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# SOME ASPECTS OF LANDLOCKED NEPAL'S TRADE RELATIONS WITH INDIA: 1960/61 - 1969/70

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# ABSTRACT

The present study is an econometric investigation into Nepal's foreign sector. Its foreign trade presents Nepal with a unique problem. While the small size of the country impels Nepal to resort to international trade, its landlocked topography severely limits its option to trade with countries other than India. Trade with India thus presents itself to Nepal as a combined situation of monopoly and monopsony. In the present study, we have (a) constructed a structural model of the Nepalese foreign sector and estimated its parameters by using multivariate regression techniques, (b) projected Nepal's imports and exports for five years and examined the required exchange rate depreciation to rectify the projected trade deficits, (c) studied the effects on Indo-Nepal trade in the event of removal of trade treaties between the two nations, and finally, (d) suggested alternative trade policies.

Lack of adequate data and the primitive state of the available data on Nepal have been the main reasons for the estimation of the functions in the model in highly aggregate form. Export demand and export supply functions have been disaggregated on the basis of end-use of the commodities. No disaggregation has been achieved in the import function.

Single equation least-squares regression techniques have been used in the estimation of the model with annual data for 1960/61 to 1969/70. The usual objections to this method become less significant

in this case because of the fact that a large number of the independent variables in the model are exogenous. The model consists of five structural equations and four identities. When data permit the construction of a model for the entire economy, the foreign trade model can be linked to a model of the domestic sector to take into account the inter-relationships and feedback between the two sectors.

Contrary to what has been found in other studies on foreign trade, the relative price variable in our model has been consistently significant in import demand and export demand functions. Elasticity of Nepal's import demand has been found to be greater than unity with respect to income as well as to its import price. This suggests that decision makers can make use of expenditure-reducing and also expenditure-switching measures in formulating trade policies aimed to remedy the trade deficits. Nepal's export demand has been found to be relatively elastic with respect to the ratio of India's national income to its agricultural income; but with respect to its export price, the elasticity was below unity. The income elasticity of Nepal's export demand indicates susceptibility of its export earnings to India's agricultural condition. The low price elasticity of export demand gives scope for the Nepalese Government to impose export levies without their possible adverse effects on its export earnings. Nepal's elasticity of export supply with respect to Nepal's income was found to be substantially below unity while its elasticity with respect to its price was found to be greater than unity.

Elasticities approach has been used in computing the required exchange rate depreciation to rectify the projected trade deficits of Nepal. The required rates ranged from 18% to about 28%. It has been found that in the event of mutual tariff imposition in each other's trade, in a static sense, Nepal's trade diversion losses in its trade with India are likely to be greater than the trade creations emanating from its free trade with India. Finally, we have examined the model in its performance in explaining the observed pattern and the accuracy of the structural estimates. The plots of each variable revealed the calculated and observed values of each variable moving convergently.

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# CHAPTER I

# INTRODUCTION

## 1.1 Statement of the Problem

Geographically sandwiched between India and China, Nepal's basic trade problems emanate from a huge commodity concentration and geographic centralization in its export trade. As presented in Table 1.1, over the period of ten years from 1960 through 1970, more than 98% of its total exports have been confined to India. Over the same period, its imports from India, though growing more slowly, still account for over 90% of total imports. The excessive dependence on one market for its entire foreign trade places Nepal in a unique problematic situation. While the small size of the nation impels Nepal to resort to international trade,[1] its claustrophobic topography limits its option for trade with countries other than India. Trade with India thus presents itself to Nepal as a combined situation of monopoly and monopsony. Furthermore, India is also a transit country providing Nepal with an access to the sea. The cumulative effects of all these factors have resulted in a weakening bargaining position of Nepal as a trading partner in

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[1] Indeed the size of a country and the role of foreign trade seems inversely related. As Kuznets puts it, "Foreign trade is of greater weight in the economic activity of small nations than in that of large units." Ringing the same bell, Stephen Enke writes, "No country that is small and backward can hope to advance materially if it attempts to exist in isolation outside the world economy. For all save countries ... which contain a wide variety of natural and human resources, autarky and stagnation go together."

Indo-Nepal trade. None of the other 24 landlocked countries in the world appear to be subject to so many constraints in their foreign trade with other countries.

Looking at the export structure of the country, one notices that food alone defined as SITC Code 'O', accounts for 60% of Nepal's total export earnings. But it has been seriously questioned whether Nepal is genuinely a food surplus country. This surmise is indeed substantiated by sporadic food problems in the Hilly regions when the country's export data for the same year boast of a bulk of food exports.

The national income accounting definition of exports as (EXP = TS - ADD), where EXP = Exports, TS = Total Domestic Supply and ADD = Aggregate Domestic Demand, thus represents a real export earnings state of a country only when ADD truly reflects the total domestic demand. When ADD is an underestimate, the exports as a result become an overestimate. In Nepal's case, this appears to be true due to the fact that there is a regional disparity in food consumption levels between the Hills and the Terai region. The food surplus from the Terai region would have been, under normal circumstances of transportation, transmitted to the food deficit regions of the Hill but the lack of transportation facilities have been preventing the marketable surplus of Terai from reaching inaccessible hilly areas. This has resulted in the transformation of the marketable surplus of Terai into exports to India. It is thus obvious that the exports to India from Nepal have an appearance

of forced domestic savings. In the event of improved transportation facilities between the two regions, the exportable surplus would be reduced substantially.

The Hills provides a mere 28% of the cultivated land for 58% of the total population. The man per cultivated land ratio is 3000 persons per square mile in the Hills as opposed to 880 for Terai. A realistic population policy necessitates that the Hills be released from its staggering population. Indeed this has been the policy of the Government. But the instant impact of such policy could mean further reduction in the export volume at least for the short run resulting from a sharp increase in domestic demand otherwise suppressed.

In addition, Nepalese exports to India appear to be highly susceptible to the harvest conditions in India. India's determination to make their "green revolution" a success could have a serious impact on the export revenue of Nepal. Even India's attempts to shift their dietary pattern from rice to wheat could affect Nepal's export earnings. This seems to indicate that Nepal's export earnings from food alone to India is relatively unstable.

On the import side, there is every indication that Nepal's total imports as a result of development efforts are likely to grow while its exportable surplus and export earnings face so much instability. The seemingly comfortable stock of Indian Currency (IC) with the Government in the face of its excess imports over its exports is again due to a large amount of aid in the form of IC

rather than its strengthening position in its trade with India. Thus overall, Nepal's balance of trade situation presents twin problems, namely continuing trade concentration both in terms of market and commodity exports combined with continuously increasing trade deficits.

It is the purpose of the present study to build a behavioral model and to find out what specific factors determine the foreign sector of a unique country like Nepal so that the findings could be of some help in formulating alternative trade policies in trying to tackle the above mentioned problems.

## 1.2 Methodology

The field of international trade has still been plagued by some problems in using econometric techniques, as in the choice of the method of estimation, specification of the independent variables and even in the interpretation of the derived results.

In the early post-war years, several studies on international trade by using the Ordinary Least Squares method suggested price elasticities to be substantially lower than the theoretical expectation. This overemphasized the role of income and under-stressed significantly the role of price mechanism in international trade.[2] This led to the dispute over the significance of income and of price in the analysis of foreign trade. This also raised

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[2] Modigliani and Neisser, National Incomes and International Trade, University of Illinois Press, Urbana, 1956.

suspicion concerning the efficacy of the techniques of estimation applied. The first of such attacks came from Orcutt against the traditional method of estimating elasticities of exports and imports from time series data.[3] Orcutt gives five sources of bias in the use of the Ordinary method of least squares regression analysis of time series data. These, according to Orcutt, lead to unreliable estimates of the foreign trade elasticities.

Orcutt starts with the disturbances which are caused during demand shifts operating simultaneously with supply relationships. In addition to the single equation bias and the identification problems, the estimation of price elasticities of demand and supply derived from time series data on quantities and price is a blending of negative demand and positive supply elasticity. The estimated elasticity therefore always tends to be biased towards zero. Harberger's criticism against the use of the Ordinary Least Squares (OLS) method in the estimation of price elasticity of imports and exports rested along the same lines.[4] He finds the price elasticities of the import demand of the U.S.A. estimated by application of single stage least squares to be biased.

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[3] G.H. Orcutt, "Measurement of Price Elasticities in International Trade," Review of Economics and Statistics, May 1950.

[4] A.C. Harberger, "A Structural Approach to the Problem of Import Demand," American Economic Review, Papers and Proceedings, May 1953.

This suggested the application of new and powerful econometric methods of estimation which will incorporate the simultaneous relationship of both demand and supply and thus overcome the constraint imposed on the application of OLS. Studies using such a method came up with higher absolute values for both price and income elasticities approaching close to the theoretically expected size.[5] But this also suggested that for countries which are not significant influences from an international price determination point of view, as exporters or importers, the application of OLS method could still give estimates close to real elasticities.[6]

Besides, even though in some cases the simultaneous estimation method has given better results, in general, they have not been all that significant.[7] Some new studies using time series data and single stage least squares method, on the other hand, have got satisfactory results and thus have restored or revived the use of the traditional method.[8]

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[5] Klein et al., An Econometric Model of the United Kingdom, Adland and Scn Ltd., Oxford, 1961.

[6] L.R. Klein, "Single Equation v.s. Equation System Methods of Estimation in Econometrics," Econometrica, October 1960.

[7] A.R. Bergstrom, "An Econometric Study of Supply and Demand for New Zealand Exports," Econometrica, July 1955.

[8] R.J. Ball and K. Marwah, "The U.S. Demand for Imports: 1948-58," Review of Economics and Statistics, November 1962.

In summary, there has not been any definite agreement on the superiority of one method over the other. Individual cases should be taken into consideration in adopting any particular method of estimation.[9] The OLS method thus can still be applied with good results.

In the present study, we have adopted the OLS method in estimating our model. This has been done for several reasons. If the country is relatively small and not important in price determination as exporter or importer, the estimation of elasticity by applying the OLS method can be expected to be very close to the real estimates. Klein observes in one of his articles, " ... international trading relationship of a small country's demand or supply against an overwhelming world market may also properly be estimated by ordinary method of least squares."[10] Klein also writes in another work, " ... the exogenous character of the overseas variables transform the export-import equations into types in which the simple application of single equation least squares method does not lead to bias ... ."[11] In other words, the exogeneity of

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[9] R.J. Ball and K. Marwah, op. cit., p. 6.

[10] L.R. Klein, op. cit., p. 6.

[11] Klein et al., op. cit., p. 6.

a large number of independent variables in the foreign trade function makes the use of the OLS method less offensive. The independent variables to explain Nepal's export and import functions in our model have been all exogenous. They are known from other sources of information. The independence of explanatory variables also solves the problem of identification of the derived results and of their interpretation. Besides, this method also becomes justifiable in view of the absence of inter-relation between the functions describing the foreign trade sector. Because the least squares bias originates from the joint interdependence of the endogenous variables.[12] In case of applying simultaneous equation method, it is important to stress that their validity depends on the proper specification of other structural equations than the one under consideration specifically with respect to the predetermined variables occurring in such equations. The OLS method is an invariant against such specification errors. For these several reasons, the choice of the OLS method in the estimation of our model becomes justifiable.

In the present study, our model will be aimed at the structural specification of Indo-Nepal trade rather than Nepal's trade with overall countries. This has been done deliberately because Nepal's trade with countries other than India has been minimal whereas with India, it has been remarkably significant throughout the sampling period as presented in Table 1.1.

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[12] Klein *et al.*, *op. cit.*, p. 6.

Table 1.1

Nepal's Trade Concentration with India, 1960/61 - 1969/70
(millions of Nepalese rupees)

| Year | Nepal's Total Exports | Exports to India (%) | Nepal's Total Imports | Imports from India (%) |
|---|---|---|---|---|
| 1960-61 | 209.74 | 99.73 | 397.98 | 94.25 |
| 1961-62 | 265.22 | 99.50 | 444.41 | 98.93 |
| 1962-63 | 287.65 | 99.43 | 604.03 | 99.16 |
| 1963-64 | 291.17 | 97.87 | 604.56 | 98.52 |
| 1964-65 | 440.56 | 98.78 | 818.87 | 98.48 |
| 1965-66 | 375.11 | 98.77 | 781.99 | 97.64 |
| 1966-67 | 426.32 | 98.62 | 481.27 | 96.64 |
| 1967-68 | 392.98 | 99.33 | *477.78 | 92.33 |
| 1968-69 | 572.16 | 99.61 | *747.88 | 93.24 |
| 1969-70 | 489.25 | 99.16 | *854.67 | 91.62 |

* Provisional Figures

Source: Nepal Rashtra Bank, Quarterly Economic Bulletin, January 1974.

The heavy concentration of Nepal's trade with India has been, among other factors, mainly due to its own landlocked location. The perennial snows in the north and the agriculturally deficit hill economy inside the country have been discouraging factors in the expansion of its trade with China. This leaves India as the only viable export market open to Nepal. Import of Indian goods into Nepal are license free. Both imports and exports payments are effected with Indian Rupees whereas licenses are required for all imports and exports to the overseas countries because all foreign exchange other than Indian currency is subject to exchange control. Furthermore, the trade composition is such that Nepal exports unprocessed agricultural primary goods to India and imports the same goods in processed form. Total imports that come from India range from basic processed consumer goods to many capital goods. These factors should explain Nepal's heavy dependence of trade on India. Considering this excessive dependence, it can safely be assumed that Nepal's foreign trade sector is satisfactorily specified without much distortion when its relationship with India alone is studied.

The observation period of the model covers a period of ten years from 1960-61 through 1969-70. No special significance has been attached to this period. The choice of the sample period for our study has been dictated purely by the availability of required data. The coverage of two of the country's development plans in the sample period is coincidental. We have been fully aware of the

desirability of a larger number of observations. However, there have been many meaningful studies done on ten-year observations as well. We feel that for a country such as Nepal with so scanty data, building a sectoral model of its foreign trade, even though with a small sample period of ten years, is a big first step in the direction of using an econometric model in formulating policy measures. The results of this model is hoped to be useful to rectify the consecutively rising annual trade deficit of Nepal.

## 1.3 Need for and Objectives of the Study

Nepal's real efforts to achieve economic progress started in the mid-fifties along with the launching of its first five-year plan (1956-61). Presently the country is on its fourth plan and even after two decades of the starting of development plans, there has not been many econometric studies made on the Nepalese economy. While this could mainly be due to scarcity of data, postponing econometric investigation of the economy till all data are made available would simply mean yielding to the situation. Need for such study has been long overdue and in the present study we intend to take a first step in that direction by building an econometric model of Nepal's foreign trade at the sectoral level. The specification of reliable quantitative estimates of the structure of Nepal's foreign trade itself is expected to be of tremendous importance to the planners in that it will provide them information on valuable concepts like price and income elasticity and import propensities.

The uneasy confession by the governor of the Central Bank of Nepal in the recent Ninth Conference of the Governors of Central Banks in South Asia (March 4-6, 1974) that due to "unavailability of up-to-date data the analysis of Nepal's trade with India is difficult and is largely based on conjecture" explains emphatically the need and importance of our proposed study. Several factors have motivated us to undertake the present study.

(a) As mentioned earlier, the foreign trade sector of the Nepalese economy has never been put under econometric scrutiny and as such its structural specification still remains all unknown.

(b) The persistent negative trade surplus throughout the period ever since data have been systematically recorded calls for serious attention to the problem. This again is reflected in the confession of the Governor in which the lamentation is expressed that in 1972-73 Nepal's exports to India have declined to some extent while volume of imports from India remain the same and that the rate of decline in Indian currency reserve with the Government has been more than double over the preceding fiscal year. The falling Indian Currency reserve with the Government is not at all a healthy sign. The explanation of the importance of Indian Currency to Nepal should need no elaboration considering that its huge imports come from India. Thus the problem of deficit balance of trade

has not only been a problem of the past during the sample period under study, it still has been a problem. The Government's policies aimed at meeting the trade deficit which after all are based on nothing more than "conjectures" has not been quite successful as has been shown in Table 2.1 to follow. As such, our study is vitally important in that it will provide a guidance to policy formulation leading towards the solution.

(c) Also attempts at sectoral research should eventually help us in building a meaningful operational model of the entire economy. This study is a first step towards that direction even though unavailability of adequate data have forced us to estimate the model at a highly aggregate level.

(d) Furthermore, to deny the importance of a foreign trade model is to deny the role of trade in development. This is more so for a country like Nepal whose geographical location, size and scanty known resources almost impels it to get out from a situation of autarky and resort to international trade.

In addition to the sectoral importance, the availability of data on foreign trade compared to other sectors of the Nepalese economy also have lured us to build a model for this sector. The model thus built would be used in projecting the imports and exports of the country for a period of five years. The resulting trade

deficits, so far, have been met by capital inflow in the form of foreign aid in IC. In the event that foreign aid is stopped and that the balance of trade problems have to be rectified by exchange rate adjustment measures, we would be computing the required exchange rate depreciation of the Nepalese currency (NC) that would bridge the trade gap in its trade with India.

Finally in our study, in a hypothetical situation where Nepal and India start imposing tariff rates on each other's goods at the same rates as in their trade with other countries, we will be examining their effects on Nepal's overall exports to and imports from India and thus the balance of trade. The hypothetical test is to study whether or not it will be to the advantage of Nepal to pursue more independent trade policies by imposing control in its trade with India.

## 1.4 Organization of the Study

The present study has been subdivided into six chapters. In Chapter 1, the statement of the problem and the hypothesis to be tested are made. Methodology is described. The purposes and need for the study is examined.

In Chapter 2, salient features of Nepal's foreign trade sector will be portrayed. Its composition and direction will be presented. There will be a discussion of trade treaties which have guided the trade between the two countries. Finally, there will be a brief discussion on Government trade policies and an examination of why they failed.

Chapter 3 includes a rather conventional custom of making a survey of literature. A review of several econometric models of foreign trade on different countries will be discussed.

Chapter 4 presents the formulation of our model. It includes choice of the model, variables, time unit, sample size and so on. The model will be explained diagrammatically also. The final section of the chapter presents the weaknesses and limitations of the model.

Chapter 5 includes a discussion on sources and nature of data, generation of data, statistical assumptions and estimation procedures. Finally, the results obtained are analyzed and evaluated.

In Chapter 6, we will be making a comparison of our study results with the results of other similar studies. Nepal's imports and exports will be projected for five years and the required rate of NC depreciation to rectify the projected trade deficits will be computed. The chapter will also deal with the effects on Nepal's imports and exports to India emanating from a hypothetical situation of Nepal and India imposing tariffs at each other at the same rates as they impose in their trade with the rest of the world.

# CHAPTER II

# SALIENT FEATURES OF NEPAL'S FOREIGN TRADE

In this chapter, we will be presenting the foreign trade structure of Nepal. We will also be analyzing government trade policies and treaties to explain the present state of the Nepalese foreign trade.

## 2.1 Introduction

Theories on economic development and trade regard foreign exchange gap and the savings-investment gap as the two most important constraints in the developmental process of many under-developed countries. The case study of Nepal presents a disequilibrium in both sides in that the trade deficits of the country has been widening and the domestic savings ratio to its gross domestic product has been quite low. Just to emphasize the seriousness of the problem presented by the trade deficits, we present a comparison of Nepal's imports and exports in the following Table 2.1.

A glimpse at the Table 2.1 shows that every single year under the sample period has been a deficit year. The deficit has been consistently increasing up to the year 1965-66. The sudden drop in the deficits in 1966-67 can be attributed to drastic measures taken by the government of Nepal following the devaluation of IC while trying to maintain its own exchange rate at the same level. The appreciation of the NC vis-a-vis IC caused a heavy speculative

Table 2.1

Nepal's Trade Balance with India, 1960/61 - 1969/70
(millions of Nepalese rupees)

| Year | Exports to India (X) | Imports from India (M) | Trade Gap (X-M) |
|---|---|---|---|
| 1960-61 | 209.17 | 375.09 | -165.92 |
| 1961-62 | 263.89 | 439.66 | -175.77 |
| 1962-63 | 286.01 | 598.75 | -312.94 |
| 1963-64 | 284.96 | 595.59 | -310.63 |
| 1964-65 | 435.17 | 806.42 | -371.25 |
| 1965-66 | 370.50 | 763.51 | -393.01 |
| 1966-67 | 420.74 | 465.11 | -44.35 |
| 1967-68 | 390.34 | 441.13 | -50.79 |
| 1968-69 | 569.92 | 697.30 | -127.38 |
| 1969-70 | 485.16 | 783.05 | -297.89 |

Source: Nepal Rashtra Bank, Quarterly Economic Bulletin, January 1974.

demand for IC bringing down the comfortable IC reserves with the government to an all time low level at NRs 63 million. Quotas were imposed in the allocation of IC, with demand exceeding 500 IC. The low import figures could also be due to unrecorded trade across the border on a large scale during that year to avoid the complications introduced by the Government. Additionally, the import values in terms of appreciated NC also could have shown a lower import figures. In the subsequent year, the NC was devalued to relieve the pressure created by speculative demand for IC. The deficit trend started to show up again.

Despite consecutive trade deficits, the IC reserves with the Government have been increasing. This has been mainly because of the Indian and U.S. aid that the country has been receiving in the form of IC. The accumulation of IC with the Government thus does not reflect an excess of its exports over its imports from India. The flow of aid which has been taking care of the trade deficits for so long is determined by various factors exogenous to the system. Consequently, a lasting improvement in the balance of trade should not be expected from aid alone.

## 2.2 Composition and Direction of Nepal's Trade

The foreign trade structure of Nepal is very similar to the foreign trade structure of most of the less developed countries in that Nepal's exports have been basically primary goods and its imports have been processed consumer goods to capital goods. The following Table 2.2 is given to illustrate the export composition

Table 2.2

Composition of Nepal's Exports to India, 1960/61 - 1969/70
(millions of Nepalese rupees)

| Year | Total Exports | Food | Percent | Manufactures | Percent | Crude Materials Fuels and Capital Goods | Percent | Others* | Percent |
|---|---|---|---|---|---|---|---|---|---|
| 1960-61 | 209.17 | 158.27 | 75.67 | 3.29 | 1.57 | 43.51 | 20.80 | 4.09 | 1.96 |
| 1961-62 | 263.89 | 173.60 | 65.78 | 35.56 | 13.48 | 50.63 | 19.19 | 4.10 | 1.55 |
| 1962-63 | 286.01 | 166.00 | 58.04 | 47.35 | 16.56 | 67.36 | 23.55 | 5.30 | 1.85 |
| 1963-64 | 284.96 | 195.03 | 68.44 | 26.67 | 9.36 | 59.18 | 20.77 | 4.07 | 1.43 |
| 1964-65 | 435.17 | 257.52 | 59.18 | 51.80 | 11.90 | 116.02 | 26.66 | 9.82 | 2.26 |
| 1965-66 | 370.50 | 183.27 | 49.47 | 64.15 | 17.31 | 115.68 | 31.22 | 7.40 | 2.00 |
| 1966-67 | 420.76 | 251.91 | 59.87 | 56.49 | 13.43 | 109.26 | 25.97 | 3.10 | 0.74 |
| 1967-68 | 390.34 | 201.41 | 51.60 | 81.91 | 20.98 | 104.05 | 26.66 | 2.96 | 0.76 |
| 1968-69 | 569.92 | 251.81 | 44.18 | 145.09 | 25.46 | 167.38 | 29.37 | 5.65 | 0.99 |
| 1969-70 | 485.16 | 294.69 | 60.74 | 64.87 | 13.37 | 120.51 | 24.84 | 5.09 | 1.05 |

Source: Nepal Rashtra Bank, Quarterly Economic Bulletin, January 1974.

* Others include beverages and tobacco, animal and vegetable oils, chemicals, drugs, and miscellaneous.

of the country. The table shows that Nepal's major exports to India have been basically food. There seems to be a slight falling trend of food exports, the lowest percentage of food exports being 44% in 1968-69. The trend is however reversed in the following year. Another feature of the foreign trade seems to indicate a gradual expansion of exports of manufactured goods. The highest percentage of such exports was 25.46% in 1968-69. The trend again reversed drastically in the subsequent years. As we see later, these apparent changes in the Nepalese export structure was not the result of genuine structural changes in the Nepalese economy. Some of the trade policies adopted by the Government with the intention of diversifying its trade had led to deflection of trade with India. This was stopped in 1969-70 as is evident from the regained high percentage of food exports to India. Otherwise the export composition of the country basically has remained the same.

Nepal's imports from India have been increasing constantly. This is illustrated in Table 2.3. As evident from the table, there has not been much change in the composition of imports over the period under study. The trend of capital goods imports has been rising gradually. This is expected; as the country attempts to develop, its demand for capital goods like machinery and transport equipments and raw materials will show an increasing trend. Beverages and tobacco imports have been falling especially after 1965-66. This can be explained by the openings of cigarette industry inside the country with the help of foreign aid. The

Table 2.3

Composition of Nepal's Imports from India, 1960/61 - 1969/70
(millions of Nepalese rupees)

| Year | Total Imports | Food | Percent | Manufactures | Percent | Crude Materials, Fuels and Capital Goods | Percent | Others* | Percent |
|---|---|---|---|---|---|---|---|---|---|
| 1960-61 | 375.09 | 47.35 | 12.62 | 201.44 | 53.70 | 69.09 | 18.42 | 57.21 | 15.25 |
| 1961-62 | 439.62 | 62.26 | 14.16 | 215.73 | 49.07 | 84.59 | 19.24 | 77.08 | 17.53 |
| 1962-63 | 598.95 | 90.91 | 15.18 | 322.94 | 53.92 | 108.87 | 18.18 | 76.23 | 12.73 |
| 1963-64 | 595.59 | 94.99 | 15.95 | 286.04 | 48.03 | 128.51 | 21.58 | 86.05 | 14.45 |
| 1964-65 | 806.42 | 101.01 | 12.53 | 388.41 | 48.16 | 203.36 | 25.22 | 113.65 | 14.09 |
| 1965-66 | 763.51 | 126.98 | 16.63 | 366.09 | 47.95 | 162.10 | 21.23 | 108.74 | 14.24 |
| 1966-67 | 465.11 | 92.90 | 19.97 | 169.31 | 36.40 | 157.73 | 33.91 | 45.17 | 9.71 |
| 1967-68 | 441.13 | 84.40 | 19.13 | 195.99 | 44.43 | 111.24 | 25.22 | 49.50 | 11.22 |
| 1968-69 | 697.30 | 103.06 | 14.78 | 356.85 | 51.18 | 172.84 | 24.79 | 64.55 | 9.26 |
| 1969-70 | 783.05 | 155.50 | 19.86 | 346.42 | 44.24 | 204.57 | 26.12 | 76.55 | 9.78 |

Source: Nepal Rashtra Bank, Quarterly Economic Bulletin (several issues).

* Others include imports of beverages and tobacco, animal and vegetable oils, chemicals, drugs, and miscellaneous.

imports of cigarette used to account for a big amount of IC. Imports of food in the processed form have been expanding gradually and the trend of imports of manufactured articles has been contractionary. This again could be due to the establishment of some of the domestic market oriented import substituting industries like sugar mills, shoe mills and so on. The basic pattern of Nepal's import structure, nonetheless, has remained the same over the period of the last two decades.

Because of its sandwiched location between India and China, Nepal's direction of trade has been less diffused and more centered to India. Nepal's historic fluorishing trade with its southern as well as northern neighbors was mainly because of the prosperous Trans-Himalayan trade in which Nepal served as a trade link between India and Tibet. The affluence they achieved through free flow of goods and services between India and Tibet via Nepal however declined sharply along with the decay of the Trans-Himalayan trade. Especially after the signing of the treaty between Lhasa and the Britishers in 1904, Nepal-Tibet trade suffered a sharp setback. The treaty opened a new trade route between British India and Lhasa. This route proved to be cheaper and better than the Nepalese route. Today its trade with Tibet, once its important trade partner, has been almost negligible and Nepal's foreign trade has been virtually confined to India. The excessive dependence on Indian market is also reflected on the fact that whereas primary products form 93% of Nepal's exports to India, manufactured goods form 77% of its

imports from India. A huge chunk of these primary products go to India with no or little industrial processing and in several cases are returned to Nepal after processing. The direction of Nepal's external trade thus despite government's attempt to diversify has remained virtually unchanged. This is presented in the following Table 2.4.

Nepal's direction of trade with Tibet has remained more or less constant and its trade with the overseas countries indicate a sign of slow expansion. In terms of percentage as well as absolute volume of the total trade, India remains a single country where almost all of Nepal's goods are traded both in terms of imports and exports. India thus stands as the main seller and buyer to Nepal.

We have noted the composition and direction of Nepal's trade. The section to follow will be devoted to the cause of the present trade structure of Nepal. This can best be explained by studying the trade treaties between Nepal and India on which the whole trade structure has been based. Indeed, a discussion of trade problems of Nepal would not be complete if no reference is made to the bilateral trade treaties between the two countries.

## 2.3 Treaty of Trade and Commerce--1950

Nepal has signed three trade treaties with India during the past twenty-five years and the present trade treaty expires in 1976. All three trade treaties have allowed free trade between India and Nepal. The first such formal trade treaty was signed between Nepal and India in 1950 and this marks the inception of modern trade

Table 2.4

Nepal's Total Imports, Imports from Overseas and Tibet, 1960/61 - 1969/70
(millions of Nepalese rupees)

| Year | Total | From Overseas Countries | | From Tibet | |
|---|---|---|---|---|---|
| | | Amount | (%) | Amount | (%) |
| 1960-61 | 397.98 | 19.13 | 4.81 | 3.76 | 0.94 |
| 1961-62 | 444.41 | - | - | 4.75 | 1.07 |
| 1962-63 | 604.03 | - | - | 5.08 | 0.84 |
| 1963-64 | 604.56 | 1.86 | 0.31 | 7.11 | 1.18 |
| 1964-65 | 818.87 | 9.42 | 1.15 | 3.02 | 0.37 |
| 1965-66 | 781.99 | 11.18 | 1.43 | 7.30 | 0.93 |
| 1966-67 | 481.27 | 10.92 | 2.27 | 5.23 | 1.09 |
| 1967-68 | 477.78 | 30.73 | 6.43 | 5.92 | 1.24 |
| 1968-69 | 777.88 | 44.21 | 5.91 | 6.37 | 0.85 |
| 1969-70 | 854.67 | 68.89 | 8.06 | 2.73 | 0.32 |

Source: Nepal Rashtra Bank, Quarterly Economic Bulletin (several issues).

between the two countries. The treaty assures Nepal transit facilities of all goods and services through the ports in India with no payments of duties on them in India. The treaty however had adverse effects on the domestic industries of Nepal in many respects. For instance, one of the articles in the treaty says, "The Government of Nepal agree to levy at rates not lower than those leviable, for the time being in India, custom duties on imports from and exports to countries outside India. The Government of Nepal also agree to levy on goods produced and manufactured in Nepal, which are exported to India, export duty at rates sufficient to prevent their sales in India at prices more favorable than those of goods produced or manufactured in India which are subject to central excise duties."[1]

The treaty of 1950 thus imposed restrictions on Nepal that Nepal should adopt the same tariff rates imposed by India as the minimum rates on its imports from third countries and that Nepal should not undersell its exports to India and this should be achieved by levying an export duty such that the landed price of imports from Nepal should not be less than the price of equivalent Indian manufactures. The article, in effect, leaves no option for Nepal but to adopt identical trade policies as pursued by India. It was more or less to the effect of forming a customs union except that by imposing upon Nepal necessity to levy "export duty at rates sufficient to prevent their sales in India," Nepal could not harvest

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[1] B.P. Shrestha, An Introduction to Nepalese Economy, Ratna Pustak Bhandar, Kathmandu, 1966.

possible trade creation in its trade with India after bearing trade diversion resulting in its trade with the rest of the world by adopting the same as Indian tariff rates to those third countries.

Understandably, considerable criticisms have been voiced against these provisions. A valid comment was made that while India wanted a common external tariff by requiring Nepal to adopt the same Indian rates in regards to imports from third countries and the association of Nepal with India would amount to a customs union, the benefits of customs union can be realized at their best only when the association is one of equal development status. If the members of the customs union have different levels of development, there is a likelihood of more gains going to the member country which is more advanced in economic development and far bigger in size and resources.[2] Further as pointed out by R.F. Mikesell, there is also the fear of emergence of economic dualism in that the advanced country with a headstart in industrialization may dominate the less advanced member country in manufacturing and reduce it to the level of being a supplier of primary goods alone.[3] In the long run there is also a fear of investment flows in terms of capital and skill both from within the region and outside the region being increasingly drawn to the industrial centers of the advanced member

[2] B.P. Shreshtha, op. cit., p. 25.

[3] R.F. Mikesell, "The Theory of Common Markets and the Developing Countries," in R.F. Harrod and D.C. Hague (eds.), International Trade Theory in a Developing World, London Macmillan, 1963.

country. If these polarization effects are allowed to grow, the political future of the association of the member countries of unequal sizes would be uncertain. In the theoretical literature on the subject, the remedies suggested are redistribution of gains from the advanced country to the less advanced countries, regulation of investment flows and regional development and all these are to be supervised by an effective supranational agency.[4]

It may be seen that the Treaty of 1950 did not make any mention of these issues and it appears in hindsight that none of the signatories had any appreciation of the problems posed by a customs union. Only the following treaty signed in 1960 showed some understanding and sought to recognize the unequal status of Nepal in a trade association with India.

Another provision namely that Nepal should not undersell her manufactures in India also invited criticisms on the ground that the emerging manufacturing sector of Nepal would not be able to meet the Indian competition anyway; but it was felt that wherever the efficient infant Nepalese industries are able to make headway, they should be encouraged rather than discouraged and priced out of market. The immediate impact of the provision might have been minimal due to the fact that the manufacturing sector of Nepal at that time was an extremely small part of the total economic activities, this certainly seems to have slowed down the process of industrialization in the

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[4] A.O. Hirschman, The Strategy of Economic Development, Yale University Press, New Haven, 1958.

country by discouraging the growth of potential export industries.

Also in its trade with the third countries, Nepal was required to obtain the amount of foreign exchange from the Government of India according to the import license issued by the latter. Nepal's foreign exchange earnings from its exports to the overseas used to be handled by the Reserve Bank of India. The country's overseas trade was thus completely under the control of India. Furthermore, in its trade with the third countries, Nepal was required by treaty to levy at rates not lower than leviable in India, custom duties on imports from and exports to countries outside India. This has forced Nepal to remain less competitive in the international market. In its already highly concentrated external trade structure resulting from several geographical and economic factors, the 1950 treaty furthermore tied up the country's overall trade relations with its southern neighbor, India.

2.4 Treaty of Trade and Transit--1960

The 1950 Treaty of Trade and Commerce was replaced by the 1960 Treaty of Trade and Transit. The Treaty of 1960 displayed an awareness of the critical atmosphere and hence a spirit of accomodation towards the less developed partner. Though the treaty deliberately uses the term "Common Market" towards which the trade relations were designed to move, there was no attempt to spell out the issues posed by a customs union let alone a common market which is a far more advanced concept in that common market visualizes free movement of factors of production in addition to free flow of trade.

The 1960 treaty was also more relaxed in that the treaty enabled Nepal to impose protective duties or quantitative restrictions on imports from India so that the infant industries in Nepal could be able to overcome the initial handicaps of development. Nepal also could levy import and export duties on goods imported from or exported to India to regulate its trade according to its own tailoring. This gave Nepal an excellent opportunity to develop its export industries which had been denied under the 1950 treaty. The treaty opened the huge Indian market for the Nepalese exporters. Nepal also could develop its domestic import substituting industries behind the tariff wall by restricting imports from India. It was more than a mere coincidence that during this period, several domestic market oriented industries such as sugar, cigarettes and shoe mills were developed during this period, now that Nepal could pursue a policy of encouraging infant industries providing protection against the imports from India.

The treaty of 1960 did not impose the need for Nepalese tariff structure to be in consonance with the Indian tariff structure and hence provided freedom for Nepal to have its own tariff structure against the third countries. Thus the treaty of 1960 sought to meet the valid criticisms of the earlier treaty by enabling Nepal to pursue an independent tariff policy against its trade with overseas countries. In essence, the association became one of a Free Trade Area rather than a customs union since it enabled both

partners to have different tariff structures against the rest of the world permitting, at the same time, free trade with each other.

Regarding Nepal's trade with third countries, the treaty permitted Nepal to adopt its own foreign exchange laws and now it also could keep with itself the foreign exchange earned from the trade with the third countries. The treaty also provided storages facilities at the Calcutta port and the transit facilities. Overall, the 1960 treaty was more favorable to Nepal.

2.5 Import Entitlement Scheme--1962-63

Immediately following the new treaty, the Government started its policy of trade diversification. One of the major policy instruments adopted to accomplish the objective was "Import Entitlement Scheme" initiated in 1962-63. The chief purpose behind the scheme is to increase exports to the hard currency countries rather than to India by specifically reserving the incentives in respect of exports to the countries only. The scheme is similar to the exports incentives prevalent in some countries such as Pakistan. Under the scheme, the Nepalese exporters exporting to the third countries were granted an import entitlement as high as up to 90% of the value of the goods exported. Depending on the commodities, 60% of the import entitlement so received could be used to import virtually anything from those countries and 40% was to be spent in the imports of what was termed as "development goods". Thus the scheme was meant to expand exports to the countries other than India and import development goods there from so that the reliance on one single country can be lessened.

The policy, for several reasons, did not appear to have yielded desirable results. The scheme stressed on only geographical aspects of diversification without a due consideration to the aspect of commodity diversification. The incentives thus granted to the industries exporting to the hard currency countries also led to a distortion in the country's allocation of resources in a very unforeseen way. The exporters took the opportunity to import materials such as nylon fabrics and stainless steel in large quantities under the scheme's provisions for free imports of any goods to the extent of 60% of the import entitlement and added very little value to these commodities and exported them to India which had closed their doors to the imports of the same nature from other countries. In a way, these exports to India could be construed to constitute a departure from the traditional exports and the diversification in exports was spurious to say the least. The scheme resulted into trade deflection rather than trade diversification. As noted in the country economic survey reports of the ECAFE bulletin, larger portions of these operations were being handled by the Non-Nepalese and understandably it resulted in a considerable capital flight from Nepal.[5] The export earnings that were either spent on unproductive goods and efforts or carried out of the country can rightly be called as misallocation of scarce resources.

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[5] United Nations, Economic Bulletin for Asia and the Far East Country Economic Reports, Vol. XXII, No. 3, December 1971.

Another aspect of the scheme which could be criticized is that 40% of the export receipts was supposed to be spent on so-called development goods. But they were never defined in any clear and concise way. This naturally led to importation of goods unconnected with export industries and also luxuries items for their re-export into the closed market of India at a highly profitable price.

The import entitlement scheme covered only a small part of Nepal's foreign trade since the proportion of trade with India to total trade was substantial and it was excluded from the purview of the scheme. Consequently, the benefits from the scheme were confined to a small part of the total export sector. Had the scheme been drawn in a different way from what it was, such as promoting processed primary goods rather than agricultural raw materials without any geographical discrimination, the gains from the scheme would have covered the total export sector and would have encouraged processed goods industries and the impact of the scheme in terms of generation of income, output and employment opportunities would have been diffused to the entire economy. This would have laid a firm industrial base in the country and also would have met domestic demand for processed goods, at least partially, if not totally, which are now being imported from India. This would reduce dependency on India in the long run. Furthermore, this would also open up markets in the third countries when Nepal gains experiences in making the processed goods to meet domestic demand. Thus, it appears that the twin objectives of reducing the country-

concentration and commodity-concentration in trade could be achieved with greater assurance of covering the total export sector and generating the multiplier effects through the economy.

Thus the import entitlement scheme was successful in developing neither indigenous manufacturers to the third countries nor making available the highly needed capital goods. On the contrary, the scarce capital resources were mobilized in lucrative re-export business. This so-called diversification in export came to a halt when India put an end to the imports of both nylon fabrics and stainless steel goods from Nepal. These industries which purported to have added value domestically to the imports of these commodities disappeared overnight. This clearly brings out the undesirable manner in which the resources were spent under the scheme. The domestic impact of these industries were very minimal in terms of generation of income, output and employment opportunities as the value added in these industries was very nominal.

A parallel system known as gift parcel system allowed parcels up to 1000 NC worth sent from abroad to the Nepalese as gifts did not require any import license. The system was used again in importing small luxury items like cameras and watches to be fed into the Indian market. While these operations showed in statistics books, an increase in the volume of Nepal's trade with the overseas countries, they did not reflect a genuine trade diversification.

While these operations did help Nepal in providing an additional supply of both hard currency and IC to combat its trade balance, their net contribution to Nepal's economic development was very small. A large part of Nepal's exports to the overseas countries was made possible only because the imports from these countries could be re-exported to the Indian market at a higher price. The whole process thus rested on a precarious base. It is very ironical that while new markets in the third countries were formed, the dependence on the Indian economy was not diminished. The underlying objective of the policy was thus not achieved. It simply gave a false sense of trade growth and a mistaken belief that Nepal was achieving a growing degree of economic independence. The devaluation of IC in 1966 came as a real test to this mistaken belief. Nepal maintained its parity. The increasing amount of IC with the Government had persuaded this step. Data were showing an increasing trade volume with India as well as the third countries. The NC appreciation led to a heavy demand for IC. Despite several measures, the large pool of the IC reserves gathered over several years were so depleted that by 1967 Nepal had to devalue its currency. This clearly shows that the IC accumulation with the Government was not because of Nepal's strengthening trading position with India. Despite the policy of trade diversification, Nepal's trade concentration in terms of commodities and market was not lessened.

## 2.6 The Trade and Transit Treaty--1971

The 1960 trade treaty that guided the trade between the two countries for ten years was terminated in 1970. The 1971 trade and transit treaty was the outcome of hard negotiations for a year and a half from both sides. Ironically, some of the clauses in the treaty were strikingly similar to the 1950 treaty. For instance, one of the clauses in the treaty says, "The Government of India will provide an access to the Indian market free of basic custom duties and quantitative restrictions generally for all manufactured articles which contain not less than 90% of Nepali materials or Nepali and Indian materials."[6] This particular provision has provoked a considerable criticism in Nepal. This provision seems to have been influenced by the earlier Nepalese exports of nylon fabrics and stainless steel to India. Mention has been made of little value added by the Nepalese exporters in these exports which had no impact on the domestic economy in terms of generating income, employment and output. In a way, the new provision can be looked upon favorably as having a salutary effect on Nepalese production for exports with the emphasis on the role of linkages effects in terms of larger impact on the economy. But it is not clear as to why such an enormously high percentage came to be imposed. Any economic activity, let alone export industry, in an emerging economy such as Nepal has to depend on certain tradable inputs. Substantial

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[6] Trade Promotion Center, Treaty of Trade and Transit, Kathmandu, August 1971.

requirements in terms of chemicals, cement and similar intermediate goods are needed even if it is considered that the major component is the domestic raw materials. Furthermore, in case of exports, the standards of specification and quality are far stricter and naturally more care has to be taken and thus import contents understandably would be at least somewhat higher than for goods meant for domestic consumption. In an infant economy like Nepal, 10% as the maximum permissible import contents seems to be too low a figure. In the absence of an input-output table for Nepal, it is difficult to pin it down to a specific percentage. However it appears reasonable to have a higher figure than the present figure of 10%. Imposition of at least 90% or more Nepalese and/or Nepalese and Indian raw materials would prohibit the Nepalese from buying raw materials from any sources other than India even though this would mean a higher price and hence a trade diversion. Thus this provision of the treaty could retard the potential export industries of the country.

Indo-Nepal trade relations have thus been marked by free trade between the countries which has some advantages from trade creation and some disadvantages from trade diversion. The exception is in the area of protecting infant industries in order to overcome their historical handicaps. Nepal's trade relations with the rest of the world are not very significant at the moment and it appears the present situation of free trade with India and freedom to have an independent tariff structure against the imports from outside world

would be better than a customs union with India. In the event of a customs union, Nepal has to have the same tariff structure as India against the imports from the third countries, which is higher than the Nepalese tariff structure. Additional trade diversion losses as a result of an upward revision of the present Nepalese tariff structure in keeping up with India's tariff structure or in accordance with the negotiated common external tariff scheme would have to be realized. Presently the proportion of Nepal's trade with the rest of the world being small, these trade diversion losses would be much smaller than otherwise. However at the present stage of economic development, it appears more desirable to have an independent tariff structure against the third countries in order to have free access to commodities from the rest of the world which is precluded under a customs union with India. Though the additional losses from trade diversion for Nepal might not be substantial in the event of the formation of a customs union with India, it is questionable whether it is necessary at all to undergo such losses, though minimal, especially when no additional gains are to be realized from such formation of customs union.

# CHAPTER III

# ECONOMETRIC MODELS OF FOREIGN TRADE: A SURVEY OF THE LITERATURE

## 3.1 Review of Literature

In a study like this, it is rather conventional to give a brief analytical review of literature in the field. A complete absence of such study with Nepal as a case study forces us to remain satisfied with the review of similar literature on other countries. In this section, we try to examine critically the available models on foreign trade for different countries.

There have been many foreign trade models for several countries. One striking similarity of most of those studies is that their approach to the problem has been from demand side only. In the current account of balance of payments, basically what is involved is the country's imports and exports. In most of the studies on foreign sector model building, the way the issue has been handled is to analyze domestic demand for goods imported by fitting an import demand function and thus estimate the import demand curve. Export is taken as the trade partner country's import demand function and again another demand function is fitted. This has been the set pattern for a long time. What has not been well considered and explored is that export is not only demand for the trading partner country, it is also supply aspect for the exporting country. First we will be examining carefully those models which

have been dealt only from the demand side. But before we examine the models we will be looking at how foreign trade is classified. (a) In some econometric models, foreign trade is classified by the type of goods traded such as consumer goods, capital goods, depending on the degree of processing. (b) Foreign trade also can be classified by origin and destination of the traded commodities as by territorial boundaries (by continent or country) or political boundaries (Western Bloc, Soviet Bloc, Non-Allied countries) or economic affiliation (like by EFTA, OECD, Common Market) or degree of development (as by developed, semi-developed or underdeveloped countries) or by monetary boundaries (U.S. dollar zone, sterling zone, etc.). The foreign trade classification could also be a mixed one or a combination of both. The choice of classification is a matter of personal judgment.

### 3.2 Trade Models from Demand Side

In his econometric model of the Greek economy, Suits fits an import function for six classes of commodities with observation of eight years for some commodities, from 1953 to 1960, and nine years for the other, from 1953 to 1961.[1] His six-fold classification of imports consists of (a) manufactured consumer goods, (b) manufactured non-consumption goods, (c) animal products and fish, (d) edible oils, (e) cereal and plant products, and (f) luxury agricultural products.

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[1] D.B. Suits, An Econometric Model of the Greek Economy, Athens, Greece, 1964.

As expected, price and income are the principal variables in his functions and in most cases what he finds is that "the coefficient of price variable is not improved by inserting income variable and also the coefficient of income variable does not become significant by the addition of relative price variable." So in most of his six equations, he drops out relative price as an explanatory variable and takes income variable instead. In the first of his six equations, he has tried to explain the functions in terms of only disposable income. In his second equation, he runs with value added by manufacturing activities as the only explanatory variable. In his import function for meat and fish, Suits finds that it is highly correlated with income and price taken separately but since price and income are highly correlated with each other, they do not provide a good result. So Suits fits the regression with income coefficient under constraint on the supposition that income elasticity of demand for these imports is the same as that for food in general. Suits does precisely the same, taking price as the explanatory variable and putting income coefficient under constraint for his fourth of the six import function. In his last two equations of plant products with domestic substitutes and edible oils respectively, Suits uses lagged domestic production and lagged stock as the independent variable but finds them quite insignificant.

Import aspect is just a partial explanation of foreign trade sector and export side also should be considered for completeness. Exports, in his model, were considered as an exogenous variable.

Constantine Thanopoulos' econometric model of the Greek foreign trade sector covers almost the same period from 1953 to 1963.[2] His model not only has more observations but also is more complete at the sectoral level since it incorporates export side of the foreign sector as well. He has approached import and export from demand side and has classified import functions into three separate equations by different commodities.

His six export functions have been disaggregated by destination like export to EEC area, dollar area, sterling pound areas and so on. He has got nine behavioral equations and one identity in his model. Since there is no simultaneity involved in the model, Thanopoulos, like Suits, uses single equation least squares method for estimation. Like Suits, he finds real income as the main independent variable and price playing only a secondary role. In his six export functions, price appears as a variable only in three equations playing a secondary role and it does not show up at all in any one of his import functions.

It is true that there has been a great controversy over the relative importance of price and income. In the neo-classical theory of international trade, flexible price and export and import

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[2] C. Thanopoulos, An Econometric Model of the Greek Foreign Trade Sector. Unpublished Ph.D. Dissertation, Indiana University, 1966.

price elasticities played a significant role in maintaining an automatic stability in the balance of trade or payments. To them, gold outflow from the country during the period of trade deficits would reduce the price level and thereby encouraging more exports of the deficit country narrowing the trade deficits. The gold inflow in the surplus country supposedly causes an increase in price and thus fall in their exports bringing back the country to the balance of trade equilibrium. This self-correcting mechanism or "the rules of the game" however, assumes the sum of the export price elasticities of the two countries to be greater than one. The other assumption of the theory is that the slope of the supply curve is infinity so that export can react to the change in relative prices. Also, the neo-classical trade theory started from the point of trade equilibrium. The Keynesians' severe criticism of the theory is directed to the small importance attributed by the neo-classics to the change in income in the process.

If price variable enjoyed a major attention in the classical theory of trade, income played a crucial role in the Keynesian theory. This probably explains the increasing use of income variable in the recent econometric studies replacing price. But then analysis of imports and exports is basically the analysis of demand and supply (from domestic side and foreign side). As such, price plays just as crucial a role as income does in demand-supply mechanism. As correctly pointed out by Hitiris, trying to

generalize the use of one or the other variable would simply mean disregarding the fact that for some commodities, price would constitute the main explaining factor and for others, income as a crucial variable and yet for others both price and income might constitute as the main influential factors.[3] Hence along with the effects of other variables, both income and price deserve a careful attention in explaining import and export functions. The incorporation of both relative price as well as income variable in the function is striking a compromise in the neo-classical trade theory and Keynesian theory.

This is what Hitiris has done in fitting his import functions. His observation period like the models described above coincides with the same period from 1955-1964, a period of ten years. But unlike his predecessors, he uses quarterly data. His disaggregation is more detailed in that he fits six import functions all disaggregated commodity-wise and he also runs the regression of total import function making his import functions seven in total. He uses both relative price as well as income variables in his estimation and he gets significant coefficients for both variables in all his functions except one in which price coefficient was found to be statistically less significant. (Statistical criteria to judge the significance of the variable is by looking at the size of its

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[3] T. Hitiris, Trade Effects of Economic Association with the Common Market: The Case of Greece, Praeger Publishers, New York, 1972.

standard error.) Like import functions, his export functions are also disaggregated commodity-wise into five sub-categories and one function for total export totalling six export equations. Price variable was found to be a significant variable for half of the regressions and in case of total export functions, price coefficient gave a correctly expected sign even though it did not come out statistically significant. Thus Thanopoulos completely ignored price variable in his import functions and Suits found "price and income too correlated with each other to provide reliable results both taken together."[4] Hitiris shows that both price and income ought to be considered as explanatory variables in dealing with exports and imports functions even though some categories of commodities could be more sensitive to price compared to income. Hitiris' work was more detailed with many observations, highly disaggregated classification both in imports and exports side and it also included both price as well as income effects in his functions.

In Dutta's model of India's foreign sector that covers the period from 1951 through 1960, there are six structural equations and one identity.[5] Out of his six functional equations, there are two import demand functions disaggregated by commodities and services.

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[4] D.B. Suits, op. cit., p. 39.

[5] M. Dutta, "A Prototype Model of India's Foreign Sector," International Economic Review, January 1964.

The rest are export functions for different regions like for dollar regions, sterling pound regions, OECD region and the rest of the world. In his import functions, Dutta finds relative price variable statistically nonsignificant and does not even report the result. Taking the results of Dutta's study for granted, Krishnamurty in his study does not even make an attempt to introduce relative price as an explanatory variable in his import demand equation and instead uses disposable income and foreign exchange reserves with the Government as the only explanatory variables.[6] But in the similar study on Indian total imports, Thampy comes up with a significant price variable even though he uses only import price without considering it in relation with domestic price and thus disregarding substitution effect.[7] In his export equation also, Dutta finds relative price as significant variable in only one out of his four functions.

In his study of An Econometric Model of India, Choudhry disaggregates his import functions into three groups of commodities and exports functions in four.[8] Choudhry finds import demand for

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[6] K. Krishnamurty, An Econometric Model of India, 1948-61, Unpublished Ph.D. Dissertation, University of Pennsylvania, 1964.

[7] M. Thampy, An Econometric Model of the Monetary Sector in India. Unpublished Ph.D. Dissertation, University of Pennsylvania, 1967.

[8] N.K. Choudhry, An Econometric Model of India. Unpublished Ph.D. Dissertation, University of Wisconsin, 1963.

food and machineries to be "generally unresponsive to price" and he excludes price variable from the estimating equations. In his import function for other consumer goods categories however, he introduces price variable. In the export side, his export equations for tea and export equations for other goods contain price as explanatory variable and the remaining two other export equations for jute and cotton do not carry price variable. As has been shown above, there have been some studies on Indian foreign trade sector with the conclusion that relative price do explain the behavior of food imports in case of India. Choudhry's rejection of an important variable like relative prices from some of his import and export functions just on his own assertion makes foreign sector of his model weak.

In his model of the foreign trade sector of the U.S. economy covering the period of 1953 to 1964 (quarterly data), Prachowny fits three import functions and one export function in the balance of trade part of the current account of the balance of payments.[9] In his import and export functions, he includes both relative prices and income variables and has got them statistically significant and thus takes account of both substitution effect as well as income effect. His work is a very elaborate work in the foreign trade of the United States covering virtually all items entering the balance of payments of the country.

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[9] Prachowny, M., A Structural Model of the Foreign Sector of the U.S. Unpublished Ph.D. Dissertation, University of Michigan, 1967.

### 3.3 Trade Models from Demand as well as Supply Side

In contrast to the above models, we now review some of the available models on foreign trade of different countries which deal with the export and import functions not only from demand side but also from the supply side. The first of such a study was on New Zealand's exports made by Bergstrom in 1955.[10] In it, Bergstrom estimates the parameters of the supply and demand equation for New Zealand's exports like dairy products, lamb and mutton. Since New Zealand's most of the trade have been limited to England, the model has been a two-country model for the period covering 1922 to 1938. In New Zealand's export equations, the variables used for explaining the functions have been standard income and relative price in the two countries. What makes this model different from the models reviewed above is the fitting of export supply functions. He fits export demand and export supply equations for New Zealand's dairy products, lamb and mutton, all in double log form. The independent variables used in the functions are the price of the respective commodities (since they are substitutes to one another), average f.o.b. price of New Zealand wool for season, index number of wage rates in New Zealand in farming during season, number of milking cows in New Zealand and number of breeding ewes in New Zealand carried from the preceding season. He finds the estimated supply elasticities for dairy products and lamb to be negative

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[10] A.R. Bergstrom, "An Econometric Study of Supply and Demand for New Zealand's Exports," Econometrica, July 1955.

reflecting the inverse relationship of their supply with their own price even though theoretically the reverse is expected. The explanation offered by the author is that a change in the price of any product will cause both income and substitution effect and they work in the opposite direction. If the income effect is sufficiently powerful to outweigh the substitution effect, supply elasticities will be negative as price goes up. The writer feels that in New Zealand, since most labor is provided by the farmers' families, any increase in the price of their products would cause preference of leisure to production expansion and thus resulting in a negative supply elasticities.

In the export demand side also, Bergstrom comes up with UK's negative income elasticities of demand for New Zealand's lamb and mutton suggesting that UK's import demand for these commodities moving in opposite direction to UK's income. Since import consumption is extension of domestic consumption, we expect, *a priori*, a positive relationship of it with income. The explanation offered for the negative income elasticity is that New Zealand's lamb export has been in frozen form. It is likely that the consumers in UK prefer fresh home produced lamb to frozen lamb as their income rises. Despite some of these unexpected signs in the estimated coefficients, Bergstrom's study appears to be one of the earlier studies to specify the export supply functions.

There has been a recent work on foreign trade model involving both demand and supply of exports undertaken by Birnberg and Resnick here after referred to as BNR model.[11] They were building a model of trade and Government sector in colonial economies. The countries adopted by them in their model include Ceylon, India, Jamaica, Nigeria, Philippines and Taiwan and also Cuba, Chile, Egypt and Thailand. The last four countries were not quite colonial countries. Out of the total five structural equations in their model, the trade sector contains three of them for export supply, export demand and import demand of the colonial countries all in aggregate form. In the export supply function, Birnberg and Resnick use export price as one of the explanatory variables. Theoretically however, the exporters are also concerned with their domestic price other than just the export price. It is after the comparison between the two that they decide the amount to be supplied in the export market. In other words, by excluding domestic price in their export supply function, Birnberg and Resnick have ignored the substitution effect. In their export demand function, the independent variables have been standard income and price variables along with export lagged by one year. In the import demand function, all the independent variables have been the same except that income has been replaced by volume of exports, the coefficient of which like that of income is expected to be positive.

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[11] T. Birnberg and S. Resnick, "A Model of the Trade and Government Sectors in Colonial Economies," American Economic Review, September 1973.

The present chapter has been devoted to a brief review of the literature of econometric models of foreign trade sectors of various countries for different periods of time. We have noticed that a large part of the literature has been devoted to the study of the foreign trade only from demand side. In the estimation of export and import demand functions, the role of price seems controversial as an explanatory variable whereas income in one form or another seems to explain the export and import behavior emphatically. The studies on foreign trade models from the supply side has remained relatively less explored. In our model which will be formulated in the next chapter, an attempt has been made to study the Nepalese foreign trade sector from both demand as well as supply aspects.

# CHAPTER IV

## THE FRAMEWORK OF THE MODEL

This chapter will contain the mathematical framework of our model. There will also be a diagrammatical exposition of the model. A brief comparison will be made of our model with other foreign trade models. Finally, we will be pointing out some of the limitations of our model which can be improved in future research as and when better data become available.

An economic model consists of a set of relationships usually in its mathematical form, which tries to explain the relationship among various quantifiable economic factors in an economic system. Exact description and explanation of them, however, is beyond the capacity of any model, because no model can incorporate all the numerous factors that one way or another affect the economy and economic behavior. That is, complex mathematical relationships among numerous variables become simple linear equations. This is because the purpose of building a model is to reduce the main features of reality to manageable form so that it can be used for policy formulation and implication. In that sense, a model can be looked at as a systematic way of organizing information. The construction of econometric models is important for several reasons. They help in specifying the inter-relationship of economic variables that have prevailed over the sampling period for which

data are available. In other words, econometric models enable us to understand the structural relationship of various economic factors of any sector or the entire economy. They also help us to understand as to what economic factors play an important role in guiding human behavior. Econometric models are very helpful in the exercise of forecasting also on the basis of trend observed during the sampling period. Assumptions made during the process of forecasting should be correct. Incorrect assumptions might foil up the forecasting even though the model presents an authentic structural information of the system. Exogenous factors inserted into the model also should be correct. Here comes the difference between a model that simply explains how the system functions and a model that is used in projecting how the system will work in time ahead. Other than its forecasting ability, the model also provides a basic framework for considering different policy alternatives to the decision makers. The model helps us to do this through a set of variables which are exogenous to the model but over which we exercise control. They may also be called "policy variables."[1]

The present study is a sectoral model on Nepal's foreign trade. The construction of a separate model on different sectors of the economy is widely accepted practice. Since there has not been many econometric studies of the Nepalese economy, any of its sectoral work at the absence of overall economy wide models will carry its

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[1] R.J. Ball, "Econometric Models," in Mathematical Model Building in Economics and Industry, Hafner Publishing Company, 1968.

own shortcomings. We will be estimating Nepal's total import demand function, export demand function and export supply function in the present study. It cannot be claimed that the present equations as they are will enter in the general economy wide model of Nepal as and when such a model is constructed. The present study is undertaken with the hope that research at the sectoral levels will be helpful in the long run in building a reliable complete model of Nepal. As noted earlier, the size of the Nepalese economy, its composition of its trade and its location makes the Nepalese economy very much susceptible to the changes in the Indian economy. Thus the economic impacts of Nepal emanating from India probably cannot be avoided but they certainly can be lessened. For that, it is essential to understand the governing factors determining the trade between the two countries. As a step towards that goal, the present study is designed as an investigation into the structure of Nepal's foreign trade. Considering its heavy dependence on India for its external trade and foreign aid in the form of much needed Indian currency, it is very important for Nepal to study and to understand the types of economic policies pursued by India and their possible effects on the economic development of Nepal through its external trade sector. Besides the structural investigation into the foreign trade of Nepal, the present work is expected to provide some guidance in formulating alternative trade policy measures as a remedy to reduce the accumulating trade deficits of Nepal with India.

In our model, there are five behavioral equations and four identities. Under the severe constraint of data availability, we have been forced to estimate the functions at a highly aggregate level than what we have desired. Nepal's import function, for instance, has been estimated into one single equation. As such the model is subject to all criticisms originating from aggregation. Total imports and exports is the amalgamation of several commodities with high and low elasticities. Elasticities of total imports and exports thus derived without consideration to the component commodities is bound to be biased. Indeed the higher the level of disaggregation by commodities or areas, the higher is the likelihood of better results.

As shown in the preceding chapter, the estimation of import and export function in a highly aggregate form in the literature is quite extensive. The total export function in our model has been broken down into two categories by the SITC classification. In that export demand function for food and non-food have been estimated separately. This is in consideration of the fact that Nepal's main exports have been food throughout the sampling period. Non-food export has been relatively small. Once again, the level of disaggregation has not been quite detailed. In an econometric study such as this for a country like Nepal, where very few of such previous study has been made, data constraint always poses the problem and limit the scope of the study. Upon the availability of all required data in detail, the present model can be expanded to

incorporate import and export functions into a highly disaggregate level. Very much like the export demand functions, we will be estimating export supply functions for food and non-food separately.[2] Nepal's export supply of food has been more significant than its export supply of non-food.

Ideally, balance of trade is expected to examine the flow of goods as well as services traded between and among the nations. In our model, we have been able to concentrate only on the goods and not on the services. For some countries like Norway, services traded (ship service) account for a big amount of their external earnings. As such, it cannot be excluded from the model. In case of Nepal, however, services do not seem to constitute any significant percentage of the total trade. While these omissions might be the limitation of the model, they do not seem to underscore the meaningful results of our study.

All the variables in the proposed model are in real terms.

$$G = X - M \tag{4.1}$$

$$M = f( Y^N, P_M^N, DMP^N, LIMP ) \tag{4.2}$$

$$X = X_F + X_{NF} \tag{4.3}$$

$$X_F^D = f( Y_{AG}^I, Y^I, (P_X^F + k), DMP_F^I ) \tag{4.4}$$

$$X_{NF}^D = f( Y_{NAG}^I, Y^I, (P_X^{NF} + j), DMP_{NF}^I ) \tag{4.5}$$

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[2] The SITC classification of '0' has been defined as food in our study. The rest of the SITC classification other than '0' have been covered under non-food items in our model.

$$X_F^D = X_F^S \tag{4.6}$$

$$X_{NF}^D = X_{NF}^S \tag{4.7}$$

$$X_F^S = f(\ Y_{AG(t-1)}^N,\ (P_X^F - p),\ DMP_F^N\ ) \tag{4.8}$$

$$X_{NF}^S = f(\ Y_{NAG}^N,\ (P_X^{NF} - q),\ DMP_{NF}^N\ ) \tag{4.9}$$

where:

$DMP_F^I$ = India's domestic food price

$DMP_{NF}^I$ = India's domestic price index of non-food items

$DMP^N$ = Domestic general price index of Nepal

$DMP_{NF}^N$ = Domestic price index of non-food articles in Nepal

$FA^N$ = Foreign aid received by Nepal

G = Trade Gap (Trade surplus if the gap is positive. Trade deficit if it is negative.)

LIMP = Nepal's imports lagged by one year

M = Total imports of Nepal

$P_M^N$ = Import price index of Nepal (In the actual estimation procedures, this has been proxied by the export price index of India as presented in the International Financial Statistics IMF publication, UN. At the absence of actual import price index of Nepal, India's export price index was the second best alternative at hand. Since Nepal's huge chunk of imports of all varieties originate in India, the use of India's export price index as proxy for Nepal's actual import price index is felt justified.)

$(P_X^F + k)$ = Nepal's export price of food $(P_X^F)$ and 'k' amount of import levies imposed upon it by India in food imports from Nepal

$(P_X^F - p)$ = Nepal's export price of food $(P_X^F)$ less 'p' amount of export levies charged by Nepal on its food exports

$(P_X^{NF} + j)$ = Nepal's export price of non-food items plus 'j' amount of import levies charged by India on the import of non-food items from Nepal

$(P_X^{NF} - q)$ = Nepal's export price of non-food items less the 'q' amount of export levies imposed upon the export of non-food items by Nepal

$X$ = Total exports of Nepal

$X^F$ = Nepal's export of food to India (As indicated earlier, this falls under '0' coding of SITC classification.)

$X^{NF}$ = Nepal's export of non-food items to India (The rest of the SITC code are covered under this classification.)

$X_F^D$ = India's import demand for Nepal's food or Nepal's export demand for food

$X_{NF}^D$ = India's import demand for non-food items from Nepal or Nepal's export demand for non-food items

$X_F^S$ = Nepal's export supply of food

$X^S_{NF}$ = Nepal's export supply of non-food items

$Y^N$ = Gross domestic product of Nepal deflated by 1960 price indices

$Y^I$ = India's real national income at 1960 prices

$Y^I_{AG}$ = Agricultural income of India deflated by 1960 food price index of India

$Y^I_{NAG}$ = Non-agricultural income of India deflated by 1960 non-food price index of India

$Y^N_{AG(t-1)}$ = Nepal's real agricultural income lagged by one year

$Y^N_{NAG}$ = Nepal's non-agricultural income in real term

Our model thus consists of five behavioral equations (one for aggregate import demand function, two for export demand functions and two for export supply functions broken down into food and non-food). The remaining equations are identities. The trade gap in our model has been defined as the difference between commodities exported and imported. Thus the term balance of trade in our context does not include the trade of services that takes place between the two countries. The omission is justified since the percentage of service trade is meager.

Exports have been disaggregated into food and non-food. Total export of the country thus by definition is the summation of food export and non-food export. The remaining two identities equate Nepal's export supply of food and non-food with India's export

demand for food and non-food from Nepal in the trade between the two countries. Placing all identities together, we have

$$G = X - M$$

$$X = X_F + X_{NF}$$

$$X_F^S = X_F^D$$

$$X_{NF}^S = X_{NF}^D$$

The first structural equation in our model deals with the behavior of Nepal's imports from India. The proposed functional form of the equation is

$$M = a_0 + a_1 Y^N + a_2 \frac{P_M^N}{DMP^N} + a_3 \text{ LIMP}$$

4.1 Derivation of Import Demand Curve

Import demand function, by its very terminology, implies that it is a study of demand for goods originating in countries abroad. "The basic explanatory variables are suggested by theory of demand according to which the consumer allocates his income among consummable commodities in an effort to achieve maximum satisfaction. The quantity of imports purchased by any consumer will thus depend on his income, the price of the imports, and the price of other consumable commodities."[3] Thus the forces that determine the domestic demand function also determine the import demand function. It is

[3] R. Stern and E. Leamer, Quantitative International Economics, Allyn and Bacon, Inc., 1970.

indeed an extension of demand theory with some modifications. Imports as such are endogenous to the system and are strongly tied to the economic activities in the country. So they can be treated in the same way as many other goods and services demanded locally. In order to explain this, it is necessary that we deal, in brief, with the microeconomic theory to show how the same variables that explain domestic demand also explain import demand. In his bid to maximize satisfaction, the consumer faces a utility or a preference function.

$U = f(M,D)$ .....(i) M = Imported goods and D = Domestic goods

His budget constraint is given by

$Y = P_m M + P_d D$ .....(ii) $P_m$ = Price of imported goods and

$P_d$ = Price of domestic goods

Maximizing (i) subject to (ii), we use the technique of Lagrange multipliers. Constructing the function

$U' = f(M,D) - \lambda(M.P_m + D.P_d - Y)$ .....[iii]

$\lambda$ = Lagrange multiplier. The first order condition requires that both partial derivatives equal zero.

$$\frac{\partial U}{\partial M} = \frac{\partial U}{\partial M} - \lambda P_m = 0$$

$$\frac{\partial U}{\partial D} = \frac{\partial U}{\partial D} - \lambda P_d = 0 \text{ .....[iv]}$$

Shifting the second term to the right hand side of the equation and dividing the first equation by the second, we get

$$\frac{\frac{\partial U}{\partial M}}{\frac{\partial U}{\partial D}} = \frac{P_m}{P_d} \qquad .....[v]$$

The left hand side of the equation gives us the marginal rate of substitution between M goods and D goods. The right hand side of the equation is the price ratio of goods M and D.

The second order condition for a maximum requires that

$$\frac{\partial^2 U}{\partial M^2} = \frac{\partial^2 U}{\partial M^2} + 2\,\frac{\partial^2 U}{\partial M \partial D}\,\frac{(-P_m)}{(P_d)} + \frac{\partial^2 U}{\partial D^2}\,\frac{(-P_m)^2}{(P_d)} < 0 \qquad .....[vi]$$

Multiplying [vi] by $P_d^2$, a positive number, we get

$$\frac{\partial^2 U}{\partial M^2}\,P_d^2 - 2\,\frac{\partial^2 U}{\partial M \partial D}\,P_m . P_d + \frac{\partial^2 U}{\partial D^2}\,P_m^2 < 0 \qquad .....[vii]$$

A local maximum is obtained if [vii] holds true along with [iv]. At the point of consumer equilibrium or the maximization, the marginal rate of substitution of goods M and D must equal the ratio of the price of goods M and D. Hence every time there is a change in the price level, the consumer adjusts the combinations of his M goods and D goods in such a way that marginal rate of substitution of M and D equals the price ratios of M and D or the above condition [v] holds. Diagrammatically,

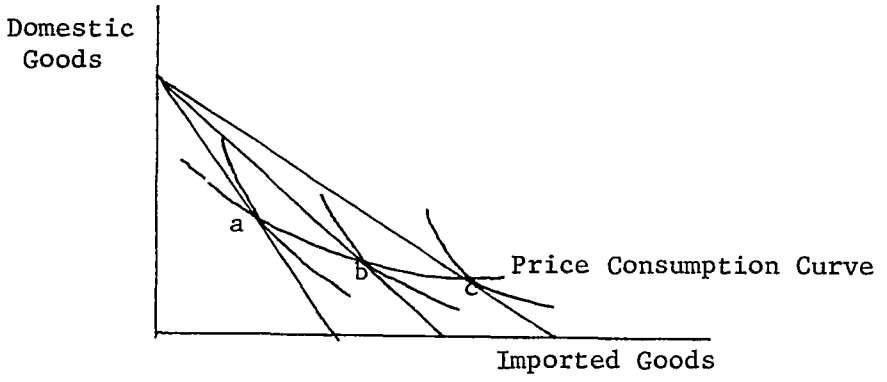


Figure 4.1. Derivation of Price Consumption Curve

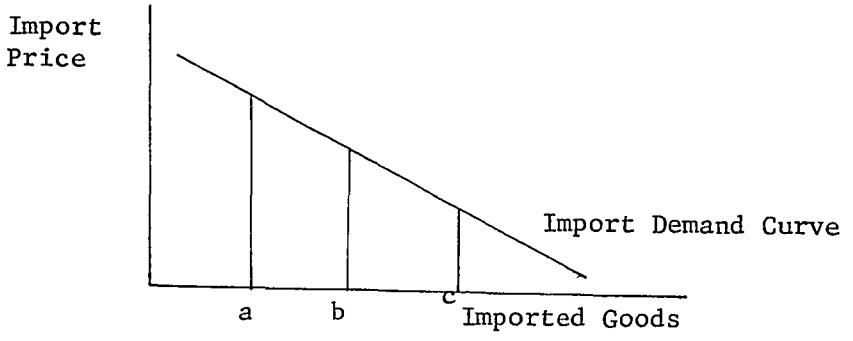


Figure 4.2. Derivation of Import Demand Curve

As the price of imported goods declines, the slope of the price line becomes flatter. The consumer constantly adjusts his combination of M and D along with the change in the price level of M or D. The consumer equilibrium points (a), (b) and (c) all meet the above condition (v). The line connecting all these equilibrium points will give us a price consumption curve. As such, all the points on the demand curve represents equilibrium points and hence maximum satisfaction at a given level of income.

## 4.2 Import and Export Demand Functions

From the above diagram, the import demand curve has been derived indicating the inverse relationship between import price and import demand. This is shown in diagram 4.2 above. Understandably as the level of income increases, the budget line will shoft to the right. This will cause a shift in the import demand curve to the right. Thus the microeconomic variables that explain domestic demand also explain import demand very well.

The principal factor that determines import demand is domestic disposable income. A word of caution is due here. In certain types of import functions, disposable income might not play an equally important role. Different components of income can be expected to play a major role for different kinds of imports. In the present case, however, the function to be estimated is an aggregate import demand function and hence the gross domestic product (GDP), rather than any particular component of income, has been taken as the income variable. Imports from India range from basic consumer goods to capital goods. The import of capital goods have been quite low in percentage, the highest of such being 8.98% in 1969/70. Nepal's import demand as such is likely to increase along with the increase in GDP in the country. This leads us to anticipate the income coefficient $a_1$ in our model to be positive showing its positive relationship with the dependent variable namely imports. The coefficient $a_1$ represents marginal propensity to import.

The next import variable that plays an equally crucial role is price factor. Unlike in the domestic demand, however, here it will be relative prices at home and abroad that will be assuming a critical role in explaining variations in a country's import demand. This will not hold if the country's import demand has low price elasticity and its production inside the country is virtually nonexistant. There have been many studies done in the field that did not consider the relative prices, i.e. domestic prices vis-a-vis foreign price, as the proper variable but instead adopted simply import price for explaining the function. The estimates could be biased if the proper and essential variables are omitted.[4] As a measure against this possible bias in estimates, we feel that the correct price variable to be considered should be the ratio of import price to domestic price. Substitution effect can be introduced by considering the ratio. Making use of relative prices in foreign trade equations enables us to show the degree of substitutability between domestic and imported goods. In several studies made in the field, evidence does not unilaterally support the conclusion that demand is always significantly influenced by price effect. Price effect on the import of some commodities has been quite significant and on the other, it has not been so significant. This is very much in contrast to income effect in that income in one form or other (or different components of income)

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[4] Rao and Miller, Applied Econometrics, Wadsworth Publishing Co., California, 1971.

has always been a significant explanatory variable in the import function of different commodities. Since import price elasticities differ from commodity to commodity, statistical studies of aggregate imports tend to be somewhat inconclusive with respect to the impact of relative prices on imports. In our present study, estimation of the import function is in aggregate form and the effect of relative prices on disaggregated import functions cannot be forecasted from the result of the study. Nevertheless, the price coefficient $a_2$ in our model is expected to carry a negative sign implying an inverse relationship of the dependent variable imports with the import price-domestic price ratio. High import price in comparison with the domestic price would cause the imports to fall because imports will be substituted by domestic output and vice versa. The coefficient $a_2$ represents import coefficient of relative prices. In linear form, the income and price elasticities of import demand will depend on the levels of these variables while in the log linear form, the income and price elasticities will be measured by the constants $a_1$ and $a_2$ which are read straight from the regression result.

As noted earlier, Nepal's import price has been represented by India's export price for want of import price data on Nepal. Nepal's huge amount of imports from India of various commodities should explain the rationale behind the use of India's export price as the second best representation of Nepal's import price.

The other variable that we have used to explain the import function is imports itself lagged by one year. The introduction of a lagged variable is to consider the continuity of the behavior pattern or to include ratchet effect. Imports are lagged to show the effects of the past in the same way as in consumption function. Lags also measure the influence of past changes in the independent variables on the current behavior of imports.

This is how the import function has been specified in our model. But as Leamer and Stern point out, there is no clear cut criteria that can be relied on in choosing a functional form.[5] The researcher is left to select a functional form according to his own theoretical leanings hoping that the choice does not affect the result adversely.

Many possible explanatory variables have not been included in our specification. One such possible but omitted variable is population. Population and the volume of imports tend to go together. Higher population would mean higher domestic demand which if not fulfilled domestically would mean higher imports. In case of Nepal, it is felt that import demand basically originates from the urbanized and industrialized sectors which is very small in terms of percentage. A large increase in population in the rural sector is not likely to boost demand for foreign goods, because the large part of the rural sector over the sampling period has also been a

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[5] E. Leamer and R. Stern, op. cit., p. 59.

sector with subsistence economy possessing features of a self-sufficient economy with very little trade channels outside their sector. So a population variable was not included in our import function. As a matter of fact, a population variable in the above context might even indicate an inverse relationship with the total demand, because higher population in the rural sector is in no way increasing demand for foreign goods.

The second behavioral equation in our model deals with Nepal's export demand function of food. This is India's import demand for food from Nepal. The function as specified in our model is

$$X_F^D = b_0 + b_1 \frac{Y_{AG}^I}{Y^I} + b_2 \frac{(P_X + k)}{DMP_F^I}$$

It is more complicated to determine the factors influencing export function than that of import function. This is reflected in the diversity of specifications in different studies made in the field. The lack of unanimity over the choice of independent variables for export function could probably be explained by the fact that a country's exports fluctuate for reasons related to the importing countries as well as to the exporting country. They are affected by many exogenous factors on which we do not exercise any control like over the change in income and/or price in the trade-partner country or the type of the trade policies being adopted by them and so on.

But in our case, since the model deals with only Nepal and India, the problem of specification is not insurmountable. Nepal's export demand function is India's import demand function. One of the main independent variables considered to explain the function is the ratio of India's agricultural income and its national income. The rationale behind the choice of the variable is that for the past several years, India's imports of food has been highly influenced by agricultural conditions inside the country. Periods of good harvest and hence a higher agricultural income have been followed by reduced imports and vice versa. For instance the bumper harvest in 1964-65 in India was followed by a fall in Nepal's exports in the following year. Hence agricultural sector income has been considered as one of the explanatory variables. Here the commodity being traded is highly substitutable and in a case like this, domestic supply variables like capacity of import competing industries should be included. Leamer and Stern call this a capacity utilization variable and feel that this represents an amendment to the traditional theory of demand.[6]

Theoretically, import function like consumption function has been specified in terms of income in that imports increasing along with the increase in income. The agricultural sector as well as the national income influence the imports of food. Their influence, however, has been in an opposite way. Unlike that of agricultural

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[6] E. Leamer and R. Stern, op. cit., p. 59.

sector income, national income is expected to have a positive relationship with the imports of food. The opposite effects of agricultural sector income and national income of India on its food imports is reflected in the following diagram.

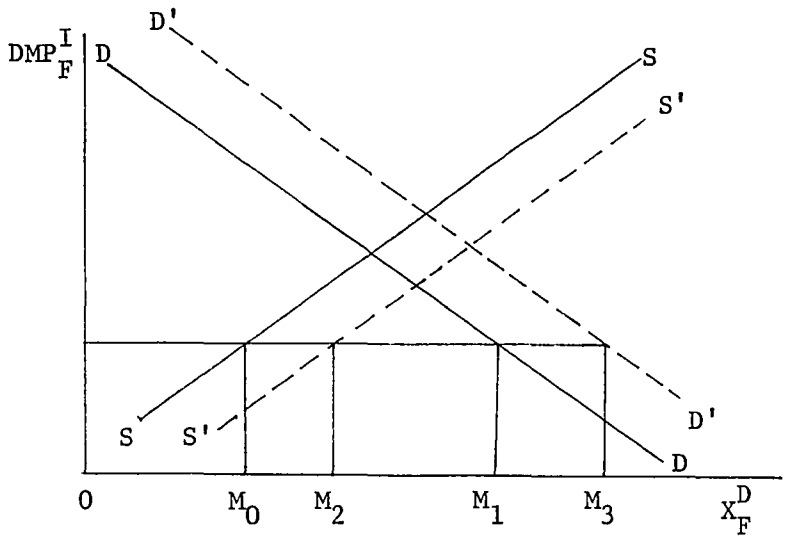


Figure 4.3. Demonstration of Opposite Effects of $Y_{AG}^I$ and $Y^I$ on $X_F^D$

An increase in $Y_{AG}^I$ resulting from an increase in food production in India as shown by S'S' reduces volume of imports from $M_0M_1$ to $M_2M_1$ whereas an increase in $Y^I$ as a result of an increase in $Y_{AG}^I$ will shift DD to D'D' and increase food imports from $M_2M_1$ to $M_2M_3$. $Y_{AG}^I$ and $Y^I$ thus demonstrate their opposite relationship to $X_F^D$.

Despite their seemingly opposite effects on imports, the proper specification of the model would demand the incorporation of both variables. Agricultural income constitutes a large segment of India's national income. Taken these two variables separately, multicollinearity between them can be anticipated. When two

explanatory variables are statistically correlated, least squares regression divides the explanatory power between them and both may take on relatively large standard errors. When one variable is removed from the regression, the other will gain in significance but the coefficient become biased.[7] One method of avoiding the possible multicollinearity in a case like this without dropping the variable is to take their ratio. This method has been suggested by Evans.[8] Following Evans' suggestion, we have proposed $Y^I_{AG}/Y^I$ as the correct income variable explaining India's import demand for food from Nepal. Higher ratio would mean larger contribution of agricultural income to India's national income and hence demand for imported food is likely to be replaced by domestic supply for food causing a decline in food imports. The lowering of the income ratio would just mean the reverse. The income ratio coefficient $b_1$ is thus anticipated to be negative implying its inverse relationship with the amount of food India imports from Nepal.

In addition to income, relative price is another theoretically important variable. What is important in determining Nepal's export demand is not just the export price that the exporting country offers (or the import price that the importing country faces) but its ratio vis-a-vis domestic price of the importing country. An increase in import price would not necessarily cause a decline in the imports if

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[7] Rao and Miller, op. cit., p. 64 and also E. Leamer and R. Stern, op. cit., p. 59.

[8] M. Evans, Macroeconomic Activity, Harper and Row Publishers, 1969.

the domestic price of the imported article in the importing country is increasing faster. It is the relative movement of the price ratio that is a more determining factor. Hence the ratio of export price vis-a-vis domestic food price in India has been chosen as a proper price variable. Different price ratios have been used in different similar studies.

The Brookings model, for instance, makes use of the ratio of the U.S. export price and the GNP prices of other countries.[9] Klein in his UK model however uses the ratio of index of world price and food price index of UK.[10] Dutta has taken the ratio of the index of the wholesale price of the importing country and the index of the export price of the exporting country.[11] It is the inverse of Klein's price ratio. In our present model, we have used Klein's relative price variable which is the ratio of export price of the exporting country to the domestic price in the importing country.

The final import price as faced by the consumers in the importing country (India) would however be the export price of Nepal, $P_X$, and certain 'k' amount of import levies imposed upon it by the

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[9] R.R. Rohmberg and L. Boissonneault, "The Foreign Sector," in The Brookings Quarterly Econometric Model of the U.S.A. (L.R. Klein et al., eds.), Rand McNally, Chicago, 1965.

[10] L. Klein, An Econometric Model of the United Kingdom, Adlard and Son Ltd., Oxford, 1961.

[11] M. Dutta, Some Econometrics of India's Foreign Sector. Unpublished Ph.D. Dissertation, University of Pennsylvania, 1962 and op. cit., p. 44.

Indian Government. As the $(P_X^F + k)$ increases relative to domestic price of food in India $(DMP_F^I)$ or as the ratio rises, the amount of Nepal's export, i.e. India's food import, is likely to fall. This is because as the importing country's import price rises vis-a-vis its domestic price, this would provide an incentive to the domestic suppliers to supply. The price coefficient $b_2$ thus is expected to carry a negative sign indicating its inverse structural relationship with the amount of food imports.

The other variable that could have been used but was omitted is time trend variable. Effect of time trend is likely to be different on different kinds of imports and export functions. In case of Nepal's food exports (and India's food imports), time path t can be expected to have its negative relationship with its imports. This would simply mean India's growing emancipation from food shortage and hence less need for food imports as time passes. The explanation is quite conceivable considering India's partial success to boost up its agricultural supply under the banner of Green Revolution.

Finally on demand side, we have Nepal's non-food export demand function. We have tried to specify the function in the following way:

$$X_{NF}^D = v_0 + v_1 \frac{Y_{NAG}^I}{Y^I} + v_2 \frac{(P_X^{NF} + j)}{DMP_{NF}^I}$$

Once we have explained the $X_F^D$ function, the explanation of $X_{NF}^D$ function needs very little further elaboration. The purpose behind taking the ratio of India's non-agricultural income to its own national income, as mentioned earlier, is basically done to avoid the possible multicollinearity. Non-agricultural income constitutes a significant portion in India's national income. The income ratio in $X_{NF}^D$ can be anticipated to have a positive sign indicating a higher import demand for raw materials as non-agricultural or industrial income increases in India. The higher the industrial expansion, the higher the demand for the imports of raw materials from Nepal. $Y_{NAG}^I$ and $X_{NF}^D$ are complementary unlike $Y_{AG}^I$ and $X_F^D$. Exports of raw materials account for a high percentage of Nepal's total non-food exports to India. Regarding the price ratio coefficient, the explanation could be the same as for $X_F^D$ function. As the export price of Nepal plus 'J' amount of import levies on them by the Indian Government ($P_X^{NF}$ + J) increases or decreases relative to the domestic price of non-food in India, India's import of non-food would decrease or increase respectively showing an opposite relationship between the price ratio and the amount of non-food imports from India. Higher export price relative to domestic market price would bring domestic suppliers to supply internally and thus reduce an import demand.

A majority of studies on trade models have almost made it a standard procedure to analyze both imports and exports functions from the demand side alone. Imports and exports functions have their supply aspects also. While import supply can be assumed to be infinitely price elastic, the same cannot be true in case of export supply except for a few countries like the United States. Hundreds of small countries involving international trade have no adequate resources to make their export supply infinite. The study and the specification of the supply aspect of the export function is equally important. Indeed only a very few studies have attempted to specify the export function from supply side also.[12]

The structural equation for Nepal's export supply function of food has been specified in our model as follows:

$$X_F^S = m_0 + m_1 \, Y_{AG(t-1)}^N + m_2 \frac{(P_X^F - p)}{DMP_F^N}$$

In a country like Nepal where the Government provision of required agricultural credit supplies to the farmers is so meager, farmers themselves are forced to assume the burden of the cost of inputs like improved seeds, chemical fertilizers, pesticides, irrigation

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[12] Among them, W. Rasaputram, Influence of Foreign Trade on the Level and Growth of National Income of Ceylon, 1926-57. Unpublished Ph.D. Dissertation, University of Wisconsin, 1959. Also see A.R. Bergstrom, op. cit., p. 47 and T. Birnberg and S. Resnick, op. cit., p. 49.

water and so on. Farmers' ability to access to these highly essential inputs are in turn dependent on his previous years' agricultural harvest. Good harvest in year t would enable farmers to invest more in agriculture for the period (t+1). Thus an increase in agricultural income in this year would mean ability of farmers to make more investment in his agriculture and thus an increase in the export supply of food. We thus anticipate a positive relationship between agricultural income lagged by a year and the country's export supply of it. The lagged coefficient $m_1$ can thus be expected to take a positive sign.

Regarding price variable, the food export price faced by the food export suppliers will be given by $(P_X^F - p)$, i.e. food export price less 'p' amount of export levies imposed upon it by the Nepalese Government. The export suppliers, before supplying in the export market, study the price situation in both domestic as well as export market. The export supply will be determined by the export price less export levies $(P_X^F - p)$ vis-a-vis domestic price. Domestic price represents a minimum price necessary to induce the exporters to supply in the export market. If $(P_X^F - p)$ is lower than the domestic price, the export suppliers find no motivation to export. Thus the price ratio $(P_X^F - p)/DMP_F^N$ takes into consideration both the markets. Theoretically, the price ratio coefficient $m_2$ in our model can be expected to be positive. This will imply a positive relationship between export price and the export supply unless there is a unique explanation for the situation causing an inverse relation.

Bergstrom, for instance, in his study of supply and demand of New Zealand's exports for the period 1922-38 finds negative supply elasticities.[13]

If the domestic price of the exporting country gives a lower bound export supply curve, domestic price of the importing country taken as an explanatory variable will give an upper bound export supply curve implying that the export price should not exceed importing country's domestic price. The rationale behind using the domestic price of the importing country as an explanatory variable is that the exporters will be motivated to supply by the prevailing price in the domestic market of the importing country. The validity of the preceding argument lies in the assumption of two countries. Export price being lower than the domestic price in the importing countries is a necessary but not a sufficient condition for free trade to occur. Export price of the exporting country should also be lower or competitive in the international market failing to which the importing country could switch its imports from another country whose export price is the lowest. Hence, in case of situation with more than two countries, the proper price variable could be the international market price or the import price of the importing country. This price, to repeat, would give an upper bound export supply curve. In our model in the present study, we will be estimating both the lower bound and the upper bound export supply

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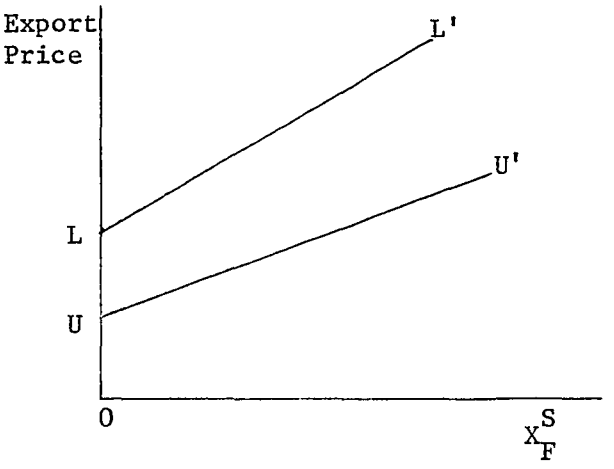
[13] A.R. Bergstrom, op. cit., p. 47.

curves. The actual export supply curve is expected to lie in between the range of these two estimated upper and lower supply curves. The graphical presentation of the function will look like the following.




LL' = Lower bound $X_F^S$ on $DMP_F^N$

UU' = Upper bound $X_F^S$ on $DMP_F^I$

Figure 4.4. Lower and Upper Bound Export Supply Curves

The actual export supply curve is expected to fall somewhere in between LL' and UU'. Thus we will be estimating several export supply functions with different price variables.

The final equation in our model is export supply function of non-food. This has been specified as the following.

$$X_{NF}^S = n_0 + n_1 Y_{NAG}^N + n_2 \frac{(P_X^{NF} - q)}{DMP_{NF}^N}$$

The income coefficient $n_1$ in the above function is expected to be positive. Higher the non-agricultural income, higher tend to be the export of non-food items manifesting the country's aspiration to

diversify its exports categories. About the price variable we have taken the ratio of export price of non-food less export levies 'q' on them by Nepalese Government ($P_X^{NF}$ - q) and domestic price of non-food in Nepal. ($P_X^{NF}$ - q) is the ideal price since this represents what the exporters supply at. In order to incorporate the substitution effect in the two markets, we take its ratio with domestic price of non-food in Nepal. Like in the $X_F^S$ function, here also we face the problem of data paucity on export levies. Like in the $X_F^S$ function, we will also be estimating the $X_{NF}^S$ function with simple $DMP_{NF}^N$ as the proper price variable. This again would give us a lower bound export supply curve of non-food. Then we will be estimating the same function with $DMP_{NF}^I$ as the price variable to get the upper bound export supply curve. Thus we will not be estimating the actual export supply curves but only the range within which these curves are expected to fall.

## 4.3 Diagrammatic Exposition of the Model

The model can be presented and explained in terms of diagrams.

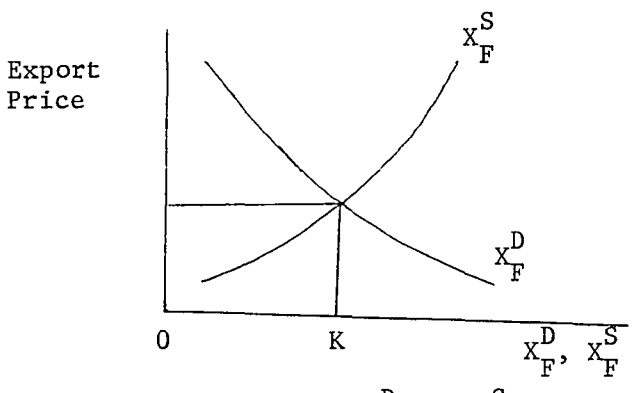



Figure 4.5. $X_F^D$ and $X_F^S$ Equilibrium

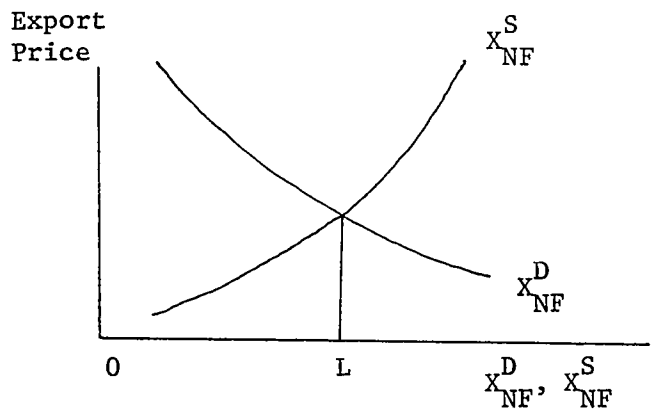



Figure 4.6. $X^D_{NF}$ and $X^S_{NF}$ Equilibrium

In Figure 4.5, $X^D_F$ and $X^S_F$ functions have been presented as the function of price ratio, given other important variables. OK is the equilibrium amount of food export ($X^D_F = X^S_F$). In Figure 4.6, we have non-food export demand and export supply curves. They have been presented as the function of price ratio given all other variables. At OL, the amount of non-food export demand is equal to non-food export supply ($X^D_{NF} = X^S_{NF}$). OK and OL added together would give the country's total exports. This is represented by point V in the diagram 4.7 on the following page. The point V also shows an excess of imports over exports of the country by the amount of TM or MD. At point T, OV represents the amount exported by Nepal and VT shows the amount imported. TM thus represents the amount of deficits Nepal is suffering in its balance of commodity trade. The $45^o$ line indicates that for VT amount of imports, there should be OQ amount of exports. By the same token, for an export amounting to OV, import should not exceed the amount VM. For trade equilibrium, we

should move to the point M or S which is tentamount to saying that if we start from the point T, either export should be increased by the amount of VQ to get to the point S. This can be tried in Figures 4.5 and 4.6 by increasing exports of food and/or non-foods. Alternatively, import should be curtailed by TM in Figure 4.7 to get to the equilibrium point M. The need to decrease imports by the TM amount is displayed in Figure 4.8. In Figure 4.8, the import demand curve of Nepal has been estimated by taking the ratio of import price and domestic price, given other factors. Our model assumes the import supply curve to be perfectly elastic. Starting from the point T, we have noticed that the trade gap of deficit by TM is equivalent to GG' in Figure 4.8. Reduction of imports from OG' to OG by lowering the import curve from MM to MM' will help to remove the deficit in trade.

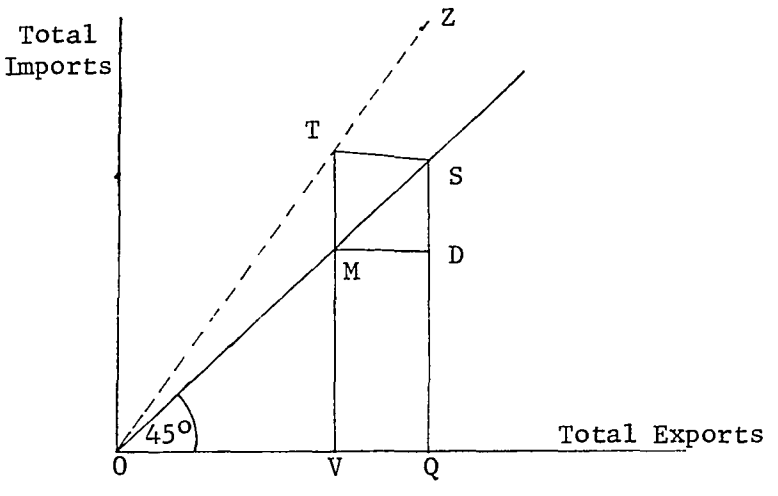



Figure 4.7. Trade Gap, Total Imports and Total Exports

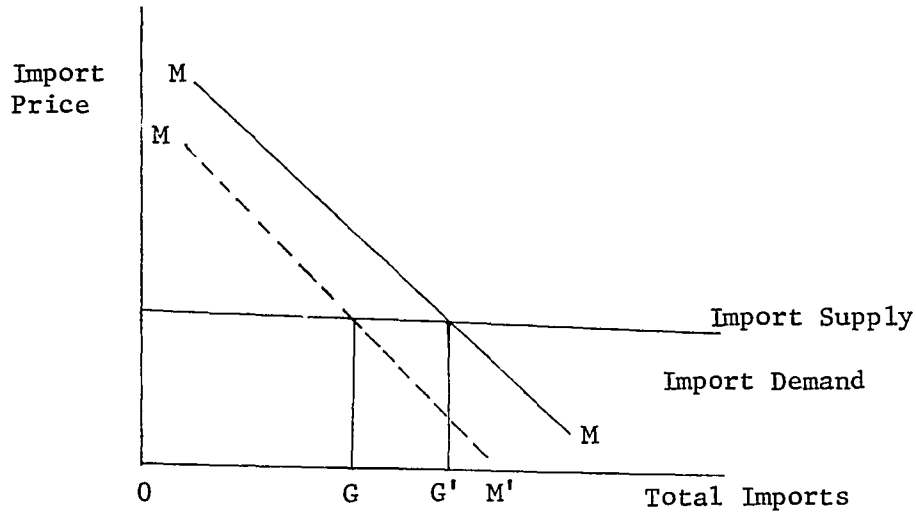



Figure 4.8. Import Reduction to Remove the Trade Gap

The soundness or strength of a model is tested by its ability to define or narrow down the forces which determine the behavior in reality and thus provide some helpful tips to the decision makers. The ability, in turn, is dictated by how well the model has been specified. Granted that exact specification of complicated reality into a model is not possible, a model should not be too broadly specified also.

## 4.4 A Brief Comparison with Other Foreign Trade Models

In comparing one model with similar other models, very often specifications and overall performance of the model are verified. As mentioned above in the explanations of functions such as import and export demand and supply, price and income become principal variables. Hence income effect and price effect ought to be considered very carefully. Of course the effects of other variables

should be investigated as well. In this aspect, all the import and export demand equations in our model incorporate the important essential variables such as price (domestic vis-a-vis foreign market) and income. In Dutta's model, price variable does not seem to have assumed a major role. In Birnberg-Resnick's model, in their export supply equation, the price variable adopted has been the absolute export price index and is not relative to its domestic price. In her econometric model of Columbia, Kanta Marwah uses time trend t as the only explanatory variable to explain the merchandise export function.[14] In this respect, the Brookings model makes use of both the crucial variables, namely relative price as well as income. The specification of our model is very similar to the latter model except with modifications wherever necessary.

In our export supply function, we do not have many models to make a comparison. In his econometric model of New Zealand, Bergstrom estimates three export supply functions for dairy products, lamb and mutton with exactly the same independent variables in each of the functions. The equations cannot really be compared with our export supply equations owing to the differences in the nature of the exports. Birnberg and Resnick, in their export supply function of total commodities, adopt export price index and the import price index as the main price variables. The conspicuous absence is the domestic price index. In our study, due to the paucity of data on

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[14] K. Marwah, "An Econometric Model of Columbia: A Prototype Devaluation View," Econometrica, April 1969.

proper price, different price indices have been used to estimate the export supply functions. The proxy variables, it is hoped, will give reliable estimates.

4.5 Limitations of the Model

On the basis of the model presented above, it is very clear that the model is not without shortcomings. First, our study is based on annual observations for a period of a decade from 1960-61 to 1969-70. As such, it is exposed to biases associated with a small sample, like limited degree of freedom and so on. The confinement of the period to ten years has been purely dictated by the data availability. As more data become available, the sectoral model can be expanded and better results can be expected. It should be noted that even though we have only ten years of observations, a large number of studies made on the basis of an equal number of observations have come up with meaningful results. This, however, is not meant to deny the desirability of a large number of sample observations.

Next, our model includes only merchandise trade. Invisible items and capital transactions in the balance of payments have been excluded. In this respect, our model is incomplete. But as Klein puts it, "if the problem concerned with behavior in the goods market for international trade can be handled at this stage, a significant step forward will have been made and the ground prepared for a more rounded attack on the entire balance of payments problem."[15]

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[15] L.R. Klein, op. cit., p. 71.

Finally, we have been painfully aware of a high degree of an aggregative form of our functions. We also realize that this will tend to bias the estimates of elasticities because of high and low elasticity commodities. While benefits of disaggregation goes undisputed, the trade elasticities derived from aggregative functions cannot all be ignored. The Brookings model, the Wharton EFU model, the Klein-Goldberger model and the Birnberg-Resnick model, just to name a few, all estimate elasticities from highly aggregate import/ export function. Disaggregation to the level of individual commodities might even be more desirable. But as Suits puts it, "we have neither the time nor the resources to deal with such a vast system of equations; to proceed at all, we must simplify and condense. Millions of households become a single household sector, millions of products become a single item of expenditure, e.g. durable goods. Moreover complex mathematical relationship among thousands of variables becomes simple linear approximations involving two or three aggregates."[16] As mentioned earlier, we are not trying to deny the superior result from disaggregate data however.

It goes without mention that an exact specification of the model is impossible. The basic objective of the model is to provide reasonably satisfactory structural specification. As R.J. Ball puts it, "By definition, models are unreal. Their purpose is not to describe reality but to reduce the key features of that reality to

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[16] D.B. Suits, "Forecasting and Analysis with an Econometric Model," American Economic Review, March 1962.

more manageable forms for the purpose of decision making and control."[17] This is what has been tried in our model.

In summary, we have presented a framework of various functions of our model in this chapter. The model has also been explained in terms of diagram. After a brief comparison of our model with other foreign trade models, we have discussed some of the weaknesses of our model. In the next chapter, we will be estimating the model developed in this chapter.

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[17] R.J. Ball, "Econometric Models," in Mathematical Model Buildings in Economics and Industry, Hefner Publishing Co., New York, 1970.

# CHAPTER V

# THE ESTIMATES OF THE MODEL

This chapter will contain a discussion on the type, nature and sources of data used in the estimation of the model. There will also be a discussion on the statistical assumptions and estimation procedures being followed in the estimation of our model. Finally the chapter will be devoted to the empirical estimates of our model.

## 5.1 Sources of Data

One of the main obstacles in parameter estimations of an econometric model is the availability of accurate data. Nepal does not have a very long history of collecting and recording statistical data. The scientific data recording system is a new phenomenon in Nepal. As such, studies on important aspects of the economy are constrained to the availability and the reliability of available data. It was only as late as 1958 that the Central Bureau of Statistics was established as a separate data collecting body replacing the existing Department of Population Census. Until the beginning of the first five year plan period (1956-61), the country did not have any collection of data except for the population census. During the first five year plan period however, manpower was trained to handle statistics. The subsequent plans gave a due importance to the compilation of data.

The data used in this study have been primarily taken from the following sources:

For data on Nepal:

(a) Quarterly Economic Bulletin and Annual Reports of the Board of Directors published by the Nepal Rashtra Bank.

(b) Agricultural Statistics of Nepal, Economic Analysis and Planning Division, Ministry of Food and Agriculture, His Majesty of Government of Nepal, 1972.

(c) Economic Data Papers, Nepal Economic Planning Section, USAID Nepal, October 1973.

(d) Statistical Year Book, Economic Commission for Asia and the Far East, United Nations.

(e) Annual Reports, FAO Several issues, Rome.

(f) Commodity Trade Statistics, United Nations Publications.

(g) Various other sources like Far Eastern Economic Review, Annual Reports, and "Behavior of Money Stock in Nepal," Shah, S., Unpublished Ph.D. Dissertation, University of Hawaii, 1973.

For data on India:

(a) Central Statistical Organization Publications, Government of India.

(b) Reserve Bank of India Publications.

(c) International Financial Statistics, International Monetary Fund.

(d) "An Econometric Model of India, A Policy Oriented Approach," Moinuddin, K., Unpublished Ph.D. Dissertation, University of Hawaii, 1974.

Data on Gross Domestic Product

The first estimates of Nepal's gross domestic product was made by William Thweatt in the early 1960's for the period of 1954 through 1960. Thweatt's estimates have been officially accepted as base figures. The Central Bureau of Statistics since then has been providing official estimates of data on Nepal's gross domestic product. In its official estimates, the Central Bureau of Statistics has adopted product approach as opposed to expenditure approach. The gross domestic product of the economy has been subdivided into the following twelve sectors: (1) Agriculture, (2) Mining, (3) Manufacturing, (4) Construction, (5) Transport and Communication, (6) Cottage Industry, (7) Financial Institutions, (8) Ownership of Dwellings, (9) Public Administration and Defense, (10) Electricity, (11) Retail and Wholesale Trade, and (12) Services.

Nepal's Exports and Imports Data

The Quarterly Economic Bulletin published by the Nepal Rashtra Bank provides annual data on Nepal's trade with India. The Bank has adopted Standard International Trade Classification (SITC) following the United Nations system of recording trade data. Under this classification, trade data are subdivided into the following ten categories: (1) Food and Live Animal Products, (2) Beverages and Tobacco, (3) Crude Materials Inedibles except Fuels, (4) Mineral Fuels, Lubricants and Related Materials, (5) Animal and Vegetable Oils and Fats, (6) Chemicals and Drugs, (7) Manufactured Goods

Classified Chiefly by Materials, (8) Machinery and Transport Equipments, (9) Miscellaneous Manufactured Articles, and (10) Miscellaneous not included elsewhere.

Food and live animal products have been defined as food in our model and the rest have been categorized as non-food items. The annual data that we use are related to the fiscal year. The fiscal year starts from the 16th of July to the 15th of July of the next year. Up to 1965-66, Nepal's exports to India also included exports to the overseas countries. Since 1966-67, they have been recorded separately. Nepal's export to the overseas countries, basically in the early period of our study, was insignificant. To take one instance in 1963-64, Nepal's imports from the overseas countries amounted to 0.31% of its imports from India. However, this has been the year with Nepal's lowest exports to the overseas countries. Nepal's import figures have been recorded separately for India, Tibet and the overseas countries right from the beginning.

Data on the Domestic Price of Nepal

Data on the domestic price of Nepal have been confusing and unreliable. For the sake of consistency, the present study makes use of ECAFE data for the domestic price level of food, non-food and the overall price index.

Nepal's Export and Import Price Indices of Food and Non-Food Items

For export and import price indices, we have made use of the United Nations data. For the import price index of Nepal, we have used India's export price index as the proxy variable. India's export price index has been obtained from the International Financial Statistics. The use of this proxy can be rationalized by Nepal's heavy and wide variety of imports from India. The justification of the proxy could have been doubted if Nepal's imports had been diversified to many countries. In such a case, the import price of Nepal being proxied by the export price index of one of its many trading countries would have distorted the results.

We have utilized the FAO Yearbook data for generating export price indices of both food and non-food commodities. The FAO Yearbook give data on volume and the value of exports. Out of the data given in the FAO Yearbook, export price indices have been generated in the following way:

$$\text{Weight } (w) = \frac{V_j}{\sum_{i=1}^{n} V_i}$$

$$\text{Price of } j = \frac{V_j}{Q_j}$$

$$\text{Weighed Price of } j = \frac{V_j}{\sum_{i=1}^{n} V_i} \cdot \frac{V_j}{Q_j} = \frac{V_j^{\,2}}{Q_j \sum_{i=1}^{n} V_i}$$

$$\text{Price Index (I)} = \frac{\sum_{j=1}^{n} V_j^{\,2}}{\sum_{j=1}^{n} Q_j \sum_{i=1}^{n} V_i} = \frac{\sum_{j=1}^{n} V_j^{\,2}}{[\sum_{j=1}^{n} Q_j]\,[\sum_{i=1}^{n} V_i]}$$

where:

$V_j$ = Value of j commodity

$\sum_{i=1}^{n} V_i$ = Summation of the values of all the commodities

$Q_j$ = Quantity of j commodity

As is evident from the above section, data that have been used in the present study can be greatly improved upon the availability of proper data. We have been forced to use highly aggregate data. In some instances such as export price indices, we had to resort to data generation and in others we had to make use of proxy data. These are, however, widely practiced customs in many studies of the present kind. Some data, such as that on export and import duties, were not available at all. It is in these areas that future research can make improvements in building and expanding the model. Even though the data used in the model are in a primitive state, they are the best available indicators.

## 5.2 Statistical Assumptions and Estimate Procedures

After the specification and formulation of the model and the collection of essential data, the next step will be to select the proper statistical procedures for the estimation of the structural

coefficients. In the present study, we have adopted the ordinary least squares method in estimating the functions for reasons explained above in the methodology section of Chapter I. After the determination of proper statistical procedures to estimate the specified model, evaluation of empirical results of the model becomes the next important step. The evaluation of the empirical results is usually based upon statistical criterion as well as economic criterion. In the statistical criterion, a widely used indicator to indicate the goodness of the fit of empirical result is the multiple correlation coefficient denoted by $R^2$. The value of $R^2$ provides us with the information regarding the explanatory ability of the independent variables to explain the variance of the value of the dependent variable during the sample period. High $R^2$ would mean a large part of the variance of the dependent variable has been explained by the independent variables of the function and thus very little variance of the dependent variable has been left unexplained. Higher $R^2$ alone, however, should not be mistaken as an indication of better quality of the function being estimated.

Another important statistic to be considered in evaluating the empirical result is the standard error of the estimates denoted by $s^2$. This shows how well the estimated values agree with the values actually observed for the variable being estimated. In other words, it shows the extent to which the sampling variations may have influenced the estimates of the coefficient and provides a means of

testing whether or not a relationship, estimated from a given sample, really exists in the population or is only due to the random variation.

Apart from the statistical criteria, the estimated equation should meet economic criterion as well. The economic criterion shows whether or not the obtained empirical result have been theoretically meaningful in an economic sense. Economic meaningfulness is indicated by the magnitude and sign of the coefficient of the regression. The coefficient shows an increase or decrease in the dependent variable caused by an increase or decrease of a specified unit in the independent variable. Once the statistical significance of the regression coefficient has been tested, its expected sign and magnitude can be verified by the implication of economic theory.

## 5.3 Empirical Estimates of the Model

We will be subsequently presenting the result of our behavioral functions. In running the regression of these functions, we have tried different variables with their different possible combinations.

### Nepal's Import Function

First, we present the result of our import function. The figures in parentheses denote standard errors.

$$M = 13.2011 + 0.0543\ Y^N - 0.1030\ P_M^N/DMP^N \qquad (5.3.1)$$

$$(2.8308)\quad (0.0951)\qquad (0.0184)$$

$R^2 = 0.78$ von Neumann ratio = 2.52

Here the explanatory variables have given a theoretically valid sign. The income coefficient, however, has been statistically insignificant. The $R^2$ has been high and the von Neumann ratio shows no evidence of serial correlation at the five percent significance level. The same regression was run taking $P_M^N$ and $DMP^N$ separately with the following result:

$$M = -17{,}3852 + 0.4569\ Y^N - 0.0958\ P_M^N + 0.1547\ DMP^N \qquad (5.3.2)$$

(10.1141) (0.2076) (0.0149) (0.0389)

$R^2 = 0.84$ von Neumann ratio = 3.06

The second regression has given an expected sign of all the coefficients with high t ratio and no evidence of the presence of serial correlation. There has also been an improvement in $R^2$.

In addition to income and relative price as explanatory variables, we introduced foreign aid as an additional variable to examine its role in the country's total imports. Following is the result.

$$M = 9.5004 + 0.1374\ Y^N - 0.1079\ P_M^N/DMP^N + 0.0094\ FA^N \qquad (5.3.3)$$

(3.9867) (0.1111) (0.0176) (0.0076)

$R^2 = 0.81$ von Neumann ratio = 2.83

$$M = -14.4414 + 0.4072\ Y^N - 0.0959\ P_M^N + 0.1366\ DMP^N + 0.0047\ FA^N$$

(10.5887) (0.2158) (0.0150) (0.0452) (0.0085)

$R^2 = 0.84$ von Neumann ratio = 3.06 (5.3.4)

As expected, foreign aid as an explanatory variable has given a correct sign indicating its positive relationship with imports. But its t ratio is not very high especially in the (5.3.4) regression. But the t ratio of other variables have improved. $R^2$ also has improved.

Foreign aid was replaced by another variable, namely the amount of Indian currency reserves with the government of Nepal. The replacement is to examine if the new variable improves the function since Indo-Nepal trade is carried in terms of Indian currency. Following is the result:

$$M = 11.8990 + 0.0571\ Y^N - 0.0978\ P_M^N/DMP^N = 0.0057\ ICR \qquad (5.3.5)$$

$$(3.0139)\quad (0.0915)\qquad (0.0172)\qquad\qquad (0.0041)$$

$$R^2 = 0.80 \qquad\qquad \text{von Neumann ratio} = 2.57$$

There has not been much change in the function by the change of the above mentioned variables. We also ran the above regression by taking Nepal's import price index and Nepal's domestic price index separately. We got the following result:

$$M = -12.0613 + 0.3496\ Y^N + 0.0902\ P_M^N = 0.1301\ DMP^N + 0.0035\ ICR$$

$$(12.6468)\quad (0.2578)\qquad (0.1670)\qquad (0.0526)\qquad (0.0052)$$

$$R^2 = 0.84 \qquad\qquad \text{von Neumann ratio} = 2.92 \qquad (5.3.6)$$

The ICR variable, even though it gave a correct sign, was statistically insignificant. One striking factor to note is the

almost similar size of the structural parameters in both the functions estimated with foreign aid $FA^N$ and Indian currency reserves with the Government of Nepal ICR.

We also introduced import variable lagged by one year to see the ratchet effect. We came up with the following:

$$M = 6.6136 + 0.1734\ Y^N - 0.1001\ P_M^N/DMP^N + 0.0090\ FA^N + 0.2236\ LIMP$$

$$(3.2755)\quad (0.0870)\quad (0.0140)\quad (0.0059)\quad (0.0861)$$

$$R^2 = 0.88 \qquad \text{von Neumann ratio} = 3.84 \qquad (5.3.7)$$

All the variables have been in the right direction with fairly high t ratio. The serial correlation test, however, indicates evidence of the presence of serial correlation at the five percent level of significance.

Considering the small t ratio of the foreign aid variable $FA^N$, we estimated the above function deleting it.

$$M = -15.8667 + 0.4283\ Y^N + 0.1357\ DMP^N - 0.0896\ P_M^N + 0.1823\ LIMP$$

$$(8.4664)\quad (0.1738)\quad (0.0332)\quad (0.0130)\quad (0.0850)$$

$$R^2 = 0.89 \qquad \text{von Neumann ratio} = 3.22 \qquad (5.3.8)$$

All the coefficients in this formulation are statistically significant, economically plausible and the sign in the right direction. The $R^2$ value has been high and the von Neumann statistics have been within the critical value at the five percent significance level. Finally we ran the regression of import function

taking the independent variables like income, relative price ratio and lagged imports. The result is given below:

$$M = 10.0925 + 0.0949\ Y^N - 0.0952\ P_M^N/DMP^N + 0.2273\ LIMP$$

$$(2.6127)\quad (0.0779)\qquad (0.0151)\qquad\qquad (0.0956)$$

$$R^2 = 0.86 \qquad\qquad \text{von Neumann ratio} = 2.86 \qquad (5.3.9)$$

This function has given high t ratio of all the coefficients with correct sign, high $R^2$ and with no indication of the presence of serial correlation at five percent level of significance.

One interesting finding of our import function is that the price coefficient, unlike in the import function of many similar studies, has been quite significant in our model. As noted earlier, the role of income, in one form or another, has been quite conclusive in explaining the import and export behavior. The explanatory power of price variable has been inconclusive in that its ability to explain the system has not been unanimously proven by other studies. In our model however, we find price variables consistently showing its significant role in the import behavior of Nepal. This is inspite of the fact that India appears as a main exporter to Nepal. The finding is quite consistent with Nepal's experience in 1966 following devaluations of India's currency in the following year. This indicates Nepal's imports sensitivity to the price variable. This might give some tips to the policy makers in shaping the trade policies of the country.

We then introduced foreign aid as an added variable to examine its role in Nepal's import and found that its introduction does not improve the function all that significantly nor does its deletion deteriorate the function. Sensing that the Indian currency reserve with the Government might be a better substitute, we ran the regression against it. The estimates were found to be very similar in both cases. Since deletion of the above variables did not seriously diminish the explanatory capacity of the function, we replaced them by lagged imports as an additional independent variable. This function against the relative price, income and lagged import improved $R^2$ and t ratio without an indication of the presence of serial correlation. Therefore equation (5.3.9) has been adopted as the final equation in our model.

One possible important variable to affect the country's import demand is the population variable. We tried to include this variable by running the import function in per capita term, per capita income and per capita foreign aid. The income coefficient was found to be negative indicating its inverse relationship with import demand. The obtained sign was theoretically unacceptable and hence it was dropped. The possible explanation to the inverse relationship between population and imports has been given previously in Chapter IV in explaining the specification of the import function.

Nepal's $X_F^D$ Function

The next behavioral equation in our model is the $X_F^D$ function. The $X_F^D$ function was estimated against the ratio of India's agricultural income to its national income and domestic food price of India with the following result:

$$X_F^D = 2.2515 - 1.6345\ Y_{AG}^I/Y^I + 0.0459\ FP^I$$

$$(11.1032)\quad (5.5730)\qquad\qquad (0.0209)$$

$$R^2 = 0.52 \qquad\qquad \text{von Neumann ratio} = 2.05 \qquad (5.3.10)$$

With the increase in agricultural income of India $Y_{AG}^I$, India's food imports could well be expected to reduce. With an increase in the national income of India $Y^I$, however, India's imports could be increased. To incorporate both opposing effects into consideration, we have adopted $Y_{AG}^I$ and $Y^I$ as separate independent variables. But agricultural income in India accounts for more than 60% of its national income. So multicollinearity is anticipated between the two variables. The purpose of taking the $Y_{AG}^I/Y^I$ ratio is to take both variables into consideration and yet avoid the problem of their mutual correlation. As expected, the domestic food price of India is positively correlated to its food import demand. The income coefficient has been insignificant and the $R^2$ low. Instead of $FP^I$, we then introduced a better price variable $P_F^X$ to see its effect on the $X_F^D$ function.

$$X_F^D = 10.2783 - 0.1709\ Y_{AG}^I/Y^I - 0.0950\ P_F^X$$

$$(7.6870)\quad (2.9021)\qquad (0.0208)$$

$$R^2 = 0.78 \qquad \text{von Neumann ratio} = 2.09 \qquad (5.3.11)$$

There was a significant improvement in $R^2$ as the price coefficient has been significant. The income coefficient has been statistically insignificant.

The proper price variable to explain the $X_F^D$ would be to incorporate both $FP^I$ and $P_F^X$ to capture the substitution effect. This was done in the following:

$$X_F^D = 22.0104 - 7.4357\ Y_{AG}^I/Y^I - 0.0882\ P_F^X + 0.0370\ FPI$$

$$(5.3243)\quad (2.4183)\qquad (0.0125)\qquad (0.0086)$$

$$R^2 = 0.92 \qquad \text{von Neumann ratio} = 2.39 \qquad (5.3.12)$$

All the coefficients gave high t ratios. There was an improvement in $R^2$ with the von Neumann ratio showing no sign of serial correlation. The following result was obtained by running the same regression taking the ratio of $P_F^X$ and $DMP_F^I$.

$$X_F^D = 35.2062 - 11.9199\ Y_{AG}^I/Y^I - 8.0704\ P_F^X/DMP_F^I$$

$$(5.4765)\quad (2.4013)\qquad (0.7271)$$

$$R^2 = 0.93 \qquad \text{von Neumann ratio} = 2.64 \qquad (5.3.13)$$

Both the income and price coefficients have been significant with a slight improvement of $R^2$. Equation (5.3.13) has been chosen as the final $X_F^D$ function in our model.

We also ran the above regression equation by adopting time as an additional independent variable. We got the following result:

$$X_F^D = 309.8765 - 12.2092\ Y_{AG}^I/Y^I - 9.4251\ P_F^X/DMP_F^I - 0.1392\ ID$$

$$(227.7633) \quad (2.2564) \qquad (1.3100) \qquad (0.1154)$$

$$R^2 = 0.94 \qquad \text{von Neumann ratio} = 2.68 \qquad (5.3.14)$$

The structural parameters of the function before and after the inclusion of the time variable have been very close except for the intercept value. All the coefficients have given the proper sign as expected and they all have statistical significance. But the coefficient of the variable ID is not significant. The negative sign of ID shows India's decreasing food imports over the period of time. This inverse relationship explains India's growing independence of food shortages and hence its food imports. This could be a result of India's improving agricultural condition or its partially successful green revolution.

Nepal's $X_{NF}^D$ Function

The $X_{NF}^D$ function in the model also have been tried basically on the same kind of income and price ratios. In the following regression, we tried $X_{NF}^D$ against $Y_{NAG}^I$.

$$X^D_{NF} = -2.0798 + 0.0039\ Y^I_{NAG}$$

$$(0.7073)\quad (0.0008)$$

$$R^2 = 0.72 \qquad \text{von Neumann ratio} = 2.86 \qquad (5.3.15)$$

The income coefficient shows $X^D_{NF}$ to be positively related to $Y^I_{NAG}$. This could be explained by the fact that an increase in $Y^I_{NAG}$ will cause more demand for $X^D_{NF}$ like raw materials which after all constitutes a large portion of Nepal's non-food exports. These raw material exports like wood, textile fibers, jute, oil seeds and nuts are complementary to $Y^I_{NAG}$. Higher industrial production in India will cause an increase in its imports of these raw materials.

In the following regression $P^X_{NF}$ was added.

$$X^D_{NF} = -0.8908 + 0.0040\ Y^I_{NAG} - 0.0116\ P^X_{NF}$$

$$(0.7156)\quad (0.0006)\qquad (0.0045)$$

$$R^2 = 0.83 \qquad \text{von Neumann ratio} = 2.78 \qquad (5.3.16)$$

The signs of the coefficients have been as expected. The t ratio of the coefficients have been high with high $R^2$ and von Neumann ratio within the computed critical values at the five percent level of significance.

The result given below is after the introduction of the income variable as a ratio of $Y^I_{NAG}$ to $Y^I$ instead of simply $Y^I_{NAG}$.

$$X^D_{NF} = -5.7122 + 15.5267\ Y^I_{NAG}/Y^I - 0.0087\ P^X_{NF}$$

$$(1.0644)\quad (1.8437)\qquad (0.0037)$$

$$R^2 = 0.89 \qquad \text{von Neumann ratio} = 2.42 \qquad (5.3.17)$$

Instead of taking $P^X_{NF}$ separate, we took the ratio of $P^X_{NF}$ to $DMP^I_{NF}$ and in the income side we took $Y^I$ instead of $Y^I_{NAG}/Y^I$ and came up with the result given below.

$$X^D_{NF} = -0.6805 + 0.0022\ Y^I - 1.7721\ P^X_{NF}/DMP^I_{NF}$$

$$(1.3624)\quad (0.0006)\qquad (0.5347)$$

$$R^2 = 0.78 \qquad \text{von Neumann ratio} = 2.79 \qquad (5.3.18)$$

As we see in the following estimate, $Y^I_{NAG}$ explains the same function in a better way than $Y^I$.

$$X^D_{NF} = -0.0385 + 0.0030\ Y^I_{NAG} - 1.3230\ P^X_{NF}/DMP^I_{NF}$$

$$(0.9229)\quad (0.0007)\qquad (0.4867)$$

$$R^2 = 0.84 \qquad \text{von Neumann ratio} = 2.79 \qquad (5.3.19)$$

There has been an improvement in $R^2$. The coefficients have been statistically significant. The signs have been in the right direction. There has been no evidence of serial correlation.

In the next stage, we included both types of incomes, took their ratio as the proper income variable and ran the regression. The result is given below:

$$X^D_{NF} = -4.3981 + 12.8273\ Y^I_{NAG}/Y^I - 0.9276\ P^X_{NF}/DMP^I_{NF}$$

$$(1.5754)\quad (2.4313)\qquad (0.4701)$$

$$R^2 = 0.87 \qquad \text{von Neumann ratio} = 2.48 \qquad (5.3.20)$$

To recapitulate, the income variable in $X_F^D$ and $X_{NF}^D$ functions act oppositely for the reason explained above. In our model, equation (5.3.20) has been taken as the final equation.

Nepal's $X_F^S$ Function

The next structural equation in our model is the estimation of the $X_F^S$ function. Before we proceed on to the empirical result of the $X_F^S$ function, a brief comment on the function itself is due. In proposing $X_F^S$ function in the model in the preceding chapter, we have mentioned that the proper export price variable should be $(P_F^X - p)/DMP_F^N$, i.e. Nepal's export price of food less export levies on them imposed by the Government of Nepal deflated by the domestic price of food in Nepal. Due to lack of data on Nepal's export levies, we proxied the above price variable by the domestic price of food in Nepal $DMP_F^N$. This after all does represent the minimum price that the Nepalese exporters demand before they decide to supply in the export market. By using $DMP_F^N$ as the proper price variable however, we are making a heroic assumption that in the functional relationship between supply and price, the latter one is a causing factor whereas in reality the reverse could be true. Thus in the $X_F^S$ function by taking $DMP_F^N$ we are risking the possible reverse relationship. In estimating $X_F^S$ by using $DMP_F^I$ however, we are ignoring the export levies imposed on the exports of food. Following is the estimation of $X_F^S$ function using $DMP_F^N$:

$$X_F^S = -4.7987 + 0.0545\ Y_{AG(t-1)}^N + 0.0593\ DMP_F^N.$$

$$(1.7375)\quad (0.0399)\qquad\qquad (0.0143)$$

$$R^2 = 0.77 \qquad\qquad \text{von Neumann ratio} = 3.12 \qquad (5.3.21)$$

One thing to be kept in mind is that in the above function, we have not considered the substitution effect at all. In the above regression, we are not explaining how the exporters study domestic price ard export price before they decide to export in the foreign market. In the above estimate, $DMP_F^N$ has been proxied as the minimum export price at which the exporters supply their excess surplus.

We also ran the $X_F^S$ function with India's domestic food price as the proper price variable. Nepal's export price under no circumstances can exceed domestic food price in India. This represents the highest export price the Nepalese exporters can expect to receive for their export supply. Once again by adopting $DMP_F^I$ as the correct price variable for the $X_F^S$ function, we are ignoring the variation in export duties on them by the Nepalese Government. The limitations involved in the use of $DMP_F^N$ and $DMP_F^I$ in the $X_F^S$ estimation are obvious. But under the data constraint, this seems to be the next best alternative available for the $X_F^S$ estimation.

$$X_F^S = -1.8050 + 0.0810\ Y_{AG(t-1)}^N + 0.0317\ DMP_F^I$$

$$(1.7141)\quad (0.0496)\qquad\qquad (0.0124)$$

$$R^2 = 0.62 \qquad\qquad \text{von Neumann ratio} = 2.73 \qquad (5.3.22)$$

The use of $DMP_F^I$ ignores the substitution effect and theoretically the exclusion makes the estimation less powerful. The exclusion is, however, due to data unavailability. Birnberg and Resnick, in their study on the trade sector of the colonial economies, while estimating export supply function, do not consider the substitution effect. The reference to the Birnberg and Resnick model is not, however, to justify the neglect of the substitution effect. In the present study, the use of $DMP_F^I$ makes an implicit assumption that export duties on them are insignificant. The above equations (5.3.21) and (5.3.22) have been chosen to represent the lower and upper bound $X_F^S$ function respectively in the model.

Nepal's $X_{NF}^S$ Function

The final structural equation left in our model is the estimation of the $X_{NF}^S$ function. We ran the regression with $Y_{NAG}^N$ and $DMP_{NF}^N$ as separate explanatory variables in two separate functions. The results are given below:

$$X_{NF}^S = -0.5461 + 0.1194\ Y_{NAG}^N$$

$$(0.7694)\quad(0.0442)$$

$$R^2 = 0.45 \qquad \text{von Neumann ratio} = 3.10 \qquad (5.3.23)$$

$$X_{NF}^S = -2.9439 + 0.0379\ DMP_{NF}^N$$

$$(0.9244)\quad(0.0078)$$

$$R^2 = 0.72 \qquad \text{von Neumann ratio} = 1.45 \qquad (5.3.24)$$

The coefficients in both functions have been statistically significant. $DMP^N_{NF}$ has been used as proxy to $(P^X_{NF} - q)$ to estimate the lower bound of the $X^S_{NF}$ function. Then we ran the regression of $X^S_{NF}$ against $Y^N_{NAG}$ and the ratio of $P^X_{NF}$ to $DMP^N_{NF}$. The result is given below:

$$X^S_{NF} = 1.2166 + 0.1011\ Y^N_{NAG} - 1.4081\ P^X_{NF}/DMP^N_{NF}$$

$$(0.6293)\quad (0.0266)\qquad (0.3460)$$

$$R^2 = 0.81 \qquad \text{von Neumann ratio} = 2.53 \qquad (5.3.25)$$

One plausible explanation for the negative price coefficient could be increasing domestic demand for raw materials in Nepal along with the expansion of non-agricultural activities over the period of time. Especially after the mid-1960's following the government policy of import substitution, several import replacing industries were set up like cigarette, sugar and shoe mills. The raw materials that would otherwise have been exported were consumed domestically. Thus despite the increasing export price, the amount of exports actually supplied in the foreign market declined. But since the right price is not $P^X_{NF}$ which has been used in the estimation, we regressed the $X^S_{NF}$ function against $Y^N_{NAG}$ and $DMP^N_{NF}$ to get the lower limit of the $X^S_{NF}$ curve. The result is given below:

$$X^S_{NF} = -3.1355 + 0.0610\ Y^N_{NAG} + 0.0306\ DMP^N_{NF}$$

$$(0.7651)\quad (0.0293)\qquad (0.0070)$$

$$R^2 = 0.81 \qquad \text{von Neumann ratio} = 2.08 \qquad (5.3.26)$$

The $X^S_{NF}$ cannot fall below the range of estimation given by $DMP^N_{NF}$. This is the minimum price required to induce the exporters to export. The structural parameters in the above function have been statistically significant with the proper sign. The $R^2$ has been high. The von Neumann statistic does not indicate the presence of serial correlation. The equation (5.3.26) has been chosen in our model as the final lower bound $X^S_{NF}$ function. The same function ran against $Y^N_{NAG(t-1)}$ gave the following estimates.

$$X^S_{NF} = -2.6642 + 0.0138\ Y^N_{NAG(t-1)} + 0.0337\ DMP^N_{NF}$$

$$(1.0154)\quad (0.0226)\qquad\qquad (0.0102)$$

$$R^2 = 0.73 \qquad\qquad \text{von Neumann ratio} = 1.60 \qquad (5.3.27)$$

$Y^N_{NAG}$ explains the function better than $Y^N_{NAG(t-1)}$. The $X^S_{NF}$ with $Y^N_{NAG(t-1)}$ gives poor $R^2$. The income coefficient loses its statistical significance.

In the following estimation of the $X^S_{NF}$ function, we replaced the $DMP^N_{NF}$ by $DMP^I_{NF}$. This should give the upper bound of the $X^S_{NF}$ curve. The result is given below:

$$X^S_{NF} = -2.2690 + 0.0101\ Y^N_{NAG} + 0.0304\ DMP^I_{NF}$$

$$(1.0558)\quad (0.0647)\qquad\qquad (0.0149)$$

$$R^2 = 0.62 \qquad\qquad \text{von Neumann ratio} = 2.87 \qquad (5.3.28)$$

The income coefficient has been statistically weak. No improvement was noticed on it after replacing it by $Y^N_{NAG(t-1)}$. The structural parameters have remained just about the same as evident in the following result:

$$X^S_{NF} = -2.1373 + 0.0080\ Y^N_{NAG(t-1)} + 0.0298\ DMP^I_{NF}$$

$$(1.2328)\quad (0.0315) \qquad\qquad (0.0131)$$

$$R^2 = 0.62 \qquad\qquad \text{von Neumann ratio} = 2.80 \qquad (5.3.29)$$

While these functions do not give us a true $X^S_{NF}$ function, they give the range within which the $X^S_{NF}$ curve is expected to fall. At the absence of required data, the best alternative is to take the second best data as proxy which can explain the behavior reasonably well. This is what has been done in the supply side of our model.

We believe that the estimated relations presented in the chapter will provide us with an insight into the structure of the relation rather than simply reflecting the history of the period. Subsequently in the following chapter, we will be making a comparison of our estimates with the estimates of other similar studies made in the field. We will also be drawing some policy inferences from our estimated model which can be of guidance to the formulation of better trade policies.

# CHAPTER VI

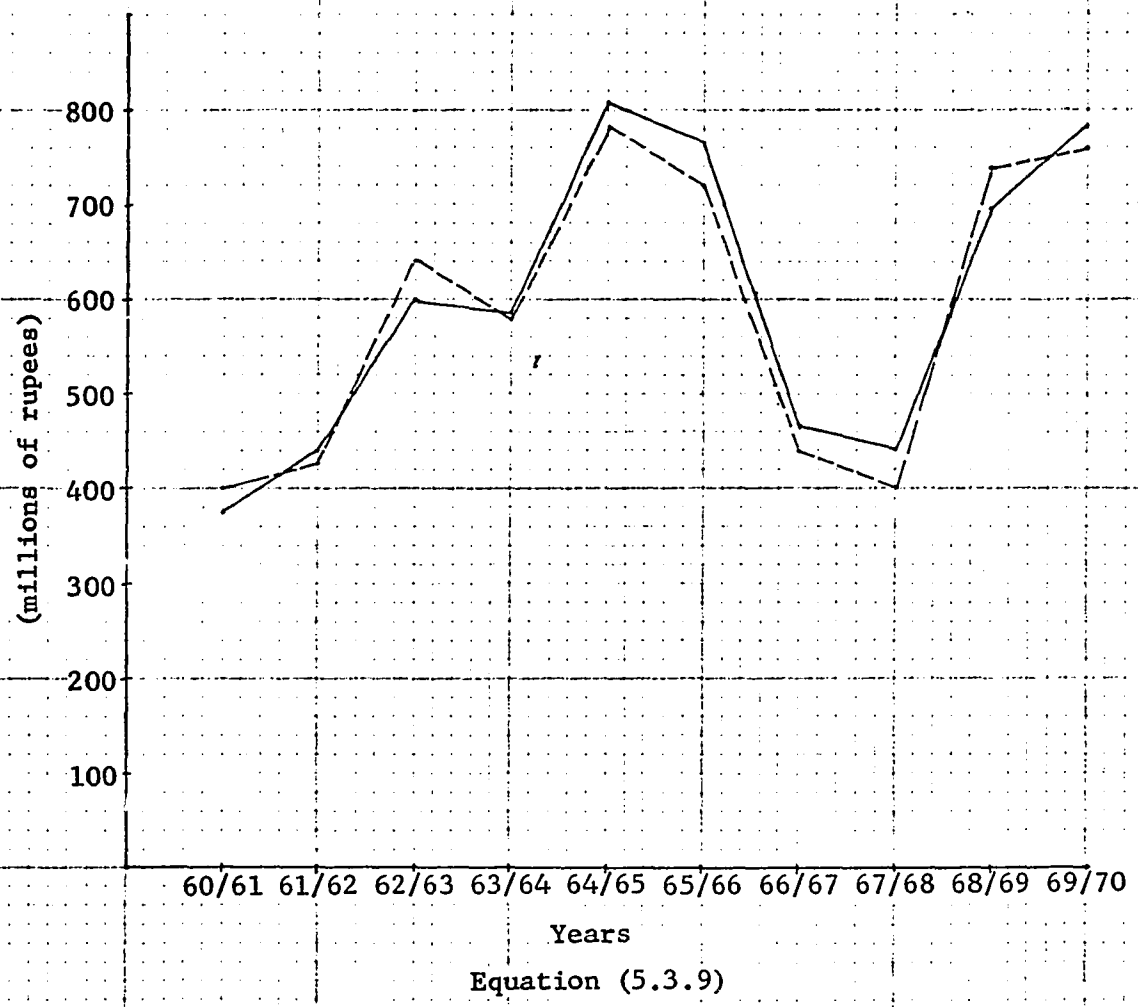
## SUMMARY AND CONCLUSIONS

In this final chapter, we have examined the behavior of the estimated trend from the observed trend of each function. The mutual independence of the residuals have been tested with the help of the von Neumann test for serial correlation. Price and income elasticities of the functions estimated have been presented. A comparison has been made of our estimates with the estimates of some other models on India's foreign sector. Nepal's imports from and exports to India and subsequently the trade gap has been projected for five years. Since aid money in the form of Indian currency has been meeting the country's trade deficits, we have computed the percentage of exchange rate depreciation required to maintain the trade balance for the projected trade deficits in the absence of aid money. The trade treaties that have guided trade between India and Nepal have provided the base for the free trade area rather than a customs union since they have enabled both parties to have different tariff structures against the rest of the world permitting at the same time free trade between the member countries. In a hypothetical case that the bilateral treaties are dropped and both countries are independent to impose tariffs on each other's trade as they impose on their trade with the rest of the world, we have tested whether a situation like this would be to the advantage of Nepal by computing the resulting effects on Nepal's exports and imports.

## 6.1 A Comparison of Estimated from Actual Time Paths of the Endogenous Variables

In the figures given below, we report the estimated time paths of the endogenous variables along with their actual time paths. It is evident from the figures that the estimated plots for each of the endogenous variables reveal no systematic deviations between the observed values of each variable. Figure (6.1) gives the estimation of the import function. Figure (6.2) presents the estimation of the $X_F^D$ function. An examination of the figure shows no big divergence of estimated plots from the actual values. Figure (6.3) presents the estimation of Nepal's $X_{NF}^D$ function. In Figure (6.4) we present an estimation of the $X_F^S$ function. It may be noted that Nepal's domestic food price and India's domestic food price have been proxied as the proper price variables in estimating Nepal's export supply curves.

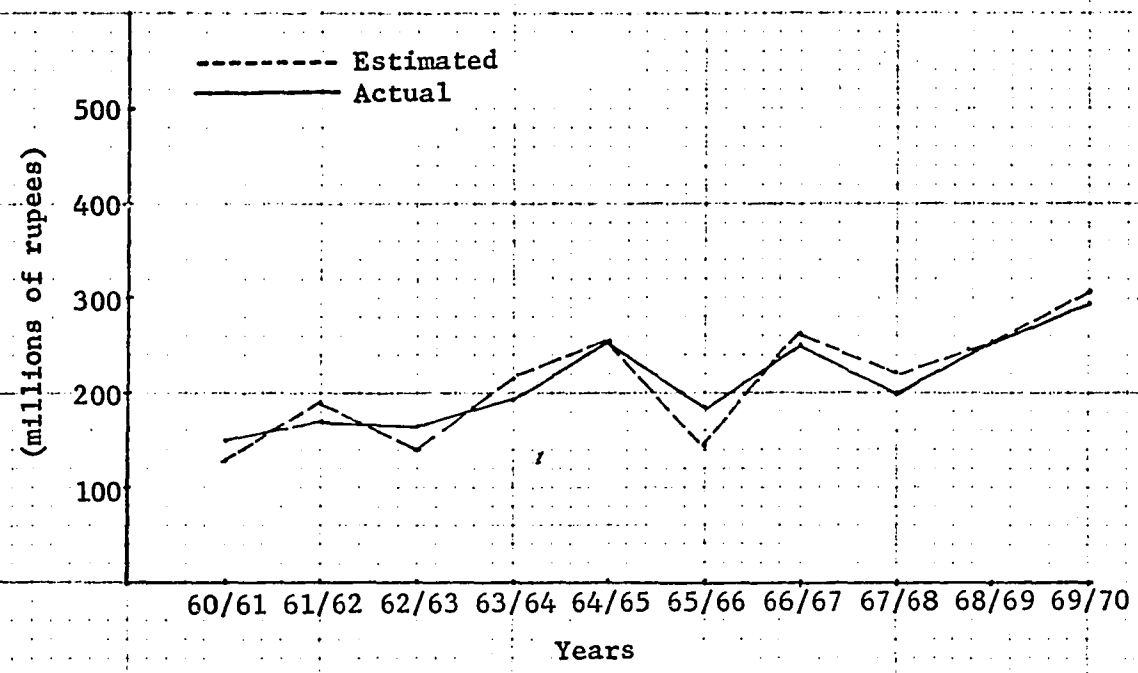
Figures (6.4a) and (6.4b) present the estimation of $X_F^S$ on both prices. In Figures (6.5a) and (6.5b) estimation has been performed for the $X_{NF}^S$ function on both prices. It is noticeable that in Figures (6.4a) and (6.5a), estimated paths have been closer to their actual time paths compared to Figures (6.4b) and (6.5b).




Equation (5.3.9)

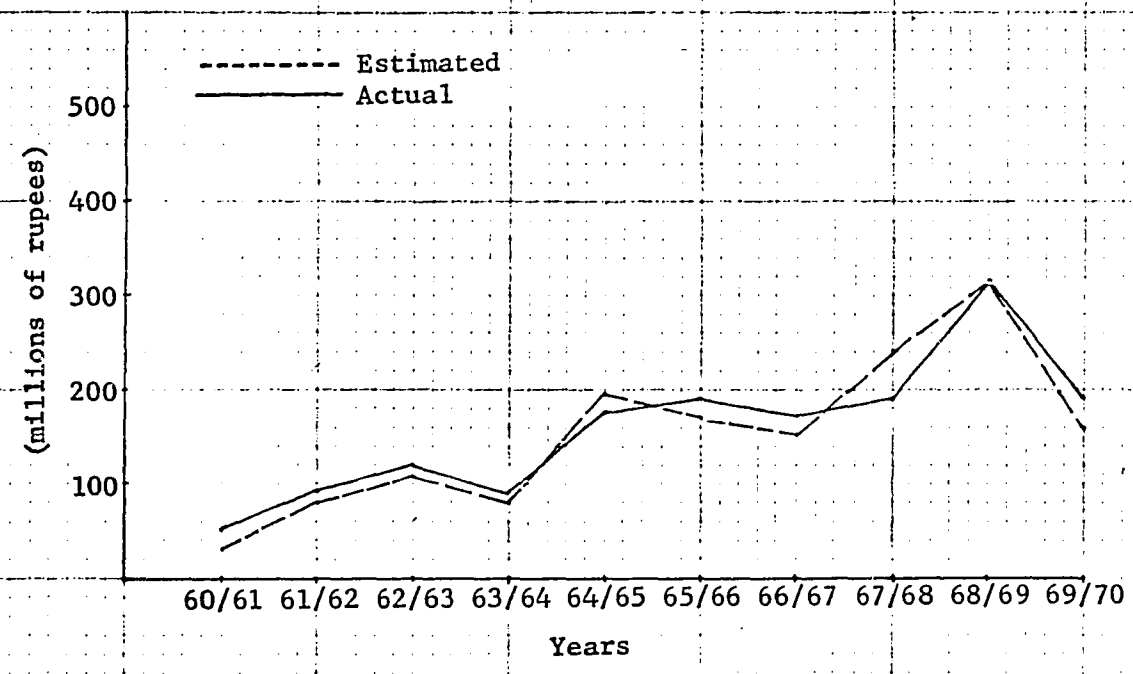
Figure 6.1. M Function

--------- Estimated
———— Actual



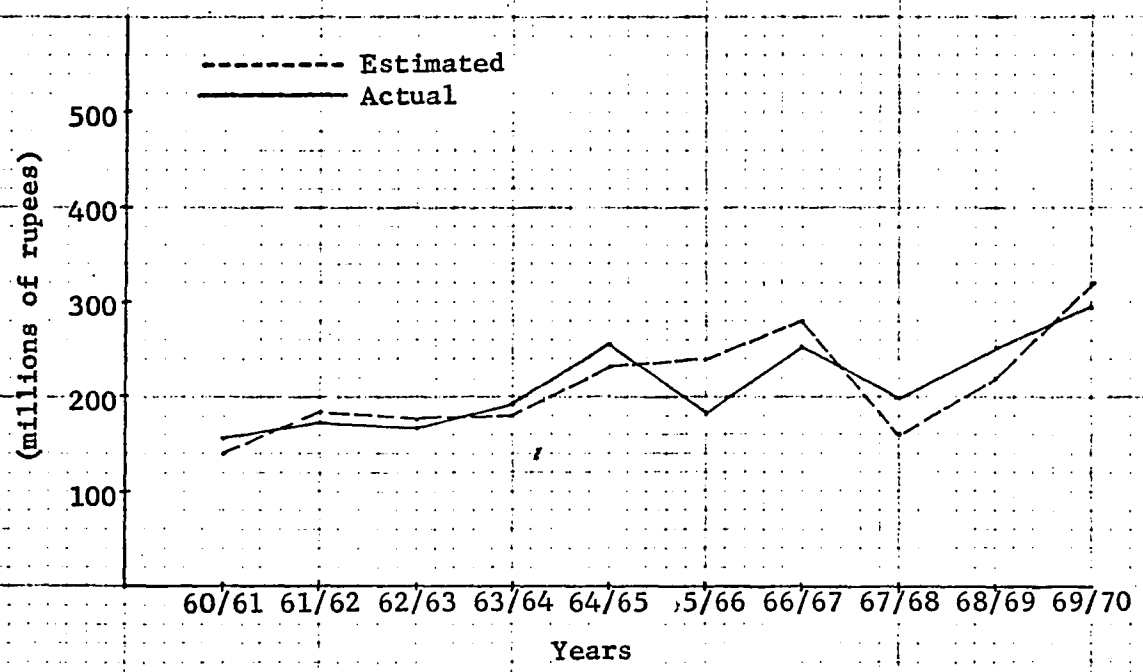

Equation (5.3.12)

Figure 6.2. $X_F^D$ Function



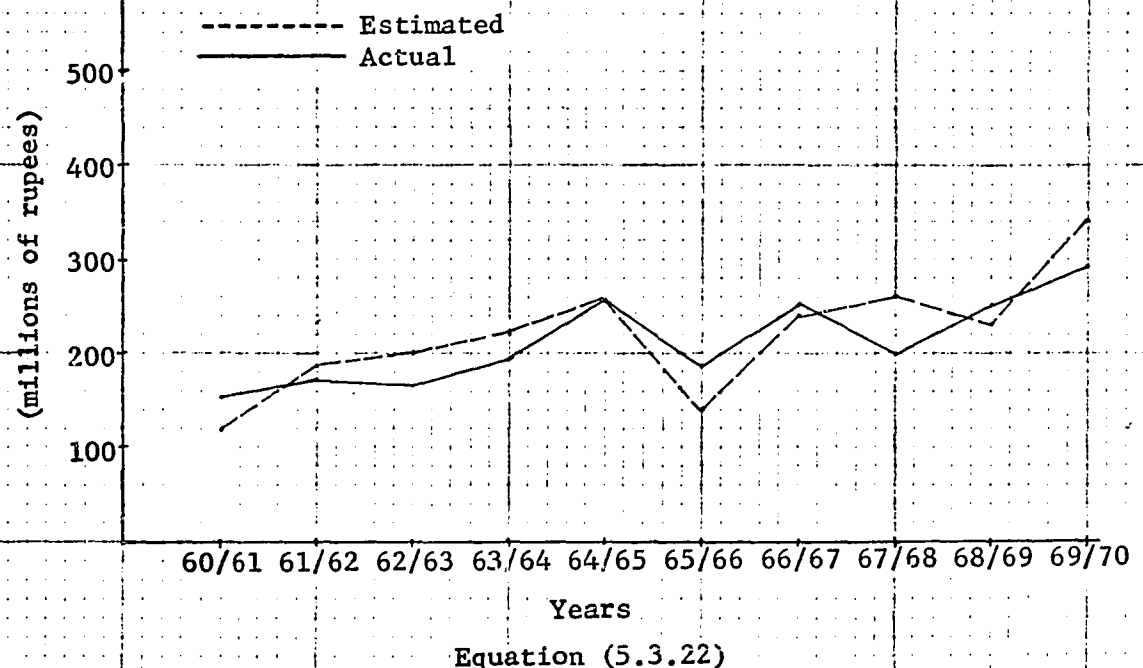

Equation (5.3.20)

Figure 6.3. $X_{NF}^D$ Function



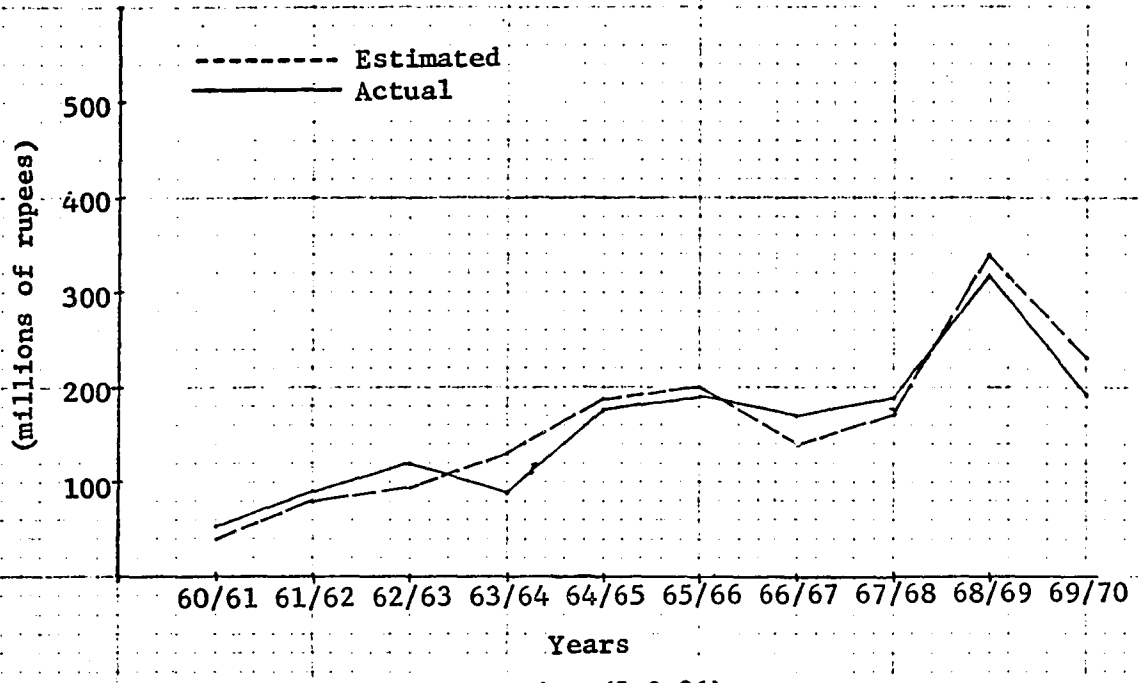

Equation (5.3.21)

Figure 6.4a. $X_F^S$ Function ($DMP_F^N$)



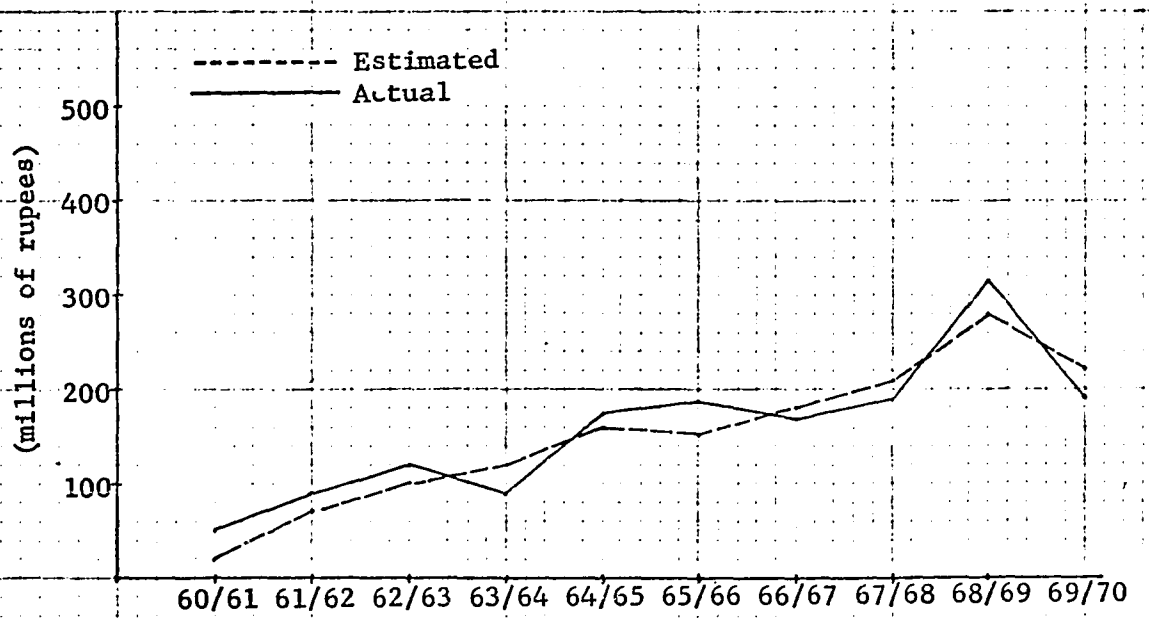

Equation (5.3.22)

Figure 6.4b. $X_F^S$ Function ($DMP_F^I$)




Equation (5.3.26)

Figure 6.5a. $X^S_{NF}$ Function ($DMP^N_{NF}$)




Equation (5.3.28)

Figure 6.5b. $X^S_{NF}$ Function ($DMP^I_{NF}$)

## 6.2 Final Structural Functions of Nepal's Foreign Sector

Once we find that the estimated time paths of the endogenous variables lie within a reasonable range of the actual time paths, it can be safely assumed that the estimates of the model adequately represent an approximation of the actual structure of the economy and sector whichever the model is built for. The objective of the present exercise has been to specify the factors affecting Nepal's foreign trade sector. On the basis of the results obtained in the course of statistical analysis, the Nepalese foreign trade sector may be presented in terms of the structural equations given below.

$$M_0 = a_0 + a_1 Y^N + a_2 \frac{P_M^N}{DMP^N} + a_3 \text{ LIMP} \qquad (5.3.9)$$

$$X_F^D = b_0 + b_1 \frac{Y_{AG}^I}{Y^I} + b_2 \frac{P_F^X}{DMP_F^I} \qquad (5.3.13)$$

$$X_{NF}^D = v_0 + v_1 \frac{Y_{NAG}^I}{Y^I} + v_2 \frac{P_{NF}^X}{DMP_{NF}^I} \qquad (5.3.20)$$

$$X_F^S = m_0 + m_1 Y_{AG(t-1)}^N + m_2 DMP_F^N \quad \text{(lower bound } X_F^S \text{ function)} \qquad (5.3.21)$$

$$X_F^S = m_0 + m_1 Y_{AG(t-1)}^N + m_2 DMP_F^I \quad \text{(upper bound } X_F^S \text{ function)} \qquad (5.3.22)$$

$$X_{NF}^S = n_0 + n_1 Y_{NAG}^N + n_2 DMP_{NF}^N \quad \text{(lower bound } X_{NF}^S \text{ function)} \qquad (5.3.26)$$

$$X_{NF}^S = n_0 + n_1 Y_{NAG}^N + n_2 DMP_{NF}^I \quad \text{(upper bound } X_{NF}^S \text{ function)} \qquad (5.3.28)$$

The several ways in which foreign trade can be classified do not lead to a unique model, but just suggest a large number of possible models of which the proposed one is only one. Nevertheless, in the writer's opinion it is the first of its kind since the present work indeed represents a first attempt of estimating the foreign trade structure of the country. In the estimation process, the single equation approach has been pursued in that each relationship has been considered independently and the estimation of the parameters takes place by fitting one function at a time in the most appropriate sets of data.

Analyzing the statistical results of the present work, we note that in import as well as export functions, both the income and price effects have been significant. This is in contrast to quite a few similar studies ending up with a relatively insignificant role of price or their wrong sign. In most of the works done in the field, prices appear to be a significant variable more frequently in exports than in imports.[1] In the export supply functions, lack of a proper export price variable has been a compelling factor for the use of Nepal's domestic price as the proxy variable showing the minimum necessary price and India's domestic price as the maximum food price that the exporters face in their export supply. Explained in this way, the price coefficients in the export supply equations have been statistically significant and in the right direction. The income

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[1] Polak, J.J., "The Foreign Trade Multiplier," American Economic Review, Vol. XXXVII, December 1947.

variable also has been quite significant in explaining the behavior of export supply.

6.3 Measures of Elasticity

The degree of responsiveness between changes in the independent variables and changes in the dependent variables represents the measure of elasticity. It is interesting to know about the elasticity of Nepalese demand for imports, supply of exports and the elasticity of Indian demand for Nepalese exports. Income and price are the two most important economic magnitudes. Measures of elasticity in terms of income and price are very important for economic decisions. Elasticity of Q with respect to P is measured from the estimated equations as follows.

$$\eta_Q = \pi_o \cdot \frac{\bar{P}}{\bar{Q}}$$

where $\bar{P}$ and $\bar{Q}$ denote the means of price and quantity and $\pi_o$, the coefficient of the price variable. Elasticities, computed with the estimated parameters, will give us a short-term or an impact elasticity. By short-term elasticity we mean, "the reaction of that volume which materializes within some short period" while by long-term elasticity, "we think of the total reaction during a long period."[2]

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[2] J. Tinbergen, "Long Term Foreign Trade Elasticities," Metroeconomica, 1, December 1949.

Table 6.1

Measures of Elasticity

| Elasticity of | Equation No. | With Respect to | Result |
|---|---|---|---|
| M | (5.3.9) | $Y^N$ | 2.61 |
| M | (5.3.9) | $P_M^N/DMP^N$ | -2.02 |
| $X_F^D$ | (5.3.13) | $Y_{AG}^I/Y^I$ | -3.65 |
| $X_F^D$ | (5.3.13) | $P_X^F/DMP_F^I$ | -0.69 |
| $X_{NF}^D$ | (5.3.20) | $Y_{NAG}^I/Y^I$ | 4.55 |
| $X_{NF}^D$ | (5.3.20) | $P_{NF}^X/DMP_{NF}^I$ | -0.58 |
| $X_F^S$ | (5.3.21) | $Y_{AG}^N$ | 0.51 |
| $X_F^S$ | (5.3.21) | $DMP_F^N$ | 1.68 |
| $X_{NF}^S$ | (5.3.26) | $DMP_{NF}^N$ | 2.43 |
| $X_{NF}^S$ | (5.3.26) | $Y_{NAG}^N$ | 0.71 |

## 6.4 Comparison of the Results

It is unfortunate that no similar studies have been made on Nepal for comparison. There have been some studies done with Indian data. We will be comparing our results with those studies. However the time periods of the present work is not directly comparable with that of other studies.

Table 6.2

Comparison of Export Demand Elasticities

| Author | Period Studied | Income Elasticity | Price Elasticity |
|---|---|---|---|
| Polak | 1923-1939 | 0.48 | - |
| Murty & Shastri | 1927-1937 | 1.19 | -0.78 |
| Dutta | 1951-1960 | | |
| *(a) $X^{\$}$ | | 0.91 | |
| *(b) $X^{SA}$ | | 3.81 | |
| *(c) $X^{OE}$ | | 4.65 | |
| *(d) $X^{RW}$ | | 0.57 | |
| Our Study | 1961-1970 | | |
| (a) $X^{D}_{F}$ | | -3.65 | -0.69 |
| (b) $X^{D}_{NF}$ | | 4.55 | -0.58 |

* Exports to dollar, Sterling, OEEC areas and rest of the world, respectively.

The negative coefficient for the $X_F^D$ function was because of the ratio of India's agricultural income to its national income. The table thus indicates Nepalese exports to be greater than unity with respect to the ratio of $Y_{AG}^I/Y^I$ and smaller than unity with respect to the export price.

Table 6.3

Comparison of the Import Demand Elasticities

| Author | Period Studied | Income Elasticity | Price Elasticity |
|---|---|---|---|
| Murty & Shastri | 1927-1937 | 2.01 | -0.38 |
| Narasimham | 1919-1952 | 2.07 | - |
| Dutta | 1951-1960 | | |
| *(a) $m_g$ | | 2.72 | - |
| *(b) $m_s$ | | 2.07 | - |
| Our Study | 1961-1970 | 2.61 | -2.02 |

* Indian imports of goods and services, respectively.

The coefficients in Table 6.4 indicate that Nepal's imports are price and income elastic. This reflects that Nepal's import demand is responsive to the changes in price as well as income. Hence price and income should be the factors to watch in controlling imports to improve the trade balance. The present work thus confirms the effectiveness of devaluation in the case of Nepal as a device for the improvement of a country's foreign trade position.

Table 6.4

Export Supply Elasticities

| Variable Measured | Income Elasticity | Price Elasticity |
|---|---|---|
| $X_F^S$ | 0.51 | 1.68 |
| $X_{NF}^S$ | 0.71 | 2.43 |

The export supply of food is found to be income inelastic. It is found to be more sensitive to Nepal's domestic food price proxied for the export price. At face value, it seems somewhat unusual. This shows that the export suppliers are more aware of the changes in the food price than what they are credited to. The farmers do respond to change in price. In case of export of non-food items, the income elasticity is found to be smaller than unity and the price elasticity has been greater than unity. This suggests that price measures might be a more effective policy to encourage the export supply.

## 6.5 Projection of Imports, Exports and the Trade Gap and the Required Rate of Exchange Rate Depreciation of the Nepalese Currency in the Absence of Aid Money in IC

By making use of the model estimated, we have projected Nepal's imports and exports for the period of five years. Subsequently, Nepal's trade gap has been computed for the corresponding years. In

the process of forecasting the unknown variables, the usual method widely followed is to project the values of known variables and insert those values in the estimated equations of the model. By doing this, the system can be solved to forecast the values of the unknowns.[3] We have projected the explanatory variables of Nepal's import and export functions against time for the period of five years. The projected values have been inserted into the final M, $X_F^D$ and $X_{NF}^D$ equations to forecast Nepal's imports and exports. In calculating the required exchange rate depreciation of the Nepalese currency, we have made two assumptions, namely (a) $\eta_{XS}^I$ is infinite and (b) $V_{MNC} > V_{XNC}$ (see below for notation). The elasticities approach has been adopted in the process of exchange rate computation.[4] It has been calculated that improvement of the trade balance in Nepalese currency would automatically mean an improvement of the trade balance in Indian currency as well.[5]

$$\frac{dB_{NC}}{de} = \frac{V_{XNC}}{e}\left[\frac{V_{MNC}}{V_{XNC}} \cdot \frac{\eta_{XS}^I\ (1+\eta_M^N)}{\eta_M^N - \eta_{XS}^I} - \frac{\eta_M^I\ (1+\eta_{XS}^N)}{\eta_{XS}^N - \eta_M^I}\right] \qquad (6.5.1)$$

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[3] D.B. Suits, "Forecasting and Analysis with an Econometric Model," American Economic Review, March 1962.

[4] C. Kindleberger, International Economics, Appendix F, Richard D. Irwin, Inc., 1973.

[5] C. Kindleberger, op. cit., p. 123.

$B_{NC}$ = Nepal's balance of trade in Nepalese currency

$e$ = Exchange rate in terms of Nepalese currency paid for per unit of Indian currency

$V_{XNC}$ = Value of exports in Nepalese currency

$V_{MNC}$ = Value of imports in Nepalese currency

$\eta^{I}_{XS}$ = Price elasticity of Indian export supply

$\eta^{N}_{M}$ = Price elasticity of Nepal's import demand

$\eta^{I}_{M}$ = Price elasticity of India's import demand

$\eta^{N}_{XS}$ = Price elasticity of Nepal's export supply

Since $\eta^{I}_{XS}$ is infinite by assumption, the above equation (1) can be written as the following:

$$\frac{dB_{NC}}{de} = \frac{V_{XNC}}{e} \left[ \frac{V_{MNC}}{V_{XNC}} \cdot \frac{(1+\eta^{N}_{M})}{-1} - \frac{\eta^{I}_{M}\ (1+\eta^{N}_{XS})}{\eta^{N}_{XS} - \eta^{I}_{M}} \right] \qquad (6.5.2)$$

We have started with the balance of trade deficits ($V_{MNC} > V_{XNC}$). In the following table, the projected trade gap and the percentage of exchange rate depreciation needed to rectify it have been presented.

The table shows that for the year 1971, in order to correct the projected trade deficits of 195.59 million Nepalese Rupees, the Nepalese currency needs to be devalued by 18.12%. Likewise for the year 1972, 19.49% of the Nepalese currency depreciation would help remove the amount of 225.77 million trade deficits of Nepal and so on.

Table 6.5

Projection of Imports, Exports and Necessary Percentage of Exchange Rate Depreciation of Nepalese Currency to Correct Trade Gap

| Year | Projected Imports (M') | Projected Exports (X') | (X' - M') | Needed Percentage of Nepalese Currency Devaluation |
|---|---|---|---|---|
| 1971 | 750.24 | 554.65 | -195.59 | 18.12 |
| 1972 | 813.70 | 587.93 | -225.77 | 19.49 |
| 1973 | 899.16 | 621.21 | -277.95 | 22.14 |
| 1974 | 992.56 | 654.49 | -338.07 | 24.89 |
| 1975 | 1092.44 | 687.77 | -404.67 | 27.60 |
| Cumulative | 4548.10 | 3106.05 | -1442.05 | 22.83 |

The cumulative trade deficits after the end of five years amount to 1,442.05 million Nepalese rupees. The depreciation of Nepalese currency by 22.83% would restore the trade balance. This is if and only if the impact and the long-run elasticities are the same. Since the long run elasticities are substantially greater than the impact elasticities, the required percentage of devaluation to correct the above cumulative amount of trade deficits tends to be smaller than 22.83%. Higher the elasticities, lower is the required percentage of devaluation to improve the trade balance of a given amount. Thus even smaller price changes would help obtain a given balance of trade improvement or a given price change will give a large balance of payments effect if the elasticities are large. On the other hand, if the elasticities are small, large price changes are needed to improve a given balance of payments deficits.

## 6.6 Effects of Removal of Indo-Nepal Trade Treaties on Each Other's Trade: A Hypothetical Case

Indo-Nepal trade guided by the bilateral trade treaties permit free trade between the two countries allowing at the same time both countries to impose different levels of tariff rates in their trade with the rest of the world. In this section, by making use of the results of the study, we will be examining the pros and cons of the removal of trade treaties in trade between the two countries. While this would mean more freedom in the pursuance of independent trade policies, it would also imply an automatic denial of the preferential

treatment granted by the treaties in each other's trade. The removal of bilateral trade treaties would cause both countries to impose the same tariff rates in each other's trade as in their trade with other countries. This would mean more trade diversion than trade creation to a country whose exports are less competitive in the world market and whose exports market availability are limited due to the type of export composition or geographical topography.

We hypothesize that after 1967 the Indo-Nepal trade as guided by the treaties between the two countries is stopped and both nations starting from 1968, levy tariff rates on the goods-trade between each other. No particular importance has been attached to the year 1968 except that UN data on Indian implicit tariff rates were available for that year. These rates have been calculated for the United Nations by V.R. Panchamukhi.[6] Implicit tariff rates have been given for several categories of commodities. We have divided them into two rates, one for food and the other for non-food commodities. In separating the Indian implicit tariff rates into two above rates, we have considered all categories of commodities traded between the two countries as reported in the UN study of Commodity Trade Statistics.

The weighed implicit tariff rates for India have been calculated in the following way.

$$K_{IT(F)} = \sum_{i=1}^{5} V_i \, IT_{(i)} \Big/ \sum_{i=1}^{5} V \qquad (6.6.1)$$

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[6] UNECAFE, Intra-Regional Trade Projections, Effective Protection and Income Distribution, Vol. II, Effective Protection, 1972.

$$K_{IT(NF)} = \sum_{i=1}^{9} V_i \; IT_{(i)} \; / \; \sum_{i=1}^{9} V \qquad (6.6.2)$$

where $K_{IT(F)}$ and $K_{IT(NF)}$ are the weighed implicit tariff rates for food and non-food items, respectively, $V_i$ is the value added of traded goods at international prices and IT is the implicit tariff rates.

By using the above method, the weighed implicit tariff rates on Nepalese exports of food and non-food items for 1968 were found as follows.

$K_{IT(F)} = 0.1164$ $\qquad$ $K_{IT(NF)} = 0.6964$

It has to be noted that nominal tariff rates play only a secondary role as an instrument of protection. The exchange controls and import quotas are much more rigorous measures. The difference in domestic price and the international price that is more than the amount of nominal tariff rates or the implicit tariff rate is explained by these measures. The common reasons for adopting the licensing system are essential in nature of the commodities and their indigenous non-availability. The domestic price added to nominal tariff rate will be the same as implicit tariff rates in the absence of quantitative restrictions. In case of Indo-Nepal trade, there has been no exchange control and import controls over the period of 1968 through 1970. So the calculated above implicit tariff rates reflect higher rates of protection than otherwise. The effects of

the hypothetical imposition of the above tariff rates from India on the Nepalese exports thus tend to display a larger reduction in Nepal's exports to India.

The following method has been used in explaining the effects of the above tariff rates on the exports of Nepalese food and non-food commodities.

$$\eta_M^I = \frac{\Delta M^I/M^I}{\Delta P_M/P_M} \tag{6.6.3}$$

$$\frac{\Delta P_M}{P_M} = \frac{P_M\ (1+K_{IT}) - P_M}{P_M} \tag{6.6.4}$$

$$= \frac{P_M + P_M K_{IT} - P_M}{P_M}$$

$$\eta_M^I = \frac{\Delta M^I/M^I}{K_{IT}} \tag{6.6.5}$$

$$\eta_M^I = \frac{\Delta M^I}{M^I} \cdot \frac{1}{K_{IT}}$$

$$\Delta M^I = \eta_M^I \cdot M^I \cdot K_{IT} \tag{6.6.6}$$

where

$\eta_M^I$ = Indian elasticity of demand for Nepal's exports

$P_M$ = India's import price

$M^I$ = India's imports

$K_{IT}$ = Weighed Indian implicit tariff rates

Equation (6.6.6) above will give the effects of $K_{IT}$ on $M^I$.

By assuming the same $K_{IT(F)}$ and $K_{IT(NF)}$ for all the remaining years of the sampling period (i.e. 1968, 1969 and 1970), we have measured their effects on the Nepalese exports to India. The results are presented in the following tables:

Table 6.6

Reduction in Nepal's $X_F^D$ After $K_{IT(F)}$

(millions of Nepalese rupees)

| Years | Actual $X_F^D$ | $K_{IT(F)}$ | $\Delta X_F^D$ | New Hypothetical $X_F^D$ |
|---|---|---|---|---|
| 1968 | 201.41 | 0.1164 | -16.1764 | 185.23 |
| 1969 | 251.81 | 0.1164 | -20.2244 | 231.59 |
| 1970 | 294.69 | 0.1164 | -23.6683 | 271.02 |

The assumption of implicit tariff rates remaining the same for all three years can be justified on the ground that even though rates on some commodities could change, the overall tariff rates over the short period do not change. The following table presents the effects of $K_{IT(NF)}$ in non-food exports of Nepal.

Table 6.7

Reduction in Nepal $X^D_{NF}$ After $K_{IT(NF)}$

(millions of Nepalese rupees)

| Years | Actual $X^D_{NF}$ | $K_{IT(NF)}$ | $\Delta X^D_{NF}$ | New Hypothetical $X^D_{NF}$ |
|---|---|---|---|---|
| 1968 | 188.92 | 0.6964 | -76.3071 | 112.61 |
| 1969 | 318.12 | 0.6964 | -128.4925 | 189.63 |
| 1970 | 190.47 | 0.6964 | -76.9331 | 113.54 |

Table 6.8

Reduction in Nepal's $X^D_F$ and $X^D_{NF}$ After $K_{IT(F)}$ and $K_{IT(NF)}$

(millions of Nepalese rupees)

| Years | Actual $X^D_F+X^D_{NF}$ | Fall in $X^D_F$ and $X^D_{NF}$ After $K_{IT(F)}$ and $K_{IT(NF)}$ | New Hypothetical $X^D_F + X^D_{NF}$ |
|---|---|---|---|
| 1968 | 390.33 | 92.4835 | 297.85 |
| 1969 | 569.93 | 148.7169 | 421.21 |
| 1970 | 485.16 | 100.6004 | 384.56 |

Data on the Nepalese tariff rates are not available to study their impacts on the Nepalese imports. We have measured the reduction of $X_F^D$ and $X_{NF}^D$ after the imposition of $K_{IT(F)}$ and $K_{IT(NF)}$. We have then computed the necessary tariff rates required for Nepal to get back to the previous level of deficits at the pre-tariff period. The necessary tariff rates have been computed in the following way.

$$\Delta M^N = \eta_M^N \cdot K_{IT} \cdot M^N \tag{6.6.7}$$

$$K_{IT} = \Delta M^N / \eta_M^N \cdot M^N \tag{6.6.8}$$

$M^N$ = Nepal's imports

$\eta_M^N$ = Nepal's import price elasticity

The results are given in the following table.

Table 6.9

Required $K_{IT}$ for Nepal to Meet Reduction in $X_F^D$ and $X_{NF}^D$ After $K_{IT(F)}$ and $K_{IT(NF)}$

(millions of Nepalese rupees)

| Years | Actual $M^N$ | Target $\Delta M^N$ To Be Reduced | Required Percentage of $K_{IT}$ |
|---|---|---|---|
| 1968 | 441.130 | 92.48 | 11.7112 |
| 1969 | 697.302 | 148.7169 | 11.9148 |
| 1970 | 783.050 | 100.6004 | 13.9329 |

The required percentage of $K_{IT}$ seems fairly low and this could be probably explained by the fact that the import price elasticity of Nepal is quite high. As such, even a small increase in import price after the imposition of $K_{IT}$ brings a big drop in Nepal's import demand.

The above tariff rates imposition is just to bring the country back to the trade deficit level of pre-tariff imposition period. If the objective lies in attaining the equilibrium in overall trade balance, the required $K_{IT}$ must obviously be much higher. Besides, it might be mentioned that the imposition of $K_{IT}$ on $\Delta M^N$ and $\Delta M^I$ gives only short run immediate effect of price change. Secondary effects on supply aspects through change in price have not been considered. If the removal of trade treaties would mean restoring to tariff policies just to remain at the same trade deficit level, Nepal's welfare might well be served better by resorting to treaties rather than tariffs. At least this would not result in a distortion of the allocation of the country's resources. Nepal's trade relations with the rest of the world are not very significant at the moment but with India, it is enormously large. In the event of mutual tariff imposition in each other's trade in a static sense, Nepal's trade creation emanating from free trade with India would have to be sacrificed and the trade diversion losses as a result of levying tariffs in each other's trade would have to be realized. Thus Nepal's trade with India being enormously large, the indications are that the trade diversion losses might be much larger also from such arrangements.

## 6.7 Policy Implications

The policy implications emanating from this study is confined to the objective of improving the balance of trade. The findings of elasticities of import and export demand can be of immense help in this regard. The elasticity of Nepal's import demand has been found to be greater than unity in terms of both income and price. This indicates the sensitivity of Nepal's imports to both income and price. This also suggests that expenditure-switching as well as expenditure-reducing policies can be effectively used in controlling imports to improve the trade balance. The use of expenditure-reducing policies is generally against the basic objective of developing countries. Nevertheless, fiscal and monetary policies may be used to correct the short run problems of the country's balance of trade. However, the potential gains from such policies should be weighed against the resulting losses from their adverse effects on the country's long run targets.

The findings of the present work suggest Nepal's export demand to be greater than unity with respect to the ratio of $Y^I_{AG}/Y^I$. This indicates that Nepal's export earnings is highly sensitive to the agricultural condition in India. The assignment of agricultural priority in the Indian planning could be a signal to a possible drop in Nepal's exports and hence necessary counter-balancing measures might be undertaken. As expected, Nepal's food export demand has been found to be inelastic with respect to the export price. This

gives scope for the Government to impose export levies without its possible adverse effects on its export earnings. The export supply of food as well as non-food items has been found to be income inelastic and price elastic. Domestic price of Nepal have been used as a proxy for the export price. Considering the sensitivity of export supply to price, the policy makers may be recommended to give price incentives to the export suppliers.

## 6.8 Summary and Conclusions

In summary, the performance of the model over the sample period 1961 to 1970 may be described as follows. All the estimated functions have shown good $R^2$ with statistically significant structural coefficients. The coefficients have the signs in the right direction. The overall performance of the model has displayed that the actual time paths of the endogenous variables move parallel without systematic divergence between the computed and the observed values. The mutual independence of the residuals have been tested with the help of von Neumann test for serial correlation. No evidence of serial correlation has been detected.

Elasticity estimates have been computed and discussed. It may be cautioned here that foreign trade elasticities estimates should be considered as indicating reasonable values of magnitude rather than exact estimators of the true values of Nepal's foreign trade elasticities. The data that have been used in the model are certainly not the perfect one. Besides, the elasticity concept

strictly speaking is a measure of the effect of a change in price or income on quantity of well specified product rather than a group of heterogenous products. With these limitations in mind, our present study indicates that Nepal's import demand elasticity is greater than unity in terms of price and income. Its export demand elasticity is found to be greater than one with respect to $Y^I_{AG}/Y^I$ and less than one with respect to the export price. Nepal's export supply elasticity is found to be smaller than unity in terms of income and greater than unity in terms of price. By making use of the model, Nepal's imports, exports and trade gaps have been projected for five years and the exchange rate depreciation of the Nepalese currency have been calculated to bring the country back to the trade balance. It has been found that it might not be to the advantage of Nepal that both countries impose tariff in each other's trade as they impose in their trade with the rest of the world.

Study of this nature can never claim to be complete and free of limitations. Yet this model should be helpful at a later stage in building a more complete and improved model of Nepal's foreign trade sector as data constraints are overcome. The study can be expanded to a highly disaggregate level. Building model is a continuous process of improvements and modifications because the structure itself does not remain unchanged over the period of time. The model as such should be reestimated at frequent intervals to ensure the structural validity. The present model represents the efforts of the

writer to collect and analyze the existing information and understanding of the operation of Nepal's external trade sector. Despite several limitations, it is hoped that the present study has helped in answering some of the questions yet unanswered by obtaining the structural estimates reasonably close to their actual values.

Appendix 1

Data and Data Sources
(in millions of rupees)

| (1) Year | (2) M (NC) | (3) $Y^N$ (NC) | (4) $P_M^N$ | (5) $DMP^N$ | (6) $X_F^D$ and $X_F^S$ (NC) |
|---|---|---|---|---|---|
| 1960-61 | 375.09 | 3419 | 100 | 100 | 158.27 |
| 1961-62 | 439.66 | 3682 | 98.40 | 100 | 173.60 |
| 1962-63 | 598.95 | 3757 | 95.20 | 106 | 166.00 |
| 1963-64 | 595.59 | 38[illegible] | 94.58 | 116 | 195.03 |
| 1964-65 | 806.42 | 394[illegible] | 96.00 | 133 | 257.52 |
| 1965-66 | 763.51 | 3940 | 100.80 | 145 | 183.27 |
| 1966-67 | 405.11 | 3979 | 146.08 | 118 | 251.91 |
| 1967-68 | 441.13 | 4239 | 149.60 | 151 | 201.41 |
| 1968-69 | 697.30 | 4493 | 150.40 | 146 | 251.81 |
| 1969-70 | 783.05 | 4700 | 155.20 | 150 | 294.69 |

Appendix 1 (continued)

Data and Data Sources
(in millions of rupees)

| Year | (7) $Y^I_{AG}$ (IC) | (8) $Y^I$ (IC) | (9) $P^F_X$ | (10) $DMP^I_F$ | (11) $X^D_{NF}$ and $X^S_{NF}$ (NC) | (12) $Y^N_{AG}$ (NC) |
|---|---|---|---|---|---|---|
| 1960-61 | 65,700 | 142,410 | 100 | 100 | 50.90 | 2759 |
| 1961-62 | 67,710 | 151,300 | 108.80 | 99.42 | 90.29 | 2338 |
| 1962-63 | 69,050 | 161,370 | 101.54 | 103.90 | 120.01 | 3809 |
| 1963-64 | 80,150 | 186,600 | 83.01 | 110.39 | 89.92 | 3885 |
| 1964-65 | 98,460 | 218,450 | 74.79 | 128.70 | 177.65 | 3915 |
| 1965-66 | 95,230 | 227,030 | 77.76 | 138.10 | 187.23 | 4694 |
| 1966-67 | 114,210 | 260,850 | 96.87 | 157.40 | 168.85 | 4218 |
| 1967-68 | 145,690 | 307,980 | 61.80 | 197.92 | 188.92 | 5217 |
| 1968-69 | 138,590 | 313,550 | 89.46 | 199.34 | 318.12 | 5890 |
| 1969-70 | 149,050 | 341,840 | 85.26 | 192.18 | 190.47 | 6563 |

Appendix 1 (continued)

Data and Data Sources
(in millions of rupees)

| Year | (13) $Y^{I}_{NAG}$ (IC) | (14) $P^{NF}_{X}$ | (15) $DMP^{I}_{NF}$ | (16) $DMP^{N}_{F}$ | (17) $Y^{N}_{NAG}$ (NC) | (18) $DMP^{N}_{NF}$ |
|---|---|---|---|---|---|---|
| 1960-61 | 67,969 | 100 | 100 | 100 | 1338 | 100 |
| 1961-62 | 73,770 | 93.44 | 105.30 | 100.58 | 1342 | 105 |
| 1962-63 | 80,760 | 111.62 | 106.04 | 107.00 | 1469 | 112 |
| 1963-64 | 91,930 | 136.26 | 107.86 | 119.84 | 1319 | 118 |
| 1964-65 | 103,630 | 120.14 | 111.76 | 159.43 | 1478 | 124 |
| 1965-66 | 112,630 | 92.91 | 120.61 | 167.99 | 2101 | 99 |
| 1966-67 | 126,450 | 139.32 | 132.37 | 142.31 | 2115 | 128 |
| 1967-68 | 140,640 | 80.95 | 137.75 | 171.20 | 2329 | 134 |
| 1968-69 | 150,770 | 127.45 | 139.74 | 160.50 | 2677 | 135 |
| 1969-70 | 164,270 | 94.16 | 148.37 | 158.36 | 2886 | 140 |

Sources:

Column ( 2 ) - Nepal Rashtra Bank, Quarterly Economic Bulletin, Mid-January 1974.

Column ( 3 ) - Shah, S., Behavior of Money Stock in Nepal, Unpublished Ph.D. Dissertation, University of Hawaii, 1973.

Column ( 4 ) - International Monetary Fund, International Financial Statistics, Several issues.

Column ( 5 ) - UNESCAP, Year Book, 1972.

Column ( 6 ) - Same as Column (2).

Column ( 7 ) - Central Statistical Organization, Government of India, National Income Estimates, 1960/61-1969/70.

Column ( 8 ) - Same as Column (7)

Column ( 9 ) - UNFAO, Year Book, 1966, 1971. Data being generated, need to be substantially improved for further research purposes.

Column (10) - Central Statistical Organization, Government of India, Statistical Abstract of India, 1960/61-1969/70.

Column (11) - Same as Column (2).
Column (12) - Same as Column (3).
Column (13) - Same as Column (7).
Column (14) - Same as Column (9).
Column (15) - Same as Column (10).
Column (16) - Same as Column (5).
Column (17) - Same as Column (3).
Column (18) - Same as Column (5).

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