirical studies on the determinants of export instability reveal that commodity concentration, geographical concentration, the ratio of food and raw materials to total exports, per capita income of the exporting country, openness of the economy and export shares in world trade are the commonly hypothesized determinants. Some recent studies extended this list by including factors like, the relative importance of major commodity, global demand conditions influencing the major commodity, internal supply conditions, etc. Further, some researchers objected the instability analysis at aggregate level as it fails to address the characteristics of individual commodities and degree of development of the exporting country. However, the empirical evidence on the relationship between the above listed determinants and export insatiability is inconclusive. This could be due to the fact that there is no-a priory theoretical foundation for the link between export instability and its alleged determinants and it seems that these empirically plausible propositions needs to be empirically verified in different situations.
Also, almost all previous studies on export instability rely on cross section data. One general problem with cross section data is that the studies using such a data estimate average relationships and does not provide much information on the specific countries and commodities. Even though some studies use time series data, they did not address the issues of non stationarity of data and may have estimated spurious regression. Studies that accounted for non stationarity of data are very few and they also do not reveal definite causal relationship between export instability and its various determinants.

Studies on the determinants of export instability related to Indian exports are very few and are mostly at aggregate level. Some of these studies found export concentration as a determinant of export instability. Regarding instability of agricultural exports most of the studies identified supply side factors as more important than demand factors. However, all these studies are based on time series data and without consideration for non stationarity issue the results of the studies may not be reliable.

2.9 Rationale for the Study

The review of the existing literature reveals the absence of coordinated studies on the factors determining exports and their instability which could be incorporated into the formulation of an export strategy for agricultural goods especially for spices in the background of Indian external sector. Hence the researcher thought it appropriate to make a comprehensive study of these various issues related to Indian spices sector and propose an export strategy for it, especially in the context of Indian Government aiming to achieve a spices export revenue of $10 billion by the year, 2017.
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