AN EMPIRICAL EXAMINATION OF BILATERAL SEABORNE TRADE FLOWS IN THE WORLD ECONOMY

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DECLARATION

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ABSTRACT

The aim of this thesis is to construct a disaggregated econometric model of the pattern of bilateral seaborne trade flows. Commodities are classified into 5 categories according to the type of ship used in their transportation. Exports and imports are classified into 30 regions, according to the major sea-lanes used by ships.

An understanding of the determinants of trade flows at this level of disaggregation is important for shipowners. The use of disaggregated data also helps in the estimation of the price elasticities of traded goods, an issue of more general interest to exporters and policy makers.

Our theoretical model borrows the ideas of multistage budgeting from consumer demand theory. The total imports of each importing region are allocated amongst their trade partners, depending on relative prices and trends in tastes. Our econometric implementation of the model uses the very general Constant Ratio of Elasticities of Substitution Homogeneous (CRESH) functional form. This encompasses the CES, LES, Cobb-Douglas and Leontief forms, more commonly used in trade models.

Empirical implementation of the model has resulted in elasticity estimates which are much higher than those estimated in earlier trade models. This indicates a high degree of competition in international markets. The pattern of these elasticities suggest that importing regions establish a few trade partners internationally for the main bulk of their imports, while the proportion of their imports allocated to the remaining trade partners, is highly sensitive to relative prices.

ABBREVIATIONS:

AE	Adaptive Expectations
ALH	Average Length of Haul
BLUE	Best Linear Unbiased Estimators
BTN	Brussels Tarif Nomenclature
CCCN	Customs Co-operation Council Nomenclature
CES	Constabt Elasticity of Substitution
cif	Cost-Insurance-Freight
CMSE	Constant Market Share Elasticities
CPC	Central Product Classification
CRESH	Constant Ratio of Elasticity of Substitution Homogeneous
CRS	Constant Returns to Scale
CV	Coefficient of Variation
DGP	Data Generating Process
DR	Democratic Republic
EEC	European Economic Community
EFTA	European Free Trade Association
fob	Free-On-Board
FOC	First Order Conditions
FR	Federal Rapublic
FRB	Federal Reserve Board
GDP	Gross Domestic Product
GDP-CON	Gross Domestic Product in Constant prices
GLS	Generalized Least Squares
GNP	Gross National Product
HS	Harmonized System
IFS	International Financial Statistics
IMF	International Monetary Fund
ISIC	International Standard Industrial Classification
LES	Linear Expenditure System
MCV	Modified Coefficient of Variation
ML	Maximum Likelihood
MLE	Maximum Likelihood Estimator
MTC	Maritime Transport Commodity (Classification)
MTCAC	Maritime Transport Coastal Area Classification
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PA	Partial Adjustment
RRSS	Restricted Residual Sum of Squares
ROW	Rest Of the World
SGM	Statistical Generating Mechanism
SITC	Standard International Trade Classification
SOC	Second Order Conditions
s.t.	subject to
SURE	Seemingly Unrelated Regression Equations
UK	United Kingdom
UN	United Nations
URSS	Unrestricted Residual Sum of Squares
USA	United States of America
USSR	United Soviet Socialist Republics
w.r.t.	with respect to

SYMBOLS:

e_{ii}	Own import price elasticity of demand
e^{xp}_{ii}	Estimated own export price elasticity of demand
e_{ih}	Cross import price elasticity of demand
e^{xp}_{ih}	Estimated cross export price elasticity of demand
e^{wp}	Estimated world export price elasticity of demand
ε_{it}	White noise error regression term
$m^k_{ij}=m_{ij}=m_i$	Volumes of bilateral imports of commodity k by country j from partner i
$m^k_j=m_j=m$	Volume of total imports of commodity k by country j
m^k	Volume of total world imports of commodity k
M_j	Value of imports of j
MP_j	Total import prices of j
$\mu^k_j=\mu$	Index of total imports of country j for commodity k
$p_{ij} = p_i$	Bilateral prices of imports of commodity k by country j from partner i
$p^k_j=P_j$	Total import prices of commodity k by country j
P_W	World price index
t	Time trend
σ_{ii}	Partial Allen own price elasticity of substitution
σ_{ih}	Partial Allen cross price elasticity of substitution
T^k	World trade volume of commodity k
T	Volume of aggregate world trade
$w_{ij} = w_i$	Bilateral shares of imports of commodity k by country j from partner i
$w^0_{ij} = w^0_i$	Bilateral shares of imports of commodity k by country j from partner i at the base year
W_{ij}	Nominal trade share
WP_k	Total world prices of commodity k
x^k_i	Volume of total exports of commodity k from country i
x^k	Volume of total world exports of commodity k
XP_i	Total export prices of country i

MATHEMATICAL SYMBOLS:

dx	Derivative of x
∂x	Partial derivative of x
X_{t-1}	Lag of variable X
$\Delta X_t = X_t - X_{t-1}$	Change in X between periods t-1 and t
$E\ X_t$	Mathematical expectation of X
$\exp = e$	=2.718
$\lim x$	Limit of x
$\ln x$	Natural logarithm of x
Π_i	Product over i
Σ_i	Sum over i
$\mathbf{x}'$	Transpose of vector $\mathbf{x}$
Σ^+	Generalized inverse of matrix Σ
$\otimes$	Kroneker product
$\forall$	For all
$\therefore$	Therefore
$\equiv$	Identical
$\neq$	Different to
∞	Infinity
$\|x\|$	Determinant or absolute value of x, where appropriate
$>$	Greater than
$<$	Less than
$\geq$	Greater or equal to
$\leq$	Less or equal to

CHAPTER 1

INTRODUCTION

1.0). Introduction.

This chapter is an introduction to the thesis. In its three main sections it considers respectively, (i) the central question which we attempt to answer, (ii) the proposed outline of the answer and (iii) the structure of the thesis.

1.1). The question.

The division of labour was seen by Adam Smith(1776) as the basis of specialization in the production of commodities. However, the extent to which the division of labour takes place was seen to be limited by the size of the market. The only way to extend markets beyond the national boundaries is by international trade.

The significance of international trade in the world economy has grown enormously since the 2nd World War. World GDP has increased in real terms by 377% between 1950 and 1986 (UN (1990)). World imports have increased in real terms by 919% over the same period (IMF (1990)).

At the time of Adam Smith, the easiest and safest way of trading amongst nations of the world was by ships. This continues to be the case today. The vast majority of goods that are traded internationally are transported by ships.

Over the years, well defined sea-lanes have developed, linking the ports of major trading regions. Specialized types of ships have also been developed, to handle different types of cargo. UN statistics on seaborne trade identify 30 trading regions, and 5 cargo types (bulk dry, bulk liquid, refrigerated goods, general cargo dry and other dry cargo). Details are given in Chapter 5, Appendices 5.1 and 5.2.

Our objective in this thesis is to understand the factors determining the demand for these different ship types on each shipping lane. In particular, we are interested in how sensitive demand is with respect to the prices of the goods being transported, and the competitiveness of the exporting and importing regions. This information is an important input in the decisions of shipowners and exporters in general.

1.2). An outline of the answer.

The demand for seaborne transport is a derived demand. A particular type of ship, over a sea-lane, at each point in time, is demanded because there is a demand for the commodity the ship can carry. If one is to explain the demand for seaborne transport in an import 'market' (where an import market is described by the importing region and the 'commodity' that is demanded by the region), then the problem is equivalent to explaining the demand for trade in that market.

In this thesis, we take as given the general level of demand in an import market at each point in time, and we explain the way this demand is allocated over trade partners. We assume that the changing patterns of allocation are driven by the relative prices offered by competing exporters in each import market, and by a time trend which describes the changing taste of importers for different exporters.

We derive our models from neoclassical optimization principles. For each country and each commodity, the structure of preferences of a representative economic agent over imports from other countries is represented by a function of the imported quantities, in the same way as consumers' preferences are represented by a utility function.

The economic properties of the system depend of course on the particular objective function chosen. We choose a function, the Constant Ratio of Elasticity of Substitution Homogeneous (CRESH) function, which is general enough to allow for a distinct bilateral price effect for each exporter, and which holds trade partners as competitors in import markets.

The possibility that trade between two regions may be influenced by the export prices of regions other than the exporter and importer is also allowed in our model. That is, apart from own price elasticities, cross price elasticities of seaborne trade demand are computed. However, the number of estimated coefficients increase only linearly with the number of trade partners, allowing us to parameterize an apparently 'large' system, using a relatively short set of data, for the years 1969-1986.

1.3). Organization.

The thesis is in 8 chapters.

In chapter two, since there are no similar studies in seaborne trade linkage models, we survey existing studies on international import allocation models.

In chapter three, we extend the theory of budget allocation of the consumer to seaborne import allocation of the regional importer, thus providing the theoretical rationale of seaborne import allocation models. We use a particular objective (or aggregator) function, which allows for relatively 'general' substitution patterns amongst trade partners and at the same time leaves the system feasible for estimation. This system encompasses most existing models of international trade as special cases.

In chapter four, we examine the econometric specification of the derived seaborne import allocation system. We turn the theoretical model of chapter three into an empirical form by linearizing it, introducing dynamics and taking into account the data constraints. A methodology for selecting among alternative models is proposed, and the theoretical consequences of the empirical formulation are examined.

In chapter five, we describe the data used in the estimation of our econometric models. Apart from the dependent variables on bilateral seaborne trade flows, we have to construct data on relative prices. Methodological and practical problems are examined in the process, and the correspondence of the data to the theoretical variables is discussed.

In chapter six, we show that our system falls into the class of Seemingly Unrelated Regression Equations (SURE), with a functional adding up constraint, which translates into a constraint on parameters across equations. Estimation methods for linear and non-linear systems of this type are proposed.

In chapter seven, we focus on the estimated systems and the results of the empirical exercise. We derive sets of own and cross export and world price elasticities of demand for each trade partner in each import market. Trends and dynamics are also discussed.

Finally, in chapter eight, we present a brief summary and conclusions of the thesis, and reflect on the problems faced. We also suggest possible drawbacks and improvements that may be made on this research front.

CHAPTER 2

LITERATURE SURVEY

2.0). Introduction.

In this chapter, we survey linkage models of the world economy, with emphasis on trade linkage. Each model is evaluated in terms of our objective, of explaining bilateral seaborne trade flows in the international economy. Ideally, we like to construct a world economy system, that can explain trade among 30 partners and 5 commodity groups. The model should have a strong theoretical structure, both economically and econometrically, and be feasible to turn into an empirical form.

This chapter is in three main sections. In the first, we look at conceptual aspects of trade linkage models in terms of an import-export matrix, and we set up the mathematical notation which is used throughout the thesis. A list of collective surveys of such models is presented and a summary of the major linkage models of the 1980's is provided in appendix 2.1. In the second, we concentrate on trade linkage systems and examine the pros and cons of different approaches. Based on this discussion, we select the class of Estimation Consistent Bilateral Import Allocation Models as the class of models which can be most fruitfully used in satisfying our objective. In the third section, we examine more closely alternative functional forms of the above class and select one of these as being the most interesting in terms of modeling our seaborne trade flows.

2.1). International Trade Linkage Systems.

2.1.1). World Trade Flows in an Import-Export Matrix.

An import-export matrix is usually employed, cf Taplin(1967), Magee(1975) etc, to illustrate world trade flows. Table 2.1 shows such a matrix. Rows of the table record export volumes of a commodity group from countries towards their trade partners. Columns of the table record import volumes of countries for that commodity coming from all their trade partners.

Table 2.1.

World Import-Export Matrix for commodity k.

Exporting country	Importing country					Total Exports
	1	2	3	...	n	
1	m^k_{11}	m^k_{12}	m^k_{13}	...	m^k_{1n}	x^k_1
2	m^k_{21}	m^k_{22}	m^k_{23}	...	m^k_{2n}	x^k_2
.	...	...	...	...	...	.
.	...	...	...	...	...	.
.	...	...	...	...	...	.
n	m^k_{n1}	m^k_{n2}	m^k_{n3}	...	m^k_{nn}	x^k_n
Total Imports	m^k_1	m^k_2	m^k_3		m^k_n	T^k

We use the following notation:

i = exporting country or region.

j = importing country or region.

k = commodity group.

m^k_{ij} = bilateral volumes of imports of commodity k by country j from partner i, or equivalently bilateral volume of exports of commodity k from country i to partner j.

x^k_i = total exports of commodity k from country i to all its trade partners.

m^k_j = total imports of commodity k by country j from all its trade partners.

x^k = total world exports of commodity k.

m^k = total world imports of commodity k.

T^k = world trade of commodity k.

T = aggregate world trade.

where 'totals' refer to the sum over trade partners, while aggregates refer to the sum over 'commodities' (or 'goods').

The following identities follow by definition. The sum of bilateral imports and exports add up to their totals per category of goods.

$$\Sigma_j m_{ij}^k = x_i^k \qquad (2.1)$$

$$\Sigma_i m_{ij}^k = m_j^k \qquad (2.2)$$

The sum of these total exports and imports should be equal to world trade per category of goods.

$$x^k = \Sigma_i x_i^k = \Sigma_j m_j^k = m^k = T^k \qquad (2.3)$$

Finally, the aggregate over all commodity groups of the above totals should be equal to aggregate total world trade.

$$\Sigma_k x^k = \Sigma_k m^k = T \qquad (2.4)$$

A world trade matrix for commodity group k at a particular period of time, a year say, is shown in table 2.1. Similar matrices can be constructed at different points in time to show volumes of world trade for the same commodity over a number of years. To increase the dimension of the problem, a series of world trade flow matrices can be constructed for each commodity group to cover the whole world, over a period of time. Thus, a series of three dimensional import-export matrices, one for each year, would represent such a situation. The horizontal axes of these matrices would record importing and exporting countries respectively, while the vertical axis would record commodity groups.

Often, people are interested in values of trade flows, in which case the entries in table 2.1 are in terms of values instead of volumes. Conventionally, capital letters are used to show the same table in value terms.

If we divide m^k_{ij} by m^k_j we obtain tables similar to 2.1 in shares form, where the entries in these new tables are w^k_{ij} ($\equiv m^k_{ij}/m^k_j$) with the property $\Sigma_i w^k_{ij}=1$.

The challenge then is to build a model that can explain the bilateral trade flows inside the table (or the corresponding values, or the bilateral shares in either volume or value terms) in such a way so that identities (2.1)-(2.3) hold. Then the above identities and (2.4) may be used to calculate consistently the totals on the margins of the tables, and aggregate world trade.

There are several approaches to solving this problem. In our attempt to give an overview of the evolution of these approaches we present a survey of surveys of world trade models. This is followed by a list of the most important trade linkage models in operation over the past decade. This helps us build a picture of the complexity and size of the currently operating linkage models, and plan for the form of our own model.

2.1.2). Surveys of World Trade Models.

Building an Import Export matrix similar to that of table 2.1, and attempting to explain its elements, narrows down the set of international trade models under consideration to the group of linkage models. That is, to models of more than two trade partners. We shall refer to these simply as trade models.

Early attempts to survey models of this type can be found in Cheng(1959). He provides an exhaustive survey of empirical estimates of international trade elasticities and propensities in the 1930's and 1940's, estimated by single equation methods. Comments on work prior to this can be found in Brown(1951). Prais(1962) surveys econometric work in international trade up to 1962, and discusses the estimation techniques used. He proposes, in line with

Orcutt(1950), that simultaneous equation methods should be used to model bilateral trade flows.

Taplin(1967) surveys a variety of approaches to the study of world trade. He compares these approaches, and discusses their pros and cons. This leads him to set the outlines for the desirable properties, a world trade model should satisfy. In broad terms, a disaggregated model that can distinguish between a large number of trade partners, and a number of commodity groups.

Leamer and Stern(1970) provide the most extensive survey of econometric work in international trade, part of which is devoted to the subset of world trade models, in chapters 5 and 6. They note that relatively small trade models, with not well understood properties, dominated the scene prior to the 1970's. However, with developments in computing and accumulated knowledge, larger and better understood models were built in the 1970's and 1980's.

Magee(1975) presents a survey of international trade models up to 1975. A section deals with world trade models, distinguishing between those using cross section and those using time series data. He chooses to discuss the latter as the most interesting, since they describe changes in the patterns of trade over time.

Stern's et al(1976) impressive work, covers the period 1960-1975, including 130 items of research. Three bibliographical indices are used to classify existing models by: (i). country or region, (ii). commodity or commodity group and (iii). author. Their bibliography contains most of the known work.

Amano et al(1980) survey and compare alternative approaches to estimating world trade models. Such approaches include the estimation of bilateral trade flows directly in volume or value terms, in shares form, or indirectly through total import or export equations.

Courbis(1981) in a round table discussion with 'eminent world trade model builders', presents a collection of the major existing multinational, econometric, and general equilibrium trade models.

Hickman(1983b) provides a cross section of global international economic models. He, conveniently, classifies them according to their principal features (i.e. by type of model, endogenous variables, exogenous variables, purpose of the model), and the type of the endogenous linkage mechanisms between countries/regions in each model. That exercise shows that trade flows are included in every model, with other linkage mechanisms, often, supplementing these in the completion of the system. A summary discussion is presented at the beginning, with the authors of each paper expanding on each project in the individual chapters of the volume.

Heliwell and Padmore(1984) cover the most important linkage macroeconometric models, of two or more countries, that were in operation in the 1970's and early 1980's. They classify them according to the type of linkage and country coverage. Studies on partial, general equilibrium, and single economy trade models are, therefore, overlooked.

Italianer(1986) in chapter 1, offers a good literature survey of trade models, which he selects out of the broader set of linkage models.

Bryant et al(1988) provide a collection of the world's most advanced multicountry econometric models up to 1988. Simulation results from these models are reported and compared, in an effort to enhance the empirical understanding of cross-border macroeconomic interactions. The reliability of the results are evaluated and controversial analytical issues are discussed.

2.1.3). Major Currently Operating World Linkage Models.

Models in the above studies have often been classified according to whether they are:

Macroeconometric, in which case a set of elaborate econometric models are linked together, for example LINK(Sawyer(1979)), etc,

General Equilibrium, which model the whole world as one country, for example Artus(1986), Parkin and Zis(1976), Piganiol(1979), Beenstock and Dicks(1983), etc,

Input-Output models, which are closely associated to a Leontief type input-output analysis, for example INFORUM(Nyhus and Almon(1983)), etc,

Single economy models, which emphasize the bilateral linkages between one country and its trade partners in a world framework, for example Batchelor and Bowe(1974), National Ports Council(1975), etc,

Hybrid models contain elements from more than one type of approach, cf COMLINK(Adams and Marquez(1983)), etc.

The most important world linkage models in operation in the 1980's are listed in appendix 2.1. A number of these models were built before the 1980's and continue to be in operation today. Many of these are refined and elaborated further to provide forecasts and simulations for international organizations. A reference on each model is provided, which, when followed, leads to a literature guide and description of the model in question. We also refer to the number of trade partners distinguished, and to the level of disaggregation of trading commodity groups in each case.

2.2). Towards an Estimation Consistent Import Allocation Model.

In this section, we analyse the progress in the state of the art towards the development of bilateral world trade models, which can accomodate a large number of trade partners and a number of disaggregated commodity groups. We evaluate alternative models in terms of size, that is, according to whether they are disaggregated enough in terms of our study, and in terms of the sensible economic properties that we expect out of such models. Elements of the desirable ecomomic properties of large scale world trade linkage

Table 2.2.

Towards an Estimation Consistent Import Allocation Model.

	International Trade Models		
↙	↓		
Traditional Theories	Trade Linkage Models		Sect. 2.2.1
↙	↓	↘	
Structural Models	Transmission Models	Imp-Exp Matrices filled.	Sect. 2.2.2
↙	↓		
Global Linkage Models	Bilateral Linkage Models		Sect. 2.2.3
↙	↓		
Total Import Allocation	Bilateral Import Allocation		Sect. 2.2.4
↙	↓		
Inconsistent Bilateral Allocation models	Consistent Bilateral Import Allocation models		Sect. 2.2.5
↙	↓		
Simulation Consistent Import Allocation Models	Estimation Consistent Import Allocation Models		Sect. 2.2.6
↙	↓		
Simple Functional Form Models	More General Functional Form Models		Sect. 2.2.7

models can be found in Taplin(1967), Rhomberg(1970,1973), Waelbroeck(1973), Barten and d'Alcantara(1977), Courbis(1981), Italianer(1986), Bryant et al(1988).

Table 2.2 summarizes the current section in a tree diagram. It can be interpreted as a flow diagram of the progress on building large scale trade linkage models of the world economy. Along its main column, it shows the development of international trade models towards the possible estimation of a large scale, bilateral, trade flow system. Each entry on that column is leading to two/three possible developments, shown by the entries one level down. The entries, on the main column, as we move down, correspond to a step towards our target. Entries on the side(s), at each level, show alternative approaches to that of the main entry on the same level. We discuss the reason we have chosen to follow the particular approach at each level, at the section listed on the far right hand column of the table, and as we leave behind the alternative routes, we give brief references on work done on each approach. It will be evident from the discussion that follows the reason for prefering a particular approach over the alternatives, in our effort to construct our world seaborne trade model.

2.2.1). Traditional Theories vs Trade Linkage Models.

Starting with the group of *International Trade Models* out of the set of economic models we choose, for our study, to estimate trade among many countries. Thus, the *Traditional theories of international trade*, such as those of Ricardo(1817), Heckscher(1919), Ohlin(1933), etc, are not discussed here. These theories consider trade between two countries, for two traded commodities at a single point in time. They are static. They fail to account for the possibility of a single economy importing the same good from more than one trade partner. They also fail to explain the situation of the same good being imported and exported by the same country. These theoretical considerations preclude them from being directly applicable for our task. However, they provide important ideas of what variables can explain trade internationally. A survey of these theories can be found in Jones and Kenen(1984).

We confine ourselves to the set of trade linkage models, which can account for the possibility of multiple trade partners, more than one commodities and dynamic elements. The beginning of interest in *Trade Linkage Models* can be associated with the increasing interdependence of national economies due to international trade, which took-off especially in the post 2nd world war period.

It is worth mentioning here the early efforts to compile *Import-Export Matrices*, without any analysis of mathematical equations and econometric estimation, by the League of Nations'(1942) 'Network of World Trade'. Import Export matrices were filled for the years 1928, 1935 and 1938, dividing the world in 17 regions. Later, Beckerman(1956) filled Import-Export matrices for 1938-1953. Woolley(1965) provided transaction matrices on payments for trade services and capital flows for 75 countries, for 1950 to 1954. Today, the compilation of such Import-Export matrices is standard work carried out by international organizations such as the UN, IMF, OECD etc.

The empirical research accelerated in the interwar period, with single equation methods used to evaluate bilateral elasticities and propensities, see Brown(1951) and later work surveyed in Cheng (1959). The need soon became apparent to study the possible interlinkages between countries in the world economy simultaneously, both for economic and econometric reasons. International trade had been taking an increasingly important part in countries' economic life, with countries being involved in trade for many commodities, with a number of partners. This made important the explicit modelling of world trade linkage in the economic models. On the econometric front, Orcutt(1950) identified the possible biases in estimation when single equation methods are used. These amount to the simultaneity bias problems when supply factors are ignored. Estimated demand elasticities by single equation methods would then be a mixture of both demand and supply elasticities, rendering inferences invalid. The solution is to use simultaneous equation techniqes.

2.2.2). *Structural vs Transmission Models.*

Trade linkage models were originally estimated by using cross section data, thus, effectively explaining the structure of world trade at a point in time, a year say. These type of models are called *Structural Models*, and are reviewed in Taplin(1967), Leamer and Stern(1970) and Italianer(1986). Examples of these are the models by Savage and Deutsch(1960), Tinbergen(1962), Poyhonen(1963), Pulliainen(1963), Linneman(1966), Waelbroeck(1967), Olsen(1971), Aitken(1973), Signora(1981), De Vos and Bikker(1982).

Prices and other variables are fixed at a point in time, and they play no role in determining patterns of world trade in the structural models. However, we also like our system to explain the way these patterns are changing over time due to more complicated inter-relationships between prices, incomes, imports, and other variables that come together to change the structure of world trade in the longer run. Such a model would establish the relationships between these variables, and trace the transmission of changes of a variable in a country into the rest of the world. We call these *Transmission Models*, and the type of data used to build them are time series or pooled data.

2.2.3). *Bilateral vs Global Linkage Models.*

Transmission models can be distinguished between Global linkage and Bilateral linkage models. *Global Linkage Models* explain total trade flows. That is, total imports of each country are explained, no matter the origin (assuming import equations are estimated). Trade might be disaggregated, but import/export shares are not explained in the system; they are only used to calculate other variables and in that respect being considered exogenous. When these shares are explained, we have *Bilateral Trade Linkage*. In terms of the Import-Export matrix, of table 2.1, a global model explains the totals, m^{k}_{j}'s or x^{k}_{i}'s, on the margins of the matrix, while a bilateral model explains the m^{k}_{ij}'s (or the shares), inside the matrix.

Often, global linkage models are used because people are interested in explaining total import/export equations. In this case the transmission mechanism can be captured by a variable such as world trade. It is also possible that people might resort to global models because it is not possible to find bilateral data, or even if these are obtained, it might be too difficult to handle them. Global models that have been built due to the former reason are those of Neisser and Modigliani(1953), Polak(1953), Beckerman(1956), Mennes(1967), Carrin et al(1980), Waelbroeck and Ginsburgh(1981), METEOR(Kooynan, 1982). Global models built due to data problems are the IMF model(Artus and McGuirk, 1981), INTERLINK(Richardson, 1988), SIMLINK(Hicks(1976a, 1976b)), MARCO II(Guillaume, 1981), Tsukuba-FAIS(Shishido, 1983).

It is suggested that global linkage is second best in comparison to bilateral linkage. This is because the latter permit a more detailed representation of the interdependency of countries through world trade. A similar argument to that made by Orcutt(1950), on aggregation over commodities, can be made here relating to aggregation over trade partners. When total imports are analysed, there is no attention paid to the differing elasticities of the component economic partners, which results in aggregation errors. If all imports from trade partners of a country vary equally over the period of observation, or if there is no correlation between the amount of variation and their elasticities, there is no bias. However, elasticity estimates based on aggregate index numbers are influenced by exporting countries with high or low elasticities of substitution. The answer to this aggregation bias problem, is to disaggregate trade. That is, to use a bilateral trade linkage model. More crudely, economic influences between closely inter-related economies (eg EEC countries) are too important to be transmitted through global variables, such as world trade, in a global model.

The importance of Orcutt's critisism was recognised early, and crude attempts were made to include elements of bilateral linkage in the estimation of global models. This was achieved by using constant bilateral shares, or utilizing shares from previous years. Examples of this are found in the models by Tyszinski(1951), Fleming and Tsiang(1956-57), Waelbroeck(1962), Tims and Meyer-zu-Schlochtern(1962), and Kuznets(1964), as they are conveniently summarized in Taplin(1967).

2.2.4). Total vs Bilateral Import Allocation Models.

The approach taken in the estimation of bilateral trade linkage models, is critical for their feasible estimation with respect to their size. There are two possible approaches. That of *Total Import Allocation*, in which case total income is allocated over domestic inputs and trade partners, and that of *Bilateral Import Allocation Models*, in which case total income is allocated between a domestic aggregate and over trade partners.

The size of a total allocation model can grow very large, when compared to its counterpart bilateral import allocation model. In an import allocation system, the number of parameters that determine the allocation of income between domestic factors and imports, is not directly entering the system of the final bilateral import demand equations. This reduces considerably the number of parameters entering the model, allowing us to include more trade partners. Therefore, when the number of trade partners increases, and as more commodity groups are distinguished, it pays to use an import allocation model. Size is the critical factor in explaining the relative decline in the use of total allocation in comparison to import allocation models.

Early efforts to estimate bilateral trade linkage systems have concentrated on total import allocation models, in theoretical studies, such as those of Metzler(1950) and Armington(1969a, 1969b, 1973), and later in the empirical models of the IMF (Polak and Rhomberg(1962), Rhomberg and Boissonneault(1964), Rhomberg and Fortucci(1964) and Rhomberg(1968)), Resnick(1968), Morishima and Murata(1972), IMF-MERM(Artus and McGuirk(1981), MCM(Edison et al(1987)) and Viaene(1983).

But how could bilateral import allocation models be implemented? The answer to this is given by Taplin(1967), proposing a two stage budgeting procedure. This approach is widely used today in the estimation of systems of demand equations, cf Baker et al(1989). At the first stage, the allocation of income over domestic factors and total imports is determined. At the second stage, total imports of each good are allocated over trade partners. This requires bilateral imports, determined at the second stage, to add up to total imports, determined at the first stage. In effect, this implies that identities (2.1)-(2.3) hold. It is important to realise, that the assumption of separability of preferences between domestic inputs and imports is underlying the two stage budgeting procedure, cf Barten and d'Alcantara(1977). Separability of preferences refers to the situation where we may partition domestic inputs and imports into separate groups, so that preferences within each group can be described independently of the preferences of the other groups. We elaborate on the latter in chapter 3.

High disaggregation of goods in international trade allows one to distinguish influences that are specific to individual commodity groups, which otherwise disappear in an aggregate study. Also, economic policies can be argued to influence different sectors of the economy in different ways. These sectors can be studied more effectively when disaggregated data are analyzed. On the estimation side, Orcutt(1950), and later Magee(1975), and others, assert that elasticities and estimation results are biased when aggregate data are used; the aggregation bias problem. Along the econometric arguments for using disaggregated data in preference over aggregate figures, one might be interested in the sectoral analysis of world trade for its own sake.

2.2.5). *Inconsistent vs Consistent Bilateral Import Allocation Models.*

Bilateral trade import allocation models can be segregated according to whether the adding up identities (2.1)-(2.3) hold. If they do, the models are termed *Consistent*, while if they fail, we are dealing with *Inconsistent Models*. In effect, the adding up conditions require bilateral imports per category of goods, determined at the second stage of the two stage budgeting procedure, to add up to total imports for each good, determined at the first stage. There is no question of inconsistency for total allocation models, since total imports are determined as the sum of bilateral imports over all trade partners. The only requirement is that the world trade balance is zero. The same requirement is also sufficient for global models, in this case because no bilateral variables appear.

It is important that the adding up constraints are satisfied, if the results of the two stage budgeting procedure are to be mutually compatible. The satisfaction of the adding up constraints also ensures, that the effects of the international transmission process are not distorted due to inconsistencies in our data. The possible inconsistency that could arise due to differences in c.i.f, f.o.b. measurement of data does not exist in our model, since volumes of seaborne trade will be examined, although, a problem ever present in international trade value data.

Examples of inconsistent linkage models in the literature are: EUROLINK(Ranuzzi, 1981), IMF World trade model(Ripley, 1981), INTERLINK(Richardson, 1988), LINK(Filatov et al, 1983), MARCOII(Guillaume, 1981), Mennes(1967), Neisser and Modigliani(1953), Marwah(1976), METEOR(Kooyman, 1982), Tsukuba-FAIS(Shishido, 1983) etc.

2.2.6). *Simulation vs Estimation Consistent Import Allocation Models.*

Two possibilities are further distinguished within the class of consistent bilateral import allocation models, according to the way the adding up constraints are imposed. Estimation consistent and simulation consistent import allocation models.

The adding up conditions may be imposed in *Simulation Consistent Import Allocation Models*, in a number of ways, at the simulation stage. It is common practice in a number of studies, cf Amano et al(1980), to consider the Rest of the World(ROW) imports as a residual in the system of import equations. Any differences that might arise in the allocation of total imports (between the total and the sum of the bilateral flows, excluding the ROW), are assigned to this residual, thus solving the problem of consistency. This is a convenient, but a somewhat arbitrary decision to treat one of the trade partners in an asymmetric way.

Another way to impose simulation consistency is to allocate the residuals that might arise between the sum of bilateral and total imports, in an arbitrary way, over given elements. This allocation could be achieved in a multiplicative or additive manner. For example, Samuelson and Kurihara(1980) apply the RAS method to modify shares in the trade matrix. The RAS method, developed by Stone and Brown(1964), consists of multiplying iteratively all rows and columns of an initial matrix by varying factors, until they both add up to the corresponding totals. For each row, the multiplicative factor is defined as the given row total divided by the row total after the previous multiplication. And similarly for the columns of the matrix. Bacharach(1965) shows that, starting with an initial (trade) matrix, this is a convergent procedure with a unique solution, subject to a given normalization.

The class of *Simulation Consistent Import Allocation Models* may be considered second best in comparison to *Estimation Consistent Import Allocation Models.* This is because consistency is imposed in the latter at the estimation stage with no concept of arbitrariness involved. Consistency for this class of models is a direct consequence of the classical optimisation problem and not a result of some arbitrary method as discussed above. The adding up constraint is taken directly into account in the optimization problem of the importer, by recognizing that the system of bilateral import demand equations should be estimated subject to the linear constraint, which requires bilateral imports to add up to total imports. The question here is whether the functional form of the objective function, permits the explicit inclusion of the constraints at the estimation stage (this is taken up more formally in the next chapter). Resort to simulation consistency then, can be argued, to take place, when the functional form of the optimization problem does not permit the explicit satisfaction of the adding up constraints at the estimation stage.

There are about 15 estimation consistent import allocation models in the literature, which we list later under two different subsets of the above class of models.

2.2.7). *Simple* vs *More General Functional Form Import Allocation Models.*

The main stream of estimation consistent import allocation models, is allowing for a single price effect only between trade partners in an importing market. We call these, *'Simple Functional Form Import Allocation Models'*. Thus, systems such as those based on a CES (Constant Elasticity of Substitution), a Cobb-Douglas, or a Stone-Geary (Linear Expenditure System) objective function belong to this category. By definition, the single price effect, only allows for a constant elasticity of substitution in an import market. This elasticity of substitution is at times constrained to take specific values, such as zero or one. Since only one price parameter need to be estimated, these systems are attractive for empirical purposes.

Alternatively, one may use functional forms which allow both for estimation consistency and more than one relative price effect. That is, 'more general' substitution patterns between trade partners are allowed in the same import market. Such models may be derived from functions which are either: (1) second order approximations to a 'flexible' functional form objective function, or (2) from a 'specific' objective function. The problem with (1) is that the number of parameters increase quadratically with the number of trade partners. This would be a problem for an empirical model of our dimensions (30 partners, 5 commodities), and the fact that our time series is short. Also, when weak-separability (the assumption needed for import allocation) is imposed on flexible functional forms, most of them may no longer be considered as second order approximations of weakly separable objective functions. So, there remains (2). Here, for n partners, there are less than 3n parameters to be estimated (Hanoch (1975, p396)).

Thus, models based on *'More General Functional Forms'* (in particular, on 'specific' objective functions) are almost as easy to estimate as their 'Simple Functional Form' counterparts. At the same time, the former allow for more general substitution patterns between trade partners as compared to the latter. At the outset then, systems based on a 'More General Functional Form' objective function are more attractive for adoption for our purposes. We expand more on the a priori choice of the functional form in the next chapter.

In the next section, we focus on the alternative functional forms that have been used in international trade to derive estimation consistent bilateral trade import allocation models. We select one of these to apply to our seaborne trade model.

2.3). Main Estimation Consistent Systems.

The question of the functional form of the objective function has been a long standing question in the literature. It may be argued that the choice of the functional form is, ultimately, a matter of empirical evidence. A number of empirical studies have been devoted to the subject. Gana et al(1979), Amano et al(1980), Italianer(1982) and Sarma(1983) are examples of studies, which compare different approaches of estimating bilateral trade flows with consistency requirements.

The different approaches that have been compared in the above studies are:

-The 'naive' approaches of Constant Quantity Shares and Constant Value Shares, which are essentialy based on a Cobb-Douglas function.

-The Klein and Van Peeterssen(1973) approach, based on the foundations of the Linear Expenditure System(LES) in consumer demand theory, as developed by Stone(1954) and reviewed in Deaton and Muellbauer(1980). A similar approach which is developed later by Samuelson and Kurihara(1980) is used in estimating total export equations. A variant of the above is the approach of Johnson(1978), who uses an extended LES function to estimate bilateral trade flow equations.

-The approach of Hickman and Lau(1973) based on a CES function. The approach of Constant Market Share Elasticities(CMSE), Samuelson(1973), which is another CES system in trade market shares form.

-Finally, the approach of COMET (Italianer, 1982), which examines each bilateral import market, deriving a set of bilateral import reduced form equations.

Since we have selected the class of estimation consistent import allocation models in the previous section, we focus more carefully on the approaches that satisfy these criteria and we leave out the inconsistent systems. As a matter of reference we present the estimation consistent systems based on 'simple' functional forms. Thus, we start by presenting some of these estimation consistent 'simple' functional form systems, and then we turn into estimation consistent systems which allow for more 'general' substitution patterns between trade partners.

2.3.1). The 'Naive' Constant Quantity/Value Share models.

The constant quantity/value share models are tested in Gana et al(1979), Amano et al(1980) and Sarma(1983).

We start with the approach of the <u>Constant Quantity Share</u>. The trade share of some good k (the index is omitted) is defined as,

$$w_{ij}=m_{ij}/m_j \qquad (2.5)$$

The basic assumption is that the trade share matrix in the base period is fixed. That is,

$$w_{ij}=w^o_{ij} \qquad (2.6)$$

where the superscript 'o' denotes the base period.

When the m_j are determined by some regional model (or given exogenously in the system) the m_{ij} can be determined by:

$$m_{ij}=w^o_{ij}m_j \qquad (2.7)$$

and the x_i are determined by the following identity.

$$x_i \equiv \Sigma_j m_{ij} \equiv \Sigma_i w^o_{ij}m_j \qquad (2.8)$$

Also, since $\Sigma_i w^o_{ij}=1$, total world trade (for commodity k) can be consistently determined through,

$$\Sigma_i x_i \equiv \Sigma_i \Sigma_j w^o_{ij} m_j \equiv \Sigma_j m_j = T \qquad (2.9)$$

Thus, identities (2.1)-(2.4) are automatically satisfied rendering the system estimation consistent. The disadvantage of this model is that the w_{ij}'s are considered constant, and this would lead to errors when this assumption is violated.

On the price side, by definition,

$$P_j m_j = \Sigma_i p_{ij} m_{ij} \qquad (2.10)$$

Dividing through by m_j yields the import price of the jth region as an expression of the exogenously given export prices p_{ij}:

$$P_j = \Sigma_i w^0_{ij} p_{ij} \qquad (2.11)$$

Similarly, denoting the world price index by P_W, since by definition,

$$P_W\ T = \Sigma_i p_{ij} m_{ij} \qquad (2.12)$$

dividing through by T yields the world price index:

$$P_W = \Sigma_i v^0_{ij} p_{ij} \qquad (2.13)$$

where $v_{ij} \equiv m_{ij}/T$, which is the share of the ith region in the world trade of some commodity k (index omitted).

The nominal trade share of the ith region in the jth import market is determined by:

$$W_{ij} = (p_{ij} m_{ij} / P_j m_j) = w^0_{ij} (p_{ij}/P_j) \qquad (2.14)$$

where $\Sigma_i W_{ij} = 1$ is satisfied.

<u>The Constant Value Share</u> approach assumes that the nominal trade share is fixed at its base year period value:

$$W_{ij} = W^0_{ij} \qquad (2.15)$$

Assuming that M_j and p_{ij} are exogenous, real bilateral import flows are determined by:

$$m_{ij} = W^0_{ij}\ M_j / p_{ij} \qquad (2.16)$$

and real total imports of j are determined through the identity:

$$m_j \equiv \Sigma_i m_{ij} \tag{2.17}$$

Since $$w_{ij} = (m_{ij}/m_j) = (W^0_{ij} M_j/p_{ij})/[\Sigma_i (W^0_{ij} M_j/p_{ij})] \tag{2.18}$$

the condition $\Sigma_i w_{ij}=1$ is satisfied. As a result, P_j and other world trade variables can be determined consistently, as in the Constant Quantity method. The same drawbacks as with the latter method are also true here.

2.3.2). The Linear Expenditure System(LES).

The Linear Expenditure System was first used empirically in consumption theory with the work of Stone(1954). Examples of estimation consistent LES models in bilateral import allocation models are the Interdependence model of Hieronymi(1983) and the model of Johnson(1978). These are extentions of the LES from the theory of the consumer to linkage models.

Let us assume that the importer optimizes a Stone-Geary objective function,

$$\Pi_i (m_{ij} - \gamma_{ij})^{\beta_{ij}} \quad \text{subject to} \quad \Sigma_i p_{ij} m_{ij} = M_j, \tag{2.19}$$

where β_{ij} and γ_{ij} are the parameters of interest with $\Sigma_i \beta_{ij}=1$, and M_j is the total import expenditure of j on some good k (index omitted).

Then, the typical LES estimating equation is:

$$p_{ij} m_{ij} = \gamma_{ij} p_{ij} + \beta_{ij} (\Sigma_i p_{ij} m_{ij} - \Sigma_i \gamma_{ij} p_{ij}) \tag{2.20}$$

Estimating the above as a system, subject to $\Sigma_i \beta_{ij}=1$, maintains adding up. Thus, (2.20) is an estimation consistent import allocation model.

Johnson(1978) extends the above to incorporate the effects of a US dock strike. Also, dynamics are introduced by assuming a price expectations mechanism. However, when the latter is applied to (2.20), short-run elasticities are necessarily larger than their long-run counterparts (see Johnson(1978,p.73)). To overcome the problem, it is assumed that $\gamma_{ij}=\gamma_i m^0_{ij}$ in (2.20), and assuming dynamics the final estimating equation is:

$$\begin{aligned} p_{ij}m_{ij} &= \tilde{\gamma}_i m^0_{ij}p_{ij} + \beta_{ij}\,[\Sigma_i p_{ij}m_{ij} - (\Sigma_i\tilde{\gamma}_i m^0_{ij}p_{ij})_{-1}] \\ &\quad + (1-\lambda_j)\{(p_{ij}m_{ij})_{-1} - (m^0_{ij}p_{ij})_{-1} - \beta_{ij}[(\Sigma_i p_{ij}m_{ij})_{-1} - (\Sigma_i m^0_{ij}p_{ij})_{-1}]\} \end{aligned} \tag{2.21}$$

where $\tilde{\gamma}_i=\lambda_j(\gamma_i-1)+1$. An iterative procedure is used to estimate the above, where, for estimation is assumed that $\lambda_j=\lambda$. Simple OLS on the pooled (2.21) satisfies the constraint on the β_{ij}'s, preserving adding up.

2.3.3). Constant Elasticity of Substitution(CES) Models.

Within the class of estimation consistent import allocation systems based on 'Simple Functional Forms', there is a particular class of models which has dominated the scene. The class of Constant Elasticity of Substitution(CES) models. It is the most general of the Simple Functional Form models, since, as we see in the next chapter, it contains the Cobb-Douglas and the LES as special cases.

The application of the CES function to import allocation models starts with the pioneering work of Hickman and Lau(1973). They use a CES objective function to derive a system of import demand equations. The objective function, or import quantity index (total imports of commodity k by country j, denoted by μ^k_j, which we simplify to μ) as is known in terms of import allocation models, takes the form:

$$\mu = [\,\Sigma_i\delta_{ij}m_{ij}^{-\rho_j}]^{-(1/\rho_j)} \qquad \text{where } \rho_j>-1 \tag{2.22}$$

$$= [\Sigma_i \delta_{ij} m_{ij}^{(\sigma_j-1)/\sigma_j}]^{\sigma_j/(\sigma_j-1)} \qquad \text{where } \sigma_j = 1/(1+\rho_j) \qquad (2.23)$$

$\delta_i \in R$, and σ_j is the Allen partial elasticity of substitution in the jth market, measuring the response of the ratio of imports from countries 1 and 2, say, to a change in the ratio of import prices from 1 and 2, holding all other import prices constant.

The importer's problem is then to optimize the objective function (2.22)/(2.23) subject to the budget constraint $M_j = \sum_{i=1}^{n} m_{ij} p_{ij}$, where M_j is the value of imports corresponding to μ.

The cost minimizing quantities of reaching a given level of imports (represented by the CES function), are then given by the following bilateral import demand equations:

$$m_{ij} = \delta_{ij}^{\sigma_j} \mu \, (p_{ij}/P_j)^{-\sigma_j} \qquad (2.24)$$

where P_j is the 'composite' CES price index,

$$P_j = [\Sigma_i \delta_{ij}^{\sigma_j} p_{ij}^{1-\sigma_j}]^{1/(1-\sigma_j)} \qquad (2.25)$$

with the additive price aggregation property that

$$P_j \mu = \Sigma_i p_{ij} m_{ij} = M_j \qquad (2.26)$$

Thus, adding up is ensured by the definition of the 'composite' price index P_j at the estimation stage, rendering the system estimation consistent. It can be seen that the relative price effect -the Allen elasticity of substitution- is the same for all bilateral import equations. This is an obvious advantage for estimation, although a disadvantage in terms of the economic possibilities of substitution allowed.

The popularity of this class of models then amounts to their theoretical consistency, being derived from classical optimization techniques, satisfying the adding-up conditions, and due to the induced convenience of being easily turned into empirical models. They can incorporate a large number of trade partners and commodity groups, thus an apparent solution to the requirements of large disaggregated world linkage models.

Hickman and Lau(1973) estimate an empirical model based on the CES function involving 27 trade partners. They extend (2.24) to include a time trend, which takes account of non-price factors. The system is then linearized by a first order Taylor expansion around some base year values, thus eliminating the unobservable CES indices μ and P_j. Price expectations are also incorporated in the form of adaptive expectations, rendering the system dynamic. Their typical estimating equation is of the form:

$$\begin{aligned}(m_{ij}-w^0_{ij}m_j) = -\sigma_j m^0_{ij}\beta_{ij} - \sigma_j(1-\lambda_j)m^0_{ij}(p_{ij}-\Sigma_i w^0_{ij}p_{ij}) \\ - \sigma_j m^0_{ij}\gamma_{ij}t + \lambda_j\ (m_{ij}-w^0_{ij}m_j)_{-1}\end{aligned} \qquad (2.27)$$

Adding up is still preserved by estimating (2.27) as a system, and constraining the sum of the coefficients of the time trend and the constants to sum to zero. So the system remains estimation consistent.

Other CES models in the literature, or variants of it are: Hickman(1973), DESMOS III(Dramais(1981)), the Interfutures project (Halttunen and Warner(1979a),(1979b)), the EPA world economic model(Amano et al(1982)), Geraci and Prewo(1982), GLOBUS(Kirkpatric(1983)), Samuelson(1973) and the INTERLINK model(Richardson(1988)).

2.3.4). The Model of Resnick and Truman(1975).

Resnick and Truman(1975) use a multistage approach to estimate bilateral trade flows for non-food imports by 10 Western European countries. The model is specified in four stages for each country.

In the first stage, total real imports of each country are described by:

$$\ln M_T = a_0 + a_1 \ln P_T + a_2 \ln Y + a_3 \ln Q_D \tag{2.28}$$

where $P_T=\Sigma_i w_i P_i$ =Relative price of imports for the world, where

$P_i=P^x_i(1+T)/P_d$, with

P^x_i=\$ export price index for the ith country,

P_d=GNP deflator of the importing country in \$'s,

$(1+T)$=Tariff index applied to the source of import,

Y =Real GNP at base year prices,

Q_D=Pressure of demand variable measured as the difference between actual demand and trend demand.

Given the total import demand from the 1st stage, imports are allocated between Europe (EUR) and the Rest Of the World (ROW), according to the equations:

$$(M_{EUR}/M_T) = d_{10} + d_{11}P_{EUR} + d_{12}P_{ROW} \tag{2.29}$$

$$(M_{ROW}/M_T) = d_{20} + d_{21}P_{EUR} + d_{22}P_{ROW} \tag{2.30}$$

focusing more on the the European countries, M_{EUR} are allocated between the EEC and the EFTA by:

$$(M_{EEC}/M_{EUR}) = b_{10} + b_{11}P_{EEC} + b_{12}P_{EFTA} \tag{2.31}$$

$$(M_{EFTA}/M_{EUR}) = b_{20} + b_{21}P_{EEC} + b_{22}P_{EFTA} \tag{2.32}$$

At the final stage, the total imports of the EEC and EFTA are allocated amongst their member countries through the equations:

$$(M_i/M_{EEC}) = c_{i0} + \sum_{j=2}^{5} c_{ij}P_j \quad ; \quad i=2,\ldots,5 \tag{2.33}$$

$$(M_i/M_{EFTA}) = c_{i0} + \sum_{j=6}^{10} c_{ij}P_j \quad ; \quad i=6,\ldots,10 \tag{2.34}$$

where P_{EUR}, P_{ROW}, P_{EEC}, P_{EFTA}, are the relative price indices from Europe, the ROW, the EEC and the EFTA, respectively, defined in a similar way to P_T above.

The equations are estimated by OLS with the following restrictions imposed on the parameters. (i) the sum of the constants is constrained to equal 1 and (ii) the sum of coefficients on the individual price variables is constrained to be 0. Own and cross price elasticities are computed from the model.

As a critique, we should say that this multi-stage import allocation produces estimation consistent results. However, the presence of the GNP deflator in all the relative price indices violates the separability conditions (implicit in multi stage import allocation, see chapter 3), since a change in the GNP price index might also influence the allocation of income between domestic goods and imports.

2.3.5). The Model of Snella(1979).

Snella(1979) assumes that the preferences of the importer can be described by some kind of utility function. He thus, starts from an indirect utility function and by using Roy's theorem (Roy(1942)) he arrives at the import demand equations (see chapter 3, for these duality properties). This, index of preferences has the form:

$$\psi_j=\psi_j(\mathbf{p},M_j^{-1})=\phi_j(M_j/A_j)\ (A_j/B_j), \qquad j=1,\ldots,n \tag{2.35}$$

where $\mathbf{p}$ = vector of prices in the jth market,

ϕ_j = a continuous, but arbitrary function,

A_j and B_j = two functions of the vector of prices $\mathbf{p}$, homogeneous of degree one and normalized to 1.

Using Roy's theorem, the import demand functions are:

$$\mathbf{m} = (\partial A_j/\partial \mathbf{p})\ C_j(\tilde{M}_j) + (\partial B_j/\partial \mathbf{p})\ (A_j/B_j)\ [\tilde{M}_j-C_j(\tilde{M}_j)] \tag{2.36}$$

where $\mathbf{m}$ = vector of imports in the jth market,

$\tilde{M}_j = M_j/A_j$, that is, total imports of j in real prices,

C_j = a function defined by $\phi_j(\tilde{M}_j) = \{\partial[\phi_j(\tilde{M}_j)]/\partial\tilde{M}_j\}\ [\tilde{M}_j - C_j(\tilde{M}_j)]$

Under the hypothesis $\tilde{M} \geq C(\tilde{M}) \geq 0$, the function C_j may be interpreted as a committed amount of imports, in real terms, while $[\tilde{M}_j - C_j(\tilde{M}_j)]$ represents the real excess amount of imports. C_j may be nonlinear and hence the import demand functions may be nonlinear.

In order to turn the family of systems defined in (2.36) into an empirical form, the functional form of the price indices A_j, B_j and the function C_j must be specified. The following linear and geometric specifications are proposed for A_j and B_j, respectively:

$$A_j = \Sigma_i a_i p_i, \quad B_j = \Pi_i p_i^{b_i}, \quad \text{where} \quad \Sigma_i a_i = \Sigma_i b_i = 1 \tag{2.37}$$

Four alternative specifications are proposed for C_j:

$$C_j(\tilde{M}_t) = \gamma \tag{2.38}$$

$$C_j(\tilde{M}_t) = (1+\gamma)^t C_0 \tag{2.39}$$

$$C_j(\tilde{M}_t)/\tilde{M}_t = S_j(\tilde{M}_t) = \exp\{-\gamma/\tilde{M}_t\} \tag{2.40}$$

$$C_j(\tilde{M}_t)/\tilde{M}_t = S_j(\tilde{M}_t) = 1-\exp\{-\tilde{M}_t/\gamma\} \tag{2.41}$$

Thus, for example, using (2.37) and (2.38) in (2.36) we may arrive at the LES (see equation (2.20)). Other specifications of the above would give different models. In fact, Snella(1979), using 11 trade regions and 6 commodity groups, finds that the best performing version of C_j is that of (2.41).

The important properties of the family of models specified by (2.36) is that they are derived from the optimizing behaviour of the importers, and the conditions for separability (used implicitly here) are satisfied. The latter due to the indirect utility function being of the Gorman polar form (see chapter).

2.3.6). *The INFORUM model (Nyhus(1978)).*

The INterindustry FORecasting of the University of Maryland (INFORUM) system is determining bilateral import shares through the following equation.

$$w_{ij} = w^{0}_{ij}\, p_{ij}^{\beta_{ij}} \tag{2.42}$$

where p_{ij} here is defined as the ratio of the effective price of some good in region i, pe_{ij}, relative to the world price as seen by the importing region j, P_j. Thus, $p_{ij}=pe_{ij}/P_j$, and (2.42) becomes:

$$w_{ij} = w^{0}_{ij}\, (pe_{ij}/P_j)^{\beta_{ij}} \tag{2.43}$$

Next, define the 'composite' price index P_j implicitly by:

$$\Sigma_i w^{0}_{ij}\, (pe_{ij}/P_j)^{\beta_{ij}} = 1 \tag{2.44}$$

This index is linearly homogeneous in prices, since if all domestic prices are doubled, then a doubling of the world price leaves the price ratio unchanged. Also, the ratio of the shares of any two regions will change if the price of a third region is changed, provided neither region's share is zero, and both do not have identical β_{ij}'s.

Adding up is satisfied as a result of the implicit definition of the price index P_j. This can be easily seen by summing both sides of (2.43) yielding,

$$\Sigma_i w_{ij} = \Sigma_i w^{0}_{ij}\, (pe_{ij}/P_j)^{\beta_{ij}} \tag{2.45}$$

Using the definition of P_j, (2.44), in the above, the right hand side becomes one, and the model can be seen to be estimation consistent.

(2.44) may also be expressed in terms of bilateral imports (not shares) as:

$$m_{ij} = w^{0}_{ij}\, m_{j}\, (pe_{ij}/P_{j})^{\beta_{ij}} \qquad (2.46)$$

The properties of (2.43) are still preserved.

Nyhus(1978) adds a time trend in the above, to take account of non-price factors. Also, the effective price term pe_{ij} for a given commodity, is defined as a weighted average of present and past domestic prices. Since the estimating equation is highly nonlinear, an iterative estimation technique is used to arrive at estimation consistent results.

The advantages of this model over the Simple Functional Form models, is that it allows for a differing price effect between trade partners in an importing market. At the same time the number of parameters only increase linearly with the number of trade partners, and thus the model remains feasible for estimation. Also, another interesting feature, is the imposition of estimation consistency through the implicit definition of the 'composite' price index P_j. The model is not derived from classical optimization principles. An empirical model is actually estimated distinguishing between 10 trade partners and 119 commodities.

2.3.7). The CRESH system (Hanoch(1971), Italianer(1986)).

The Constant Ratio of Elasticities of Substitution Homothetic(CRESH) function was first introduced by Hanoch(1971) in production theory. The function is homothetic (or homogeneous), and the derived elasticities of substitution vary between different factors (trade partners), but are in fixed ratios. Italianer(1986) applies this function to an import allocation model, distinguishing between 7 trade partners and 5 commodity groups. The derived system is similar to that of Nyhus(1978), except that the estimating equations are derived from neoclassical optimization principles.

Assume that the importer optimizes the following, implicitly defined, objective function:

$$F(\mu, m_{1j}, \ldots, m_{nj}) = \Sigma_i \delta_{ij} (m_{ij}/\mu)^{-\rho_{ij}} - 1 \equiv 0 \qquad (2.47)$$

where δ_i, $\rho_i \in R$. Then, the derived import demand equations are of the form:

$$m_{ij} = \mu \; [\,|\delta_{ij}\rho_{ij}|(p_{ij}/P_j)^{-1}]^{a_{ij}}, \qquad a_{ij} = 1/(1+\rho_{ij}) \qquad (2.48)$$

Finally, the 'composite' price index P_j is defined implicitly by:

$$G(P_j, p_{1j}, \ldots, p_{nj}) = \Sigma_i \delta_{ij} [\,|\delta_{ij}\rho_{ij}|(p_{ij}/P_j)^{-1}]^{-a_{ij}\rho_{ij}} - 1 \equiv 0 \qquad (2.49)$$

This definition of P_j ensures that adding-up is satisfied, yielding an estimation consistent import allocation model. The substitution possibilities allowed by this function are quite general, since there is a distinct price effect for each trade partner. At the same time the number of estimated parameters rise linearly with the number of trade partners, and the model remains feasible for estimation.

Following the tradition of Hickman and Lau(1973), Johnson(1978), Nyhus(1978) etc, Italianer(1986) includes a time trend in order to take account of non-price factors in the allocation of imports. He then linearizes (2.48), and incorporates price expectations, rendering the system dynamic. The final estimating equation has the form:

$$\begin{aligned}\Delta \ln(m_{ij}/\tilde{m}^0_j) = {} & \lambda_j \Delta \ln(m_{ij}/\tilde{m}^0_j)_{-1} + b_{ij}(1-\lambda_j) - a_{ij}(1-\lambda_j)[\Delta \ln p_{ij} - \Sigma_h w^0_{hj} \Delta \ln p_{hj}] \\ & + (1-\lambda_j)\; \Sigma_h w^0_{hj} a_{hj}\; [\Delta \ln p_{hj} - \Sigma_l w^0_{lj} \Delta \ln p_{lj}]\end{aligned} \qquad (2.50)$$

where $$\Delta \ln(\tilde{m}_j^0) = \Sigma_i w_{ij}^0 \Delta \ln m_{ij} \tag{2.51}$$

A property of (2.50) is that $\Sigma_i w_{ij}^0 \Delta \ln(m_{ij}/\tilde{m}_j^0)=0$. When the above is estimated as a system and the constraint $\Sigma_i w_{ij}^0 b_{ij}=0$ is imposed on the constants, adding up is satisfied, and the system remains estimation consistent. Regarding the substitution possibilities allowed in the system, trade partners stand as competitors in import markets.

The last approach seems to be the most fruitful in terms of our objectives in this study. In the rest of the thesis we use the CRESH function to derive more formally, from neoclassical optimization principles, an import allocation model for seaborne trade flows in the international economy.

2.4). Conclusion and Summary.

The aim of this chapter has been to survey the literature of world trade linkage models, and to select the system with the most desirable properties, which we can then apply into seaborne trade. The survey is related to our aim of constructing a relatively large seaborne trade model of the world economy, of 30 trade partners and 5 commodity groups. We started the chapter by explaining the concept of world trade flows in the context of an import-export matrix. The various methodological directions which have been followed in the past to build linkage models have been examined and compared, subsequently.

In conclusion, it is argued that a theoretically consistent and empirically feasible world linkage model is desirable. The class of Estimation Consistent Bilateral Import Allocation Models based on General Functional Forms is the best choice, a priori. In particular, the CRESH objective function of Hanoch(1971), may be used to derive a set of bilateral seaborne import demand equations from neoclassical optimization principles. The system is estimation consistent, allows for more than one price effect amongst trade partners in the same import market, the number of estimating parameters increases linearly with the number of equations (trade partners), and trade partners are held as competitors in the same import market. Thus, the CRESH system, while allowing for a sound theoretical structure, it is possible to estimate a large scale seaborne bilateral trade flow model based on it.

Appendix 2.1.

Major Linkage Models of the 1980's.

LINK(USA-International) - Sawyer(1979), Filatov et al(1983) - 28 countries and 4 regions, 4 commodity groups. The LINK project is continuously elaborated to include more national models.

INTERLINK(OECD model) - Richardson(1988) - 23 countries and 8 regions, 4 categories of goods.

Fair(1987)- 63 countries and rest of the world (64 partners), aggregate trade. The largest existing model, in terms of trade partners.

COMET IV(EEC, etc) - d'Alcantara and Italianer(1982) - 13 countries with 5 commodity groups, and the rest of the world divided in 5 regions with aggregate trade.

DESMOS(EEC, etc) - Dramais(1981)- 10 countries and 3 regions, aggregate trade.

METEOR(EEC, etc) - Kooyman(1982)- 9 countries and 5 regions, aggregate trade.

EPA(Japan -World model) - Kaneko and Yasuhara(1986) - 9 countries and 6 regions, aggregate trade.

EUROLINK - Ranuzzi(1981) - 4 countries and Rest of the World, disaggregated trade.

MCM(USA - F.R.B.) -Edison et al(1987) - 5 countries and rest of the world, aggregate trade.

IMF World Trade Model -Ripley(1981) -14 countries and 4 regions, 4 categoties of goods.

IMF Multilateral Exchange Rate Model(MERM) -Artus and McGuirk(1981), Theoretical model, 20 countries, 6 commodity groups.

MARCO II(Brussels) -(Guillaume(1981)) -7 partners, 5 commodity groups.

WEP(UK-Treasury) -Horton(1984)- 9 countries and 5 regions, aggregate trade.

GEM(UK-National Institute Global Econometric Model) - Wren-Lewis(1987) - An extension of the WEP model with new equations describing the exchange rates.

LIVERPOOL model -Canzoneri and Minford(1988), Minford et al (1986)-9 countries and 3 regions, aggregate trade. A rational expectations model.

Tsukuba-FAIS - Shishido(1983) - Linked trade models for 15 trade partners.

FUGI(Japan) -Kaya et al(1983)- 28 trade partners.

DYNAMICO(UN) -Costa(1983), 10 trade partners, 10 sectors.

MOISE- (Lafay and Brender(1981)) -8 countries and 12 regions, 12 commodity groups.

EXPLOR-MULTITRADE -(Sallin-Kornberg and Fontela(1981)) -10 countries and 5 regions, 31 commodity groups.

CHAPTER 3

THEORY

3.0). Introduction.

In this chapter we examine more formally the theoretical basis of import allocation models, and we develop a model which can allow for differing elasticities of substitution amongst trade partners.

This chapter is in three main sections. In the first, we focus at the experience from consumer demand theory in estimating systems of consumer demand equations. Theoretical and practical problems in estimating such systems are examined. In the second, we extend the results to the case of systems of seaborne import demand equations. An aggregator function is defined, which plays the role of the utility or production function according to whether the importer is a producer or a consumer. The principles of multistage budgeting and the related problems of consistency of aggregation, and adding-up are discussed. In the third section, we propose the use of a specific form of the aggregator function, the Constant Returns to Scale(CRS) version of the Constant Ratio of Allen Elasticities of Substitution Homogeneous Homothetic(CRESH) function. This kind of function permits relatively 'general' substitution patterns between trade partners, while at the same time it leaves the derived model feasible to estimate.

We derive fully the properties of the import allocation model based on the CRESH function. One of the nice properties of this model is that it can encompass most of the import allocation models of the literature as special cases. Thus, systems such as the CES, the Cobb-Douglas, the LES and the Leontief can be obtained from CRESH, by placing restrictions on the parameters of the latter. At the same time we show that CRESH is flexible enough to incorporate factors other than relative prices, as the determinants of the competitive position of a trade partner in an import market.

3.1). The Experience from the Theory of the Consumer.

The theory of consumer choice was developed in order to describe how a fixed total expenditure is allocated over a number of goods. The problem of the consumer consists of maximizing utility $u(\mathbf{x})$, subject to a budget constraint $\mathbf{p}'\mathbf{x} \leq y$, where $\mathbf{x}$ is a vector of quantities of consumption goods $\mathbf{x}=(x_1,\ldots,x_n)$, $\mathbf{p}$ is the vector of the associated prices $\mathbf{p}=(p_1,\ldots,p_n)$, and y is the consumers' total expenditure (or income, provided there is no saving). Solving the primal problem (as defined above) results in a set of Marshallian demand equations $x_i^*=g_i(\mathbf{p},y)$, $i=1,\ldots,n$. If these optimal quantities are substituted into the direct utility function, we obtain a function which shows the maximum utility attainable given $\mathbf{p}$ and y. This new function $\psi(\mathbf{p},y)$ is known as the indirect utility function. The Marshallian demand functions are related to the indirect utility functions through Roy's(1942) identity; $g_i(\mathbf{p},y)=-[\partial\psi(\mathbf{p},y)/\partial p_i]/[\partial\psi(\mathbf{p},y)/\partial y]$.

The problem of the consumer can be stated in an alternative form, that of minimizing $\mathbf{p}'\mathbf{x}$ subject to $u(\mathbf{x})\geq\bar{u}$. In words, the consumer wants to find the minimum expenditure necessary to reach the level of utility $\bar{u}$. The solution to the dual problem yields the Hicksian demand functions $h_i(\mathbf{p},\bar{u})$. When these are substituted in the minimized function $\mathbf{p}'\mathbf{x}(=\Sigma_i p_i h_i(\mathbf{p},\bar{u}))$, they yield the cost (or expenditure) function $y=e(\mathbf{p},\bar{u})$. This function shows the minimum expenditure necessary to reach a fixed level of utility $\bar{u}=\psi(\mathbf{p},y)$. The Hicksian demand equations are related to the expenditure function through Shephard's Lemma; $h_i(\mathbf{p},\bar{u})=[\partial e(\mathbf{p},\bar{u})/\partial p_i]$.

These two consumer problems exhibit duality in the sense that the Marshallian and the Hicksian demand functions are equivalent at the optimum. The Marshallian demands at income y are the same as the Hicksian demands at utility $\psi(\mathbf{p},y)$. That is, $g_i(\mathbf{p},y)\equiv h_i(\mathbf{p},\psi(\mathbf{p},y))$. Similarly, the Hicksian demands at utility $\bar{u}$ are the same as the

Marshallian demands at expenditure $e(\mathbf{p},\bar{u})$; that is, $h_i(\mathbf{p},\bar{u}) \equiv g_i(\mathbf{p},e(\mathbf{p},\bar{u}))$. As a result, the expenditure function can be derived by inverting the indirect utility function ψ, $\psi(\mathbf{p},e(\mathbf{p},\bar{u})) \equiv \bar{u}$, which states that the maximum utility from expenditure $e(\mathbf{p},\bar{u})$ is $\bar{u}$. Similarly, the indirect utility function can be derived by inverting the expenditure function e, $e(\mathbf{p},\psi(\mathbf{p},y)) \equiv y$, which states that the minimum expenditure necessary to reach $\psi(\mathbf{p},y)$ is y.

Important properties of the Marshallian and Hicksian demand equations are the following:

<u>1).Adding-up:</u> The total value of both Hicksian and Marshallian demands is equal to expenditure. That is, $\Sigma_i p_i h_i(\mathbf{p},\bar{u}) = \Sigma_i p_i g_i(\mathbf{p},y) = y$.

<u>2).Homogeneity:</u> The Hicksian demands are homogeneous of degree zero in prices, while the Marshallian demands are homogeneous of degree zero in both total expenditure and prices. That is, for any scalar $\lambda > 0$, $h_i(\lambda\mathbf{p},\bar{u}) = h_i(\mathbf{p},\bar{u}) = g_i(\lambda\mathbf{p},\lambda y) = g_i(\mathbf{p},y)$.

<u>3).Symmetry:</u> The cross-price derivatives of the Hicksian demands are symmetric. That is, for all $i \neq j$, $[\partial h_i(\mathbf{p},u)/\partial p_j] = [\partial h_j(\mathbf{p},u)/\partial p_i]$.

<u>4).Negativity:</u> The (nxn) matrix of substitution terms, with elements $[\partial h_i(\mathbf{p},u)/\partial p_j]$, is negative semidefinite. Negativity is a direct consequence of the concavity of the cost function in prices $\mathbf{p}$, the latter being due to the fact that costs are minimized, or equivalently, due to utility being maximized.

Empirically, early efforts to model consumer demand equations focus on explaining the demand for each good, as a function of total expenditure and the prices of all other commodities in the system. For a large multigood system, lack of degrees of freedom is a problem in estimation. Stone(1954), solves the problem by transforming the Marhallian demands of the primal problem into Hicksian compensated demands, and applying the homogeneity property to a logarithmic form of the system. This enables him to reduce the set of the cross price effects entering each equation to the subset relevant to the good in question. Thus, the application of the theoretical properties of Marshallian demands enables the conservation of degrees of freedom, and the feasible estimation of such systems of equations. This approach does not, however, necessarily preserve the symmetry properties of the demand equations.

Alternatively, all the theoretical restrictions, of adding-up, homogeneity and symmetry can be imposed from the outset. This reduces the (n^2+n) estimated parameters of a system of Marshallian demand equations to $[(n^2+n)/2]-1$. An example of this is Stone's(1954) Linear Expenditure System (LES). In this case the number of independent parameters is further reduced to 2n-1, due to the selection of a particular functional form. A similar gain in degrees of freedom can be obtained with the choice of other functional forms, notably the Constant Elasticity of Substitution(CES) function.

However, the considerable savings in degrees of freedom in empirical systems is achieved by decomposing the consumer's consumption decision into smaller problems, which result in the same choice as the original problem. In general, two sets of conditions must be observed in order to guarantee the existence of commodity aggregates, which let us decompose the problem of the consumer in two ways:

1). Hicksian separability, (Hicks (1936)). This is based on the composite commodity theorem. It asserts that if a group of prices move in parallel, then the corresponding group of commodities can be treated as a single good. This would enable us to aggregate such commodities into a single group, distinct from all other commodities in the economy. It can be shown (Varian 1984, p 147) that the new preferences defined over the decomposed sets of commodities leads to the same choices as the original ones. In practice, in considering demands of a particular commodity we take the composite commodity to be all goods in the economy except the one we are interested in. However, in open competitive economies, when we are modelling choices over long time periods, relative prices are unlikely to be stable.

2). Functional separability. This is based on the concept of multi-stage budgeting, introduced by Strotz(1957) and Gorman(1959). There are two ideas behind this: i) separability of preferences, and ii) consistency of aggregation over goods.

(i). Separability of preferences refers to the possible partitioning of commodities into groups, so that preferences within groups can be described independently of the quantities on other groups. This implies that closely related goods can be grouped together. (ii). Consistency of aggregation requires that the commodities purchased by optimizing the group objective functions, should be the same as those purchased if the consumer allocated his consumer budget directly to individual commodities.

If such conditions are satisfied, a number of subutility functions can be optimized, each of which involves only quantities related to the group in question. This increases considerably the degrees of freedom available. However, it is important to be aware that separability of preferences imposes restrictions on behaviour that limit the possible substitution effects between goods in different groups. To be able to derive such a model mathematically, the utility function must have a special functional form, whence the term functional separability. These possible functional forms are discussed below, in the context of import allocation models.

3.2). Seaborne International Import Allocation Models.

The experience of estimating multigood systems of demand equations in consumption theory leads us to select multistage budgeting procedures, as the most fruitful way of turning demand theory, consistently, into empirical models of demand. The lesson from the theory of the consumer is that multistage budgeting can allow for a compromise between the requirements of theory and empirical work.

In international trade linkage models, a fixed total expenditure on imports is allocated over a number of trade partners. In this section, we extend the ideas of multistage budgeting from the theory of the consumer to derive import allocation models of seaborne trade. The results discussed so far in the context of the consumer theory apply, mutatis mutandis, to this problem.

3.2.1). The Regional-National Aggregator Function.

Before we examine the multistage budgeting procedures in the context of import allocation models, it is necessary to look more carefully at the microfoundation problem of the individual importer.

Imports may be regarded either as inputs in the production process, or as consumption goods, which satisfy directly aggregate demand. In the former case, imports are inputs in the production function, in the cost minimizing problem of the producer-importer. In the latter case, imports are consumption goods in the utility maximizing problem of the consumer-importer. Fortunately, it is not necessary to make this distinction in order to derive bilateral import demand equations.

An objective function can be introduced, called the *aggregator function* after Diewert(1976, 1982), which takes the form of either a production or a utility function when needed. The aggregator function can be taken to represent the preferences of each geographical region (the national economy, in the case of one country) with respect to its expenditures on domestic goods and imported goods. The aggregator function for region (country) j takes the form (The index j of the importing region is omitted for notational convenience):

$$y=f(q_1,\ldots,q_g,m_1^1,\ldots,m_n^1,\ldots,m_1^g,\ldots,m_n^g) \qquad (3.1)$$

where $q_1,\ldots,q_g$ are goods produced domestically, while the m_i^k are imports of goods $k=1,\ldots,g$, from trade partners $i=1,\ldots,n$, with $i\neq j$.

Two assumptions are used in writing the aggregator function as in (3.1). The Armington(1969a) assumption, that no matter how detailed the category of goods may be, the 'same' goods supplied by different countries are imperfect substitutes, and therefore deserve a separate place in the aggregator function. The second assumption, is that employed by Barten(1971), that domestically produced goods are imperfect substitutes for the same kind of imported goods, so that domestic goods also deserve a separate place in the aggregator function.

It is assumed that the aggregator function, y=f(.) obeys the regularity properties usually imposed on utility and production functions. That is, f(.) is twice continuously differentiable, it is strictly quasi-concave and has decreasing positive marginal derivatives.

Optimization of this aggregator function leads to demand functions for the domestically produced goods, $q_1,\ldots,q_g$, and the bilateral imports, $m_1^1,\ldots,m_n^1,\ldots,m_1^g,\ldots,m_n^g$. In each of these demand functions, the demand for each good is explained in terms of the total outlay of the region, the prices of all the goods entering the aggregator function, and possibly other variables. Empirical implementation of such a system would be impossible for a world model of the dimensions we set as 'ideal' in chapter 2; that is, 5 commodities and 30 regions. There would not be enough degrees of freedom to estimate such a model.

3.2.2). Separability of Preferences and Multistage Budgeting.

We assume that commodities can be aggregated into groups, so that preferences within each group can be described independently of the quantities in other groups. Preferences are, thus, assumed to be separable with respect to different groups of goods. For example, if dry bulk goods produced and imported in a region is taken as one group of goods, the decision maker (consumer or producer), is assumed to be able to rank individual dry bulk goods in a well defined utility ordering, which is independent of his decision on other domestic or imported goods.

This implies that we can define subaggregator functions for each group. The values of these subaggregator functions then combine to give the regional aggregator function. Assuming separability of preferences between different types of goods, and consistent aggregation of the subaggregator functions into the regional aggregator function, (3.1) can be written as:

$$y=v[f^1(q_1,m_1^1,\ldots,m_n^1),\ldots,f^g(q_g,m_1^g,\ldots,m_n^g)] \qquad (3.2)$$

where v(.) is an increasing function in all its arguments, and $f^k(.)$, $k=1,\ldots,g$, are the subaggregator functions. Optimizing one subaggregator function, $f^k(.)$, $k=1,\ldots,g$, is a separate or independent action from optimizing any other one. Optimization of $f^1(.)$, say, generates demand functions for the domestic good q_1 and imports $m_1^1,\ldots,m_n^1$, in terms of total expenditure on good 1, the domestic price of the good, all bilateral import prices and possibly other variables.

So far, a two-stage budgeting procedure has been defined: At the first or higher stage, total expenditure is allocated to the broad groups of goods, $1,\ldots,g$. At the second, or lower stage, group expenditures are allocated over domestic goods and imports.

A third disaggregation of the aggregator function can further increase the degrees of freedom. It amounts to defining sub-subaggregator functions, which distinguish in each subaggregator function the good produced domestically from the whole set of the same imported good. That is, it is assumed, Barten(1971), that preferences are separable with respect to whether each good is produced domestically or abroad. The decision to produce or consume the domestic good k, $k=1,\ldots,g$, is independent from the decision to produce or consume the 'same' imported good k (as well as being independent from quantities on other groups).

This enables us to write (3.2) further as:

$$y=v=u[f_D^1(q_1),\ldots,f_D^g(q_g),f_I^1(m_1^1,\ldots,m_n^1),\ldots,f_I^g(m_1^g,\ldots,m_n^g)] \qquad (3.3)$$

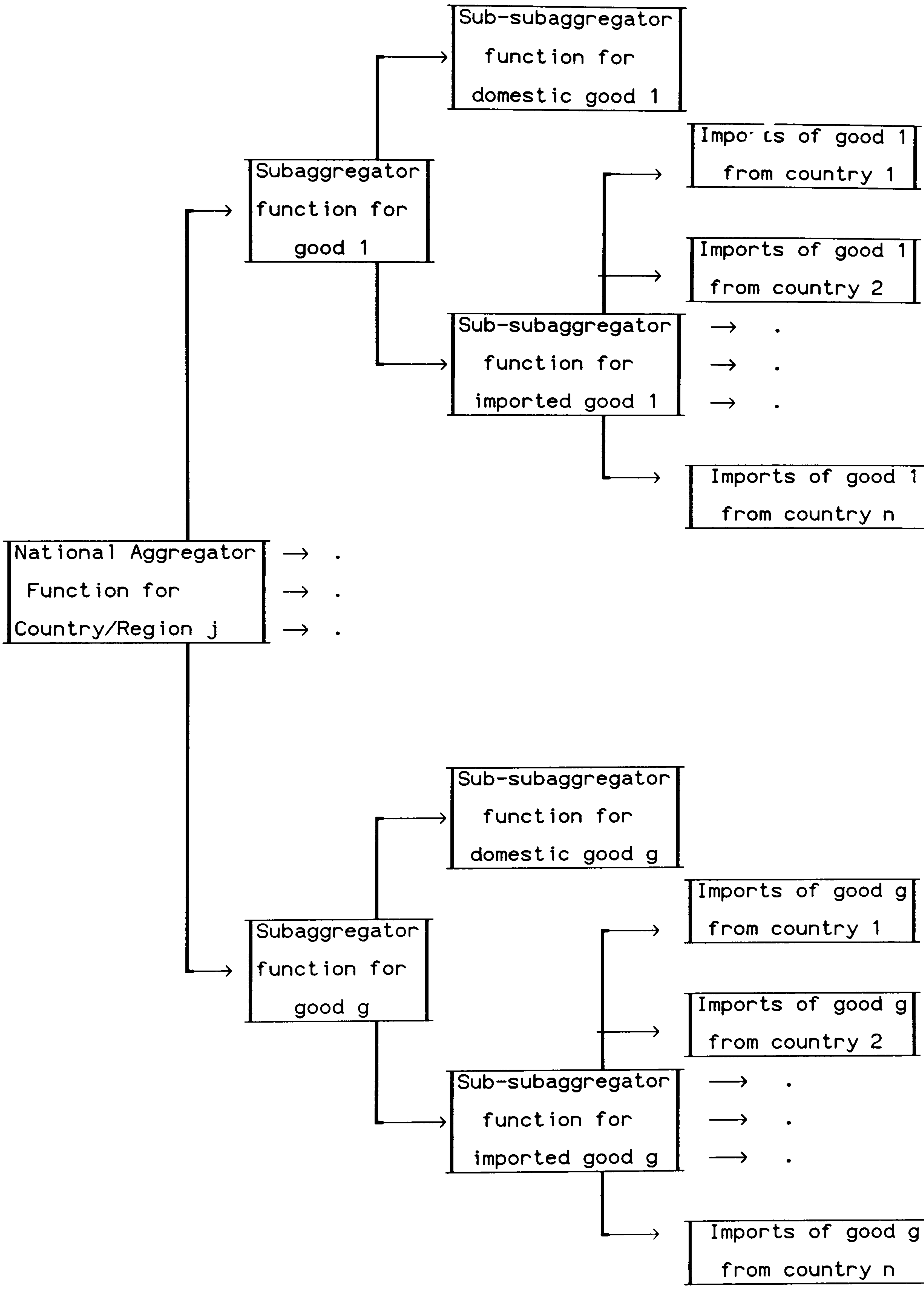
where $f_I^k(.)$ describe preferences over imports from each of the $i=1,\ldots,n$, trade partners for good k, while $f_D^k(.)$ describe preferences over the domestic product k. u(.) is increasing in all its arguments. At the final stage of the multi-stage budgeting procedure, import expenditure for each imported good is allocated amongst trade partners. This is in line with the Armington(1969a) assumption that the same goods imported from different trade partners are imperfect substitutes.

Bilateral import demand equations may now be derived, by optimizing independently each of the g sub-subaggregator functions, in the regional aggregator function. Each of these bilateral import demand equations, for good k, is explained in terms of total import outlay for the particular good, the bilateral prices for that good coming from trade partners $i=1,\ldots,n$, and possibly other relevant variables. The increase in the degrees of freedom is significant. In terms of our ideal model, for say, 5 commodity groups and 30 regions, we would have had to include 5+(30x5)=155 prices in the system. Use of multistage budgeting, reduces the included price variables in the system to 30 bilateral import prices related to a particular commodity k, thus, saving 125 degrees of freedom.

A utility (aggregator) tree describing this three stage budgeting procedure is shown on Table 3.1. The importing region-country allocates total expenditure in three stages. At the first or highest stage, expenditure of region j, say, is allocated to the broad groups of goods, 1,...,g. Thus, g subaggregator functions, one for each group, are determined at this stage. At the second or middle stage, the expenditure for each good is allocated between domestic goods and imports. An import quantity index (or sub-subaggregator function) for each good is defined at this stage, and this forms the basis for the existence of import allocation models. At the third or lowest stage, total import expenditure for each good is allocated between trade partners, leading to bilateral import demand equations from each trade partner of j, for each kind of good k.

Table 3.1.

The Utility (Aggregator) Tree.



Three stage-budgeting involves both consistent aggregation (to construct the broad groups at the different stages) and separability of decision making (for each of the subgroup problems). Separability of preferences is both necessary and sufficient for the third stage of the procedure. The existence of the sub-subaggregator function at the second stage, is then sufficient for the existence of an import allocation model. But separability of preferences, and two - or three - stage budgeting, are not equivalent. Neither implies the other.

It is important to be aware of the limitations which separability imposes on the resultant bilateral import demand equations. These limitations refer to the possible substitution effects between goods in different groups. Apart from income effects, a change in the imported price of dry bulk (say) from partner i, for example, will affect the demand for liquid bulk goods in the same way as a change in the price of dry bulk from any other partner $j \neq i$.

In practice, in estimating import allocation models, only the last two stages of the three-stage budgeting procedure are utilized in order to derive the bilateral import demand equations. It is assumed that, preferences are separable with respect to imports and domestic goods, and aggregation over imports is consistent. These two assumptions are necessary and sufficient for the existence of import allocation models.

3.2.3). Consistency of Aggregation.

Consistent aggregation (over imports) occurs when bilateral imports derived by the optimization of the sub-subaggregator functions, lead to the same solution as that derived by the optimization of the subaggregator functions themselves. This requires us to be able to define a single, aggregate, import quantity and price index for each sub-subaggregator function, which is then used to allocate import expenditures for each good amongst bilateral trade partners. It is not generally true that, given separability of preferences, aggregation will be consistent. It requires restrictions to be placed on the functional form of the sub-subaggregator functions. It is worth mentioning here that since the demand functions can be derived from the indirect utility or expenditure functions, we may, alternatively, impose the restrictions on one of these functions. An example of the former is the model of Snella(1979), see section (2.3.5).

Gorman(1959) derived the required conditions for consistent aggregation in consumption theory. If we think of the subaggregator functions as general utility functions, the sub-subaggregator functions as group utility or subutility functions, and bilateral imports as the individual commodities, we can use the consumption theory terminology to describe the <u>Gorman conditions for consistent aggregation.</u>

To understand the Gorman conditions, some further terminology is required. Assume that $\mu_k=\theta_k(f_k)$ are group quantity indices, where μ_k is the composite quantity index of imports for good k. Goldman and Uzawa(1964), show that:

if the utility function f(.) is weakly separable, it can be written in the form $u(f_1^{-1},...,f_g^{-1})$, where f_k^{-1} is the subutility function, $k=1,...,g$.

Also, if f is strongly or additively separable it can be written in the form $u(f_1^{-1}+...+f_g^{-1})$.

The utility function f is defined as weakly homothetic separable if it can be written as, $u(f_1^{-1},...,f_g^{-1})$ (i.e., if it is weakly separable), and if $f_1^{-1},...,f_g^{-1}$, are each homothetic.

The function $u(f_1,...,f_g)$ in turn, is homothetic if it is a monotonically increasing transformation $u[g(f_1,...,f_g)]$ of a function $g(f_1,...,f_g)$, which is homogeneous of degree one. $f=u(f_1,...,f_g)$ is therefore homothetic if and only if the expenditure function can be written as $e(u,p)=\theta(u)b(p)$.

The first condition for consistent aggregation derived by Gorman(1959), is that each group expenditure function can be written as a homothetic homogeneous expenditure function: $e_k(f_k,p_k)=\theta_k(f_k)b_k(p_k)$. If we think of $\mu_k=\theta_k(f_k)$ as group quantity indices, and $b_k(p_k)$ as the corresponding price indices, then if preferences are weakly separable, the utility maximization problem,

$$\max\ u=u(f_1,\ldots,f_g)\quad \text{subject to}\quad \Sigma_k e_k(f_k,p_k)=y_k,$$

becomes:

$$\max\ u=f[\theta_1^{-1}(\mu_1),\ldots,\theta_g^{-1}(\mu_g)]\quad \text{subject to}\quad \Sigma_k \mu_k b_k(p_k)=y_k$$

Thus, weak separability with homotheticity (in other words, weak homothetic separability) of the group utility functions implies consistent aggregation. This form of cost function imposes stringent conditions on behaviour. It implies that the composition of the budget is independent of total expenditure or of utility. This would produce linear Engel curves through the origin, implying that all expenditure elasticities are unity.

An alternative solution proposed by Gorman(1959) is that the group indirect utility function should take, what is now called, the Gorman generalized polar form:

$$\psi_k(y_k,p_k)=F_k[y_k/b_k(p_k)]+a_k(p_k)$$

for some monotone increasing function $F_k(.)$, and some explicitly additive utility function:

$$u=\theta^{-1}(\mu_1)+\ldots+\theta^{-1}(\mu_g)$$

A utility function of the above form implies that preferences are strongly or additively separable. The consumer's optimization problem is then reduced to:

$$\max\ u=\Sigma_k\ F_k(\mu_k)+\Sigma_k\ a_k(p_k)\qquad \text{subject to}\qquad \Sigma_k\ \mu_k b_k(p_k)=y_k$$

where $\mu_k=y_k/b_k(p_k)$ is the group quantity index, and $b_k(p_k)$ is the corresponding price index. Note that the additive structure of the utility function results in the a_g being irrelevant to the maximization problem. However, their presence makes the Gorman polar form of the indirect utility function less restrictive, in the sense that it allows nonlinear relationships between within group expenditures and group outlay.

Nonetheless, additivity of the utility function is also a severe restriction. The problem lies in the fact that, due to additivity, any group in the utility function can be a combination of any other groups. This effectively prevents the existence of any special relationships between any pairs of groups. In particular, only substitutes are permitted, but not complements, and there is an approximate proportionality between expenditure and price elasticities. It can be argued that, both proportionality and absence of complementarity (and inferiority) are not too severe restrictions for broad groups of goods. This argument is quite relevant in the context of import allocation models, where imports of the same kind of good from different trade partners are likely to be substitutes in world import markets.

A third way of imposing consistent aggregation is by assuming weak separability and quasi-homotheticity of the expenditure function, where quasi-homotheticity implies for the expenditure function: $e_k(f_k,p_k)=\theta_k(f_k)b_k(p_k)+a_k(p_k)$, $(k=1,...g)$. It can be shown (Deaton and Muellbauer 1980, p 132-133) that total group expenditure can then be written in terms of total expenditure and two sets of price indices constructed from the functions a_g and b_g. In practice, if prices move together, the two price indices may be proxied by one. In this system, Engel curves are again linear, but are not constrained to go through the origin. Income elasticities only tend to unity as total expenditure increases. Barten and Turnovsky(1966), Barten(1970) and Theil(1975), working with differential demand systems, have used this idea, together with local approximations, to estimate systems of consumer demand equations. The conditions required are less stringent than in the other two cases.

To summarize, given weak separability, for consistent aggregation of the import allocation model, one of the following conditions should be true: i) the expenditure function should be homothetic homogeneous, ii) the indirect utility function should be of the Gorman polar form, and the utility function should be additive (the latter implying strong separability of preferences), or iii) the expenditure function should be quasi-homothetic.

3.2.4). The Adding-up Conditions.

From equation (3.3), the sub-subaggregator functions $f_I^k(.)$, or partial aggregator functions $\mu_k(.)$, or import quantity indices, as they are more widely known, form the basis of the import allocation model. We simplify our notation to write:

$$f_I^k(m_1^k, \ldots, m_n^k) \equiv \mu_k(m_1^k, \ldots, m_n^k) \equiv \mu$$

When we defined the regional aggregator function we asserted that for the purpose of deriving import allocation models, it does not matter whether it is viewed as a utility or a production function, in the consumption or production theory, respectively. The same is true for the regional sub-subaggregator functions. We call these functions from now on partial aggregator functions or partial import quantity indices, or simply objective functions.

If the partial aggregator functions for some good k play the role of the utility function in the problem of the consumer-importer, then his problem is to:

$$\max \ \mu(.) \quad \text{subject to} \quad M_j = \sum_{i=1}^{n} m_i p_i \qquad i=1, \ldots, n,$$

where p_i are the bilateral seaborne import prices corresponding to the bilateral seaborne import quantities m_i, and M_j is the import bill of some commodity k, in current prices. The bilateral import demand equations, can be derived as functions of total expenditure on imports (of country j on good k) and all bilateral import prices for the particular good. That is:

$$m_i=g_i(M_j,p_1,\ldots,p_n) \; ; \qquad i=1,\ldots,n.$$

If the aggregator function plays the role of the production function in the problem of the producer-importer, then his problem is to minimize the cost of the import bill M_j as follows:

$$\min M_j=\Sigma_i m_i p_i \quad \text{s.t.} \quad \mu=\mu(.)$$

where $\mu=\mu(m_1,\ldots,m_n)$, is the import quantity index for some good k, which describes the technical relationship between $m_1,\ldots,m_n$ and μ. Solution of the above problem gives factor demand equations for the bilateral imports-inputs in the form:

$$m_i=g_i(m_j,p_1,\ldots,p_n) \; ; \qquad i=1,\ldots,n.$$

where m_j is the total volume of imports of good k (index omitted) by j.

In any case, we would expect that identity (2.2), of the previous chapter, should hold by definition of the data. That is, bilateral imports (for some good k) should add up to total imports in volume terms:

$$\Sigma_i m_i=m_j$$

and also bilateral import expenditures should add up in value terms:

$$M_j= \Sigma_i m_i p_i$$

The last condition is automatically satisfied, since it constitutes the binding budget constraint in the utility maximizing problem, while it is the cost function in the cost minimizing problem of the producer. Also the first condition is satisfied for the import demand equations derived from the cost minimizing problem of the producer-importer. The total volume of imports by country j for good k, expressed by m_j enter directly each of the bilateral import demand equations.

This is along the line of the adding-up property we expect systems of demand equations to satisfy. Satisfaction of the adding-up constraint in this way makes the model estimation consistent. Adding-up is imposed by virtue of the optimization problem of the importer. The rest of the identities of world trade as defined in equations (2.1), (2.3), (2.4) are then automatically satisfied as a result.

3.3). A Specific Import Allocation Model.

Having provided the theoretical framework of import allocation models, we need to determine a specific functional form of the aggregator function, which allows for separability of preferences and satisfies the consistent aggregation requirements. The choice of such a function is critical for the substitution possibilities allowed in the estimated model.

3.3.1). The Choice of the Aggregator Function.

As we saw in the previous chapter, Hickman and Lau(1973) introduced a CES partial aggregator function and by classical optimization techniques derived an estimation consistent import allocation model for some good k, say. The CES partial aggregator function, which describes the preferences of the importer j for some good k, takes the form (the indices j and k are omitted):

$$\mu=[\Sigma_i\delta_i m_i^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \qquad \text{where} \quad \sigma=(1/1+\rho), \quad \rho>-1.$$

This function satisfies both the assumptions of weak separability and homotheticity, which are needed in order to derive consistent import allocation models (see Hickman and Lau(1973, p350)).

Optimization of the CES function leads to the following import demand equations.

$$m_i = \mu \ \delta_i^{\sigma}(p_i/P)^{-\sigma}$$

where P is the 'composite' CES price index,

$$P = [\Sigma_i \delta_i^{\sigma} p_i^{(1-\sigma)}]^{1/(1-\sigma)}$$

with the additive price aggregation property that

$$P \ .\mu = \Sigma_i p_i m_i = M$$

However, as we can see from the derived demand equations the CES function allows for only one relative price effect (a single elasticity of substitution), which is what makes it empirically attractive to estimate, but at the same time restrictive in the substitution possibilities it allows in the system.

The CES import quantity index is not the only function that satisfies the weak separability and homotheticity assumptions, necessary for import allocation models, contrary to the assertion of Hickman and Lau(1973, p 350).

One set of functions which satisfies these conditions is the <u>'flexible functional form'</u> family of Diewert(1973), which may be considered as second order approximations to a general aggregator function. The number of parameters in these models increase quadratically with the number of trade partners. This make it unsuitable for empirical import allocation models, especially when the length of the available time series data is short and the number of trade partners large. Examples of such models is the translog model of Christensen et al(1973), models based on the quadratic function, Diewert's(1971, 72, 73, 74) Generalized, Linear and Leontief models, and other similar models referenced in Blackorby et al(1978, ch. 8).

An alternative to the flexible functional form approach is to derive the import allocation model from a 'specific aggregator function'. If the aggregator function contains n factors, the derived demand equations will have less than 3n parameters, cf Hanoch(1975, p 396). This makes the model feasible to estimate. Furthermore, the n factor CES function and the functions derived as special cases of it are special cases of the specific aggregator set of functions (Arrow(1960-1961), Arrow et al(1961), Uzawa(1962)). There are two classes of models based on a specific aggregator function, defined by Hanoch(1975).

First, 'explicit additive models' derived from an explicitly (or strongly or additively separable) additive aggregator function. Hanoch(1975, p 396), suggests that this form of the aggregator function is very restrictive, because of the existence of multiplicative or additive relationships between each substitution effect and its related income effect. To this class, belong functions such as the CES, the Cobb Douglas, or the Leontief type function (Bergson(1936), Berndt and Cristensen(1973)), with elasticities of substitution constant and equal for all trade partners, and unit value income elasticities.

Second, 'implicit additive models' derived from a corresponding type of direct or indirect aggregator function. These allow for non-constancy and non-homotheticity of the Allen elasticities of substitution (the latter are defined formally later in the chapter). Imposing the restrictions of Constant Ratio of Elasticities of Substitution and linear Homogeneity, results in the CRS version of the CRESH model, cf Hanoch(1971). The assumption of linear homogeneity, as discussed earlier is restrictive, although, perhaps not so much in the context of import allocation models. Still, it is convenient in making the model estimation consistent; that is, for consistency of aggregation, and as a result for adding-up to hold.

The CRESH function retains the advantages of being theoretically consistent and estimation feasible, while it allows for more than one relative price effects. The CRESH function has been used by

Italianer(1986) to derive an empirical import allocation model. This function contains the CES as a special case, and in consequence the special cases of the latter are special cases of CRESH - that is, the Cobb-Douglas, the Leontief and the linear functions. CRESH in turn belongs to a wider class of functions which have a constant ratio of elasticities of substitution, but are not necessarily homogeneous or homothetic cf Hanoch(1971). We work with a special form of the CRESH function which makes it homogeneous of degree one - the CRS (Constant Returns to Scale) form.

It may be noted here that, other functional forms of the aggregator function satisfy the theoretical conditions of import allocation models, but may not be practical for estimation, because the number of parameters increase more than proportionately with the number of trade partners.

3.3.2). The CRESH Import Allocation Model.

Earlier in the chapter, in dealing with multistage budgeting, we noted that at the second stage of the three stage budgeting procedure, an import quantity index or partial aggregator function μ for each category of goods is determined. This is then allocated at the third stage amongst trade partners, thus deriving a set of bilateral import demand equations. We use the CRESH function for this partial aggregator function. The properties of the derived import allocation model depend on the properties of the CRESH function.

Given a set of exogenously determined bilateral import prices, $p_1,\ldots,p_n$, for the good k, say, the problem of the importer is to minimize import costs for product k subject to a technical relationship between μ and m_1, where m_i, $i=1,\ldots,n$, are the bilateral import quantities of good k.

Let μ be defined implicitly by the following CRESH function of Hanoch(1971), where implicit additivity refers to the fact that the aggregator function is defined by an identity of the following form:

$$F(\mu, m_1, \ldots, m_n) = \Sigma_i \delta_i (m_i / h(\mu))^{-\rho_i} - 1 \equiv 0 \qquad (3.4)$$

with $m_i > 0$, $0 \leq \mu \leq \bar{\mu} \leq \infty$, where $h(\mu)$ is continously differentiable with $h(0)=0$, $h(\bar{\mu})=\infty$ and $h'(\mu)>0$, where $\bar{\mu}$ denotes the maximum of the import quantity index. Also $F(0,\ldots,0)=0$. Following Arrow et al (1961, p230), we refer to ρ_i as the substitution parameters (since they determine the substitution possibilities between the m_i's for a given $h(\mu)$), and to δ_i as the distribution parameters (since δ_i determine the distribution of $h(\mu)$ for a given set of ρ_i's).

Hadley(1964, p47) shows that, using the implicit function theorem, (3.4) gives a unique, continuously differentiable import quantity index $\mu = f(m_1, \ldots, m_n)$ if and only if $\max_i \delta_i > 0$ and $\delta_i \rho_i$ are of the same sign for all i, or if $\rho_i = 0$ for some i. We assume that the parameters satisfy these restrictions.

The function $\mu = f(m_1, \ldots, m_n)$ is homothetic, satisfying $h[f(tm_1, \ldots, tm_n)] = th[f(m_1, \ldots, m_n)]$. That is, $h(\mu)$ is linearly homogeneous with respect to $m_1, \ldots, m_n$, which is necessary for consistent aggregation (since the expenditure or cost function of a homogeneous function of degree one is written as $e(\mu, \mathbf{p}) = h(\mu) b(\mathbf{p})$, which is one way of satisfying the assumption of consistent aggregation, see section (3.2.3)). If we choose $h(\mu) = \mu^{1/r}$ then $f(m_1, \ldots, m_n)$ is homogeneous of degree r; that is, $f(tm_1, \ldots, tm_n) = t^r f(m_1, \ldots, m_n)$. Here we choose $h(\mu) = \mu$, in which case $f(m_1, \ldots, m_n)$ is homogeneous of degree one, which is the CRS (Constant Returns to Scale) version of (3.4) - the CRESH function - giving:

$$F(\mu, m_1, \ldots, m_n) = \Sigma_i \delta_i (m_i / \mu)^{-\rho_i} - 1 \equiv 0 \qquad (3.5)$$

In many empirical studies so far (cf Hickman and Lau(1973), Nyhus(1978), Italianer(1986)), the introduction of a trend term seems to be indispensable in the explanation of import demand. This takes account of systematic non-price factors that affect imports, such as changes in tastes or technology, for instance. This time trend t, can be inserted directly in (3.5), where t=0 in the base year. The trend coefficient γ_i are interpreted then as shifts in the import quantity index due to non-price factors, such as changes in tastes, technology etc.

$$F(\mu, m_1, \ldots, m_n, t) = \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} - 1 \equiv 0 \qquad (3.6)$$

The regularity conditions of (3.4) are assumed to hold for (3.5) and (3.6) also.

Having defined the aggregator function, we can express mathematically the problem of the importer as min $\Sigma_i p_i m_i$ subject to (3.6). This is equivalent to minimizing the following Lagrangean w.r.t. $m_1, \ldots, m_n, \lambda$, where λ is a linear homogeneous function of prices $p_1, \ldots, p_n$:

$$L = \Sigma_i p_i m_i + \lambda \, [1 - \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i}] \qquad (3.7)$$

The first and second order conditions for minimization of (3.7) are equivalent to the conditions for quasi-concavity of $f(m_1, \ldots, m_n)$. The First Order Conditions (F.O.C.) for minimizing (3.7) are:

$$\partial L/\partial m_i = p_i + \lambda \; \delta_i \rho_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} \; m_i^{-1} = 0 \; ; \quad i = 1, \ldots, n. \qquad (3.8)$$

$$\partial L/\partial \lambda = \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} - 1 \equiv 0 \qquad (3.9)$$

For a solution of the above system $\delta_i \rho_i$ should have the same sign for all i, and this should be the sign of λ, because $\lambda \delta_i \rho_i > 0$, for all i. This system of equations gives bilateral import demand equations m_i, i=1,...n, and an equation for λ, in terms of μ, p_i and t. Because μ is a linearly homogeneous homothetic import quantity index, the elasticity of m_i with respect to μ at the optimum is 1. This implies:

$$|\lambda| = \mu\, P(p_1,\dots,p_n,t) \tag{3.10}$$

where P(.) is a price index which is a real positive function of the bilateral prices p_i and time t.

Hence, solving (3.8) for m_i and eliminating λ by using (3.10) we get the system of bilateral import demand equations at a given μ. These equations are shown below and are homogeneous of degree 0 in prices.

$$m_i = \mu\, [\,|\delta_i\rho_i|e^{\gamma_i t}(p_i/P)^{-1}]^{a_i}, \qquad a_i = 1/(1+\rho_i) \tag{3.11}$$

where the price index P>0 is defined implicitly, by substituting (3.11) in the budget constraint, equation (3.9), resulting in:

$$G(P,p_1,\dots,p_n,t) = \Sigma_i\delta_i[\,|\delta_i\rho_i|e^{(-\gamma_i/\rho_i)t}(p_i/P)^{-1}]^{-a_i\rho_i} - 1 \equiv 0 \tag{3.12}$$

Thus, we have defined a specific import allocation model through the CRS version of the CRESH function. Because of the way we defined the CRESH 'composite' price index P in (3.12), the system has the property of consistent aggregation and adding up. That is μ and P are defined so that the additive price aggregation property $P.\mu = \Sigma_i m_i p_i = M$ holds.

Since $\delta_i > 0$, also $\delta_i e^{\gamma_i t} > 0$, and $C = \Sigma_i\delta_i e^{\gamma_i t} > 0$. Since minimizing $\Sigma_i p_i m_i$ subject to μ or μ/C leads to exactly the same solution we may divide the aggregator function μ by $\Sigma_i\delta_i e^{\gamma_i t}$. This is equivalent to a normalization of these parameters so that $\Sigma_i\delta_i e^{\gamma_i t} = 1$.

3.3.3). Properties of the model.

In order to derive the properties of the model we work here for computational ease with a general aggregator function of the form $\mu = f(m_1,\dots,m_n)$. We then extent our general results to the CRESH model. Let us assume that $\mu=f(m_1,...,m_n)$ is twice continuously differentiable. The cost minimizing importer wants to minimize the import cost subject to the relation described by the aggregator function. He thus has to solve a problem similar to (3.7). Mathematically, his aim is to:

$$\min L(m_i,\lambda) = \Sigma_i p_i m_i + \lambda\ [\mu-f(m_1,...,m_n)] \tag{3.13}$$

Let $f_i=\partial f/\partial m_i$. The FOC are:

$$\partial L/\partial m_i = p_i - \lambda\ f_i = 0, \qquad i=1,...,n \tag{3.14}$$

$$\partial L/\partial \lambda = \mu - f(m_1,...,m_1) = 0 \tag{3.15}$$

These constitute a set of (n+1) equations to solve for the (n+1) unknowns $m_1,...,m_n,\lambda$ in terms of the (n+1) parameters $p_1,...,p_n,\bar{\mu}$. When solved they provide import demand equations in terms of the specified total imports $\bar{\mu}$ and bilateral prices. These equations have the form:

$$m_i=f_i(p_1,...,p_n,\bar{\mu}) \qquad i=1,...,n \tag{3.16}$$

(3.14) may be rewriten in two different ways:

a) $$(f_i/f_j)=(p_i/p_j) \tag{3.17}$$

which gives us the optimal input combination as the point where the marginal rate of technical substitution between any pair of imports, equals the corresponding import price ratio.

b) $$(f_1/p_1)=...=(f_n/p_n)=(1/\lambda) \tag{3.18}$$

which indicates that the optimal input combination is at the point where the marginal productivity of the last **$** spent on imports $(1/\lambda)$, is the same everywhere.

3.3.3.1). Comparative Statics.

In order to describe the effects of changes of total import requirements (μ) or of changes of import prices (P) on the optimal import mix of an importing region, we derive the following results.

Taking the total differentials of the FOC (and using $p_i=\lambda f_i$ to eliminate p_i) yields:

$$\Sigma_i f_i dm_i = d\mu \quad , \qquad i=1,\ldots,n \qquad (3.19)$$

$$-f_i d\ln\lambda + df_i = (1/\lambda)dp_i \quad , \qquad i=1,\ldots,n \qquad (3.20)$$

which we may write in matrix notation as:

$$\begin{bmatrix} 0 & f_1 \ldots f_n \\ f_1 & f_{11} \ldots f_{1n} \\ \\ f_n & f_{n1} \ldots f_{nn} \end{bmatrix} \begin{bmatrix} -d\ln\lambda \\ dm_1 \\ \\ dm_n \end{bmatrix} = (1/\lambda) \begin{bmatrix} \lambda d\mu \\ dp_1 \\ \\ dp_n \end{bmatrix} \qquad (3.21)$$

Equivalently: $$F\,\underline{m} = \lambda^*\,\underline{q}$$

or $$\underline{m} = \lambda^*\,F^{-1}\underline{q} = K\underline{q} \qquad (3.21')$$

where the definitions of F, $\underline{m}$, λ^*, $\underline{q}$ and K are obvious from (3.2.1).

3.3.3.2). Elasticities.

The effect of changes of total imports on the imports of j from i, *ceteris paribus*, can be measured by the total import elasticity (income elasticity in consumption, output elasticity in production) defined by:

$$e_{i\mu}=(\partial m_i/m_i)/(\partial\mu/\mu) \quad \equiv \quad \partial\ln m_i/\partial\ln\mu \qquad (3.22)$$

It measures the percentage change in imports from country i for a percentage change in the total import requirements μ in the importing region j.

For the matrix equation the elasticities take the form (for $i=1,...,n$):

$$e_{i\mu}= K_{i0}(\mu/m_i)= (\lambda^* F^{-1})_{i0}(\mu/m_i)= [(1/\lambda)(F_{i0}/|F|)](\mu/m_i) \quad (3.23)$$

where F_{i0} is the $(i0)$ cofactor, and $|F|$ is the determinant of the bordered Hessian F. Similarly K_{i0} is the $(i0)$ cofactor of K.

The effect of changes of import prices on import demands in an importing market j may also be derived. Thus, using the own and cross price elasticities of bilateral imports we can measure, respectively, the percentage change in the import quantity of partner i for a percentage change in the own import price or the import price of another partner, *ceteris paribus*. Mathematically, these price elasticities are defined as:

$$\begin{aligned} e_{ii} &= (\partial m_i/m_i)/(\partial p_i/p_i) \equiv \partial \ln m_i/\partial \ln p_i \\ e_{ih} &= (\partial m_i/m_i)/(\partial p_h/p_h) \equiv \partial \ln m_i/\partial \ln p_h \end{aligned} \quad (3.24)$$

For the matrix equation they are (for $i,h=1,...,n$):

$$e_{ih}=K_{ih}(p_h/m_i)=(\lambda^* F^{-1})_{ih}(p_h/m_i)=[(1/\lambda)(F_{ih}/|F|)](p_h m_i) \quad (3.25)$$

From (3.18) we know that $(f_h/p_h)=(1/\lambda)$, which, when subsituted in (3.25) yields:

$$e_{ih}= [(F_{ih}/|F|)](f_h/m_i) \quad (3.26)$$

Now, if we divide the elasticity by the optimal value share (the proportion of total imports spent on imports from region h), that is by $w_h=(p_h m_h)/(\Sigma_h p_h m_h)$, which at the optimum (using (3.17)) is equivalent to $w_h=(f_h m_h)/(\Sigma_h f_h m_h)$, we obtain:

$$e_{ih}/w_h= [(\Sigma_h f_h m_h)/(m_i m_h)][(F_{ih}/|F|)] \equiv \sigma_{ih} \quad (3.27)$$

This is the partial elasticity of substitution between two trade partners (factor inputs) i and h as against all other imports (factors) as defined by Allen(1938, p 503), in production theory.

For a linearly homogeneous function $\mu=f(m_1,...,m_n)$, such as our CRESH function, we have from Euler's theorem, $\mu=f_1m_1+...+f_nm_n$ $=\Sigma_h f_h m_h$. As a result (3.27) reduces to:

$$\sigma_{ih} \equiv (\mu/m_i m_h)(F_{ih}/|F|) \tag{3.28}$$

It is common practice, in production (consumption) theory, to use the elasticity of substitution as a measure of the degree of substitutability between two factors (two consumer goods in consumption), for a change in their relative prices, *ceteris paribus*. It may be interpreted as describing the percentage change in the relative quantities of two importing regions for a percentage change in their relative prices.

An important deficiency of the elasticities of import demands e_{ih} as defined in (3.24)-(3.27) is that they are not symmetric. The Allen elasticities of import substitution, as normalized import demand elasticities (since the former are obtained by dividing the latter by the optimal value share, as shown in (3.27)), solve this problem. Thus σ_{ih} are symmetric with respect to the two imports m_i and m_h, and positive.

There are two limiting cases in the concept. When m_i and m_h are perfect substitutes σ_{ih} tend to infinity, while when m_i and m_h can not be substituted $\sigma_{ih}=0$.

We also showed that σ_{ih} can be obtained from e_{ih} by:

$$\sigma_{ih}=(1/w_h)e_{ih} \qquad i,h=1,...,n \tag{3.29}$$

which is very convenient mathematically since we can obtain estimates of σ_{ih} from e_{ih} and the optimal share w_h.

From the properties of the determinants, we know that if each element of the 1st row of F is multiplied by the cofactor of the corresponding element of another row, then the sum of the products is zero. That is,

$$f_1F_{h1}+f_2F_{h2}+\ldots+f_nF_{hn}=0 \;; \qquad k=1,\ldots,n \tag{3.30}$$

Multiplying both sides of (3.26) by w_h yields:

$$w_h\sigma_{ih}=(f_hF_{ih})/m_i|F| \quad \text{and hence} \quad \Sigma_h w_h\sigma_{ih}=0 \tag{3.31}$$

From the SOC, $|F|$ should be positive definite, that is the elements of F should alternate in sign. Thus, F_{ih} and $|F|$, say, should be opposite in sign. But σ_{ih} is proportional to the ratio F_{ii} to $|F|$ and so $\sigma_{ii}<0$, $i=1,\ldots,n$. As a result,

$$\Sigma_{i\neq h}w_h\sigma_{hi}>0, \qquad i=1,\ldots,n \tag{3.32}$$

This implies that the elasticities can be positive or negative, but the weighted positive elasticities must outweight the negative ones.

3.3.3.3). Introducing Market Conditions.

So far we have looked at the cost minimizing decision of the producer importer without considering the total import price P he is faced with (the price at which he sells his product in production theory). The total demand for imports is determined as a function of the total import price index. The importer, under perfect competition, equates P to AC and MC (where AC and MC are equal for a linear production function) in order to determine his optimum. Assuming that the elasticity of demand for total imports is $\eta=-(P/\mu)(d\mu/dP)$, then equilibrium is described by the following equations:

$$f(m_1,\ldots,m_n)=\phi(P) \tag{3.33}$$

and $(p_1/f_1)=\ldots=(p_n/f_n)=P$ (3.34)

where $\phi(P)$ is the demand function for total imports. Using (3.33) and (3.34) it can be shown that the own and cross price elasticities of demand are (see for example Allen(1938, p503-509)):

$$e_{ih}=w_h(\sigma_{ih}+\eta) \qquad i,h=1,\ldots,n \tag{3.35}$$

Hence, if the price of imports from partner i rises then the demand from this or any other partner is affected in two ways:

a) The overall cost of imports is higher and total imports are dearer. For decreasing demand ($\eta<0$) less are imported and there is a proportional fall in imports from all sources (this is the output effect in production, or the income effect in consumption) as shown by the negative factor $w_h\eta$, in (3.35).

b) Demand of imports from partner i is reduced relative to the other regions since it is relatively more expensive to import from the relatively more expensive partner. Hence, demand from h is reduced, as shown by $w_h\sigma_{hh}$ in (3.35), where $\sigma_{hh}<0$. The effect on the demand for the other regions' imports depends on the sign of the σ_{ih}: (i) if $\sigma_{ih}>0$ then demand from h increases and i and h are substitutes, (ii) if $\sigma_{ih}<0$ then demand from h decreases and i and h are complements. Thus, the sign of σ_{ih} indicates substitutability or complementarity. In general, substitutes must be more than complements, as we saw from (3.32).

3.3.3.4). Extension of Results to CRESH.

For the CRESH model, the values of the total, own and cross price elasticities of import demand may be obtained from (3.11) by applying (3.22) and (3.24). We already know that since the CRESH function is linearly homogeneous its total import elasticity is 1. The own and cross import price elasticities are:

$$e_{ii}=(w_i a_i^2/a)-a_i, \qquad i=1,\ldots,n \tag{3.36}$$

and

$$e_{ih}=a_i w_h a_h/a, \qquad i\neq h=1,\ldots,n \tag{3.37}$$

where $a=\Sigma_j w_j a_j$ is a weighted average of the a_i's. The proof of (3.36) and (3.37) is relegated to appendix 3.1.

The own and cross partial Allen elasticities of substitution for the CRESH import allocation model can also be derived by using (3.36) and (3.37) in (3.29). Thus,

$$\sigma_{ii}=(a_i^2/a)-(a_i/w_i) \tag{3.38}$$

and

$$\sigma_{ih}=(a_i a_h/a) \tag{3.39}$$

3.3.3.5). Second Order Conditions(SOC).

In order to verify that the solution of the Lagrangean problem defined in (3.13) gives a minimum, we need to check the SOC. The SOC require that the bordered Hessian F defined in (3.21)/(3.21′) is negative semi definite, or equivalently that the matrix with element i,h, equal to $\partial m_i/\partial p_h$, is negative semi definite. But from the definition of σ_{ih} in (3.27) we observe that we can equivalently write the SOC in terms of the (nxn) matrix $\Sigma=[\sigma_{ih}]$. Thus $[\sigma_{ih}]$ must be negative semi definite for a minimum, which in turn requires the principal minors of $[\sigma_{ih}]$ to alternate in sign (see for example Allen (1938, p 505)). Thus,

$$(-1)^m|\Sigma_m|\geq 0, \qquad m=1,\ldots,n-1$$

and

$$|\Sigma_n|=0 \tag{3.40}$$

where $|\Sigma_m|$ is any principal minor determinant of Σ of order m.

For the CRESH model, using (3.38) and (3.39) in (3.40) yields:

$$(-1)^m|\Sigma_m|=(\Pi_{i=1}^m a_i/w_i)(1-\Sigma_{i=1}^m(w_i a_i/a)) \tag{3.41}$$

Thus, (3.40) becomes:

$$(\Pi_{i=1}^{m} a_i)(1-\Sigma_{i=1}^{m}(w_i a_i/a))\geq 0 \qquad (3.42)$$

This condition excludes the possibility of more than one $a_i<0$, (Hanoch(1971, p700), Italianer(1986, p175-178)).

When one $a_i<0$, let us say a_1, while all others are positive, then m_1 is a substitute for all the other imports, which form a set of complements.

When all $a_i>0$, (3.42) always holds, in which case all bilateral imports are substitutes, since $\sigma_{ih}>0$, $\forall$ i≠h.

3.3.4). Models Nested in CRESH.

As noted earlier, a nice feature of the CRESH aggregator function, presented in (3.6), is that a number of well known models may be obtained as nested functions by placing restrictions on the substitution parameters ρ_i (or equivalently on the a_i's). This amounts to placing restrictions on the partial Allen elasticities of substitution, as we can see from (3.38) and (3.39). As a consequence, the bilateral import demand equations of (3.11) and the own and cross price elasticities of import demands of (3.36) and (3.37) alter appropriately. We derive the results below for each nested model.

1). The <u>CES aggregator function</u> may be derived by letting $\rho_i=\rho$ (ie $a_i=a$) in (3.6). Thus (3.6) becomes:

$$\mu = [\ \Sigma_i \delta_i e^{\gamma_i t} m_i^{-\rho}]^{-1/\rho} \qquad (3.43)$$

or equivalently if we let $\rho=(1-\sigma)/\sigma$ (since $a_i=1/(1+\rho_i)$),

$$\mu=[\Sigma_i \delta_i e^{\gamma_i t} m_i^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)} \qquad \sigma=1/(1+\rho) \qquad (3.44)$$

Similarly, the derived bilateral import demand equations (3.11) become:

$$m_i = \mu\ [|\delta_i\rho| e^{\gamma_i t} (p_i/P)^{-1}]^{\sigma} \qquad (3.45)$$

or
$$m_i = \mu\ [|\delta_i\rho| e^{\gamma_i t} (p_i/P)^{-1}]^{1/(1+\rho)} \qquad (3.46)$$

The own and cross partial Allen elasticities of substitution are obtained from (3.38) and (3.39):

$$\sigma_{ii} = \sigma(1-(1/w_i)) \quad \text{and} \quad \sigma_{ih} = \sigma \qquad (3.47)$$

The own and cross price elasticities of import demands are also derived with the use of (3.36) and (3.37):

$$e_{ii} = \sigma\ (w_i - 1) \quad \text{and} \quad e_{ih} = \sigma\ w_h \qquad (3.48)$$

The above special case of the CRESH model is the CES model of Hickman and Lau (1973), outlined in section (2.3.3). It is more restrictive than CRESH since the substitution parameter ρ is constant over trade partners.

2). The <u>fixed-input Leontief model</u> may be derived as the limit of the CRESH model as $\rho_i \to \infty$ (ie $a_i \to 0$), or equivalently as the limit of the CES as $\rho \to \infty$ (ie $\sigma \to 0$). This is the limiting case mentioned earlier, when we considered the properties of the elasticities of substitution, where there is no substitutability between imports.

The aggregator function is obtained by considering the limit of (3.43) as $\rho \to \infty$:

$$\lim_{\rho\to\infty} \mu = \lim_{\rho\to\infty} \{1/[\Sigma_i \delta_i e^{\gamma_i t}/m_i^{\rho}]^{1/\rho}\}$$

$$= \lim_{\rho\to\infty} \{1/\ [(\delta_1 e^{\gamma_1 t}/m_1^{\rho}) + (\delta_2 e^{\gamma_2 t}/m_2^{\rho}) + \ldots + (\delta_n e^{\gamma_n t}/m_n^{\rho})]^{1/\rho}$$

$$= \lim_{\rho\to\infty} \{\ m_1\ /\ [\delta_1 e^{\gamma_1 t} + \delta_2 e^{\gamma_2 t} (m_1/m_2)^{\rho} + \ldots + \delta_n e^{\gamma_n t} (m_1/m_n)^{\rho}]^{1/\rho}\}$$

When $m_1<m_i$ for $i\neq 1$, then $\lim_{\rho\to\infty} (m_1/m_i)^{\rho}=0$, and since also $\lim_{\rho\to\infty} (\delta_i e^{\gamma_i t})^{1/\rho}=1$, then $\lim_{\rho\to\infty} \mu$ for $m_1<m_2,\ldots,m_n$, is m_1.

When $m_2<m_1,m_3,\ldots,m_n$,

$$\lim_{\rho\to\infty} \mu = \lim_{\rho\to\infty} \{m_2/[\delta_1 e^{\gamma_1 t}(m_2/m_1)^{\rho}+\delta_2 e^{\gamma_2 t}+\ldots+\delta_n e^{\gamma_n t}(m_2/m_n)^{\rho}]^{1/\rho}\} = m_2$$

and so on, for the rest of imports. So, the aggregator function for the n importing regions is:

$$\mu = \min \{m_1,\ldots,m_n\} \tag{3.49}$$

The bilateral import demand equations (3.45)/(3.46) become:

$$m_i = \mu \tag{3.50}$$

indicating that imports from partner i are not related to prices, but depend solely on the total import requirements μ of the importing region.

The partial elasticities of substitution are zero, reflecting the non-substitutability between imports from different regions. The own and cross import elasticities are also zero; the demand for imports from any region does not depend on prices.

3). The <u>Cobb-Douglas model</u> can be derived from CRESH when $a_i=1$ $(\rho_i=0)$, or $\sigma=1$ $(\rho=0)$ for the CES model. The limit of (3.43) as $\rho\to 0$ is indeterminate. Taking logs of both sides of (3.43) yields:

$$\ln \mu = -(1/\rho)\ \ln[\Sigma_i\delta_i e^{\gamma_i t} m_i^{-\rho}] = -(1/\rho)\ \ln[\Sigma_i\delta_i e^{\gamma_i t} e^{-\rho \ln m_i}]$$

By L'Hopital's rule we have the following results:

$$\lim_{\rho\to 0} \ln\mu = \lim_{\rho\to 0} [f(\rho)/g(\rho)] = \lim_{\rho\to 0} [f(\rho)'/g(\rho)']$$

where $\quad g(\rho)=\rho \quad$ and $\quad f(\rho)=-\ln[\Sigma_i\delta_i e^{\gamma_i t} e^{-\rho\ln m_i}]$

Thus, $g(\rho)'=1$, and $f(\rho)'=[\Sigma_i\delta_i e^{\gamma_i t}\ln m_i e^{-\rho\ln m_i}]/[\Sigma_i\delta_i e^{\gamma_i t} e^{-\rho\ln m_i}]$

$$\therefore \quad \lim_{\rho\to 0} \ln\mu = \lim_{\rho\to 0} \{[\Sigma_i\delta_i e^{\gamma_i t}(\ln m_i)m_i^{-\rho}]/[\Sigma_i\delta_i e^{\gamma_i t} m_i^{-\rho}]\}$$

$$= (\Sigma_i\delta_i e^{\gamma_i t}\ln m_i)/(\Sigma_i\delta_i e^{\gamma_i t}) = \ln(\Pi_i m_i^{\delta_i e^{\gamma_i t}})/(\Sigma_i\delta_i e^{\gamma_i t})$$

Using the normalization $\Sigma_i\delta_i e^{\gamma_i t}=1$, we have:

$$\lim_{\rho\to 0} \ln\mu = \ln(\Pi_i m_i^{\delta_i e^{\gamma_i t}})$$

Hence,
$$\mu = \Pi_i m_i^{\delta_i e^{\gamma_i t}} \tag{3.51}$$

The partial Allen elasticities of substitution are $\sigma=1$, and the import elasticities of demand are:

$$e_{ii} = (w_i - 1) \quad \text{and} \quad e_{ih} = w_h \tag{3.52}$$

4). The <u>Linear Expenditure System (LES)</u> is derived when $a_i\to\infty$ ($\rho_i\to-1$) for the CRESH or when $\sigma\to\infty$ for the CES model. This is the other limiting case of the elasticities of substitution. Here, there is perfect substitutability between the imports of two regions.

The LES aggregator function is derived by letting $\rho=-1$ in (3.43).

$$\mu = \Sigma_i\delta_i e^{\gamma_i t} m_i \tag{3.53}$$

Both the partial elasticities of substitution and the import demand elasticities tend to infinity, reflecting the perfect substitutability between the imports of different trade partners. If the price of imports from a partner is lower than the prices of other partners, then all the imports in the importing region would come from the partner with the lowest price. The result is a corner solution.

3.3.5). Extensions of the simple CRESH model.

The CRESH aggregator function (3.6) used to derive our import allocation model is describing the 'technical' relationship between total imports of a region and its trade partners, assuming a producer importer. For a consumer importer, the aggregator function describes the relationship between total imports and the preferences of the importer. In either case, the simplicity or complexity of these relationships depends on the factors included in the aggregator function. Thus, imports and a time trend are included in (3.6). These factors are reflected later in the derived demand equations of the optimizing importer, as can be seen from the time trend, total imports and relative prices that appear in (3.11).

In this section we extend the CRESH aggregator function to incorporate factors, other than relative prices and time trends, which might be important in the optimizing behaviour of the importer. Such factors could reflect demand or supply elements, and they are often, in the international markets, as important as relative prices in the allocation of imports amongst trade partners.

In international trade, information is an important element in the decision to import from a particular region rather than some other one. An exporter might be better known in an import market if he sells a variety of products, thus establishing a name in the market. This is achieved easier by countries with large potential capacities, relative to other regions. Also, one of the important factors in international trade is the marketing of a product. Economies of scale are very important in marketing internationally, and it is expected that such economies show more in countries with higher capacity. Thus, the production capacity of an exporting region relative to that of its competitors is, expected to affect positively its bilateral exports in the jth import market.

Another factor that reflects the competitive position of exporters in an import market, is their ability to fulfil the import requirements of the importer, relative to their competitors. Thus, if production is at full employment in a certain region delivery times might increase, sales promotions might fall and also the ability to meet export requirements might fall because of domestic demand pressure. The competitive position of such an exporter with high <u>degree of capacity utilization</u> (or equivalently, with high demand pressure) would deteriorate relative to its competitors in a certain importing market.

We may incorporate such non-price factors in the CRESH model by introducing extra terms in (3.6). A relative capacity (potential output) and/or a relative capacity utilization (demand pressure) factor may thus be included in (3.6). Let ψ_i denote the index of exporting capacity of region i, and Ψ the corresponding CRESH 'composite' capacity index of all trade partners. Similarly, let ϕ_i be an index of the pressure of demand for region i, while Φ is the corresponding 'composite' CRESH index over all trade partners. Then (3.6), the CRESH aggregator function becomes:

$$F(\mu,\underline{m},t,\Psi,\underline{\psi},\Phi,\underline{\phi})=\Sigma_i\delta_i e^{\gamma_i t}(m_i/\mu)^{-\rho_i}(\psi_i/\Psi)^{+\zeta_i}(\phi_i/\Phi)^{-\theta_i}-1\equiv 0 \qquad (3.54)$$

where $\underline{m}$, $\underline{\psi}$ and $\underline{\phi}$ are (1xn) vectors. The same regularity conditions as with (3.6) are assumed to hold here too.

We eliminate for simplicity the pressure of demand variable ϕ, in order to consider the solution of the problem of the optimizing importer. The results are then easily extended to functions with more variables. (3.54) becomes:

$$F(\mu,\underline{m},t,\Psi,\underline{\psi})=\Sigma_i\delta_i e^{\gamma_i t}(m_i/\mu)^{-\rho_i}(\psi_i/\Psi)^{+\zeta_i}-1\equiv 0 \qquad (3.56)$$

The cost minimizing importer wants to min $\Sigma_i m_i p_i$ s.t. (3.56). This amounts to minimizing the following Lagrangean:

$$\min \quad L=\Sigma_i p_i m_i+\lambda\ [1 - \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} (\psi_i/\Psi)^{+\zeta_i}] \qquad (3.57)$$

The F.O.C. for minimizing (3.57) are:

$$\partial L/\partial m_i = p_i + \lambda\ \delta_i \rho_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i}\ m_i^{-1} (\psi_i/\Psi)^{+\zeta_i} = 0; \quad i=1,\ldots,n \qquad (3.58)$$

$$\partial L/\partial \lambda = \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} (\psi_i/\Psi)^{+\zeta_i} - 1 \equiv 0 \qquad (3.59)$$

Since the elasticity of m_i with respect to μ is 1, we can write:

$$|\lambda| = \mu\ P(p_1,\ldots,p_n,\psi_1,\ldots,\psi_n,t) \qquad (3.60)$$

where $P(.)$ is a price index which is a real positive function of the bilateral prices p_i, capacity outputs ψ_i, and time t.

Solving (3.58) for m_i and eliminating λ by using (3.60) we get the system of bilateral import demand equations at a given μ.

$$m_i = \mu\ [\,|\delta_i \rho_i| e^{\gamma_i t} (p_i/P)^{-1}]^{a_i} (\psi_i/\Psi)^{+\zeta_i}, \qquad a_i = 1/(1+\rho_i) \qquad (3.61)$$

where the CRESH price and capacity-output indices (P, Ψ) are defined implicitly, by substituting (3.61) in the budget constraint, equation (3.59), resulting in:

$$G(P,p_i,\Psi,\psi_i,t)=$$

$$=\Sigma_i \delta_i [\,|\delta_i \rho_i| e^{(-\gamma_i/\rho_i)t} (p_i/P)^{-1}]^{-a_i \rho_i} (\psi_i/\Psi)^{+\zeta_i(1-\rho_i)} - 1 \equiv 0 \qquad (3.62)$$

Because of the way we defined the CRESH 'composite' price and capacity-output indices P and Ψ in (3.62), the system still has the property of consistent aggregation and adding up. That is, μ, P and Ψ are defined so that the additive price aggregation property $P.\mu = \Sigma_i m_i p_i = M$ holds.

It is a simple matter to extend the above framework, to incorporate more relevant factors (such as the relative pressure-of-demand of a region) in the decision function of the optimizing importer. Incorporating the relative pressure of demand in the aggregator function, and solving the problem of the optimizing importer yields the following bilateral import demand equations:

$$m_i=\mu[\,|\delta_i\rho_i|e^{\gamma_i t}(p_i/P)^{-1}]^{a_i}(\psi_i/\Psi)^{+\zeta_i}(\phi_i/\Phi)^{-\theta_i},\quad a_i=1/(1+\rho_i) \tag{3.63}$$

where the CRESH 'composite' price, capacity-output and pressure-of-demand indices (P, Ψ and Φ) which ensure adding up, are defined implicitly in the following:

$$G(P,p_i,\Psi,\psi_i,\phi_i,\Phi,t)=$$
$$=\Sigma_i\delta_i[\,|\delta_i\rho_i|e^{(-\gamma_i/\rho_i)t}(p_i/P)^{-1}]^{-a_i\rho_i}[(\psi_i/\Psi)^{+\zeta_i}(\phi_i/\Phi)^{-\theta_i}]^{(1-\rho_i)}-1\equiv 0 \tag{3.64}$$

The pressure of demand variable for some exporting region i is measured by the ratio of actual output to capacity output. Let us denote this ratio for region i by q_i/ψ_i, and the corresponding CRESH ratio in some importing region j by Q/Ψ, where Q is again defined implicitly in a similar way to Ψ. Let us further take the last two terms of (3.63), which become now:

$$(\psi_i/\Psi)^{+\zeta_i}[(q_i/\psi_i)/(Q/\Psi)]^{-\theta_i} \tag{3.65}$$

In the long run, we have full employment and $q_i=\psi_i$. The last term in the above becomes unity, and we go back to model (3.61).

Since the estimates of ζ_i and $-\theta_i$ are close to unity, (3.65) reduces to q_i/Q, and the import demand equations become:

$$m_i=\mu[\,|\delta_i\rho_i|e^{\gamma_i t}(p_i/P)^{-1}]^{a_i}(q_i/Q),\qquad a_i=1/(1+\rho_i) \tag{3.66}$$

which is the gravity model.

In the short run capacity is fairly constant. That is, $(\psi_i/\Psi)=K$. In this case the import demand function becomes:

$$m_i = \mu \, [\,|\delta_i \rho_i| e^{\gamma_i t} (p_i/P)^{-1}]^{a_i} \, K \, (q_i/Q)^{-1}, \qquad (3.67)$$

Thus, the model behaves initially opposite to that of a gravity model.

3.4). CONCLUSION.

The aim of this chapter has been to develop an estimation consistent import allocation model, which can be turned into an empirical model. To achieve this, we have applied to the theory of import allocation models the ideas of multistage budgeting. Multistage budgeting allowed us to break the problem of the consumer-producer importer into smaller, more manageable sub-problems. In order to apply such a problem 'consistently' we had to select an aggregator function that satisfied the criteria of consistent aggregation and adding up.

Our final import allocation model is based on the CRESH function. We have adopted this function since it satisfies the conditions necessary for the existence of a consistent import allocation model, and is 'general enough' in terms of the substitution possibilities it allows between different trade partners. The CRESH function leads to a model with 'normal' looking bilateral import demand equations, for each category of goods, derived by using neoclassical optimization techniques. Economically, the important thing is the differing relative price effect between trade partners in the model. Empirically, the important thing is the high level of disaggregation we may achieve with such a specification, which is our goal in terms of our world seaborne trade model. Furthermore, The CRESH model encompasses most of the other import allocation models used in the literature, as nested models which appear when restrictions are placed on the substitution parameters between the trade partners.

Appendix 3.1.

The CRESH Import Elasticities of Demand.

The import elasticities of demand for the CRESH model are easiest derived by taking logs of (3.11), yielding:

$$\ln m_i = \ln\mu + a_i \ln(|\delta_i \rho_i|) + a_i \gamma_i t - a_i \ln(p_i/P) \qquad (1)$$

From the definition of the own and cross import elasticities of demand of (3.24) we have:

(i) $$e_{ii} \equiv \partial \ln m_i / \partial \ln p_i = -a_i (P/p_i)[\partial(p_i/P)/\partial p_i]$$

$$= -a_i (P/p_i) \ \{[P - p_i(\partial P/\partial p_i)]/P^2\}$$

At the base year values (t=0), prices are 1. The above then reduces to:

$$e_{ii}|_{t=0} = -a_i[1 - (\partial P/\partial p_i)|_{t=0}] \qquad (2)$$

From equation (32), Appendix 4.1 we have:

$$(\partial P/\partial p_i)|_{t=0} = (w_i^0 a_i)/(\Sigma_h w_h^0 a_h) \qquad (3)$$

which, when used in (2) yields:

$$e_{ii}|_{t=0} = (w_i^0 a_i^2/a) - a_i \qquad (4)$$

The latter is (3.36) at the base year values.

(ii) Similarly, $e_{ih} \equiv \partial \ln m_i / \partial \ln p_h = -a_i (P/p_i)[\partial(p_i/P)/\partial p_h]$

$$= a_i (P/p_i)(p_i/P^2)(\partial P/\partial p_h)$$

$$\therefore \qquad e_{ih}|_{t=0} = a_i (\partial P/\partial p_h)|_{t=0}$$

using $(\partial P/\partial p_h)|_{t=0} = (w_h^0 a_h)/(\Sigma_j w_j^0 a_j)$ we get (3.37) at the base year values:

$$\therefore \qquad e_{ih}|_{t=0} = a_i a_h w_h^0 \ / \ a \qquad (5)$$

CHAPTER 4

ECONOMETRIC SPECIFICATION

4.0). Introduction.

In the previous chapter we derived a set of nonlinear, but theoretically consistent, bilateral import demand equations in (3.11). The implicit CRESH indices μ (the aggregator function) and P (the composite price index) have to be defined empirically in order to be able to estimate the equations. In this chapter we use first order Taylor approximations to find analytical solutions to this problem. At the same time the nonlinearities in the system are reduced considerably, a result that helps in the computational solution of the system. The non-availability of data on bilateral seaborne import prices force us to reformulate the model.

This chapter is in six main sections. In the first, we consider the Taylor linearization of equations (3.11). A similar approximation is also derived for equations in logarithms and logarithmic first differences. In the second, we introduce dynamics and we discuss a sequence of nested models, created by restrictions on the dynamic mechanisms. In the third, we further linearize the system in order to able to identify all the structural parameters, and also arrive at a more easily estimable system. In the fourth section, we consider restrictions placed on the model by the non-availability of bilateral import prices for each commodity. Proxies are introduced and a framework for testing the restricted models and the functional form is suggested. In the fifth section, we consider some estimation problems which arise due to the introduction of these proxies. The concept of the bilateral import price elasticities is also altered, and the new price elasticities arising are derived here. In the sixth section, we examine a number of nested models (CES, Cobb-Douglas, Linear Expenditure System, Leontief fixed factors models) by placing restricions on the parameters of the system. This reflects restrictions on the initial preference/technology structure of the optimizing trade partners.

4.1). Linearizing the Import Allocation Model.

The bilateral import demand equations resulting from the classical optimization problem of the importer were derived in the previous chapter in equations (3.11), repeated here for convenience.

$$m_i = \mu \, [\,|\delta_i \rho_i| e^{\gamma_i t} (p_i/P)^{-1}]^{a_i}, \qquad a_i = 1/(1+\rho_i) \tag{4.1}$$

These equations are nonlinear and the CRESH indices μ (the aggregator -utility or production- function) and P (the composite price index) are unobservable. These problems must be overcome in order to be able to turn the system into an empirical form.

We may eliminate μ by summing both sides of (4.1) over the exporting regions i to get:

$$\Sigma_i m_i = \mu \, \Sigma_i [\,|\delta_i \rho_i| e^{\gamma_i t} (p_i/P)^{-1}]^{a_i} \qquad \text{where} \qquad \Sigma_i m_i \equiv m$$

Solving this equation for μ and substituting back into (4.1) eliminates the unobservable μ, giving:

$$m_i = m \, [\,|\delta_i \rho_i| e^{\gamma_i t} (p_i/P)^{-1}]^{a_i} \{\Sigma_k [\,|\delta_k \rho_k| e^{\gamma_k t} (p_k/P)^{-1}]^{a_k}\}^{-1} \tag{4.2}$$

It may be easily verified that adding up is satisfied by summing up both sides of (4.2).

If we can further make the assumption that the combined price index P is a fixed weighted average of the bilateral import prices p_i, where the weights are, say, the base year import shares $w_i^0 = (m_i^0/m^0)$, then we can write $P = \Sigma_i w_i^0 p_i$ as the empirical counterpart of P in (4.2).

All the variables in (4.2) are now defined empirically but we are faced with the estimation of a highly nonlinear system of equations. Estimating such a system may be achieved by a number of methods, cfr Maddala(1977, p 171-174). The Taylor approximation around some set of values seems to be the most fruitful answer empirically. This involves linearizing the set of equations around some initial parameter values chosen in an iterative procedure. For practical purposes, when dealing with large models, convergence might be computationally expensive and often not possible. As a result, it is desirable to derive an analytical solution to the linearization problem, reduce the system to a more linear version, and let further linearizations if necessary be achieved computationally.

Following Italianer(1986), we propose three different approximations to (4.1), which eliminate the unobservable μ, solve the problem of defining the price index P (in a non ad-hoc manner), and at the same time linearize the import allocation model. These approximations involve variables in levels, logarithms and logarithmic first differences.

4.1.1). Variables in Levels.

When the unobserved import quantity index μ is eliminated we obtain equation (4.2), with the composite price index P still to be defined for empirical purposes. A first order Taylor expansion of (4.2) around the base year values, say, $m=m^0$, $t=0$ and $p_i=1$, $\forall$ i gives. (The proof of this is relegated to appendix 4.1).

$$m_i=w_i^0m + m_i^0c_it - m_i^0a_i[p_i- \Sigma_h(w_h^0a_h/a^0)p_h], \ \forall \ i=1,\dots,n, \qquad (4.3)$$

where

$$c_i=a_i[\gamma_i+ \Sigma_h(w_h^0a_h/a^0)(\gamma_h/\rho_h)]-\Sigma_hw_h^0(\gamma_h/\rho_h)], \ \forall \ i=1,\dots,n, \qquad (4.4)$$

and a^0 is a weighted average of the a_i's

$$a^0=\Sigma_h w_h^0 a_h \tag{4.5}$$

and $w_i^0=(m_i^0/m^0)$ are the base year import shares with the property that $\Sigma_i w_i^0 = 1$.

From (4.4) we can see that $\Sigma_i w_i^0 c_i=0$, and as a consequence $\Sigma_i m_i^0 c_i=0$. Summing both sides of (4.3) over i gives,

$$\Sigma_i m_i = \Sigma_i w_i^0 m + \Sigma_i m_i^0 c_i t - \Sigma_i m_i^0 a_i p_i + \Sigma_i m_i^0 a_i (1/\Sigma_j w_j^0 a_j)(1/m^0)\Sigma_h m_h^0 a_h p_h$$

which, with the use of $\Sigma_i m_i^0 c_i=0$, results in $\Sigma_i m_i=m$. That is, adding up is automatically satisfied. Thus, attaching an error term to (4.3) and estimating the system of equations will guarantee adding up by construction. On the other hand, defining P arbitrarily by $P=\Sigma_i w_i^0 p_i$, as suggested earlier, fails to meet adding up.

4.1.2). Variables in Logarithms.

Transforming the model to log-linear form by taking logarithms of both sides of (4.2) violates adding-up. The alternative is to proceed from (4.1) by taking logs of both sides, giving:

$$\ln m_i = \ln \mu + a_i[\ln |\delta_i \rho_i| + \gamma_i t - \ln (p_i/P)] \;;\quad i=1,\ldots,n \tag{4.6}$$

where the corresponding CRESH price index lnP, which guarantees consistency of aggregation, is now defined implicitly (through the first order conditions derived in chapter 3) by:

$$\Sigma_i \delta_i \exp\{a_i[-\rho_i[\ln|\delta_i\rho_i|+\gamma_i t+\rho_i \ln(p_i/P)]\}-1\equiv 0 \tag{4.7}$$

Now assume that the import quantity index $\bar{m}$ is defined as a weighted geometric average of the bilateral imports with weights the base year values.

$$\bar{m} = \Pi_i m_i^{w_i^0} \quad \text{that is} \quad \ln \bar{m} = \Sigma_i w_i^0 \ln m_i \tag{4.8}$$

Multiplying both sides of (4.6) by w_i^0, summing over i and solving for $\ln\mu$ gives,

$$\ln \mu = \ln \bar{m} - \Sigma_i \{ w_i^0 a_i [\ln |\delta_i \rho_i| + \gamma_i t - \ln (p_i/P)]\}$$

This may be substituted into (4.6) to eliminate $\ln\mu$, resulting in:

$$\ln m_i = \ln \bar{m} + \ln \eta_i + \bar{c}_i t - a_i \ln (p_i/P) + \Sigma_h w_h^0 a_h \ln (p_h/P) \qquad (4.9)$$

where

$$\bar{c}_i = a_i \gamma_i - \Sigma_h w_h^0 a_h \gamma_h$$

$$\ln \eta_i = a_i \ln |\delta_i \rho_i| - \Sigma_h w_h^0 a_h \ln |\delta_i \rho_i|$$

Equation (4.9) in the base year, when t=0, $m_i = m_i^0$, $\bar{m} = \bar{m}^0$ and $p_i = 1$, becomes:

$$\ln m_i^0 = \ln \bar{m}^0 + \ln \eta_i$$

Defining the share $\bar{w}_i = m_i / \bar{m}$, we observe that $\eta_i = \bar{w}_i^0$.
Hence (4.9) reduces to:

$$\ln m_i = \ln (\bar{m}\ \bar{w}_i^0) + \bar{c}_i t - a_i \ln (p_i/P) + \Sigma_h w_h^0 a_h \ln (p_h/P) \qquad (4.10)$$

as a result $\ln\mu$ does not appear in (4.10) and lnP has still to be defined for empirical purposes. A first order Taylor expansion of (4.10) around the base year values, t=0, $\ln\bar{m} = \ln\bar{m}^0$ and $\ln p_i = 0$ yields:

$$\ln m_i = \ln (\bar{w}_i^0\ \bar{m}) + c_i t - a_i [\ln p_i - \Sigma_h (w_h^0 a_h / a^0) \ln p_h] \qquad (4.11)$$

where the trend parameters c_i are defined in (4.4) and satisfy the condition $\Sigma_i w_i^0 c_i = 0$.

Multiplying both sides of (4.11) by w_i^0 ana summing over i yield:

$$\Sigma_i w_i^0 \ln m_i = \Sigma_i w_i^0 \ln (\bar{w}_i^0 \bar{m}) + \Sigma_i w_i^0 c_i t - \Sigma_i w_i^0 a_i \ln p_i + \Sigma_i w_i^0 a_i (1/a^0) \Sigma_h w_h^0 a_h \ln p_h$$

Since $\Sigma_i w_i^0 \ln(\bar{w}_i^0 \bar{m}) = \Sigma_i w_i^0 \ln m_i$ and $\Sigma_i w_i^0 c_i = 0$, the adding up restrictions are satisfied. That is, $\Sigma_i w_i^0 \ln m_i = \ln \bar{m}$.

4.1.3). Variables in Logarithmic First Differences.

An alternative form of the system may be obtained by taking the first differences of the variables in (4.11), yielding:

$$\Delta \ln m_{it} = \Delta \ln (\bar{w}_i^0 \bar{m}_t) + c_i \Delta t - a_i [\Delta \ln p_{it} - \Sigma_h (w_h^0 a_h / a^0) \Delta \ln p_{ht}] \qquad (4.12)$$

where the operator Δ for some variable x, say, is $\Delta x_t = x_t - x_{t-1}$ and $\Delta t = 1$. Adding up in the above equation is satisfied provided both sides of the equation are multiplied by w_i^0 and summed over i, and the first term on the right hand side (total imports) is $\Sigma_i w_i^0 \Delta \ln m_{it}$. The latter is the first difference form of the logarithm of the total imports variable, defined in (4.8) as a weighted geometric average of the bilateral imports m_i. Thus, rewriting (4.12) using $\Delta \ln \tilde{m}_t \equiv \Sigma_i w_i^0 \Delta \ln m_{it}$ instead of $\Delta \ln(\bar{w}_i^0 \bar{m}_t)$ yields:

$$\Delta \ln m_{it} = \Delta \ln \tilde{m}_t + c_i - a_i [\Delta \ln p_{it} - \Sigma_h (w_h^0 a_h / a^0) \Delta \ln p_{ht}] \qquad (4.13)$$

We can see below that when (4.13) is multiplied through by w_i^0 and summed over i, it satisfies adding up:

$$\Sigma_i w_i^0 \Delta \ln m_{it} = \Sigma_i w_i^0 \Delta \ln \tilde{m}_t + \Sigma_i w_i^0 c_i - \Sigma_i w_i^0 a_i \Delta \ln p_{it} + \Sigma_i w_i^0 a_i (1/a^0) \Sigma_h w_h^0 a_h \Delta \ln p_{ht}$$

where $\Sigma_i w_i^0 c_i = 0$, is used.

Alternatively, we may arrive at (4.13), with a little algebra, from the first order conditions (equations (3.8) and (3.9), derived in chapter 3 of the optimization problem of the importer. (4.13) resembles the well known Rotterdam model of consumer demand, Barten(1967).

4.2). Dynamics.

The static equations defined by (4.3) and (4.11) and the dynamic equation defined by (4.13) can be written in terms of differences in growth rates, between bilateral imports from partner i and total imports, with respect to the base year. Since the coefficients of the total trade variables is 1 (a property of the underlying CRESH aggregator function), we obtain respectively:

$$(m_i - w_i^0 m)_t / m_i^0 = c_i t - a_i [p_{it} - \Sigma_h (w_h^0 a_h / a^0) p_{ht}] \qquad (4.3')$$

$$\ln(m_i / \overline{w_i^0 m})_t = c_i t - a_i [\ln p_{it} - \Sigma_h (w_h^0 a_h / a^0) \ln p_{ht}] \qquad (4.11')$$

$$\Delta \ln(m_i / \tilde{m})_t = c_i - a_i [\Delta \ln p_{it} - \Sigma_h (w_h^0 a_h / a^0) \Delta \ln p_{ht}] \qquad (4.13')$$

We may write the above specifications as the single equation with a stochastic term ε_{it}:

$$y_{it} = c_i T - a_i [LP_{it} - \Sigma_h (w_h^0 a_h / a^0) LP_{ht}] + \varepsilon_{it} \qquad (4.14)$$

where the new variables y_{it}, T, and LP_{it} are defined appropriately. It is easily checked that adding up holds in (4.14) in the sense of $\Sigma_i w_i^0 y_{it} = 0$. Estimates of the 'structural' parameters a_i and c_i may be obtained directly from the coefficients of the estimated equations. Thus, price elasticities of demand and elasticities of substitution may be estimated through the a_i's (using equations (3.36)-(3.39)).

The γ_i parameters represent trend shifts in imports for country i. Overall, trend shifts away from one partner are allocated to the rest of the trade partners. On average, over all trade partners, trends should cancel each other out. Thus, $\Sigma_i w_i^0 \gamma_i = 0$. As will be seen later, the adding up requirement enables only (n-1) of the c_i's to be estimated since one of the equations has to be deleted for estimation. As a result, given estimates for the c_i and the a_i parameters, the n γ_i's may be estimated from the (n-1) equations (4.4), and $\Sigma_i w_i^0 \gamma_i = 0$ being the last equation needed.

4.2.1). Simple One Period Lags and Two Possible Variants.

The specification of the models represented by (4.14) are overly simple. However, dynamics and time lags between changes in variables that determine trade flows and the flows themselves are often important in international trade. Lags may be important because of imperfect information in the market, especially when importing from markets which are geographically and culturally distant. Production and delivery lags are important for certain categories of products. Random, one-off, events (such as the oil crisis) also have a role to play. We may thus extend the static model to include simple one period lags. Assuming common lag coefficients, λ, ξ, between trade partners write (4.14) as:

$$
\begin{aligned}
y_{it} = {} & c_i T - a_i \, [LP_{it} - \Sigma_h (w^0_h a_h / a^0) \; LP_{ht}] + \lambda \, y_{it-1} \\
& + \xi \, \{c_i (T-1) - a_i [LP_{it-1} - \Sigma_h (w^0_h a_h / a^0) \; LP_{ht-1}]\} + \varepsilon_{it}
\end{aligned}
\qquad (4.15)
$$

By placing restrictions on the above simple dynamic structure we may obtain a number of economically meaningful models:

a). When $(1+\xi)(c_i - a_i) = 1$ we have the <u>error correction model</u>:

$$
\begin{aligned}
\Delta y_{it} = {} & \{c_i \Delta T - a_i \, [\Delta LP_{it} - \Sigma_h (w^0_h a_h / a^0) \; \Delta LP_{ht}]\} \\
& + (1-\lambda)\{[(T-1)-(LP_{it-1} - \Sigma_h (w^0_h a_h / a^0) LP_{ht-1})] - y_{it-1}\} + \varepsilon_{it}
\end{aligned}
\qquad (4.16)
$$

This equation indicates that y_{it} is obtained from y_{it-1} by adding a random shock ε_{it}, a portion of the change in $\{T-[LP_i - \Sigma_h (w^0_h a_h / a^0) LP_h]\}$, and a portion of the deviation from the equilibrium value of the previous period, $(\{(T-1)-[LP_{it-1} - \Sigma_h (w^0_h a_h / a^0) LP_{ht-1}]\} = y_{it-1})$. Despite its nice economic interpretation, adding up does not hold. We can see that by multiplying through by the base year import share and summing over i:

$$\Sigma_i w_i^0 \Delta y_{it} = \Sigma_i w_i^0 \{c_i \Delta T - a_i\ [\Delta LP_{it} - \Sigma_h (w_h^0 a_h / a^0)\ \Delta LP_{ht}]\}$$

$$+(1-\lambda)[\Sigma_i w_i^0 (T-1) - \Sigma_i w_i^0 LP_{it-1} + \Sigma_i w_i^0 (1/a^0) \Sigma_h w_h^0 a_h LP_{ht-1} - \Sigma_i w_i^0 y_{it-1}]$$

$$=(1-\lambda)[\Sigma_i w_i^0 (T-1) - \Sigma_i w_i^0 LP_{it-1} + \Sigma_i w_i^0 (1/a^0) \Sigma_h w_h^0 a_h LP_{ht-1}]$$

$$\neq 0.$$

b). When $\xi=0$ in (4.14) we have the <u>partial adjustment model</u>:

$$y_{it} = c_i T - a_i\ [LP_{it} - \Sigma_h (w_h^0 a_h / a^0)\ LP_{ht}] + \lambda\ y_{it-1} \tag{4.17}$$

Adding up holds here since $\Sigma_i w_i^0 y_{it} = 0$. We further discuss the economic interpretation of this model below when we combine it with a model of adaptive expectations. In that way we form a general dynamic structure against which we can test more restrictive, parsimonious models.

4.2.2). A 'Mixed' System of Adaptive Expectations and Partial Adjustment.

Dynamics may, alternatively, be introduced in (4.14) by assuming some expectations formation mechanism for the price variables entering the equations. The introduction of expectations is justified since the importer may not have perfect information about prices. He might thus have to speculate on future delivery prices on the basis of past price information. In particular, we assume Adaptive Expectations first proposed by Cagan(1956). It is asserted that expectations of prices are generated by revising the previous period's expectations, by a fraction of the error in expectations in the previous period (the difference between the actual and expected prices of the previous period). Mathematically:

$$LP_t^e = LP_{t-1}^e + \lambda\ (LP_{t-1} - LP_{t-1}^e) \quad ; \ 0 \leq \lambda \leq 1. \tag{4.18}$$

Essentially this amounts to forming expected current prices as a function of weighted past prices, where the weights are declining geometrically as we go back in time:

$$LP^{e}_{t} = (1-\lambda) \sum_{h=0}^{\infty} \lambda^{h} LP_{t-h} \tag{4.19}$$

If production and delivery lags are also important we can let the dependent variable y^{*}_{it} represent the desired rather than the actual value of y_{it}. Assuming then that there are some costs of adjustment which involve adjusting y_i by part of the discrepancy between y_{it-1} and y^{*}_{it}, we may write the partial adjustment mechanism as:

$$y_{it} = (1-\theta)\ y_{it-1} + \theta\ y^{*}_{it} \qquad 0 \le \theta \le 1 \tag{4.20}$$

or equivalently

$$y_{it} = y_{it-1} + \theta\ (\ y^{*}_{it} - y_{it-1}) \tag{4.20'}$$

Thus, if both adjustment costs and price expectations are important we may rewrite (4.14) as:

$$y^{*}_{it} = c_i T - a_i [LP^{e}_{it} - \Sigma_h (w^{0}_{h}\ a_h / a^{0}) LP^{e}_{ht}] + \varepsilon_{it} \tag{4.21}$$

Incorporating (4.19) and (4.20) in (4.21) yields a 'mixed' model of Adaptive Expectations (AE) and Partial Adjustment (PA):

$$y_{it} = (1-\theta) y_{it-1} + \theta c_i T - \theta a_i [(1-\lambda) \sum_{h=0}^{\infty} \lambda^{h} LP_{it-h} - \Sigma_l (w^{0}_{l} a_l / a^{0}) (1-\lambda) \sum_{h=0}^{\infty} \lambda^{h} LP_{lt-h}] + \theta \varepsilon_{it}$$

The infinite price lags may be truncated for estimation purposes by the Koyck transformation (Koyck(1954)). This amounts to subtracting a multiple λ of the above equation from itself, yielding:

$$\begin{aligned} y_{it} = {} & (1-\theta+\lambda)\ y_{it-1} - \lambda\ (1-\theta)\ y_{it-2} + \theta\ (1-\lambda)\ c_i T + \lambda\ \theta\ c_i \\ & - \theta\ (1-\lambda) a_i [LP_{it} - \Sigma_h (w^{0}_{h} a_h / a^{0}) LP_{ht}] + \theta(\varepsilon_{it} - \lambda \varepsilon_{it-1}) \end{aligned} \tag{4.22}$$

Writing the system in general form for estimation purposes yields:

$$y_{it}=Ay_{it-1}+By_{it-2}+C_iT+D_i+E_i[LP_{it}-\Sigma_h(w_h^0a_h/a^0)LP_{ht}]+\theta(\varepsilon_{it}-\lambda\varepsilon_{it-1}) \quad (4.23)$$

Note that in (4.22)/(4.23):

a). Adding up is satisfied since $\Sigma_i w_i^0 y_{it}=0$.

b). for the model in logarithmic differences there is no trend term, while the constant is $\theta(1-\lambda)c_i$. The latter picks up any trends in this model.

c). the error term has now become first order moving average MA(1), as a result of applying the Koyck transformation. Thus, if the original stochastic term is white noise an MA(1) would be introduced, while if serial correlation is originally present it could be removed as a result. This is a matter of empirical testing.

d). Only ratios of the parameters a_i and c_i may be calculated. They can not be identified individually.

e). the structural parameters of the expectations' mechanisms, θ and λ, cannot be identified. We can see that by solving for θ and λ from: $A=1-\theta+\lambda$ and $B=-\lambda(1-\theta)$, resulting in the quadratic equation $\lambda^2-A\lambda-B=0$ with roots:

$$\lambda_1=(1/2)[A+\surd(A^2+4B)] \qquad \lambda_2=(1/2)[A-\surd(A^2+4B)]$$

and the corresponding solutions for θ are:

$$(1-\theta_1)=(1/2)[A-\surd(A^2+4B)] \qquad (1-\theta_2)=(1/2)[A+\surd(A^2+4B)]$$

Thus, because of the way θ and λ enter symmetrically in the system we cannot determine which value is θ and which is λ.

Despite not being able to identify the structural parameters from (4.23), the system may be estimated using appropriate econometric techniques. If forecasting is the primary aim of estimation, identification of the structural parameters may not be essential, as long as the model can predict the data 'well'.

The adaptive expectations, partial adjustment and static systems may be obtained by restrictions on the coefficients of the 'mixed' model (4.22)/(4.23).

4.2.3). *Adaptive Expectations(AE) Systems:*

When $\theta=1$, we have the Adaptive Expectations model:

$$y_{it}= \lambda\, y_{it-1} + (1-\lambda)\, c_i\, T + \lambda\, c_i -(1-\lambda)a_i[LP_{it}-\Sigma_h(w_h^0 a_h/a^0)LP_{ht}]+ (\varepsilon_{it}-\lambda\varepsilon_{it-1}) \tag{4.24}$$

This may be tested against the 'mixed' model by a t test on B in equation (4.23). The estimating model is now:

$$y_{it}=A'y_{it-1}+C_i'T+D_i'+E_i'[LP_{it}-\Sigma_h(w_h^0 a_h/a^0)LP_{ht}]+(\varepsilon_{it}-\lambda\varepsilon_{it-1}) \tag{4.24'}$$

The structural parameters may be identified in this model from the estimated parameters of (4.24') as: $\lambda=A'$, $a_i=E_i'/(A'-1)$, $c_i=D_i'/A'$.

The adaptive expectations model of (4.24) with the variables substituted in is shown below:

$$(m_i-w_i^0 m)_t/m_i^0=\lambda(m_i-w_i^0 m)_{t-1}/m_i^0+c_i(1-\lambda)t+c_i\lambda-a_i(1-\lambda)[p_{it}-\Sigma_h(w_h^0 a_h/a^0)p_{ht}]$$

$$\ln(m_i/\overline{w_i^0 m})_t=\lambda\ln(m_i/\overline{w_i^0 m})_{t-1}+c_i(1-\lambda)t+c_i\lambda-a_i(1-\lambda)[\ln p_{it}-\Sigma_h(w_h^0 a_h/a^0)\ln p_{ht}]$$

$$\Delta\ln(m_i/\tilde{m})_t=\lambda\Delta\ln(m_i/\tilde{m})_{t-1}+c_i(1-\lambda)-a_i(1-\lambda)[\Delta\ln p_{it}-\Sigma_h(w_h^0 a_h/a^0)\Delta\ln p_{ht}]$$

4.2.4). *Partial Adjustment(PA) Systems:*

when $\lambda=0$, we have the Partial Adjustment Model:

$$y_{it}=(1-\theta)y_{it-1}+\theta c_i T-\theta a_i[LP_{it}-\Sigma_h(w_h^0 a_h/a^0)LP_{ht}]+\theta\varepsilon_{it} \tag{4.25}$$

The estimating model is in this case:

$$y_{it}=A''y_{it-1}+C_i''T+E_i''[LP_{it}-\Sigma_h(w_h^0a_h/a^0)LP_{ht}]+\theta\varepsilon_{it} \qquad (4.25')$$

The 'structural' parameters can be identified in this model through: $\theta=1-A''$, $c_i=C_i''/(1-A'')$ and $a_i=E_i''/(1-A'')$. Here the error term has become white noise again.

The PA model may be tested against the 'mixed' model by an F test on $B=D_i=0$ in equation (4.23). Also, the partial adjustment model may be tested against the more general AE's model by a t test on $D_i'=0$.

Substituting the actual variables in (4.25) yield:

$$(m_i-w_i^0m)_t/m_i^0=(1-\theta)(m_i-w_i^0m)_{t-1}/m_i^0+\theta c_it-\theta a_i[p_{it}-\Sigma_h(w_h^0a_h/a^0)p_{ht}]$$

$$\ln(m_i/\overline{w_i^0m})_t=(1-\theta)\ln(m_i/\overline{w_i^0m})_{t-1}+\theta c_it-\theta a_i[\ln p_{it}-\Sigma_h(w_h^0a_h/a^0)\ln p_{ht}]$$

$$\Delta\ln(m_i/\tilde{m})_t=(1-\theta)\Delta\ln(m_i/\tilde{m})_{t-1}+\theta c_i-\theta a_i[\Delta\ln p_{it}-\Sigma_h(w_h^0a_h/a^0)\Delta\ln p_{ht}]$$

4.2.5). Static Systems:

When $\lambda=0$ and $\theta=1$ we end up with the static models of (4.14).
This may be tested against the 'mixed' model with an F test on $A=B=D_i=0$. Similarly, an F test on $A'=D_i'=0$, will test the Static system against the AE systems. A t test on $A''=0$ will test the Static versus the PA systems.

4.3). Linearizing further.

The equations of the 'mixed' model (4.22) and its restricted versions (equations (4.24), (4.25) and (4.14)) are still highly nonlinear in the 'structural' parameters a_i. Let us linearize the system further by taking a first order Taylor expansion around some value $a=\Sigma_iw_ia_i$, a weighted average of the a_i's. The resulting equations are:

$$y_{it} = (1-\theta+\lambda)y_{it-1} - \lambda(1-\theta)\, y_{it-2} + \theta\,(1-\lambda)b_i T + \lambda\,\theta\, b_i$$

$$-\theta(1-\lambda)a_i[LP_{it}-\Sigma_h w_h^0 LP_{ht}]+\theta(1-\lambda)\Sigma_i w_i^0 a_i[LP_{it}-\Sigma_h w_h^0 LP_{ht}]+\theta(\varepsilon_{it}-\lambda\varepsilon_{it-1}) \tag{4.26}$$

where

$$b_i = a_i\gamma_i - \Sigma_h w_h^0\, a_h\, \gamma_h + [a/(1-a)](a_i - \Sigma_h w_h^0 \gamma_h)\ \Sigma_h w_h^0 \gamma_h \tag{4.27}$$

Again, for the model in logarithmic differences, there is no trend term, while the constant is $\theta(1-\lambda)c_i$.

Using $\Sigma_i w_i^0 \gamma_i = 0$ (as in section 4.2), (4.27) reduces to:

$$b_i = a_i\gamma_i - \Sigma_h w_h^0\, a_h\, \gamma_h \tag{4.28}$$

As with the c_i's earlier on, it can be easily seen that the sum of a weighted average of the b_i's is also zero:

$$\Sigma_i w_i^0\, b_i = 0 \tag{4.29}$$

As a result, adding up is automatically satisfied since $\Sigma_i w_i^0 y_{it}=0$. (4.26) shows that differences of growth rates of bilateral imports, of region j from i and total imports, with respect to the base year depend on the last two years' differences in growth rates, on time trend factors, on the relative import price from i with respect to a weighted import price from all trade partners, and on a weighted factor of the latter relative import price where the weights are $w_i^0 a_i$.

We may write the further-linearized 'mixed' model for estimation purposes as follows:

$$y_{it} = A\ y_{it-1} + B\ y_{it-2} + C_i T + D_i + E_i\ [LP_{it} - \Sigma_h w_h^0 LP_{ht}]$$

$$+ F\ \Sigma_i w_i^0 a_i [LP_{it} - \Sigma_h w_h^0 LP_{ht}] + \theta\ (\varepsilon_{it} - \lambda\varepsilon_{it-1}) \tag{4.26'}$$

The structural parameters of the system are then identified by:

$$a_i=-(E_i/F), \qquad b_i=(C_i/F), \tag{4.30}$$

and there remain the γ_i's, λ and θ to be determined. Again given estimates for the b_i's and a_i's the γ_i's may be estimated from $\Sigma_i w_i^0 \gamma_i=0$ and the (n-1) equations (4.28).

However, λ and θ enter symetrically the equation and they still cannot be determined. Only one of them may be determined at the time, which amounts to assuming either adaptive expectations or partial adjustment only. Still, the system can be estimated in the usual way. If λ and θ are not of direct interest to us, we observe that the rest of the structural parameters needed to calculate elasticities and trends can be well identified. Also, nothing impeeds us to use (4.26') for forecasting.

Note also that $-E_i=a_i\theta(1-\lambda)$ may be interpreted as the short run a_i's, and we may therefore calculate short run own and cross price elasticities of substitution.

Again, placing restrictions on the coefficients of the 'mixed' model enables us to arrive at either the adaptive expectations, the partial adjustment or the static system.

a). When $\theta=1$, we obtain the <u>Adaptive Expectations model</u>:

$$\begin{aligned} y_{it} = \lambda\ y_{it-1} + (1-\lambda)\ b_i T + \lambda\ b_i - (1-\lambda) a_i [LP_{it} - \Sigma_h w_h^0 LP_{ht}] \\ + (1-\lambda)\ \Sigma_i w_i^0 a_i\ [LP_{it} - \Sigma_h w_h^0\ LP_{ht}] + (\varepsilon_{it} - \lambda\varepsilon_{it-1}) \end{aligned} \tag{4.31}$$

That is, B=0 in (4.26').

For the model in logarithmic differences there is no trend term and the constant becomes $(1-\lambda)b_i$.

(4.31) in its estimating form becomes:

$$y_{it} = A' y_{it-1} + C_i' T + D_i' + E_i' [LP_{it} - \Sigma_h w_h^0 LP_{ht}]$$

$$+ F' \{ \Sigma_i w_i^0 a_i \, [LP_{it} - \Sigma_h w_h^0 LP_{ht}] \} + (\varepsilon_{it} - \lambda \varepsilon_{it-1}) \tag{4.31'}$$

where the structural parameters are identified through: $\lambda = A'$, $a_i = -(E_i'/F')$ and $b_i = (D_i'/A')$.

b). When $\lambda=0$, we obtain the <u>Partial Adjustment model</u>:

$$y_{it} = (1-\theta) \, y_{it-1} + \theta \, b_i T - \theta \, a_i [LP_{it} - \Sigma_h w_h^0 LP_{ht}]$$

$$+ \theta \, \Sigma_i w_i^0 a_i [LP_{it} - \Sigma_h w_h^0 LP_{ht}] + \theta \, \varepsilon_{it} \tag{4.32}$$

That is, $B=D_i=0$ in (4.26'). For the model in logarithmic first differences T=1.

(4.32) in its estimating form is:

$$y_{it} = A'' y_{it-1} + C_i'' T + E_i'' [LP_{it} - \Sigma_h w_h^0 \, LP_{ht}]$$

$$+ F'' \{ \Sigma_i w_i^0 a_i \, [LP_{it} - \Sigma_h w_h^0 \, LP_{ht}] \} + \theta \, \varepsilon_{it} \tag{4.32'}$$

where the structural parameters are identified by: $\theta = F''$, $a_i = -(E_i''/F'')$ and $b_i = (C_i''/F'')$.

c). When both $\theta=1$ and $\lambda=0$, we have the <u>Static model</u>:

$$y_{it} = b_i T - a_i \, [LP_{it} - \Sigma_h w_h^0 LP_{ht}] + \Sigma_i w_i^0 a_i [LP_{it} - \Sigma_h w_h^0 LP_{ht}] + \varepsilon_{it} \tag{4.33}$$

That is, $B=D_i=A=0$ and $F=1$ in (4.26').

Finally, the models represented by (4.26)/(4.26') and its restricted versions are still nonlinear in the parameters, except when $\theta=1$, $\lambda=0$; that is, when there are no dynamics in the system. However, the nonlinearities are considerably reduced and that makes it a lot easier to estimate the model computationally. In addition, all the structural parameters, including γ_i, are identified (except of course of the dynamic parameters λ and θ in the 'mixed' model, as explained earlier on).

4.4). Restrictions Imposed by the Data.

In the systems developed above, the LP_i's represent bilateral seaborne import prices of region j from its trade partners i ($i=1,\ldots,n$) for good k ($k=1,\ldots,g$) in either levels, logarithms or logarithmic first differences. As we discuss in the next chapter values of these bilateral price variables (for either seaborne trade or general trade) are not available. The alternative is to use proxies based on the available data, which purport to describe the actual required prices.

Let the bilateral import prices of j from i for good k ($LP_i \equiv LP^k_{ij}$) be a weighted average of the total export prices of region i, the total import prices of region j and the world prices of good k. That is, $LP^k_{ij}=f(XP_i, MP_j, WP_k)$. We may further assume that we can use a Cobb-Douglas function to represent the relationship.

Let the variables be in levels:

$$p^k_{ij} \equiv p_i = xp_i^{\alpha} \; mp_j^{\beta} \; wp_k^{(1-\alpha-\beta)} \tag{4.34}$$

with variables in logarithms:

$$\ln p^k_{ij} \equiv \ln p_i = \alpha \ \ln xp_i + \beta \ \ln mp_j + (1-\alpha-\beta) \ \ln wp_k \tag{4.35}$$

with variables in logarithmic first differences:

$$\Delta\ln p^k_{ij} \equiv \Delta\ln p_i = \alpha \ \Delta\ln xp_i + \beta \ \Delta\ln mp_j + (1-\alpha-\beta) \ \Delta\ln wp_k \tag{4.36}$$

where α and β are parameters to be determined at the estimation stage (the alternative is to impose a priori values on these parameters), and $0 \le \alpha, \ \beta \le 1$. We also assume that α and β are common across trade partners.

4.4.1). 'Mixed' Systems.

Substituting (4.34)-(4.36) into equation (4.26') -the 'mixed' model- yields:

a). Variables in Levels:

$$y_{it}=Ay_{it-1}+By_{it-2}+C_iT+D_i+E_i[xp_i^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}-\Sigma_h w_h^0\ xp_h^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}]$$

$$+\ F\ \{\Sigma_i w_i^0 a_i[xp_i^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}]-\ \Sigma_h w_h^0\ [xp_h^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}]\} \qquad (4.37)$$

b). Variables in Logarithms:

$$y_{it}=A\ y_{it-1}+B\ y_{it-2}+C_i\ T+D_i \qquad (4.38)$$

$$+E_i\{[\alpha\ln xp_i+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]-\Sigma_h w_h^0[\alpha\ln xp_h+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]\}$$

$$+F\{\Sigma_i w_i^0 a_i[\alpha\ln xp_i+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]-\Sigma_h w_h^0[\alpha\ln xp_h+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]\}$$

c). Variables in Logarithmic First Differences:

$$y_{it}=A\ y_{it-1}+B\ y_{it-2}+D_i \qquad (4.39)$$

$$+E_i\{[\alpha\Delta\ln xp_i+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]\}$$

$$+F\{\Sigma_i w_i^0 a_i[\alpha\Delta\ln xp_i+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]\}$$

where the definitions of A, B, C_i, D_i, E_i and F are the same as in (4.26'). As a result, all the properties of the system before the introduction of the proxies still hold. Thus, adding up for example is satisfied for all three equations in the sence of $\Sigma_i w_i^0 y_{it}=0$.

The question that arises here, is whether these new formulations can be derived from the preference structures of the individual importer, which are now altered. That is, xp_i, mp_j and wp_k take the place of $p^k_{ij}(\equiv p_i)$ in the objective function of the importer. In fact, it is not difficult to derive (4.37)-(4.39) from this altered objective function. The proof is slightly more complicated but runs along the same lines as that of appendix 4.1 and the steps followed to derive (4.26). The formulation of this new problem of the importer is presented in appendix 4.2.

The advantage of defining bilateral import prices in this way is that the weights of its constituent parts are determined at the estimation stage (simultaneously with the other parameters), subject to the properties of the available data and the overall specification of the model. Furthermore, consistency is maintained in the system at the estimation stage.

However, having defined the bilateral import prices in this way the non-linearities in the model are increased once again. We do not attempt to further linearize the model analytically. Instead we let these linearizations be determined computationally during estimation.

We once more place restrictions on the above -'mixed'- systems of the final estimating equations, to present a clear picture of the final equations that may be chosen for estimation.

4.4.2). Adaptive Expectations Systems.

When $\theta=1$ in (4.26), we have the adaptive expectations model of (4.31)/(4.31'). Thus, when (4.34)-(4.36) are substituted in for the LP's we have:

a'). Variables in Levels:

$$y_{it}=A'y_{it-1}+C'_iT+D'_i+E'_i[xp_i^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}-\Sigma_h w_h^0\, xp_h^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}]$$

$$+ F'\{\Sigma_i w_i^0 a_i [xp_i^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}] - \Sigma_h w_h^0\ [xp_h^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}]\} \tag{4.40}$$

b'). Variables in Logarithms:

$$y_{it} = A'\ y_{it-1} + C_i'\ T + D_i' \tag{4.41}$$

$$+E_i'\{[\alpha \ln xp_i + \beta \ln mp_j + (1-\alpha-\beta) \ln wp_k] - \Sigma_h w_h^0 [\alpha \ln xp_h + \beta \ln mp_j + (1-\alpha-\beta) \ln wp_k]\}$$

$$+F'\{\Sigma_i w_i^0 a_i [\alpha \ln xp_i + \beta \ln mp_j + (1-\alpha-\beta) \ln wp_k] - \Sigma_h w_h^0 [\alpha \ln xp_h + \beta \ln mp_j + (1-\alpha-\beta) \ln wp_k]\}$$

c'). Variables in Logarithmic First Differences:

$$y_{it} = A'\ y_{it-1} + D_i' \tag{4.42}$$

$$+E_i'\{[\alpha\Delta \ln xp_i + \beta\Delta \ln mp_j + (1-\alpha-\beta)\Delta \ln wp_k] - \Sigma_h w_h^0 [\alpha\Delta \ln xp_h + \beta\Delta \ln mp_j + (1-\alpha-\beta)\Delta \ln wp_k]\}$$

$$+F'\{\Sigma_i w_i^0 a_i [\alpha\Delta \ln xp_i + \beta\Delta \ln mp_j + (1-\alpha-\beta)\Delta \ln wp_k] - \Sigma_h w_h^0 [\alpha\Delta \ln xp_h + \beta\Delta \ln mp_j + (1-\alpha-\beta)\Delta \ln wp_k]\}$$

The structural parameters of these models are determined in the same way, as those of equation (4.31'). It should also be noted that the following restrictions are placed across the estimating parameters of (4.40) and (4.41): $A'+F'=1$ and $C_i'A'-D_i'F'=0$. For model (4.42) only the linear restriction (ie $A'+F'=1$) is relevant. The error term in all the equations is the same as in (4.31).

4.4.3). Partial Adjustment Systems.

When $\lambda=0$ in (4.26), we have the partial adjustment model of (4.32)/(4.32'). Thus, when (4.34)-(4.36) are substituted in for the LP's we have:

a''). Variables in Levels:

$$y_{it}=A''y_{it-1}+C_i'T+E_i''[xp_i^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}-\Sigma_h w_h^0\ xp_h^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}]$$
$$+\ F''\{\Sigma_i w_i^0 a_i[xp_i^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}]-\Sigma_h w_h^0\ [xp_h^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}]\} \tag{4.43}$$

b''). Variables in Logarithms:

$$y_{it} = A''\ y_{it-1} + C_i''\ T \tag{4.44}$$
$$+E_i''\{[\alpha \ln xp_i+\beta \ln mp_j+(1-\alpha-\beta)\ln wp_k]-\Sigma_h w_h^0[\alpha \ln xp_h+\beta \ln mp_j+(1-\alpha-\beta)\ln wp_k]\}$$
$$+F''\{\Sigma_i w_i^0 a_i[\alpha \ln xp_i+\beta \ln mp_j+(1-\alpha-\beta)\ln wp_k]-\Sigma_h w_h^0[\alpha \ln xp_h+\beta \ln mp_j+(1-\alpha-\beta)\ln wp_k]\}$$

c''). Variables in Logarithmic First Differences:

$$y_{it} = A''\ y_{it-1} + C_i'' \tag{4.45}$$
$$+E_i''\{[\alpha\Delta \ln xp_i+\beta\Delta \ln mp_j+(1-\alpha-\beta)\Delta \ln wp_k]-\Sigma_h w_h^0[\alpha\Delta \ln xp_h+\beta\Delta \ln mp_j+(1-\alpha-\beta)\Delta \ln wp_k]\}$$
$$+F'\{\Sigma_i w_i^0 a_i[\alpha\Delta \ln xp_i+\beta\Delta \ln mp_j+(1-\alpha-\beta)\Delta \ln wp_k]-\Sigma_h w_h^0[\alpha\Delta \ln xp_h+\beta\Delta \ln mp_j+(1-\alpha-\beta)\Delta \ln wp_k]\}$$

The sructural parameters of these systems are identified in the same way as those of equation (4.32'). Furthermore, the linear restriction $A''+F''=1$ is relevant in the models.

4.4.4). Static Systems.

When $\lambda=0$ and $\theta=1$ in (4.26), we have the not so interesting static model of (4.33). When (4.34)-(4.36) are substituted in for the LP's we have:

a'''). Variables in Levels:

$$y_{it}= C_i'''T + E_i'''[xp_i^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}-\Sigma_h w_h^0\ xp_h^{\alpha}mp_j^{\beta}wp_k^{(1-\alpha-\beta)}]$$

$$+ \Sigma_i w_i^0 a_i [xp_i^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}] - \Sigma_h w_h^0\ [xp_h^{\alpha}\ mp_j^{\beta}\ wp_k^{(1-\alpha-\beta)}] \tag{4.46}$$

b'''). *Variables in Logarithms:*

$$y_{it} = C_i'''T \tag{4.47}$$

$$+E_i'''\{[\alpha\ln xp_i+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]-\Sigma_h w_h^0[\alpha\ln xp_h+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]\}$$

$$+\Sigma_i w_i^0 a_i[\alpha\ln xp_i+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k-\Sigma_h w_h^0[\alpha\ln xp_h+\beta\ln mp_j+(1-\alpha-\beta)\ln wp_k]$$

c'''). *Variables in Logarithmic First Differences:*

$$y_{it} = C_i''' \tag{4.48}$$

$$+E_i'''\{[\alpha\Delta\ln xp_i+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]\}$$

$$+\Sigma_i w_i^0 a_i[\alpha\Delta\ln xp_i+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+\beta\Delta\ln mp_j+(1-\alpha-\beta)\Delta\ln wp_k]$$

where $b_i=C_i'''$ and $a_i=E_i'''$.

4.5). Methodology, Problems and Properties of the Empirical Systems.

4.5.1). Methodology.

A number of possible estimating versions of the CRESH model have been defined in terms of Mixed systems, Adaptive Expectations(AE), Partial Adjustment(PA) and Static systems.

Ideally, concerning the dynamics of the CRESH model, we like to start from the Mixed model and by placing restrictions on its parameters arrive at some more parsimonious system of AE, PA or Static.

Once a particular system has been chosen, by placing further restrictions on its parameters we could move from the 'statistical' form of the model to the corresponding 'econometric' version. Thus, we refer to the estimating version of the AE system, say, equation (4.31'), as the statistical model, while by placing restrictions on its coefficients we arrive at what we call the econometric version of the AE model, equation (4.31). These restrictions are, $A=\lambda$, $C_i=(1-\lambda)b_i$, $D_i=\lambda b_i$, $E_i=-(1-\lambda)a_i$, $F=(1-\lambda)$.

The functional form of the selected system should also be decided upon. Should the system be in levels, in logs, or in first differences? We discuss more of this in chapter 7.

Restrictions on the estimated coefficients may reflect restrictions on the initial preferences of the optimizing agents. Thus, the significance of the trend term, for example, may be questioned by letting $\gamma_i=0$ in the above systems. Further restricted versions of the above systems are considered later in the chapter.

4.5.2). Estimation Problems of the Empirical Systems.

Data restrictions (only 18 time series observations in a system of 30 equations) have forced us to compromise. The Mixed Model involves two lags of the dependent variable. Lack of degrees of freedom forbids identification of the individual coefficients of the statistical Mixed system during estimation. Imposing the theoretical restrictions enables estimation, but the coefficients θ and λ cannot be identified individually (see section (4.2.2)).

As a result, we have to define as our most general model, a system with at most one lagged dependent variable as a regressor. This leaves us with the AE as the most general model compared to PA and Static systems. When we attempt to estimate the statistical version of this system we run into difficulties once more, due to lack of degrees of freedom. The theoretical restrictions are then imposed and this enables estimation of the econometric system.

Another problem incured during estimation, is that the price indices of total exports, xp_i, and imports, mp_j, are highly collinear. As a result only α or β can be identified at any time. In order to be able to distinguish the individual price effect of each export partner, we choose to drop the total import price index mp_j, setting $\beta=0$ throughout. Thus, the definition (4.34) of p^k_{ij} in its Cobb-Douglas form is now.

$$p^k_{ij} = xp_i^{\alpha}\ wp_k^{(1-\alpha)} \tag{4.49}$$

where $\ln(p^k_{ij})$ and $\Delta\ln(p^k_{ij})$ alter apropriately. Similarly, in all the estimating systems $\beta=0$, and the mp_j term is dropped as a result.

Thus, for some import market, j, and some traded good, k, (the subscripts j, k, omitted through out), the AE systems become ($\beta=0$):

a'). Variables in Levels:

$$y_{it}= \lambda y_{it-1}+(1-\lambda)b_i t+ \lambda b_i -(1-\lambda)a_i\{[xp_i^{\alpha}wp_k^{(1-\alpha)}]-\Sigma_h w_h^0[xp_h^{\alpha}wp_k^{(1-\alpha)}]\}$$
$$+ (1-\lambda)\ \{\ \Sigma_i w_i^0 a_i[xp_i^{\alpha}\ wp_k^{(1-\alpha)}]\ -\ \Sigma_h w_h^0\ [xp_h^{\alpha}\ wp_k^{(1-\alpha)}]\ \} \tag{4.50}$$

b'). Variables in Logarithms:

$$y_{it} = \lambda\ y_{it-1} + (1-\lambda)\ b_i\ t + \lambda\ b_i \tag{4.51}$$
$$-(1-\lambda)a_i\{[\alpha\ln xp_i+(1-\alpha)\ln wp_k]-\Sigma_h w_h^0[\alpha\ln xp_h+(1-\alpha)\ln wp_k]\}$$
$$+(1-\lambda)\{\Sigma_i w_i^0 a_i[\alpha\ln xp_i+(1-\alpha)\ln wp_k]-\Sigma_h w_h^0[\alpha\ln xp_h+(1-\alpha)\ln wp_k]\}$$

c'). Variables in Logarithmic First Differences:

$$y_{it}= \lambda\ y_{it-1} + (1-\lambda)\ b_i \tag{4.52}$$

$$-(1-\lambda)a_i\{[\alpha\Delta\ln xp_i+(1-\alpha)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+(1-\alpha)\Delta\ln wp_k]\}$$

$$+(1-\lambda)\{\Sigma_i w_i^0 a_i[\alpha\Delta\ln xp_i+(1-\alpha)\Delta\ln wp_k]-\Sigma_h w_h^0[\alpha\Delta\ln xp_h+(1-\alpha)\Delta\ln wp_k]\}$$

and similarly for the Mixed Model, the Partial Adjustment and the Static systems.

4.5.3). The Elasticities Under the New Formulation.

Having altered the system, slightly, to take account of the lack of data for bilateral prices and the empirical problems incured during estimation, we need to re-interpret the elasticities derived in section (3.3.3.4). In this new specification, the bilateral (own and cross) import price elasticities, in some import market j, are decomposed into an import elasticity (own and cross) with respect to a change in the total export price of the exporting region, and an import elasticity with respect to a change in the world price of the traded good.

Thus, the own import price elasticity, in market j from i for some good k, with respect to a change in the total export price of partner i, which we will call the **Own Export Price Elasticity**, is:

$$e_{ii}^{xp}= \alpha\ e_{ii}=\{\alpha\ [(w_i a_i^2/a)-a_i]\}, \qquad i=1,\dots,n \qquad (4.53)$$

The cross import price elasticity, in market j from i for some good k, with respect to a change in the total export price of partner h, $i\neq h=1,\dots,n$, which we will call the **Cross Export Price Elasticity**, is:

$$e_{ih}^{xp}= \alpha\ e_{ih}=\{\alpha\ [(a_i w_h a_h/a)]\}, \qquad i\neq h=1,\dots,n \qquad (4.54)$$

The import price elasticity, in market j from i for some good k, with respect to a change in the total world price of good k, which we will call the **World Export Price Elasticity**, is:

$$e^{wp}=(1-\alpha)e_{ii}=\{(1-\alpha)[(w_i a_i^2/a)-a_i]\}, \quad i=1,\ldots,n \tag{4.55}$$

In (4.53)-(4.55) we observe that the newly defined elasticities are multiples of the elasticities derived in chapter 3 (before the introduction of the proxies for bilateral prices) with the multiplicative factors being α and $(1-\alpha)$. The proof of (4.53)-(4.55) is relegated to appendix 4.3.

4.6). Restrictions on the CRESH function.

At the end of chapter 3, we derived a sequence of nested aggregator functions as special cases of the preferences described by the CRESH function. Similarly, a sequence of nested demand equations may be derived by placing restrictions on the CRESH models derived above. Thus, when $a_i=\sigma$ (a constant), we have the class of Constant Elasticity of Substitution(CES) models. When σ takes the limiting values of $\sigma=0$ and $\sigma=\infty$, we obtain the Leontief and the Linear Expenditure Systems(LES), respectively. The Leontief technology characterizes systems where there is no substitutability between imports from different trade partners, while the LES imposes perfect substitutability between trade partners. When $\sigma=1$ we arrive at the Cobb-Douglas model of unitary elasticities. We present as examples of nested versions of CRESH the estimating systems of the CES and the Cobb-Douglas models.

4.6.1). Constant Elasticity of Substitution(CES) Systems.

Take the static models specified by (4.14). These were derived as first order Taylor approximations to the bilateral import demand equations of chapter 3. We repeat the equation here for convenience.

$$y_{it}= c_i T - a_i[LP_{it}- \Sigma_h(w_h^0 a_h/a^0)LP_{ht}] \ ; \quad a_i=1/(1+\rho_i) \tag{4.14}$$

where c_i were defined in (4.4), also repeated here.

$$c_i=a_i[\gamma_i+\Sigma_h(w_h^0 a_h/a^0)(\gamma_h/\rho_h)]-\Sigma_h w_h^0(\gamma_h/\rho_h)] \quad \forall\ i=1,\dots,n. \qquad (4.4)$$

When $a_i=\sigma$ (also, using $\Sigma_i w_i^0=1$ and $\sigma-1=\sigma\rho$) then (4.4) becomes:

$$c_i=\sigma[\gamma_i+(\sigma/\Sigma_j w_j^0\sigma)(1/\rho)(\Sigma_h w_h^0\gamma_h)]-(1/\rho)\Sigma_h w_h^0\gamma_h \quad = \sigma(\gamma_i+\Sigma_h w_h^0\gamma_h)$$

To avoid confusion we write c_i for the CES case as:

$$r_i=\sigma(\gamma_i-\Sigma_h w_h^0\gamma_h) \qquad (4.56)$$

Then leting $a_i=\sigma$ (and $c_i=r_i$) in (4.14) we have

$$y_{it}=r_iT-\sigma[LP_{it}-(1/\sigma\Sigma_j w_j^0)\sigma\Sigma_h w_h^0\ LP_{ht}]$$

$$\therefore \qquad y_{it}=r_iT-\sigma\ [LP_{it}-\Sigma_h w_h^0\ LP_{ht}] \qquad (4.57)$$

which is the CES equivalent of the static models described in (4.14). Hence, there is a single common price effect σ between the trade partners in the same importing market j. (4.57) is equation (4.28) of Hickman and Lau(1973, p354) derived by optimizing a CES production function.

Similarly, the dynamic CES version of the 'mixed' model of equation (4.22) reduces to:

$$y_{it}=(1-\theta+\lambda)\ y_{it-1}-\lambda\ (1-\theta)\ y_{it-2}+\theta(1-\lambda)r_iT+\lambda\ \theta\ r_i$$

$$-\ \theta\ (1-\lambda)\ \sigma\ [\ LP_{it}-\Sigma_h w_h^0\ LP_{ht}]+\theta\ (\varepsilon_{it}-\lambda\varepsilon_{it-1}) \qquad (4.58)$$

where the trend term and the constant for the model in logarithmic first differences become one term, equal to: $\theta(1-\lambda)r_i$.

As would be expected, when we consider the CES version of equation (4.26), that is, the further linearized ('mixed') model in the a_i parameters (now σ), we get back to equation (4.58). That is, the same model, as if we hadn't linearized the system in the α_i

parameters. Hence, our final estimating import demand equations would be (4.58) with the appropriate LP_i's substituted to take account of data restrictions, in line with the analysis of the previous sections. It should be noted here that none of λ, θ, r_i or σ can be identified from (4.58).

4.6.2). Cobb-Douglas Systems.

The corresponding equations to (4.57) and (4.58) when σ=1 are:

$$y_{it} = (\gamma_i - \Sigma_h w_h^0 \gamma_h)\ T - [LP_{it} - \Sigma_h w_h^0\ LP_{ht}] \qquad (4.59)$$

and

$$y_{it} = (1-\theta+\lambda)\ y_{it-1} - \lambda\ (1-\theta)\ y_{it-2} + \theta(1-\lambda)(\gamma_i - \Sigma_h w_h^0 \gamma_h)T$$

$$+ \lambda\ \theta\ (\gamma_i - \Sigma_h w_h^0 \gamma_h) - \theta\ (1-\lambda)\ [\ LP_{it} - \Sigma_h w_h^0\ LP_{ht}] \qquad (4.60)$$

Thus, the Cobb-Douglas systems are nested in CRESH, since they are special cases of the CES.

4.7). Conclusion.

The aim of this chapter has been to turn the system of the bilateral seaborne import demand equations derived in the previous chapter, to a system of equations which can be implemented empirically. In doing so we were careful not to lose the theoretical properties imposed by the standard theory of systems of demand equations. Thus, adding-up, for instance, is maintained throughout.

By linearizing the system of theoretical equations we were able to define empirically the composite price index P. At the same time, the cost of computing time in estimation is reduced, which for large systems of equations is considerable. It often makes the difference between converging to a solution or not. Dynamics and proxies of the unobservable bilateral import prices are introduced. The introduction of dynamics makes the system considerably richer. It also provides us with a framework of moving from some general model that can describe the data sufficiently well, to a more restricted theoretically consistent econometric model. The introduction of proxies for the missing bilateral prices introduces empirical and theoretical problems. The collineariry between the proxies and the lack of degrees of freedom problems are solved by imposing the theoretical restrictions at the outset. The elasticities of demand are further examined under the new formulation. Furthermore, as examples of the encompassing properties of the CRESH model, we derive the CES and the Cobb-Douglas import demand equations by placing restrictions on the parameters of CRESH.

Appendix 4.1.

First Order Taylor Linearizations of the Import Demand Equations.

We want to linearize equation (4.2), which is repeated here for convenience.

$$m_i=m\,[|\delta_i\rho_i|e^{\gamma_i t}(p_i/P)^{-1}]^{a_i}\{\Sigma_h[|\delta_h\rho_h|e^{\gamma_h t}(p_h/P)^{-1}]^{a_h}\}^{-1} \qquad (1)$$

where the composite price index P is defined implicitly by:

$$G(P,p_1,\ldots,p_n,t)=\Sigma_i\delta_i[|\delta_i\rho_i|e^{(-\gamma_i/\rho_i)t}(p_i/P)^{-1}]^{-a_i\rho_i}-1\equiv 0 \qquad (2)$$

and $a_i=1/(1+\rho_i)$

Using (2) we derive the following results at the base year values (when t=0, $m=m^0$, $p_i=1$), which will be useful later:

$$\partial G/\partial p_i=\delta_i a_i\rho_i[|\delta_i\rho_i|^{-\rho_i e^{\gamma_i t}}(p_i/P)^{\rho_i}]^{a_i}\,p_i^{-1} \qquad (3)$$

$$\partial G/\partial p_i|_{t=0}=\delta_i a_i\rho_i|\delta_i\rho_i|^{-\rho_i a_i} \qquad (3')$$

$$\partial G/\partial P=-\Sigma_h\delta_h a_h\rho_h[|\delta_h\rho_h|^{-\rho_h e^{\gamma_h t}}(p_h/P)^{\rho_h}]^{a_h}\,P^{-1} \qquad (4)$$

$$\partial G/\partial P|_{t=0}=-\Sigma_h\delta_h a_h\rho_h|\delta_h\rho_h|^{-\rho_h a_h} \qquad (4')$$

$$\partial G/\partial t=\Sigma_h\delta_h a_h\gamma_h[|\delta_h\rho_h|^{-\rho_h e^{\gamma_h t}}(p_h/P)^{\rho_h}]^{a_h} \qquad (5)$$

$$\partial G/\partial t|_{t=0}=\Sigma_h\delta_h a_h\gamma_h|\delta_h\rho_h|^{-\rho_h a_h} \qquad (5')$$

By the implicit function theorem:

$$\partial P/\partial p_i=-(\partial G/\partial p_i)/(\partial G/\partial P)$$

$$\partial P/\partial t=-(\partial G/\partial t)/(\partial G/\partial P)$$

$$\partial p_i/\partial t=-(\partial G/\partial t)/(\partial G/\partial p_i)$$

At the base year values:

$$\partial P/\partial p_i|_{t=0}=(\delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i})/(\Sigma_h \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h}) \tag{6}$$

$$\partial P/\partial t|_{t=0}=(\Sigma_h \delta_h a_h \gamma_h |\delta_h \rho_h|^{-\rho_h a_h})/(\Sigma_h \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h}) \tag{7}$$

$$\partial p_i/\partial t|_{t=0}=(\Sigma_h \delta_h a_h \gamma_h |\delta_h \rho_h|^{-\rho_h a_h})/(\delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i}) \tag{8}$$

Let us write (1) for notational convenience as $m_i=f(m,t,p_i)=f(\underline{x})$. A first order Taylor approximation around the base year values takes the form:

$$m_i \simeq f(\underline{x}^0)+[\partial f(\underline{x}^0)/\partial m](m-m^0)+[\partial f(\underline{x}^0)/\partial t](t-0)+\Sigma_h[\partial f(\underline{x}^0)/\partial p_h](p_h-1) \tag{9}$$

Let us find each term in (9):

A). First, find $f(\underline{x}^0)$ $(=m_i^0)$.

$$f(\underline{x}^0) = f(m^0,0,1) = m^0(|\delta_i \rho_i|^{a_i})/(\Sigma_h |\delta_h \rho_h|^{a_h}) \tag{10}$$

which implies for the base year share

$$w_i^0= (|\delta_i \rho_i|^{a_i})/(\Sigma_h |\delta_h \rho_h|^{a_h}) \tag{11}$$

Hence, (10) becomes: $$m_i^0=m^0 w_i^0 \tag{10'}$$

B). $\partial f(\underline{x}^0)/\partial m$ is:

$$\partial f(\underline{x}^0)/\partial m = (|\delta_i \rho_i|^{a_i})/(\Sigma_h |\delta_h \rho_h|^{a_h}) = w_i^0 \tag{12}$$

C). To find $\partial f(\underline{x}^0)/\partial t$:

Let

$$K_i=|\delta_i\rho_i|^{a_i}p_i^{-a_i}, \tag{13}$$

which at the base year values is

$$K_i|_{t=0}=|\delta_i\rho_i|^{a_i}, \tag{14}$$

and from (12) we have:

$$(K_i/\Sigma_h K_h)|_{t=0}=w_i^0 \tag{15}$$

With the use of (13), (1) can be simplified to:

$$m_i=(m\ K_i e^{a_i\gamma_i t}P^{a_i})(\Sigma_h K_h e^{a_h\gamma_h t}P^{a_h})^{-1} \tag{1'}$$

$$\begin{aligned}\partial m_i/\partial t=&(\Sigma_h K_h e^{a_h\gamma_h t}P^{a_h})^{-1}\{[m\ K_i[a_i\gamma_i e^{a_i\gamma_i t}P^{a_i}+e^{a_i\gamma_i t}a_iP^{a_i-1}(\partial P/\partial t)]\}\\ &-(mK_ie^{a_i\gamma_i t}P^{a_i})\{\Sigma_h K_h[a_h\gamma_h e^{a_h\gamma_h t}P^{a_h}+e^{a_h\gamma_h t}a_hP^{a_h-1}(\partial P/\partial t)]\}(\Sigma_h K_h e^{a_h\gamma_h t}P^{a_h})^{-2}\end{aligned} \tag{16}$$

$$\begin{aligned}\partial m_i/\partial t|_{t=0}=&\ (\Sigma_h K_h|_{t=0})^{-1}\{m\ K_i|_{t=0}[a_i\gamma_i+a_i(\partial P/\partial t)|_{t=0}]\}\\ &-(m\ K_i|_{t=0})\{\Sigma_h K_h|_{t=0}[a_h\gamma_h+a_h(\partial P/\partial t)|_{t=0}]\}(\Sigma_h K_h|_{t=0})^{-2}\end{aligned} \tag{17}$$

which, with the use of (15), we can write as:

$$\partial m_i/\partial t|_{t=0}=m\ w_i^0\{a_i[\gamma_i+(\partial P/\partial t)|_{t=0}]\}-m\ w_i^0\{\Sigma_h w_h^0 a_h[\gamma_h+(\partial P/\partial t)|_{t=0}]\} \tag{18}$$

From

$$a_i=1/(1+\rho_i), \qquad -\rho_i a_i=a_i-1 \tag{19}$$

Dividing top and bottom of (7) by $(\Sigma_h|\delta_h\rho_h|^{-\rho_h a_h}$ and using (19) and (10′) we may write:

$$\partial P/\partial t|_{t=0}\ =\ (\Sigma_h w_h^0 a_h\gamma_h/\rho_h)\ /\ (\Sigma_h w_h^0 a_h) \tag{7'}$$

Use (7′) and $w_i^0=(m_i^0/m^0)$ in (18) to get:

$$\partial m_i/\partial t|_{t=0} = m_i^0 \{ a_i [\gamma_i + (\Sigma_h w_h^0 a_h \gamma_h/\rho_h)/(\Sigma_h w_h^0 a_h)]$$

$$- [\Sigma_h w_h^0 a_h \gamma_h + \Sigma_h w_h^0 a_h (\Sigma_h w_h^0 a_h \gamma_h/\rho_h)/(\Sigma_h w_h^0 a_h)] \}$$

$$= m_i^0 \{a_i [\gamma_i + (\Sigma_h w_h^0 a_h \gamma_h/\rho_h)/(\Sigma_h w_h^0 a_h)] - \{\Sigma_h w_h^0 a_h \gamma_h [1+(1/\rho_h)]\}\}$$

which, with the use of $[1+(1/\rho_h)]=1/a_h\rho_h$ becomes:

$$\partial m_i/\partial t|_{t=0} = m_i^0 \{a_i[\gamma_i + (\Sigma_h w_h^0 a_h \gamma_h/\rho_h)/(\Sigma_h w_h^0 a_h)] - \Sigma_h w_h^0 \gamma_h/\rho_h\} \tag{20}$$

Further, let $a^0 = \Sigma_i w_i^0 a_i$, then (16) can writen as:

$$\partial m_i/\partial t|_{t=0} = m_i^0 \{a_i[\gamma_i + \Sigma_h (w_h^0 a_h/a^0)(\gamma_h/\rho_h)] - \Sigma_h w_h^0 (\gamma_h/\rho_h)\} \tag{21}$$

$$= m_i^0 c_i \tag{22}$$

where, $$c_i = a_i[\gamma_i + \Sigma_h (w_h^0 a_h/a^0)(\gamma_h/\rho_h)] - \Sigma_h w_h^0 (\gamma_h/\rho_h) \tag{23}$$

D). Finally, we need to find $\Sigma_h [\partial f(\underline{x}^0)/\partial p_h]$

Let $$B_i = [|\delta_i \rho_i| e^{\gamma_i t}]^{a_i} \tag{24}$$

which at the base year values becomes:

$$B_i|_{t=0} = |\delta_i \rho_i|^{a_i} \tag{25}$$

From (12) we have: $$(B_i/\Sigma_h B_h)|_{t=0} = w_i^0 \tag{26}$$

Using (24), we may write (1) as:

$$m_i = m B_i (p_i/P)^{-a_i} [\Sigma_h B_h (p_h/P)^{-a_h}]^{-1} \tag{1''}$$

Distinguish between 1) i=h and 2) i≠h:

1). Let i=h, then:

$$\partial m_i/\partial p_i = m\ \{B_i[\Sigma_h B_h(p_h/P)^{-a_h}]^{-1}\ \{\partial[(p_i/P)^{-a_i}]/\partial p_i\}$$

$$- B_i(p_i/P)^{-a_i}\ \Sigma_h B_h\{\partial[(p_h/P)^{-a_h}]/\partial p_i\}\ [\Sigma_h B_h(p_h/P)^{-a_h}]^{-2}\}\} \tag{27}$$

where

$$\partial[(p_i/P)^{-a_i}]/\partial p_i = -a_i(p_i/P)^{-a_i-1}\ [\partial(p_i/P)/\partial p_i]$$

$$= -a_i(p_i/P)^{-a_i-1}\ [P-p_i(\partial P/\partial p_i)]/P^2$$

$$\therefore \quad \partial[(p_i/P)^{-a_i}]/\partial p_i|_{t=0} = -a_i[1-(\partial P/\partial p_i)|_{t=0}] \tag{28}$$

Next, find $\partial[(p_h/P)^{-a_h}]/\partial p_i$ in the $\Sigma_h B_h \partial[(p_h/P)^{-a_h}]/\partial p_i$ term of (24):

a). For i≠h: $\quad =-a_h(p_h/P)^{-a_h-1}\ [\partial(p_h/P)/\partial p_i]$

$$=-a_h(p_h/P)^{-a_h-1}\ [-p_h P^{-2}(\partial P/\partial p_i)]$$

$$\therefore \quad \partial[(p_h/P)^{-a_h}]/\partial p_i|_{t=0} = a_h(\partial P/\partial p_i)|_{t=0} \tag{29}$$

b). For i=h, the expression is the same as in (28).

Combining (28) and (29) we find:

$$\{\Sigma_h B_h\{\partial[(p_h/P)^{-a_h}]/\partial p_i\}|_{t=0} = \{\Sigma_h B_h|_{t=0} a_h(\partial P/\partial p_i)|_{t=0}\} - a_i B_i|_{t=0} \tag{30}$$

Using (28) and (30) in (27) we get:

$$\partial m_i/\partial p_i|_{t=0} = m\ \{B_i|_{t=0}(\Sigma_h B_h|_{t=0})^{-1}\ \{-a_i[1-(\partial P/\partial p_i)|_{t=0}]\}$$

$$-B_i|_{t=0}\{[\Sigma_h B_h|_{t=0} a_h(\partial P/\partial p_i)|_{t=0}] - a_i B_i|_{t=0}\}\ [\Sigma_h B_h|_{t=0}]^{-2}\}$$

With the use of (26) we have:

$$= m w_i^0\{\{-a_i[1-(\partial P/\partial p_i)|_{t=0}]\} - \{[\Sigma_h w_h^0 a_h(\partial P/\partial p_i)|_{t=0}] - a_i w_i^0\}\}$$

$$\therefore\ \partial m_i/\partial p_i|_{t=0}=m_i^0[-a_i+a_iw_i^0+a_i(\partial P/\partial p_i)|_{t=0}-\Sigma_h w_h^0 a_h(\partial P/\partial p_i)|_{t=0}] \tag{31}$$

Finally, (6), with the use of (19) and the fact that sign$(\delta_i\rho_i)$ is the same for all i (see section 3.3.2 of chapter 3), becomes:

$$\partial P/\partial p_i|_{t=0} = [a_i(\delta_i\rho_i)^{a_i}]/[\Sigma_h a_h(\delta_h\rho_h)^{a_h}]$$

dividing top and bottom by $\Sigma_j(\delta_j\rho_j)^{a_j})$ and using (11) we obtain:

$$\partial P/\partial p_i|_{t=0}=(w_i^0a_i)/(\Sigma_h w_h^0a_h) \tag{32}$$

which, when substituted in (31) gives:

$$\partial m_i/\partial p_i|_{t=0}=m_i^0\{-a_i+a_iw_i^0+a_i[(w_i^0a_i)/(\Sigma_h w_h^0a_h)]-\Sigma_h w_h^0a_h[(w_i^0a_i)/(\Sigma_h w_h^0a_h)]\}$$

$$\therefore\quad \partial m_i/\partial p_i|_{t=0} = m_i^0a_i\{-1+ [(w_i^0a_i)/(\Sigma_h w_h^0a_h)]\} \tag{33}$$

2). Let i≠h, then:

$$\begin{aligned}\partial m_i/\partial p_h= m\ \{&B_i[\Sigma_j B_j(p_j/P)^{-a_h}]^{-1}\ \{\partial[(p_i/P)^{-a_i}]/\partial p_k\} \\ &- B_i(p_i/P)^{-a_i}\Sigma_j B_j\{\partial[(p_j/P)^{-a_j}]/\partial p_h\}\ [\Sigma_j B_j(p_j/P)^{-a_j}]^{-2}\}\}\end{aligned} \tag{34}$$

where, from (29), by interchanging the i and k subscripts, we have the result:

$$\partial[(p_i/P)^{-a_i}]/\partial p_h|_{t=0} = a_i(\partial P/\partial p_h)|_{t=0} \tag{35}$$

Next, find $\partial[(p_j/P)^{-a_j}]/\partial p_h$ in $\Sigma_j B_j\{\partial[(p_j/P)^{-a_j}]/\partial p_h\}$ of (34):

a). For h≠j we have a result similar to (29) by substituting the subscripts h and i with j and h respectively:

$$\therefore\quad \partial[(p_j/P)^{-a_j}]/\partial p_h|_{t=0}=a_j(\partial P/\partial p_h)|_{t=0} \tag{36}$$

b). For h=j, the expression is the same as in (35).

Combining (35) and (36) we find:

$$\{\Sigma_j B_j\{\partial[(p_j/P)^{-a_h}]/\partial p_h\}|_{t=0}=[\Sigma_j B_j|_{t=0}a_j(\partial P/\partial p_h)|_{t=0}]-a_h B_h|_{t=0} \tag{37}$$

Using (35) and (37) in (34) we get:

$$\partial m_i/\partial p_k|_{t=0} = m\ \{B_i|_{t=0}(\Sigma_j B_j|_{t=0})^{-1}\ [a_i(\partial P/\partial p_h)|_{t=0}]$$
$$-B_i|_{t=0}\{[\Sigma_j B_j|_{t=0}a_j(\partial P/\partial p_h)|_{t=0}]-a_h B_h|_{t=0}\}\ (\Sigma_j B_j|_{t=0})^{-2}\} \tag{38}$$

With the use of (26) we have:

$$=mw_i^0\{a_i(\partial P/\partial p_h)|_{t=0}-[\Sigma_j w_j^0 a_j(\partial P/\partial p_h)|_{t=0}-a_h w_h^0]\}$$

$$\therefore \quad \partial m_i/\partial p_h|_{t=0} = m_i^0[a_h w_h^0+a_i(\partial P/\partial p_h)|_{t=0}-\Sigma_j w_j^0 a_j(\partial P/\partial p_h)|_{t=0}] \tag{39}$$

Using (32) in (39) we obtain:

$$\therefore \quad \partial m_i/\partial p_h|_{t=0} = m_i^0 a_i[(w_h^0 a_h)/(\Sigma_j w_j^0 a_j)]\} \tag{40}$$

Thus, using (10′), (12), (22), (33) and (40) in (9) we obtain:

$$m_i= m^0 w_i^0 + w_i^0(m-m^0) + m_i^0 c_i(t-0) - m_i^0 a_i(p_i-1) + m_i^0 a_i \Sigma_h (w_h^0 a_h/a^0)(p_h-1)$$

$$\therefore m_i= w_i^0 m + m_i^0 c_i t - m_i^0 a_i[p_i- \Sigma_h (w_h^0 a_h/a^0)p_h] \qquad \forall\ i=1,\dots,n. \tag{41}$$

where

$$c_i=a_i[\gamma_i+ \Sigma_h (w_h^0 a_h/a^0)(\gamma_h/\rho_h)]-\Sigma_h w_h^0(\gamma_h/\rho_h)] \qquad \forall\ i=1,\dots,n. \tag{42}$$

and

$$a^0=\Sigma_h w_h^0 a_h \tag{43}$$

These are equations (4.3) - (4.5) of section (4.1.1).

Appendix 4.2.

The Underlying Problem of the Importer Given the Data Restrictions.

By substituting p^k_{ij} as defined in (4.49), repeated here for convenience,

$$p^k_{ij}\ (\equiv p_i) = xp_i^{\alpha}\ wp_k^{(1-\alpha)} \qquad (1)$$

for p_i, in the bilateral import demand equations, we, essentialy, redefine the classical optimization problem of the importer as:

$$\min \Sigma_i (xp_i^{\alpha} wp_k^{(1-\alpha)}) m_i \qquad \text{s.t.} \qquad \Sigma_i \delta_i e^{\gamma_i t} (m_i/\mu)^{-\rho_i} - 1 \equiv 0 \qquad (2)$$

From the solution of this problem (following the same procedures as we did in chapter 3 - the proof is easy and therefore omitted) we obtain bilateral import demand equations of the form:

$$m_i = \mu\ [\,|\delta_i \rho_i| e^{\gamma_i t} (xp_i^{\alpha} wp_k^{(1-\alpha)} / \ P\ )^{-1}]^{a_i} \qquad (3)$$

where the composite CRESH price index which guarantees adding-up is defined implicitly by:

$$G(P, xp_1, \ldots, xp_n, wp_k, t) = \Sigma_i \delta_i [\,|\delta_i \rho_i| e^{(-\gamma_i/\rho_i)t} (xp_i^{\alpha} wp_k^{(1-\alpha)}/P)^{-1}]^{-a_i \rho_i} - 1 \equiv 0 \quad (4)$$

It is easy, but messy, to show (following the same steps as in appendix 4.1 (That is, by a 1st order Taylor approximation around the base year values of the variables), and then with a 2nd linearization around the value $a = \Sigma_i w_i a_i$ of the parameters) that the empirical estimating equations are those presented in (4.37)-(4.39), with $\beta = 0$.

Digression:

In order to find the elasticities of substitution (in appendix

4.3) we need to derive $\partial P/\partial xp_i$, $\partial P/\partial xp_h$ and $\partial P/\partial wp_k$ at the base year values. These are defined as:

$$
\begin{aligned}
\partial P/\partial xp_i &= -(\partial G/\partial xp_i)/(\partial G/\partial P) \\
\partial P/\partial xp_h &= -(\partial G/\partial xp_h)/(\partial G/\partial P) \qquad (5) \\
\partial P/\partial wp_k &= -(\partial G/\partial wp_k)/(\partial G/\partial P)
\end{aligned}
$$

where
$$\partial G/\partial xp_i|_{t=0} = \alpha\ \delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i} \qquad (6)$$

$$\partial G/\partial xp_h|_{t=0} = \alpha\ \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h} \qquad (7)$$

$$\partial G/\partial wp_i|_{t=0} = (1-\alpha)\delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i} \qquad (8)$$

$$\partial G/\partial P|_{t=0} = -\Sigma_h \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h} \qquad (9)$$

Using, also the result of equation (32) of appendix 4.1, we have:

$$\partial P/\partial xp_i|_{t=0} = \alpha\ [(\delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i})/(\Sigma_h \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h})]$$

$$\therefore \quad \partial P/\partial xp_i|_{t=0} = \alpha\ [w_i^0 a_i/\Sigma_h w_h^0 a_h] = \alpha\ [w_i^0 a_i/a] \qquad (10)$$

$$\partial P/\partial xp_h|_{t=0} = \alpha\ [(\delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h})/(\Sigma_l \delta_l a_l \rho_l |\delta_l \rho_l|^{-\rho_l a_l})]$$

$$\therefore \quad \partial P/\partial xp_h|_{t=0} = \alpha\ [w_h^0 a_h/\Sigma_l w_l^0 a_l] = \alpha\ [w_h^0 a_h/a] \qquad (11)$$

$$\partial P/\partial wp_k|_{t=0} = \alpha\ [(\delta_i a_i \rho_i |\delta_i \rho_i|^{-\rho_i a_i})/(\Sigma_h \delta_h a_h \rho_h |\delta_h \rho_h|^{-\rho_h a_h})]$$

$$\therefore \quad \partial P/\partial wp_k|_{t=0} = (1-\alpha)\ [w_i^0 a_i/\Sigma_h w_h^0 a_h] = (1-\alpha)\ [w_i^0 a_i/a] \qquad (12)$$

where $a=\Sigma_i w_i^0 a_i$.

Appendix 4.3.

The New Elasticities of Substitution Given the Data Restrictions.

We want to derive the own and cross export price elasticities with respect to a change in the total export price of the trade partners, and the world price elasticity with respect to a change in the world price of the traded good k, in some import market j.

These are easiest derived by taking logs of (3) in appendix 4.2.

$$\ln m_i = \ln\mu + a_i \ln|\delta_i\rho_i| + \gamma_i t - a_i[\ \alpha \ln xp_i + (1-\alpha) \ln wp_k - \ln P)] \qquad (1)$$

a). Thus, the own and cross export price elasticities with respect to a change in the total export price of the trade partners, are defined mathematically as:

$$e^{xp}_{ii} = \partial \ln m_i / \partial \ln xp_h, \qquad i=h=1,\dots,n \qquad (2)$$

From (1) we have:

$$\partial \ln m_i / \partial \ln xp_i = -a_i\ [\alpha\ xp_i^{-1} - P^{-1}(\partial P/\partial xp_i)]$$

$$\partial \ln m_i / \partial \ln xp_i|_{t=0} = -a_i\ [\alpha\ -\ (\partial P/\partial xp_i)|_{t=0}]$$

which, with the use of (10) of appendix 4.2, yields:

$$e^{xp}_{ii} = \{\alpha\ [(w_i a_i^2/a) - a_i]\} = \alpha\ e_{ii}, \qquad i=1,\dots,n \qquad (3)$$

From the definition of the cross price elasticity:

$$\partial \ln m_i / \partial \ln xp_h = a_i\ P^{-1}(\partial P/\partial xp_h)$$

$$\partial \ln m_i / \partial \ln xp_h|_{t=0} = a_i(\partial P/\partial xp_i)|_{t=0}$$

which, with the use of (11) of appendix 4.2, yields:

$$e^{xp}_{ih}=\{\alpha\ [(a_i w_h a_h/a)]\}=\ \alpha\ e_{ih}, \qquad i\neq h=1,\dots,n \qquad (4)$$

b). The world price elasticity, with respect to a change in the world price of the traded good k, is defined by:

$$e^{wp} = \partial \ln m_i/\partial \ln wp_k, \qquad i=1,\dots,n \qquad (5)$$

$$\therefore \quad \partial \ln m_i/\partial \ln wp_k=-a_i\ [(1-\alpha)\ wp_k^{-1}-P^{-1}(\partial P/\partial wp_k)]$$

$$\partial \ln m_i/\partial \ln wp_k\big|_{t=0}=-a_i\ [(1-\alpha)\ -\ (\partial P/\partial wp_k)\big|_{t=0}]$$

which, with the use of (12) of appendix 4.2, yields:

$$e^{wp}=\{(1-\alpha)[(w_i a_i^2/a)-a_i]\}=(1-\alpha)e_{ii}, \qquad i=1,\dots,n \qquad (6)$$

CHAPTER 5

DATA

5.0). Introduction.

In chapter 3 we derived sets of bilateral seaborne import demand equations, in terms of equation (3.11). Each of these systems of equations describe the bilateral seaborne import-flows of a region of the world from all other regions, for a certain commodity group. Ideally, we would like to obtain data for the theoretical variables described in (3.11). That is, for each commodity group we need:

- Volumes of bilateral seaborne trade-flows,
- the corresponding bilateral trade prices,
- the total volume of trade of each region,
- other relevant variables specific to the import region/good,
- intermediate variables needed to construct the final variables.

A feature of empirical international trade models of this type is that data for bilateral import prices are not available. Total import prices are used instead. We face a similar problem in this thesis. This has forced us in chapter 4 to respecify our theoretical model in order to take account of the lack of data in the empirical model.

This chapter is in three main sections. In the first, we describe the international systems which are used to classify commodities and regions of the world into aggregates, and are relevant to the objectives of our study. In the second, the seaborne bilateral and total volumes of trade used are described, and their peculiarities are examined. A snap-shot of world trade patterns is presented in terms of 5 tables of bilateral seaborne trade shares for 1980. In the third section, we explain the construction of the final data of import prices used in the estimation of the model. The appropriateness of a number of alternative series of index numbers and the inherent problems involved are discussed. Other relevant and intermediate variables used in the construction of the model, and the transformations of the original data into the final dataset are also discussed here.

5.1). The SITC, MTC and MTCAC Classifications of the UN.

Data for Commodities traded internationally such as motorcars, salt, tobacco etc, are aggregated into groups in order to reduce the information into smaller more manageable proportions, which are easier to understand, compile and analyze. A classification system is required to aggregate commodities.

The most commonly known classification system is the UN (United Nations) SITC (*Standard International Trade Classification*) system (UN, 1951). This is a multi-digit system introduced in 1950, which is used to classify internationally traded commodities. Total trade is divided into 10 (1-digit) 'sections' as follows:

0 - Food and live animals chiefly for food
1 - Beverage and tobacco
2 - Crude materials, inedible, except fuel
3 - Mineral fuels and related materials
4 - Animal and vegetable oils, fats and waxes
5 - Chemicals and related products
6 - Manufactured goods by materials
7 - Machinery and transport equipment
8 - Miscellaneous manufactured articles
9 - Commodities not included elsewhere

Each of these 'sections' is further divided into 'divisions', 2-digit commodity aggregates, providing a greater detail of disaggregation. For example, 'section' 1 is disaggregated into 2 'divisions' as follows:

11 - Beverages

12 - Tobacco and tobacco manufactures

'Divisions' are subdivided into 3-digit 'groups', 'groups' into 4-digit 'subgroups' and 'subgroups' into 5-digit 'items', at the most detailed level.

The need soon became apparent to take account of changes in the volume and patterns of international trade over time, and to make the SITC compatible with other internationally used commodity classification systems. Such systems are the BTN (Brussels Tariff Nomenclature, Customs Co-operation Council(1955)), the CCCN (Customs Co-operation Council Nomenclature, Customs Co-operation Council(1976)), the HS (Harmonized System, Customs Co-operation Council(1985)), the CPC (Central Product Classification, UN(1988)), and the ISIC (International Standard Industrial Classification, UN(1968)). Thus, the 'original' SITC system is reshaped and extended gradually, to more and more headings of disaggregated commodities: Thus, SITC Revised (UN, 1961) revise the 'original' SITC in order to make it compatible with the BTN classification. The latter is classifying commodities according to the nature of the material commodities are made from. This makes the data from this classification not readily available for economic analysis. SITC Revised provides a one to one correspondence with the BTN. The former containes information for 1312 commodity aggregates.
Beginning with data in 1976, SITC Revision 2 (UN, 1975) was introduced to accommodate for changes in the volume, composition and geographical patterns of trade. The BTN is also revised resulting in the CCCN, under which there is a one to one correspondence betweem the CCCN and the SITC Revision 2's headings. The number of commodity aggregates in the SITC Revision 2 are extended to 1924.
The need for more detail and greater harmonization of commodity systems produce a revision of CCCN to give the HS. Along these lines, the SITC Revision 2 is harmonized with the HS, the ISIC and the CPC (A classification intended for use for all kinds of statistics; not for any specific reason, such as international trade) classifications. The resultant SITC Revision 3 (UN, 1985) is

in use since 1988. In this classification, greater disaggregation expands the number of basic headings to 3118 (10 'sections', 67 'divisions', 261 'groups', 1033 'subgroups', 720 of the latter divided further into 2805 basic 'items', which gives us 3118 basic headings in total).

Another commodity classification system, more relevant to shipping analysts, is the MTC (*Maritime Transport Classification*) system (see for e.g. UN, 1980, p23-27). This is a 5-digit system, which is used to classify total seaborne-trade according to the characteristics of its ocean carriage. Thus, total seaborne-trade is divided into 5 (1-digit) commodity sections shown in table 5.1.

Table 5.1.

Commodity Sections of the MTC.

1 - Bulk, Dry
2 - Bulk, Liquid
3 - Refrigerated Goods
4 - General cargo, Dry
5 - Other Dry Cargo

These sections are divided into 37 3-digit 'categories', which are further subdivided into 128 5-digit commodity 'items' at the highest level of disaggregation. The full MTC commodity classification system is listed in appendix 5.1. The appendix includes the commodity break-down of seaborne-trade in terms of the MTC classification codes, and the corresponding codes for SITC Revised and SITC Revision 2.

In a similar way to commodity classification, the whole world is divided into 30 coastal regions along the lines of compatibility with geographical and national constraints. The segregation of the world into 30 major regions is defined by the UN MTCAC (*Maritime Transport Area Classification*) listed in appendix 5.2 (see for e.g. UN 1980, p28-30). These coastlines determine the major sea-lanes over which international seaborne trade is conducted.

The seaborne exports/imports of landlocked countries are credited to the coastline which they use for their seaborne trade transactions. Landlocked countries are thus, classified under the coastal region which they use to conduct their trade. Some of these countries use more than one coastlines for their seaborne trade. For example, Switzerland uses both the ports of the North Sea and Italy. In that case the country is classified under both coastal regions.

Countries which use widely separated seaports, within their own boundaries, for their seaborne trade transactions have separate coastlines. This is essential for the definition of a sea-lane to be meaningful. Examples of such countries are the USSR, USA, Colombia etc (see appendix 5.2). In such a situation, one country is classified under more than one coastlines.

Along the above arguments, the UN guidelines of appendix 5.2, and from the answers to questionnaires, which we have received from the embassies in London of landlocked countries, we have classified the countries of the world in the 30 coastline regions defined in appendix 5.2. The outcome is shown in Table 5.2. Some countries in certain regions are in brackets. The reason for that is explained later on in the chapter.

Table 5.2.

Classification of Countries According to the MTCAC.

01 - Canada, USA.

02 - Canada.

03 - USA.

04 - USA.

05 - USA.

06 - USA.

07 - Canada, USA.

08 - Belize, Costa Rica, El Salvador, Guatemalla, Honduras, Mexico, Nicaragua, Panama.

11 - Antigua and Barbuda, Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Netherlands Antilles(that is Aruba, Bonaire, Curacao), St Kitts and Nevis, St Lucia, St Vincent, Trinidad and Tobago, (Anguilla, Bermuda, Cuba, Guadeloupe, Martinique, Virgin Islands).

12 - Colombia, Guyana, Surriname, Venezuela, (French Guiana).

13 - Argentina, Bolivia, Brazil, Paraguay, Uruguay, (Falklands, St Georgia).

14 - Colombia, Chile, Ecuador, Peru.

15 - Iceland, Ireland, UK, (Faeroe Island).

16 - Belgium, Denmark, Finland, Germany F.R., Hungary, Luxembourg, Netherlands, Norway, Sweden, Switzerland.

17 - Hungary, Poland, (Czechoslovakia, German D.R., USSR).

18 - France, Portugal, Spain.

19 - Austria, France, Greece, Hungary, Italy, Malta, Spain, Switzerland, Yugoslavia, (Albania, Andora, Gibraltar, Monaco).

20 - Romania, (Bulgaria, USSR).

21 - Cyprus, Israel, Lebanon, Syria, Turkey.

22 - Algeria, Egypt, Libya, Morocco, Tunisia.

23 - Benin, Cameroon, Central African Republic, Congo, Chad, Ivory Coast, Gabon, Gambia, Ghana, Guinea Bissau, Liberia, Mauritania, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo, Zaire, Zambia, (Angola, Equatorial Guinea, Guinea, Namibia, Sao Tome and Principe, Upper Volta).

24 - Lesotho, South Africa, Swaziland.

25 - Botswana, Burundi, Kenya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Somalia, Swaziland, Tanzania, Uganda, Zaire, Zambia, Zimbabwe, (Comoros, Mozambique, Zanzibar).

26 - Egypt, Ethiopia, Israel, Jordan, Saudi Arabia, Sudan, Yemen, (Djibouti, Democratic Yemen).

27 - Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates.

28 - Afganistan, Bangladesh, Burma, India, Maldives, Nepal, Pakistan, Sri Lanka, (Bhutan).

29 - Indonesia, Malaysia, Phillipines, Singapore, Thailand, (Brunei Darussalam, Democratic Kampuchea, East Timor).

30 - China, (Laos, Dem. People's Republic of Korea, USSR, Viet Nam).

31 - Hong Kong, Japan, Republic of Korea, (Macau).

32 - Australia, Fiji, New Zealand, Papua New Guinea, Solomon Islands, Western Samoa, Vanuatu, (Kiribati, Nauru, New Hebrides, Tonga, Tuvalu).

33 - Unspecified.

5.2). Bilateral Seaborne Import Trade-Flows.

Data for Volumes (in metric tons), Ton-miles and ALH (Average Length of Haul, in nautical miles) of bilateral and total seaborne trade flows have been obtained from the UN Maritime Tansport Study (called 'International trade statistics yearbook' after 1983, see for example UN(1983)), for the years 1969 to 1986. The published data can be thought of as matrices of the form of table 2.1, in chapter 2. The importing-exporting regions of the table are the coastal areas specified in table 5.2, while the different commodities are the types of cargo listed in table 5.1. The published data have been compiled by collecting information of seaborne trade from coastline countries of the world (85 in 1982). The main features of this compilation, the limitations of the study and the accuracy of the results are described in the volumes of the Maritime Transport Study (see for example chapters II-IV).

The main limitations of the study are the same as those encountered in international trade statistics, plus those specific to seaborne trade statistics (Chapter III). For example import matrices for a country may be different from export matrices because of the different trade systems used in different countries (general, special etc). c.i.f., f.o.b. differences, common in trade values, are not a problem here since we are dealing with volumes of trade. Another limitation of the study is the 2-3 years time lag in publishing the data.

Dividing the world in 30 coastlines and distinguishing amongst 5 types of cargo, amounts to considering 30 bilateral seaborne trade flows for each coastline (the intra-seaborne trade of the importing region plus the 29 flows from the other regions), per type of cargo. That is, (30x5=)150 bilateral trade flows for each region. The bilateral trade of each region should add-up to the total trade of the region, for the specific type of cargo ('commodity'). This is identity (2.2) of chapter 2, and should hold for each year in the time period considered. For the whole world, we obtain data for

(150x30=)4500 trade flows. (Thus, (4500x18=)81000 observations of bilateral trade volumes, over the 18 years.)

By definition, a number of identities should hold for these data. These are described in section 2.1, in terms of the import-export matrix of table 2.1. Thus, apart from identity (2.2), (2.3) and (2.4) should also hold for our data. (2.3) amounts to the sum of the total imports of all regions, per commodity, adding-up to total world imports (for that commodity), for every year. (2.4) amounts to the sum of the total world imports of each commodity adding-up to total world imports for all commodities.

In terms of estimating our import allocation models (with respect to the bilateral imports of one region for one commodity), it suffices for identity (2.2) to hold. That is, the bilateral imports of a region for a certain commodity should add-up to the total imports of the commodity by that region.

The nature of our study, estimation of highly disaggregated import allocation models of 5 goods and 30 trade zones in the international economy has consequences for our data. An importing region has a pre-specified total amount of imports, of a particular commodity, which it wishes to allocate amongst its 30 trade partners (including intra-trade). The number of alternative sources of imports for most goods is large (30), with no one region predominating trade internationally (for most goods, with the exception of Bulk Liquid). Thus, often, seaborne imports from trade partners at certain time periods are zero. Outliers and zero trade are a common feature in the data. This produces very volatile time series, increasing the convergence problems of the nonlinear estimating systems.

Often in import markets, there are no seaborne imports over the entire period from one or more regions. The consequences for estimation is that these regions are dropped from the system and we have less than 30 equations to estimate. This is quite common for **Good** 2 (not many regions produce **Bulk Liquid goods**) and **Good** 3. Also, there is no seaborne trade in the import regions 03, 04, 05, 06 from 03, 05 and 06, for all goods (freight is transported by land). It is important to note here, that even though there are situations when there is trade between two trade partners for only one year, the equation is kept in the system. This is because, even one years' trade amongst two regions implies that the particular exporting region is in the information set of the relevant importer, albeit not offering relatively 'good' terms of trade for more than one year over the considered period. Statistically, keeping the equation in the system ensures adding-up (that is identity (2.2) holds), for every time period.

Finally, we may obtain a picture of the patterns of seaborne trade by looking at the base-year (1980) import shares for the 5 commodities, shown on tables 5.3-5.7. The columns of these seaborne import share tables are used as the base-year weights (w_i^0) in the estimation of the individual models (see for example (4.50)-(4.52)). These shares are also used in the calculation of the elasticities (see (4.53)-(4.55)).

A number of patterns of trade in the international economy are revealed by observing the seaborne import share tables.

We observe no one region predominating trade for most goods. That is, there is no single exporter which has monopolistic power internationally. The exception is for good 2(Bulk Liquid), particularly regions 27(Persian Gulf) and 29(South-East Asia), and also regions 11(Caribbean Area) and 12(N. Coast of South America), which capture the largest shares in the international import markets.

For, good 1(Bulk Dry), region 05(US Gulf) is in a strong position internationally.

There is a high export penetration of region 08(Central America) in the neighboring 03, 04, 05 and 06 (USA) for good 3(Refrigerated goods) and other goods to a lesser extent.

The strong export position of the industrialized regions 16, 19, 15 (Europe), and 31(Far East Asia), for good 5(Other Dry Cargo) in the world markets is to be noticed.

Table 5.3.

MATRIX OF SEABORNE IMPORT SHARES FOR BULK, DRY (1980).

IMPORTING REGION j (columns 01–15)

PARTNER i	01	02	03	04	05	06	07	08	11	12	13	14	15
01	77.365	29.699	0.3312	0.2559	0.0773	0.0466	2.2398	0.9037	4.3820	3.7536	1.5920	1.2792	1.4471
02	16.584	0.0538	42.245	30.087	8.7502	0.0694	1.3860	1.2800	18.159	1.5053	7.0105	0.6557	12.615
03	0.0147	3.2889	0.0000	0.0000	0.0000	0.0000	0.0856	3.4985	1.4798	3.0678	16.492	7.9246	9.2417
04	0.0185	0.8477	0.0000	0.0000	0.0079	0.0000	1.0427	1.3978	5.4064	2.6795	0.8157	2.3739	0.2665
05	0.3488	11.919	0.0000	0.0000	0.0000	0.0000	6.1037	50.837	20.445	43.626	23.377	45.125	3.3133
06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2952	5.2201	0.0010	0.2734	0.0589	3.7936	0.0372
07	0.0849	0.0000	2.9519	3.2315	0.2358	5.0462	34.828	7.0780	1.3895	1.5764	7.4211	6.3834	2.0469
08	0.0677	0.9280	1.6266	0.8314	2.5157	20.898	12.875	0.0820	1.3619	0.5166	0.2968	0.4502	0.1155
11	0.3654	7.0724	7.6389	13.133	33.350	1.2490	1.1144	0.3620	3.7074	9.2372	0.1825	0.1479	1.9092
12	0.2323	0.6893	12.866	1.7464	7.3468	0.2274	0.3052	2.3368	11.548	2.3658	0.7621	0.2093	1.9343
13	0.3825	13.712	5.7488	9.8864	6.8326	2.3741	0.6178	3.2022	10.659	2.3231	18.119	9.6666	4.3621
14	0.0000	0.2364	2.0733	2.7349	3.0002	0.5447	0.4955	1.2889	1.1905	2.1794	1.9394	2.4271	0.1861
15	0.3405	1.4788	0.4442	0.0822	0.3792	0.6476	0.5305	0.1954	0.9694	0.6371	0.4213	0.1623	3.8383
16	1.9687	3.2807	3.7337	11.811	3.3862	10.242	1.3395	4.6821	2.5082	4.7377	4.8705	1.9382	23.443
17	0.0140	0.0972	0.2339	0.9001	0.9971	0.0000	0.0015	0.0027	7.7813	2.3366	6.3251	0.2487	5.0143
18	0.4657	0.3296	0.5555	0.5813	1.0808	1.1607	0.2256	1.0055	2.5101	0.6426	0.6883	0.5094	8.0621
19	0.1839	2.5397	0.6795	5.0365	1.4536	0.3283	0.3891	3.1912	0.9025	4.9074	1.1813	0.7112	2.2951
20	0.0037	0.0053	0.0059	1.6373	0.3156	0.0000	0.0000	0.0000	1.1220	0.0003	0.1959	0.1912	0.1510
21	0.0000	0.0142	0.6045	4.4928	0.4384	0.1113	0.0015	0.0540	0.0033	0.0004	0.9330	0.0000	0.4716
22	0.0080	0.1716	0.2868	0.0006	1.5565	0.0537	0.0000	6.0553	0.5337	0.7935	1.9921	0.0000	2.3810
23	0.0771	18.330	7.2284	0.2834	8.5590	0.0019	0.0011	0.6362	0.0003	0.1773	0.2040	0.0056	3.3454
24	0.4302	2.5234	1.1924	1.9822	4.6899	2.3838	0.5431	0.0359	0.0084	3.9085	0.2284	1.1575	1.9786
25	0.0173	0.1428	0.9425	2.0395	1.2568	0.0001	0.0000	0.0000	0.0012	0.2677	0.0085	0.0350	1.4352
26	0.0000	0.0000	0.1245	0.0000	0.0000	0.0000	0.0000	0.0006	0.0008	0.0000	0.0000	0.0000	0.1183
27	0.0000	0.0036	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0023	0.0000	0.0003	0.0000	0.0612
28	0.0285	0.0109	0.1429	0.0520	0.5003	0.0731	0.0626	0.1932	0.9907	0.0013	0.2338	0.4329	0.3776
29	0.0000	0.4412	2.1136	1.2256	0.6529	0.8830	0.7257	0.2681	0.4629	0.1089	0.5747	0.1494	0.4709
30	0.0000	0.0000	0.1312	0.0232	0.8596	0.1100	0.1770	0.0189	0.0483	0.0225	0.0000	0.0077	0.3057
31	0.6145	0.2721	2.9180	4.2481	8.9973	38.150	9.7614	6.0995	2.3842	8.3438	3.4626	11.271	0.6523
32	0.3825	1.9095	3.1785	3.6950	2.7590	15.397	23.850	0.0724	0.0376	0.0085	0.6103	2.7419	8.1222

IMPORTING REGION j (columns 16–32)

PARTNER i	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	1.0481	1.5872	1.2669	1.5920	0.5068	0.0261	1.3517	0.9246	3.9336	0.0000	0.1749	0.5589	0.8607	0.4925	0.5032	0.1319	0.0078
02	5.8785	6.5102	3.9115	6.6440	3.7120	4.1995	4.5976	6.3878	0.4195	0.6770	2.2598	2.6016	1.7378	1.3517	2.3337	0.7573	0.5614
03	6.1640	3.3837	14.040	12.842	6.2784	10.482	9.7834	0.2172	2.5670	4.0844	0.9394	0.5564	1.5753	0.7856	2.3402	5.6051	0.4256
04	0.5864	0.7978	0.4884	0.7479	0.7206	1.4331	0.3717	0.2608	1.8273	1.2885	0.1648	0.0531	1.2716	0.1417	0.7975	0.2482	0.5330
05	12.430	8.3934	6.9120	7.7293	14.851	19.130	8.5081	20.191	20.498	20.639	10.434	4.7163	11.971	4.1471	13.766	6.1326	5.8897
06	0.2290	0.0699	0.0323	0.1714	0.0410	0.0169	0.3016	0.0061	4.1841	0.0020	0.3474	0.0907	1.2341	0.7200	2.9270	2.3106	2.4525
07	0.9217	1.6910	0.3879	1.5818	0.8961	0.4442	6.3786	3.9054	23.859	4.8869	0.6241	1.9909	15.489	8.1786	13.844	14.079	13.268
08	0.1420	0.1413	0.1383	0.1256	0.0000	0.1217	0.0601	0.0000	0.0000	0.0000	0.0000	0.0001	0.1117	0.0000	0.0000	1.0545	0.0577
11	0.4313	6.1410	0.2341	0.2320	0.8657	1.0707	1.5779	2.8499	0.0000	0.0173	0.2750	1.4876	0.0361	0.2027	1.2215	0.0714	0.8622
12	1.8146	0.7357	1.3639	2.3379	0.7503	0.0000	0.0156	0.1039	0.6350	0.1553	0.0001	0.0015	0.1165	0.0145	0.0000	0.0749	0.0694
13	11.351	27.160	10.504	10.514	6.0103	9.3882	2.3514	1.7735	5.4528	1.1759	0.9285	5.0883	2.6019	8.2262	3.6069	7.9943	0.0643
14	0.4702	0.1245	0.1986	0.7316	1.3347	0.3230	0.1637	0.0507	0.0063	0.1635	0.4772	1.3720	0.0979	0.1282	0.3976	2.2553	0.0005
15	6.1674	2.0061	6.1924	2.3138	0.5253	0.9604	1.2238	3.2528	4.4515	1.1205	0.6440	0.8512	1.4730	0.4197	0.0783	0.0182	0.4593
16	18.846	22.203	9.8309	5.2582	4.2198	9.5532	15.121	13.759	14.371	9.4660	12.896	15.457	11.983	4.0082	2.1664	0.1447	0.7888
17	7.4287	3.5671	6.5707	3.4719	0.0000	0.5461	1.8924	0.2194	0.0000	0.1733	1.0447	0.7302	1.5959	0.5180	0.5437	0.1222	0.0047
18	2.7496	4.4250	1.1008	1.4629	3.8440	2.9288	13.268	12.520	0.2789	5.9412	4.8646	6.0916	2.1814	0.0433	0.8350	0.0199	0.2886
19	0.9380	0.0634	1.0100	3.8678	7.6731	19.034	15.387	9.3868	8.2153	7.8293	7.8866	9.1730	3.1141	0.8804	1.3617	0.0837	0.1925
20	0.0950	0.0000	1.2926	5.0352	24.337	5.9385	4.6375	0.0797	0.0000	0.4494	3.1894	0.3970	4.4639	0.6770	0.0000	0.0065	0.0259
21	0.3874	0.1738	0.8500	1.4129	1.9931	1.3914	1.0905	0.0646	0.0736	0.9614	0.4908	0.1357	0.0716	0.1799	0.0226	0.0565	0.0174
22	2.0730	2.9317	5.5422	4.8838	3.3842	4.3356	0.6635	2.1090	0.0061	0.0000	0.2071	1.2537	3.5718	0.0106	0.8610	0.1728	0.2446
23	6.3753	5.2489	9.6985	10.869	2.8567	1.9834	0.6548	4.8360	0.1748	0.1120	0.0410	0.0091	0.5016	0.3939	0.0847	0.5117	0.0233
24	6.6124	0.0036	13.396	6.2077	0.0372	0.1421	0.0658	0.0187	0.0000	0.6082	0.1355	0.0400	0.5568	0.1592	0.0000	4.5291	1.4966
25	0.0702	0.0168	0.2142	0.2624	0.1073	0.0833	0.1419	0.2226	0.9635	11.526	1.6769	0.2413	0.4065	2.2622	0.0394	0.0412	0.0246
26	0.0837	0.5884	0.0485	0.3097	1.1604	3.6481	0.0750	0.0008	0.0000	2.3800	4.5731	0.1525	5.5646	1.1888	0.4454	0.1361	0.0008
27	0.0108	0.0235	0.0022	0.0491	0.0000	0.0810	0.5227	0.0000	0.0127	0.5369	0.7228	4.3664	6.9918	0.3246	0.3897	0.0207	0.1089
28	0.4312	1.4785	0.2684	1.0679	11.972	0.4665	0.1222	2.7862	0.0839	6.1946	1.9067	4.3749	1.5489	1.4664	1.5554	4.9661	0.0965
29	1.1574	0.0304	0.4534	0.6258	0.0170	0.2435	0.4580	6.0687	0.1448	7.4999	9.6571	7.0687	2.7148	18.389	3.4922	9.3895	3.3441
30	0.3156	0.4039	0.1408	0.3214	0.0000	0.0473	0.0694	0.1909	0.0000	0.9167	2.0357	0.5738	1.4651	3.7552	0.1491	3.4432	0.3907
31	0.2557	0.0917	0.2060	0.7972	1.1292	1.8525	1.7057	7.7988	7.5699	9.5596	22.406	17.601	8.9950	26.362	15.226	2.9092	18.230
32	4.5330	0.0061	3.7015	6.5309	0.7731	0.1255	7.4361	0.0127	0.2692	1.6335	8.9940	12.963	5.6926	14.571	31.009	32.711	50.068

Table 5.4.

MATRIX OF SEABORNE IMPORT SHARES FOR BULK, LIQUID (1980).

PARTNER i	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	70.801	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
02	7.3226	0.3042	0.5019	0.0085	0.0005	0.0000	0.0000	0.0000	0.1041	0.9579	0.2454	1.8780	0.2086	0.3666	0.0000	0.1231	0.0979	0.0000	0.1515	0.0000	0.7137	0.0000	0.0000	0.0000	0.0000	0.1158	0.5574	0.0000	0.0000	0.0000
03	0.0892	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0052	0.0005	0.0491	0.0036	0.0321	0.0030	0.0110	0.0004	0.0019	0.0011	0.0000	0.0058	0.0080	0.0148	0.1428	0.0082	0.0024	0.0203	0.0048	0.0026	0.0032	0.0036	0.0113
04	0.0000	0.0000	0.1809	0.1058	0.0663	0.0000	0.0000	0.1716	0.0053	0.0251	0.0000	0.0167	0.1173	0.0126	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0001	0.0003
05	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.1236	0.0206	0.1888	0.0151	0.2649	0.5316	0.0365	0.0000	0.0000	0.0114	0.0000	0.0011	0.0086	0.0083	0.0219	0.0004	0.0281	0.0241	0.0034	0.0222	0.0000	0.0064	0.1111
06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.1304	0.8458	0.0022	0.0007	0.0005	0.0124	0.0000	0.0125	0.0000	0.0152	0.0000	0.0000	0.0000	0.0000	0.0000	0.0034	0.0000	0.0000	0.0079	0.0001	0.8039	0.0018	0.0507	0.0881
07	2.0208	0.0000	0.0000	0.0000	0.0000	0.0000	2.1489	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0057	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	4.7378	0.3192	0.0019
08	0.9011	2.1170	2.9059	2.2781	13.713	0.0725	0.2468	5.3026	0.3340	0.0015	1.6034	0.0000	0.5887	0.1828	0.0000	1.0500	2.3292	0.0000	20.130	0.0000	0.1158	0.0000	0.0000	0.0000	0.0000	0.0000	0.0563	0.0000	0.3510	0.0000
11	6.1533	19.933	37.071	19.289	28.982	4.4180	1.7567	20.461	2.7644	59.768	0.4665	6.3134	1.0410	1.6362	0.0000	0.8990	0.9696	0.0000	1.2822	0.0000	5.1624	0.0000	0.0000	0.0000	0.0000	0.0000	0.0406	0.0000	0.0144	0.1708
12	11.577	24.897	21.256	12.547	2.3858	2.2771	4.7026	50.946	23.504	20.971	7.5841	30.153	2.0679	1.8471	0.3216	2.1291	3.7608	0.0000	0.7285	0.2638	9.8947	0.2353	0.0000	0.0000	0.0000	0.2844	0.4031	0.0000	0.7556	0.0031
13	0.0000	0.0000	0.4726	0.2075	0.0029	0.0000	0.0000	0.0000	0.0758	0.2630	1.2882	0.0000	0.0796	0.4274	0.0000	0.0310	0.2337	0.1076	0.0000	0.1134	5.0168	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.8106	1.5295	1.0996	0.9778	0.0000	1.5296	2.5601	1.8859	0.4843	26.238	0.0001	0.0152	0.0213	0.0186	0.0761	0.0000	0.0000	0.0000	0.0007	0.6760	0.0000	0.0000	0.0000	0.0000	0.0027	0.0000	0.3386	0.0000
15	0.0041	1.3114	3.5396	0.4059	4.6050	0.0000	0.0000	0.0048	3.6967	0.3107	0.0012	0.0059	5.7430	15.465	0.0018	5.5944	0.8335	0.0000	0.6244	0.1299	1.5548	0.1383	0.1537	0.8048	3.0769	0.2075	0.0265	0.0004	0.0000	0.0327
16	0.0016	1.3667	0.4251	0.1005	0.0550	0.0000	0.0015	0.1376	0.1199	1.0420	0.0049	0.4039	14.265	6.1125	0.0328	3.4744	0.6222	0.0926	1.4003	1.2374	25.639	1.8250	0.8421	0.5862	2.7037	0.4631	0.0146	0.1125	0.0018	0.1525
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.2894	9.3290	34.009	2.4162	0.1112	0.0000	0.0000	0.4686	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0004	0.1437	0.4636	0.0000	0.0000	0.0000	0.0000	0.4366	0.0099	0.0000	0.0000	2.8890	0.7809	0.0000	0.3190	0.2511	0.0000	0.0549	0.7340	1.5032	0.0001	0.0074	0.0000	0.2608	0.0000	0.0387	0.0000	0.0000	0.0004
19	0.0000	1.5871	0.8957	1.0570	0.0758	0.0000	0.4434	2.2013	0.1357	0.0914	0.0555	0.0002	1.8708	1.3198	0.4279	0.6849	2.4474	0.1286	10.039	30.091	7.5961	3.8063	3.8461	0.3297	3.3559	1.5424	0.2181	6.3115	0.0234	0.1520
20	0.0000	0.0000	0.0893	0.3374	0.0000	0.0000	0.0000	0.0000	5.1605	4.0238	0.0000	0.0000	0.3152	0.5118	0.0000	1.2763	8.5389	53.923	11.659	6.6767	0.0002	0.0000	0.0000	1.0291	0.0000	6.7019	0.0464	0.0000	0.0117	0.0925
21	0.0000	0.0000	0.2485	0.0000	0.0479	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1821	0.0461	0.0000	1.3513	9.3070	18.190	1.3712	0.1105	0.0002	0.0000	0.0751	0.0095	0.0003	0.0000	0.1032	0.0000	0.0533	0.0000
22	1.1279	0.9052	15.459	23.395	17.328	0.2929	2.0289	0.0497	8.8609	2.6354	2.2471	0.0000	3.1414	5.0365	5.1583	3.8822	36.605	10.354	17.984	0.6063	4.4841	0.0000	1.2945	0.8673	0.0000	0.0001	0.1907	0.0000	1.3126	0.0000
23	0.0000	0.5084	9.5373	0.2008	12.351	2.3358	0.0000	0.0000	14.501	7.7738	5.6789	27.020	0.4919	10.001	4.9270	8.0501	6.0990	0.2072	0.0000	3.1477	25.348	0.0000	1.5004	0.0000	0.0000	0.0000	0.0578	0.0000	0.4826	0.0000
24	0.0000	0.0000	0.0336	0.0000	0.0034	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000	0.0289	0.0143	0.0000	0.0044	0.0159	0.0000	0.0000	0.0000	0.0000	0.0000	0.0100	0.0000	0.0000	0.0000	0.0380	0.0000	0.0151	0.1393
25	0.0000	0.0000	0.0069	0.0000	0.0000	0.0000	0.0000	0.0000	0.0205	0.0000	0.0000	0.0000	0.3875	0.0667	0.0000	0.0757	0.0721	0.0000	0.1651	0.0010	0.0038	0.0060	1.4976	0.2433	0.4702	0.0000	0.6429	0.0293	0.0156	0.0000
26	0.0000	0.1391	0.0480	0.1327	0.0923	0.0000	0.0000	2.8299	0.4165	0.0000	0.0000	0.0000	0.3091	0.1020	0.0000	0.0609	1.9543	0.8403	5.2427	0.0000	0.0008	0.0000	2.0433	2.0353	8.1140	0.0000	0.0858	0.0000	0.0000	0.0000
27	0.0000	46.662	5.8360	37.516	18.989	2.3666	22.997	13.389	34.219	0.0000	76.963	4.2988	62.003	46.356	55.098	68.254	25.319	13.449	28.585	55.394	12.940	0.0000	88.137	93.683	72.861	82.284	70.443	77.919	70.670	63.336
28	0.0000	0.0000	0.0000	0.1917	0.0000	0.0000	0.0000	0.0000	0.0582	0.0000	0.0000	0.0000	0.2306	0.0834	0.0000	0.0749	0.0311	0.0000	0.5703	0.2602	0.0000	0.0000	0.0000	0.3006	3.0653	2.3060	0.1849	5.2125	0.0593	0.1219
29	0.0000	0.2661	0.5119	0.0769	0.1151	84.969	63.480	0.0000	2.9842	0.0000	1.0930	0.3150	0.1098	0.0982	0.0000	0.2113	0.2426	0.0000	0.0013	0.7477	0.0000	93.141	0.5269	0.0793	6.0350	5.6570	22.674	3.7439	21.608	29.827
30	0.0000	0.0000	0.0000	0.0935	0.0563	2.1316	0.0618	0.0000	0.0000	0.0000	2.2630	3.0446	0.0054	0.1103	0.0000	0.0000	0.0585	2.7051	0.0000	0.0000	0.0000	0.0000	0.0428	0.0002	0.0006	0.0003	2.5624	0.0000	3.3669	0.2840
31	0.0000	0.0000	0.0002	0.0000	0.0003	0.0229	0.0002	0.0000	0.0161	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.3271	0.3376	1.9271	0.0827	0.0304
32	0.0000	0.0000	0.0242	0.0610	0.0276	0.1347	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0975	0.0097	0.0000	0.0000	0.0098	0.0000	0.0000	0.0000	0.0000	0.0026	0.0130	0.0002	0.0011	0.1007	0.4442	0.0000	0.4561	5.4434

Table 5.5.

MATRIX OF SEABORNE IMPORT SHARES FOR REFRIGERATED GOODS (1980).

PARTNER I	IMPORTING REGION J																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	71.119	0.0028	0.0050	0.0014	0.0000	0.0000	0.0000	0.0000	0.2127	0.0000	0.0000	0.1723	0.1835	0.3897	0.0000	0.6363	0.0007	0.0000	0.0000	0.0000	0.0000	0.0264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000
02	0.0135	2.0521	1.4987	0.0034	0.0000	0.0000	0.4899	0.8288	17.704	20.017	4.9371	2.5905	1.2476	2.1333	0.1145	1.5369	1.0264	0.0216	0.3603	7.3915	6.7366	4.1748	0.1270	0.0000	0.0429	0.1762	0.1715	0.0000	0.8903	0.9897
03	0.1694	6.9328	0.0000	0.0000	0.0000	0.0000	0.0114	4.1801	4.0589	0.3345	0.3446	0.6038	0.3595	2.0544	0.0327	1.1427	0.2705	0.3869	1.4176	0.7718	0.7068	1.9142	0.0130	0.1355	0.3414	0.0057	0.1799	0.0000	0.5947	0.1067
04	0.0000	0.0017	0.0000	0.0096	0.0000	0.0000	0.0000	20.610	18.482	25.125	0.3043	0.4538	0.0502	1.1138	0.0643	1.5795	0.6473	0.0000	0.0729	0.2131	0.4388	0.9438	0.0235	0.0710	0.1364	0.0000	0.1058	0.0000	1.5562	0.1969
05	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.8716	0.9489	2.0035	0.3997	1.2393	0.3085	1.4706	0.0000	1.5906	0.0887	0.5983	7.0818	6.8424	0.7416	7.2708	0.0013	3.4034	0.4537	0.0000	0.0066	0.0000	1.6272	0.0074
06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.2738	2.2081	0.0056	2.6314	0.2675	1.7502	0.7588	2.3771	0.3960	1.3235	0.9214	0.0000	0.0412	0.0000	0.0000	2.0675	0.0392	0.5206	0.5829	0.1936	8.0855	0.0000	15.221	6.5491
07	1.5456	0.0000	0.0158	0.0000	0.0000	0.0174	18.325	0.0713	0.0001	4.8219	0.6608	4.9844	0.2960	0.7898	0.0000	0.7853	0.2195	0.0000	0.0000	0.0000	0.0000	0.3886	0.0000	2.7351	0.9319	0.0606	0.5491	0.9351	7.6555	1.4296
08	0.0000	0.7514	38.216	54.640	72.622	29.084	0.0418	6.6590	0.1990	0.0338	4.8898	0.0163	0.4788	16.765	0.0000	2.5915	13.775	0.0000	1.1911	0.0000	0.0000	0.0000	0.0000	3.3288	0.2358	0.0000	0.0013	0.0000	0.5362	0.0544
11	0.0000	1.3600	0.3679	7.8476	0.0153	0.0138	0.0000	6.1353	2.7095	0.1064	0.0000	0.0097	2.3817	0.1661	16.712	7.3179	0.8128	0.0000	0.0000	0.0000	0.0486	0.0290	0.0000	0.0088	0.0153	0.0000	0.0022	0.0000	0.0667	0.0082
12	0.0000	0.0000	3.3906	5.1281	17.151	0.0000	0.0000	0.0144	5.3677	1.8244	2.6888	0.0402	2.3552	2.0022	9.8610	6.6413	3.3984	1.9185	4.6361	0.0000	0.0000	0.0000	0.0000	0.0280	0.0080	0.0000	0.0001	0.0000	0.1188	0.0000
13	0.0000	1.0837	1.5942	3.8074	0.0589	0.3301	0.3462	2.2560	0.3548	0.7392	53.422	15.889	0.6205	6.0491	13.462	2.5916	5.5385	0.3352	6.4556	4.4748	8.3636	2.3293	0.0000	6.8590	7.9187	0.0000	0.0306	0.0000	1.4513	0.0411
14	0.0000	0.0211	17.106	2.5598	6.6215	38.395	3.1042	3.7222	0.0907	3.8727	11.064	56.263	1.2450	5.1939	13.248	2.8000	11.620	0.0000	5.3964	0.0764	0.5393	2.8554	0.0013	7.4055	4.1124	0.3337	0.0017	1.0903	0.9742	11.708
15	0.0067	2.2559	4.8118	0.0674	0.0039	0.0192	0.2559	7.9680	3.8702	0.3768	0.2318	2.2910	7.7717	9.3693	14.260	17.982	4.5588	3.4469	8.2849	13.466	15.032	2.1363	0.5750	0.2184	0.6354	0.1820	0.4860	0.0000	0.4885	0.3736
16	1.8371	21.415	5.2203	1.0302	0.1504	0.7129	3.5209	16.941	11.180	25.508	18.693	6.9434	20.557	20.089	15.286	6.7020	7.3405	1.1199	27.579	28.800	23.920	7.0858	11.071	6.9696	15.615	38.388	4.3754	0.1483	2.1700	2.1444
17	0.0000	0.0000	0.3788	0.0000	0.0000	0.0000	0.0019	2.8231	13.390	0.0018	0.0000	0.1114	0.1228	0.3826	0.0000	1.5193	0.2006	0.0000	4.1282	1.1220	2.9042	0.0000	0.0000	0.1622	0.1094	0.3901	0.0679	0.0000	0.1172	0.0005
18	0.0067	4.1755	0.5178	0.0630	0.0048	0.1265	0.6583	2.9278	15.756	4.0282	0.9829	0.9610	26.502	2.6848	4.9019	0.3553	0.7781	14.911	1.2952	11.133	11.104	1.2479	21.425	10.256	5.7133	6.5168	0.7630	0.0000	0.1987	1.0412
19	3.4912	6.3864	0.7821	0.3470	0.0064	0.2797	0.3367	0.1180	0.3314	1.3229	0.3466	0.0701	6.5802	2.5284	5.6536	0.2432	2.7416	15.161	6.6384	16.906	7.3689	3.1304	12.417	9.4190	5.6884	2.2064	0.0717	0.0062	1.1121	0.8752
20	0.0000	0.0365	0.1036	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0171	0.0198	0.0000	0.1264	0.2621	14.806	0.0000	3.5633	7.3391	0.0000	20.617	3.0116	0.6752	0.0000	0.0008	0.0000	0.0051	0.3002
21	0.0000	1.3949	0.2429	0.0137	0.0152	0.0934	0.0000	0.0000	0.0138	0.0006	0.0007	0.0000	11.566	8.9625	3.0985	1.5784	12.302	9.8352	9.5578	2.8973	0.0380	0.0000	0.0799	9.8952	5.9594	0.1459	1.2291	0.0000	0.1161	0.0664
22	0.0271	3.3847	0.0277	0.0032	0.0000	0.0000	0.0000	0.0167	0.0009	0.0000	0.0000	0.0000	3.4125	5.6215	1.4584	12.402	10.401	37.217	11.989	0.0952	0.5420	0.0000	0.0000	7.4598	2.0770	0.0000	0.0687	0.0000	0.2102	0.0280
23	0.0000	1.8414	0.0665	6.9244	0.0101	0.0000	0.0000	2.6805	0.0000	0.0024	0.0000	0.9316	0.4593	0.5956	0.0000	5.7381	8.2717	0.0926	0.0016	0.1062	7.0665	0.2247	0.0013	0.0359	0.0047	0.0014	0.0000	0.0000	0.1763	0.2298
24	10.283	12.857	0.5451	2.5968	0.0172	0.2736	0.1874	0.0000	0.0000	0.0000	0.0000	0.0211	4.9371	5.5977	0.0000	2.6739	3.6078	0.0000	0.0000	0.0000	0.5408	0.0000	8.8474	4.3429	1.8751	0.0939	0.0001	0.0000	0.3342	2.2050
25	0.0000	0.0205	0.0023	1.3938	0.0033	0.0000	0.0000	0.0000	0.0003	0.0024	0.0000	0.0000	0.3530	0.1317	0.7895	0.2182	2.7786	0.0001	0.0049	0.0026	0.0826	3.4609	3.2997	0.7780	1.0214	1.5909	0.0041	0.0000	0.0747	0.0000
26	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0097	0.0000	0.0002	0.0054	0.0005	0.0214	0.0000	0.0000	0.0753	0.0065	0.0412	0.0837	0.0426	0.5975	1.2248	0.5371	3.7091	0.4407	0.0236	0.0000	0.1350	0.0093
27	0.0000	0.2009	0.1299	0.7419	0.0000	0.0095	0.0000	0.0000	0.0013	0.0024	0.0010	0.0000	0.1085	0.0758	0.0993	0.0548	0.4649	0.0000	0.3428	0.0922	0.0009	0.0000	0.2004	0.2319	1.6277	12.380	1.6553	0.0102	0.1317	1.2566
28	0.0745	0.3574	0.3704	0.0384	0.0046	0.0440	0.1036	0.0000	0.0056	0.0629	0.0000	0.0005	0.1339	0.1524	0.0009	0.0143	0.2768	0.0026	0.3054	0.0654	0.1610	0.1057	1.5994	2.0800	20.958	31.315	4.3497	7.6629	1.1853	0.1505
29	10.317	0.5315	0.1876	0.7997	0.0000	2.6631	1.6163	0.6907	0.0000	0.0949	0.1057	0.0000	0.0448	0.3788	0.0000	17.872	2.7661	0.1386	0.1871	0.0360	0.0001	0.0000	0.5659	13.683	5.9894	1.4637	20.185	0.0170	26.396	2.7959
30	0.0000	0.0000	0.0502	0.0062	0.0000	0.0098	0.0627	0.0089	0.0060	0.0229	0.0000	0.0000	0.1425	0.3469	0.1625	0.3149	1.6897	0.0000	0.0000	0.0000	0.0033	0.0000	0.4807	0.4894	0.3246	0.0028	21.734	7.6817	4.5061	0.3835
31	0.0000	3.9785	1.9460	1.6820	0.0191	11.498	23.898	0.5771	1.1695	2.0724	0.6430	0.1712	0.0566	0.3739	0.0000	1.3212	1.9694	0.0000	0.0819	0.0549	5.6712	50.782	9.1592	0.2832	0.2914	1.5894	15.988	0.3803	19.144	18.771
32	1.1049	28.955	22.421	10.293	3.2946	16.427	45.763	16.689	4.1283	4.9894	0.0134	4.4794	6.9469	2.1602	0.3969	0.3437	1.1923	0.0000	2.9084	1.8032	0.6045	9.2274	8.2278	5.6484	12.943	2.5200	19.859	82.067	12.803	48.275

Table 5.6.

MATRIX OF SEABORNE IMPORT SHARES FOR GENERAL CARGO, DRY (1980).

IMPORTING REGION j (regions 01–16)

PARTNER i	01	02	03	04	05	06	07	08	11	12	13	14	15	16
01	74.233	9.8868	0.6068	0.7263	2.8661	0.0025	0.0040	0.0433	0.4253	0.2165	0.0451	1.2276	0.7711	0.9578
02	2.8482	0.6352	3.3379	11.368	0.9797	0.0686	0.0006	2.5962	6.8864	3.4016	2.2722	3.0523	3.8143	1.8806
03	0.3893	0.8326	0.0000	0.0000	0.0000	0.0000	0.0006	3.0841	2.1836	5.1712	4.6989	6.8779	1.6256	3.7311
04	0.0170	0.0208	0.0022	0.0059	0.0005	0.0000	0.0008	8.3486	12.247	6.7361	6.3076	5.4344	0.8953	1.4464
05	0.2725	10.250	0.0000	0.0000	0.0000	0.0000	0.0000	36.556	17.004	30.258	18.000	21.530	2.7519	8.0668
06	0.0006	0.0065	0.0000	0.0000	0.0000	0.0000	3.7455	2.5829	0.1251	1.8844	3.1082	2.7609	0.2111	2.5965
07	2.3611	0.0576	0.1074	0.2331	1.1934	11.470	20.691	1.5802	0.4385	0.7805	1.0428	2.6795	0.9261	0.7211
08	5.0888	0.3953	1.8140	8.0254	24.474	0.9735	0.2351	0.7557	0.6720	1.9662	5.1239	1.9601	0.1222	0.7190
11	0.2590	3.4823	5.9479	17.026	5.4909	0.0812	0.0024	3.1720	6.4810	2.2158	1.0007	2.3242	1.3631	0.4803
12	0.1247	0.0596	0.3841	2.1738	0.4263	0.5848	0.0111	3.0928	6.5391	10.162	1.4951	3.1437	0.3914	0.9640
13	1.6886	1.8995	6.1522	4.6194	6.9257	1.4846	1.0324	2.5484	0.8834	2.4037	12.172	9.5533	1.1748	2.7584
14	0.0000	0.3596	2.6418	1.4059	1.4832	1.1728	0.3770	4.1671	0.4312	2.1733	4.0185	8.3386	0.1411	0.6916
15	3.3678	14.250	6.3897	2.2624	5.0095	3.2640	1.9685	4.0384	3.1249	2.4627	1.7926	2.4736	8.5355	11.008
16	4.8631	30.228	22.586	12.108	13.458	5.6124	4.4986	9.5346	6.3079	11.670	14.429	10.369	43.960	32.180
17	0.3650	1.2179	1.2667	1.0809	2.1486	0.1755	0.1315	0.1887	21.313	0.7507	0.6974	0.1961	2.1860	3.1524
18	0.4491	3.2732	3.8712	1.8404	5.7392	0.8441	0.7721	2.4976	8.7358	3.4127	1.3338	0.6699	12.938	3.3925
19	1.5246	6.4194	11.073	9.5916	6.6835	2.4172	1.0376	6.1118	2.8350	10.126	6.6293	4.6561	5.2805	1.9013
20	0.0292	0.2419	0.8610	6.6995	6.9996	0.7781	2.0308	0.0969	0.0050	0.0844	0.5275	0.6989	0.2632	0.1204
21	0.0037	0.3448	1.0652	0.8684	0.1992	0.0965	0.0000	0.0176	0.0127	0.0623	0.2976	0.0369	1.3054	0.7216
22	0.2677	0.9418	0.2922	0.2825	0.0048	0.0014	0.0013	0.0068	0.1126	0.0211	0.7545	0.0072	0.2404	1.0797
23	0.0000	0.0786	1.9489	0.7311	0.4566	0.0328	0.0436	0.0890	0.0339	0.0033	0.0577	0.0339	0.8863	1.3104
24	0.4380	1.5844	0.4385	0.2698	0.2312	0.2878	0.0550	0.0057	0.0002	0.1044	8.9483	0.8920	1.0372	0.5570
25	0.0226	0.5328	0.7315	0.3204	0.9998	0.0714	0.0716	0.0001	0.0063	0.0038	0.0035	0.0037	0.9549	0.4903
26	0.0000	0.0000	0.1367	0.0042	0.3660	0.0151	0.0000	0.0011	0.0014	0.0006	0.0017	0.0000	0.1576	0.1123
27	0.0000	1.4237	0.0079	0.0056	0.0027	0.0154	0.0033	0.0003	0.0088	0.0137	0.2675	0.0155	0.0813	0.0866
28	0.4014	1.3967	1.9123	3.4109	1.3361	1.3320	0.7836	0.2148	0.0199	0.0293	0.4025	0.2474	1.3288	0.5880
29	0.2921	3.8555	8.6976	2.7614	6.3793	10.714	12.847	1.3171	0.2164	0.3469	1.3150	1.1260	2.5795	12.119
30	0.0000	0.0000	0.5288	0.1087	0.3177	1.0609	1.3048	0.0746	0.0654	0.2882	0.0909	0.3585	0.7744	1.9021
31	0.4203	5.6848	16.525	11.712	5.5023	56.515	46.037	6.5245	2.6040	3.0117	2.9005	8.3397	2.4338	3.5936
32	0.2704	0.6385	0.6704	0.3552	0.3236	0.9256	2.3104	0.7513	0.2763	0.2354	0.2629	0.9906	0.8663	0.6684

IMPORTING REGION j (regions 17–32)

PARTNER i	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0.2549	0.1999	0.2737	0.2525	0.0796	0.2118	0.3853	0.5684	0.0425	0.0953	0.0006	0.4885	0.0144	0.0026	0.0191	0.2696
02	1.9051	1.9142	1.8714	0.8279	0.5249	1.0123	0.2888	0.6844	0.1587	0.3118	1.1680	1.2904	0.5937	1.4171	0.4684	1.9693
03	0.6371	3.0263	3.2127	0.4985	2.3932	0.9728	1.3842	5.7325	0.7157	1.7376	2.2734	1.0720	1.4038	2.2373	2.3478	3.5770
04	0.6638	1.5868	1.9323	1.9069	2.9155	0.5324	0.3899	2.5565	0.7097	0.3774	0.3764	1.4454	1.0157	6.0484	1.3542	0.8016
05	0.2811	5.7468	11.606	2.1835	8.5748	6.5177	3.6151	19.627	7.1945	2.6778	1.8935	8.8281	4.0705	9.5442	6.1372	13.518
06	0.1219	3.0235	2.0143	0.4511	0.0725	0.0001	0.0072	1.1471	0.0388	0.0290	0.1443	1.3653	3.4923	4.2914	16.021	4.3608
07	0.0008	0.6362	0.6956	0.9988	0.0000	0.0618	0.0000	0.2935	0.1051	0.0055	0.0856	1.7702	1.4069	0.9701	6.1196	4.1737
08	0.1468	1.7758	1.6293	0.0001	0.0149	0.1659	0.0019	0.0136	0.0001	0.0199	0.0103	0.0941	0.2461	0.7314	0.8644	0.0685
11	0.4097	1.2960	0.4837	0.0654	0.0056	0.0323	0.2720	0.0000	0.7857	0.0193	0.0122	0.0244	0.1311	0.0000	0.0814	0.5094
12	1.0350	1.2087	0.9771	0.1751	0.0445	0.1706	0.0024	0.0035	0.1987	0.0018	0.0010	0.0091	0.0065	0.0948	0.0057	0.0826
13	15.753	3.4994	3.8466	0.6516	1.3273	1.2018	1.7834	1.4605	0.8773	0.1767	1.6551	3.5044	0.2716	1.2359	1.7335	0.5130
14	0.2038	0.2872	0.3323	0.0759	0.0395	0.0042	0.0135	1.0431	0.0011	0.0050	0.0119	0.0060	0.0155	0.0203	0.3475	0.1062
15	9.0722	16.478	6.6369	1.8906	4.4140	1.9264	11.723	17.628	6.0372	2.0596	3.4834	1.7234	1.8516	0.9939	1.4895	6.1900
16	44.591	22.479	9.5386	3.6308	15.039	10.328	22.336	24.442	18.411	8.7743	12.384	7.4339	5.9363	9.5911	4.8607	10.652
17	0.0000	1.7610	1.4460	0.0000	0.3315	0.7602	2.2401	0.0005	0.2702	0.4334	0.5804	1.2226	0.4647	0.1440	0.2328	0.1115
18	4.0878	5.5552	1.6943	12.922	4.5543	4.9084	13.076	1.5297	7.3685	0.4581	0.8048	2.0097	0.5017	0.4622	0.5991	1.3819
19	3.6316	5.2703	15.533	17.040	33.527	53.171	33.124	8.2523	15.240	50.327	25.598	2.7100	1.9581	5.6418	1.8701	3.9540
20	0.0000	3.3191	4.8688	21.846	6.0413	11.327	0.3043	0.0000	1.0489	5.9343	1.6685	3.8827	0.4095	0.0000	0.0980	0.0259
21	1.6757	0.8952	4.1549	7.7738	11.755	1.4083	0.0302	0.0331	0.5089	1.0223	0.2444	0.5179	0.1147	0.1364	0.2141	0.2402
22	0.6157	2.6042	9.7166	12.336	1.6406	0.3232	0.4385	0.0016	0.3140	0.1400	0.1089	2.5271	0.7293	0.5350	0.1723	0.0033
23	0.3081	5.5853	2.0661	0.2526	0.0071	0.3623	2.8161	0.0904	0.0493	0.0288	0.0534	0.0081	0.0532	0.0283	0.3006	0.1830
24	0.0000	0.4654	0.9612	0.0000	0.0164	0.0002	0.0059	0.0000	5.0346	0.0136	0.0150	0.0896	0.0257	0.0000	0.7963	1.1597
25	0.1369	1.0396	0.6675	0.9940	0.0977	0.1689	0.0873	0.1498	13.192	0.7691	0.8305	0.6103	0.8925	0.1491	0.2268	0.2381
26	0.1262	0.4323	0.7728	0.4759	0.0181	0.0286	0.0018	0.0018	1.2388	0.2134	0.0266	0.0218	0.1248	0.4188	0.2364	0.0038
27	0.0399	1.6157	0.1919	1.0641	0.2694	0.1321	0.0001	0.0120	0.7253	0.2441	4.7011	1.9301	0.8501	0.0063	0.2189	0.0800
28	8.5124	0.9272	1.7629	8.4739	0.8407	0.6854	0.2882	0.6665	3.4782	1.1419	2.0744	3.0984	1.1986	3.7681	1.7342	1.0066
29	1.9321	3.5402	4.2914	2.2534	1.4967	0.9104	0.6450	0.0113	9.2527	2.4154	3.7512	21.630	18.787	13.562	10.245	5.3992
30	0.9430	0.3323	1.3175	0.0000	0.1582	0.6036	0.4569	0.0000	1.1338	1.8829	0.7933	8.4085	4.9192	6.9177	4.3938	1.1270
31	1.8794	2.7748	4.4359	0.8316	3.7072	1.9997	4.2270	12.680	3.0563	17.986	33.357	20.064	43.918	26.822	32.869	22.651
32	1.0329	0.7220	1.0659	0.1241	0.0909	0.0697	0.0534	1.3686	2.8098	0.6969	1.8896	2.2121	4.5943	4.2271	3.9392	15.640

Table 5.7.

MATRIX OF SEABORNE IMPORT SHARES FOR OTHER DRY CARGO (1980).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	53.344	0.1327	0.0192	0.0019	0.0000	0.0001	0.0093	0.0000	0.7714	2.5939	0.1550	0.3568	0.6617	0.1582	0.6118	0.3357	0.3585	0.0438	0.0196	0.1514	0.0556	0.8050	0.0451	0.0300	0.0001	0.0772	0.0706	0.0135	0.0757	0.0161
02	2.4647	0.2303	0.7088	0.0222	0.0061	0.0013	0.0000	6.9962	5.8553	12.551	4.2898	2.9795	6.7207	6.7687	9.0431	4.5970	6.0596	0.0078	3.0622	0.8551	1.9251	1.4480	2.4494	0.3303	0.3689	4.3495	0.7776	5.2145	3.9391	2.0625
03	0.0205	0.1728	0.0000	0.0000	0.0000	0.0000	0.0016	1.0184	1.8300	8.3730	6.2849	8.2585	1.6331	2.4790	0.3898	3.6892	5.9436	0.6232	5.3181	1.6742	3.1032	5.4028	2.5536	5.8671	7.9872	3.5645	1.0790	0.9051	2.7476	4.0013
04	0.0306	0.0130	0.0008	0.0052	0.0016	0.0014	0.0007	6.9768	20.876	21.979	2.5636	6.3810	0.9675	3.1028	0.0159	5.3946	4.6542	2.0410	2.0059	1.4750	0.2573	4.9026	0.7025	0.8305	0.4087	1.5374	0.3300	0.8498	1.1635	0.4907
05	0.0000	0.0350	0.0000	0.0000	0.0000	0.0000	0.0000	21.109	5.2207	13.874	6.5430	9.2071	2.1402	3.8824	0.3724	1.5214	3.7939	6.2026	4.5346	2.8290	3.3496	2.9920	1.6784	2.7409	4.2329	2.5921	1.6172	2.7608	4.0094	1.7125
06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0057	0.9016	0.0201	1.3029	0.4202	0.6845	0.2192	0.3855	0.0525	0.8257	1.4668	0.0000	0.0985	0.0001	0.0048	1.0212	0.0044	0.0858	0.1580	0.6930	4.2443	0.9046	15.600	6.9920
07	0.0121	0.0000	0.1708	0.0005	0.0000	0.3410	7.7874	2.7464	1.0981	5.9053	2.2485	3.1427	6.5240	6.6244	0.6131	3.3149	12.160	0.7199	0.0000	0.5723	0.0000	4.7872	0.0540	0.0251	0.3903	4.1360	2.8777	21.794	25.212	8.6322
08	0.0000	1.2138	0.0209	0.7006	1.5358	0.0426	0.1087	0.8140	0.2660	0.9309	2.5962	1.6279	0.1757	0.1779	0.0013	0.5597	0.4729	0.0002	0.0005	0.0012	0.0018	0.0000	0.0013	0.0006	0.0001	0.0030	0.1339	0.0040	0.2950	0.0002
11	0.0000	0.1196	0.0497	1.1177	0.2437	0.0070	0.0000	0.8694	3.6574	0.9946	0.0064	0.0235	0.0211	0.0520	0.0000	0.0158	0.0142	0.0000	0.0057	0.0135	0.0010	0.0000	0.0136	0.0268	0.0035	0.0018	0.0043	0.0012	0.0080	0.0093
12	0.1096	0.0118	0.2621	1.5041	0.2839	0.0057	0.0077	1.1598	0.4478	0.1174	0.6172	1.0666	0.0949	0.4601	0.0023	0.1671	0.2106	0.0000	0.0001	0.0000	0.0005	0.0000	0.0008	0.0140	0.0510	2.1040	0.0002	0.0000	1.9717	0.0011
13	0.2303	6.5360	2.4302	7.3720	4.1389	1.4833	0.4237	6.5655	1.2557	3.7090	7.6687	12.489	0.6434	3.5136	0.1119	1.0130	1.8202	0.0000	0.0542	1.0984	3.4126	1.8210	2.6694	0.6913	0.8619	1.0993	0.2838	1.0246	3.0331	0.3544
14	0.0000	0.8309	5.0095	2.5157	6.3304	0.1825	0.0200	3.8221	0.1066	4.2920	27.670	10.948	1.8445	2.3517	1.4769	4.3200	5.6748	0.0000	0.0026	0.0012	0.1365	0.0559	0.0025	0.0000	0.0000	0.0086	0.0385	5.9308	2.4886	0.0001
15	10.991	17.891	4.0247	3.1047	2.7742	1.0021	0.8347	2.8287	6.3478	1.6968	4.2970	1.1833	5.5059	10.989	8.5605	17.029	6.4173	4.2235	9.5601	8.0369	10.444	20.682	17.131	6.0554	6.5549	10.477	2.9139	0.4279	1.0810	6.4755
16	17.989	52.252	26.438	11.206	18.710	10.787	5.7351	14.359	8.1970	5.3026	10.343	7.1847	40.799	38.085	67.776	28.120	19.837	11.878	30.824	18.719	19.070	18.899	16.763	14.546	16.735	7.7484	6.7622	12.132	3.5756	8.4985
17	3.0517	2.9046	0.5342	0.2441	0.2832	0.0019	0.0012	0.1521	6.7032	1.4544	0.3087	0.3965	0.9308	1.9107	0.0000	1.0507	0.3043	0.0000	3.1794	1.1373	0.2363	0.0000	0.0097	0.3492	0.7551	1.3227	0.0759	1.6297	0.0366	0.0147
18	6.9147	4.3451	3.7725	2.6074	1.7812	0.5742	0.5040	2.8717	7.4598	2.6415	1.7944	2.6045	11.372	3.1371	4.3031	6.8396	2.4857	13.783	2.8738	4.9191	16.851	6.6528	8.4722	1.1881	1.3772	0.8601	0.7494	0.2765	0.2244	2.0237
19	2.0033	3.6030	11.510	3.4613	2.7901	1.2809	0.4720	5.6353	6.2493	6.2340	9.0173	5.3909	5.5035	2.7181	1.3913	5.4539	8.0136	22.325	27.267	39.528	16.631	5.0579	20.671	15.225	13.176	7.1104	2.3964	2.9790	1.0161	1.8845
20	0.0000	0.1131	0.2775	0.1121	4.3583	0.0000	0.0000	0.0867	0.0340	0.1192	0.0179	0.0284	0.0485	0.0931	0.0000	2.3147	1.9304	29.582	2.3498	5.7239	0.0862	0.0000	0.4638	1.2438	0.0347	2.8341	0.0921	0.0000	0.3091	0.1009
21	0.0010	0.1727	0.2331	0.0487	0.1802	0.0685	0.3269	0.0051	0.0020	0.0082	0.0006	0.0113	0.1228	0.1236	0.0019	0.0163	0.3463	0.8472	0.1422	0.0952	0.0086	0.0058	0.4733	0.1606	0.2904	0.0422	0.1187	0.0188	0.0169	0.0144
22	0.1285	0.0407	0.0990	0.0039	0.1980	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4060	0.2490	0.0066	0.7074	1.9116	4.3896	0.0351	0.1518	0.0196	0.0046	0.0002	0.4557	0.1170	0.0025	0.0000	0.0000	0.0244	0.0000
23	0.0000	0.3301	0.1602	0.0015	7.5490	0.0000	0.0000	0.0000	0.0019	0.0000	2.0805	0.0002	0.0852	2.3625	0.0000	1.2230	1.4726	0.0000	0.0161	0.0672	0.9569	0.0234	0.0392	0.0068	0.0008	0.5845	0.3609	0.0000	0.8354	0.0002
24	1.7115	1.1762	1.5712	0.5049	10.350	0.0615	0.1377	0.0073	0.0000	0.3953	0.7761	1.8951	4.4181	1.0522	0.0000	0.8417	2.2676	0.0000	0.0014	0.0000	0.0023	0.0000	0.2494	0.0018	0.0004	0.0997	0.3398	0.0000	1.1423	0.1163
25	0.0711	0.0081	1.6957	0.2146	1.7194	0.0000	0.0000	0.0000	0.0140	0.0000	0.1534	0.0726	0.6392	0.6567	0.0001	3.2795	3.0534	0.0384	0.0647	0.2140	0.0184	0.0804	0.5451	5.7339	0.2782	3.3258	0.3666	0.0347	1.5835	0.0004
26	0.0000	0.0000	0.0594	0.0002	0.0444	0.0001	0.0000	0.0000	0.0038	0.0000	0.0000	0.0000	0.0849	0.0856	0.0932	0.0323	0.3247	0.4299	0.0396	0.6615	0.0142	0.0034	1.1856	3.2858	0.1553	0.0098	0.0000	0.0159	0.0140	0.0000
27	0.0000	0.0000	0.1382	0.0623	0.6713	0.0096	0.0080	0.0002	0.0165	0.0022	0.0522	0.0000	0.0489	0.1691	0.0001	0.0070	0.3250	0.0215	0.9730	0.1591	0.0000	0.0099	0.4967	0.9711	3.8958	2.1647	0.2518	0.0030	0.5206	0.0318
28	0.3757	0.1542	0.1036	0.0407	0.0462	0.0945	0.6533	0.0064	0.0557	0.0255	0.0329	0.0268	0.0251	0.0260	0.0907	0.0363	0.2622	0.9719	0.0684	0.6676	0.9147	0.0278	5.5401	0.5093	2.1421	1.8583	1.1289	0.4549	0.0668	0.0658
29	0.0000	0.1026	1.6268	0.0727	0.2349	1.8476	0.1521	0.0829	0.0079	0.0134	0.0463	0.0273	0.1567	0.4368	0.1718	0.0690	0.1505	0.1542	0.0823	0.0509	0.3652	0.0011	0.6846	0.4290	0.6240	2.8295	6.6521	1.3801	1.2539	1.5235
30	0.0000	0.0000	0.0578	0.0278	0.0020	0.0358	0.0685	0.0365	0.0349	0.0502	0.0077	0.1171	0.0168	0.2215	0.3364	0.0719	0.2796	0.0000	0.4263	0.3517	0.2971	0.0008	0.6732	1.0218	0.2551	0.8717	1.5777	0.0000	2.2249	0.0880
31	0.5413	6.2187	37.835	64.724	33.436	79.838	82.069	20.595	23.198	5.4137	9.8909	23.828	5.7352	7.1214	1.7312	6.7380	6.1677	1.3311	6.8083	8.3533	21.764	24.709	15.801	33.980	31.857	21.645	55.493	36.541	15.903	37.066
32	0.0074	1.3864	1.1883	0.3212	2.3287	2.3315	0.6712	0.3523	0.2667	0.0169	0.1153	0.0654	2.4525	0.6040	2.8447	0.4132	1.8183	0.3837	0.1843	2.4898	0.0697	0.6032	0.6212	4.1904	7.2845	16.044	9.2612	4.7018	9.6254	17.821

We observe very strong ties (high shares) between the neighboring regions 29, 30, 31, 32(the Pacific rim countries). Also, a similar relationship exists between regions 15, 16, 17, 18 and 19; that is, the EFTA/EEC regions.

We notice the almost self-sufficient 01 in terms of seaborne trade (over 70% for all goods except for good 2 with a 50% intra-seaborne trade), due to the special type of ships needed in the Great Lakes. Of course, 01 is also supplied through the road and rail system.

Also the high intra seaborne trade (around 50%) of region 32 for goods 1 and 3 is worth noting. These are Bulk Dry and Refrigerated goods which are produced 'locally' and need to be transported between areas of Oceania.

5.3). Bilateral Import Prices.

The specification of the theoretical equations of the model (equation (3.11) and its linerized form, equation (4.14)) requires us to obtain bilateral import prices, for each commodity group which correspond to the bilateral volumes of seaborne trade flows. To the best of our knowledge, these data are not published anywhere. To be able to construct these aggregate price indices (for each region/good) ourselves using raw data, we must have information on bilateral import prices for each individual good and country of the world. Information for this type of data is limited and partial (data are only available for certain countries, goods, years over the period considered).

This has forced us to change the specification of our model, to take account of these data restrictions. In altering the specification of the model, (in chapter 4) bilateral import prices of a region for a type of commodity are thought of as a function of the total import prices of the importing region, the total export prices of the exporting region and the world price of the type of commodity considered. According to this specification, we have to obtain the following data for our import allocation model:

1) Total import data for each of the 30 regions,

2) Total export data for each of the 30 regions and

3) World prices for each of the 5 types of goods considered.

5.3.1). Total *Import-Export Price Aggregates for a Region.*

The procedure to answering 1) and 2) is similar. It involves finding total import/export prices for each country in each region, and calculating a weighted average for every region.

We obtain these data (126 countries) from the World Bank publications, in machine readable form, after the kind permission of the Bath university computer centre to use their database. Additionally, some data from the IFS (International Financial Statistics) of the IMF (International Monetary Fund) are obtained for another 14 countries. This brings the list of countries for which we have data to 140. In table 5.2 the countries inside the brackets, in each region, are countries for which there are no data available. These countries are relatively unimportant (in terms of size and resources) in influencing the total trade of the region they belong to, with the exception of, probably, Cuba in region 08 and the Eastern block countries in regions 17, 20 and 30.

Total import(c.i.f.)/export(f.o.b.) price indices (1980=100), dollar exchange rates and GDP-CON's (Gross Domestic Products, in constant 1980 prices), in local currencies, are collected for each country. The published world bank total import/export price indices for industrial economies come from the UN 'Yearbook of International Trade Statistics' (e.g., UN(1989)), the 'Monthly Bulletin of Statistics' (eg UN(1990)) and the 'International Financial Statistics Yearbook' (e.g. IMF(1990)). The total import/export price indices for developing countries are world bank estimates. They are based on international prices for primary commodities and unit value indices for manufactures. In order to ensure consistency between data for a group of countries and those for individual countries, the published indices are aggregated by broad commodity groups for each country.

A number of alternatively weighted total import/export price indices may be constructed for a region, depending on the weighting scheme used. Constant or varying weights may be used, each reflecting certain underlying assumptions. The weights used must reflect the relative importance of the country in the region, according to some criterion. We use the dollar GDP-CON of each country in the region, as the criterion. We arrive at the \$GDP-CON, from the original data, by dividing the GDP-CON in local currency by the dollar exchange rate of the country in question, also obtained from the world bank publications.

In general, with price indices, the decision has to be made as to whether to use base year or current year weights. A price index number is meant to show changes in prices over time. This requires prices only to change over time. If both prices and the weights ('quantities') are allowed to vary, the change in the price index might be a combined effect of both variables changing.

Laspeyres price indices use base year weights in constructing the index. That is, they measure the change in prices of a given set of 'quantities', those of the base year. However, as tastes, technology and other factors in the economy change over time, the base year weights become outdated as we move away from the base year. Mathematically, the Laspeyres import (export) price index of a region is:

$$L_{pt} = [(\sum_{i=1}^{n} q_{i0}\, p_{it})/(\sum_{i=1}^{n} q_{i0}\, p_{i0})] \times 100 \qquad (5.1)$$

where p_{it} are the input import (export) indices of each country $i=1,\ldots,n$ in the region at time t, and q_{i0} are the 1980 (\$GDP-CON based) weights of each country in the region.

Paasche price indices use current year weights in constructing the index. This remedies the critisism of the Laspeyres indices because the weights are revised in each time period, to take account of changes in tastes, technology, etc. Strictly speaking, these are not price indices since they do not reflect changes in prices only ('quantities' are allowed to vary). Mathematically, the Paasche import (export) price index of a region is:

$$P_{pt} = [(\sum_{i=1}^{n} q_{it}\ p_{it})/(\sum_{i=1}^{n} q_{it}\ p_{i0})] \times 100 \qquad (5.2)$$

where p_{it} are defined as before, and q_{it} are the ($GDP-CON) current period (t) weights of each country in the region.

In general, there is likely to be a discrepancy between the Laspeyres and the Paasche price (and quantity) indices. The following results are due to Bortkiewicz(1923, 1924), also reproduced in Allen(1975).

Let L_{qt}, P_{qt} denote the Laspeyres and Paasche quantity indices respectively, where the weights now are prices instead of 'quantities' (as they are in the price indices). From the mathematical definitions (leaving aside the factor of 100) we observe that,

$$L_{pt} \times P_{qt} = L_{qt} \times P_{pt} = V_t \qquad (5.3)$$

where V_t is the change in value between year 0 and t. That is,

$$V_t = [(\sum_{i=1}^{n} q_{it}\ p_{it})/(\sum_{i=1}^{n} q_{i0}\ p_{i0})] \qquad (5.4)$$

(5.3) indicates that the good of the Laspeyres price index times the Paasche quantity index is equivalent to the Laspeyres quantity index times the Paasche price index. Therefore we can write:

$$(P_{pt} / L_{pt}) = (P_{qt} / L_{qt}) \qquad (5.5)$$

(5.5) allows one to state that whatever divergence there is between the price indices there is an equivalent one between the quantity indices. To qualify the statement, let us start by writing the Laspeyres price and quantity indices in their relatives form. For convenience we omit the summation index i, and also assume that the q's represent quantities.

$$L_{pt} = [\Sigma\, w_0 \frac{p_t}{p_0})/(\Sigma\, w_0)] \quad \text{and} \quad L_{qt} = [\Sigma\, w_0 \frac{q_t}{q_0})/(\Sigma\, w_0)] \tag{5.6}$$

where $w_0 = p_0 q_0$ are the item by item base year weights.

The indices in (5.6) can be interpreted as the weighted means of relatives. The corresponding weighted variances are:

$$\sigma_p^2 = \Sigma\, w_0 (\frac{p_t}{p_0} - L_{pt})^2]/(\Sigma\, w_0) \text{ and } \sigma_q^2 = \Sigma\, w_0 (\frac{q_t}{q_0} - L_{qt})^2]/(\Sigma\, w_0) \tag{5.7}$$

The weighted covariance times $\Sigma\, w_0$ is:

$$\sigma_{pq} = \Sigma\, w_0 \,(\frac{p_t}{p_0} - L_{pt})\,(\frac{q_t}{q_0} - L_{qt})$$

$$= \Sigma\, w_0 \frac{p_t q_t}{p_0 q_0} - L_{pt} \Sigma\, w_0 \frac{q_t}{q_0} - L_{qt}\, \Sigma\, w_0 \frac{p_t}{p_0} + L_{pt}\, L_{qt}\, \Sigma\, w_0$$

Using (5.6) in the above yields,

$$\sigma_{pq} = \Sigma\, w_0 \frac{p_t q_t}{p_0 q_0} - L_{pt}\, L_{qt}\, \Sigma\, w_0 \tag{5.8}$$

The weighted correlation coefficient between prices and quantities is:

$$r = \sigma_{pq} / \sigma_p \sigma_q\, \Sigma w_0 \tag{5.9}$$

Using (5.8), (5.9) becomes:

$$r = [1/(\sigma_p \sigma_q)]\{[(\Sigma\, w_0 \frac{p_t q_t}{p_0 q_0})/\,\Sigma w_0] - (L_{pt} L_{qt})\} \tag{5.10}$$

Using $w_0 = p_0 q_0$ and (5.3) in $[(\Sigma\, w_0 \frac{p_t q_t}{p_0 q_0})/\Sigma w_0]$ of (5.10) we get:

$$[(\Sigma\, w_0 \frac{p_t q_t}{p_0 q_0})/\ \Sigma w_0] = [(\Sigma\, q_t p_t)/\ (\Sigma\, q_0 p_0)] \equiv V_{0t} = P_{pt}\ L_{qt} \qquad (5.11)$$

Put (5.11) into (5.10) to get:

$$r = [1/(\sigma_p \sigma_q)][(P_{pt} L_{qt}) - (L_{pt} L_{qt})]$$

$$= [1/(\sigma_p \sigma_q)]\ [(L_{pt} L_{qt})]\ [(P_{pt}/\ L_{pt}) - 1]$$

Rearranging gives:

$$(P_{pt}/L_{pt}) = 1 + r\ (\sigma_p/L_{pt})\ (\sigma_q/L_{qt}) \qquad (5.12)$$

Thus, the ratio of the Paasche to the Laspeyres price index is 1 plus a term, which consists of the good of the correlation coefficient between prices and quantities times two coefficients of variation, one for L_{pt} the other for L_{qt}. The coefficients of variation are always positive. This leaves the correlation coefficient to determine whether the ratio of the Paasche to the Laspeyres price (or quantity) index is greater or less than one; that is, whether the Paasche or the Laspeyres index is the greater of the two.

The Paasche index is the greater if r>0; that is, when prices and quantities move in the same direction. This would be typical of a market dominated by suppliers so that an increase in prices leads to increased supplies and sales. Examples of such rare markets are those of exporters selling on a large international market, and farmers selling on a market comprising both home produced and imported food.
The Laspeyres index is the greater of the two if r<0; that is, when prices and quantities move in opposite direction. This would be typical of a demand dominated market where buyers buy less as prices rise and more as prices fall. Such markets are those for imports or consumer goods, and is the more usual situation.

The magnitude of the discrepancy between the Paasche and the Laspeyres indices depends on the strength of the correlation between prices and quantities (as shown by r), and on the dispersion of the price and quantity relatives (as shown by the coefficients of variation of L_{pt} and L_{qt}).

One way of reconciling the problem of the Laspeyres and Paasche price indices, is to use the Fischer or Perfect price index structures. These are geometric averages of Laspeyres and Paasche price indices. In this way, the average of a changing set of numbers is obtained, the new index spliting the discrepancy between the Laspeyres and Paasche indices. Mathematically they are defined by:

$$F_t = \sqrt{(L_t \times P_t)} \tag{5.13}$$

We use the above principles to find averages of the import/export price indices for the set of countries in each region. Both Laspeyres and Paasche indices are calculated, with the weights used being the \$GDP-CON of each country. These indices are then used to calculate the Fischer's price index used during estimation.

5.3.2). World Price Aggregates for the 5 Types of Products.

Our solution to part 3) above, to finding world prices for each of the 5 types of goods, consists of two alternatives:

a) Constructing world price indices for each type of good,

b) Constructing unit value indices for each type of good.

Ideally, we like price indices to reflect the prices at which 'commodities' are exchanged, as opposed to unit values. Value changes are shown in (5.3) to be split into a product of a Laspeyres quantity (price) times a Paasche price (quantity) index, and conversely. In the division of the value into quantity and price components by means of index numbers, the price index should relate to 'pure' price quotations, leaving the quantity index to represent changes both in the number of units (e.g. tonnes) and in the quality of items.

Unit values are values per unit of quantities for the most disaggregated commodities (homogeneous 'commodities') entering trade. However, it is impossible to find data for every single commodity entering trade (e.g. Ford cars, JVC stereos, etc). As a result, there is no way of ensuring that a change in an aggregate unit value of a 'commodity' reflects a change in its price. This is because even if prices are constant and quantities change (or if there is a shift from, say, cheaper to dearer goods) within a certain type of aggregate good, the unit value of the good may change. But this would reflect changes in quantities (composition of the aggregate), rather than prices.

Another potential problem with unit value indices (Kravis and Lipsey, 1971, Introduction) is that they might not show the price at which the commodity may be obtained today, but the price at which it was negotiated when the commodity was contracted. This would be a problem, when we explain current import flows in terms of past contracted prices.

The answer as to what to do is not straight forward. However, we suggest a number of rules which we follow:
When price indices are available then they must be the first choice. Price indices for an aggregate 'good' may be constructed as a weighted average of the prices of the constituent goods.
If there are no sufficient data of prices for our aggregate goods use unit values. If data are available base these unit values on as many fine and homogeneous subdivisions of items as possible. Unit values can be acceptable when items are homogeneous or because different brands and qualities move together over time.

a) Constructing world price indices for each type of good:

World export price indices for (i) 66 primary commodities, (ii) 6 non-ferrous base metals, and (iii) machinery and transport equipment are published by the UN. Indices for the first two groups are available at the UN Statistical papers, Series M, No 82, for 1950 to 1985 (UN, 1987), and are updated every year at the UN Monthly Bulletin of Statistics. Data for the last group are available at the

UN Monthly Bulletin of Statistics. A list of all the commodities is presented in appendix 5.3. The first column shows the aggregate commodity groups for which there is a price index. This has been using the indices of the commodity subgroups of the second column and/or the commodity classes, shown in the third column of the appendix.

The methods used in the construction of the above published world price indices are described on pages 2 to 16 of the UN Series M, No 82 publication (UN, 1987).

In sum: The indices are world export price indices for commodities entering international trade. They are Laspeyres price indices with 1980=100, calculated in US $. The weights used are designed to reflect patterns of world trade, and are adjusted on average every 5 years (e.g. beginning in 1977, the 1980 patterns of world trade are used). Often, an index represents the average price movement of an aggregate of goods larger than the aggregate on which the computation of the index is based (e.g. an index for beef, fresh is assumed to represent price changes of meat of bovine animals, fresh, chilled or frozen). This permits us to use the index for a wider class of goods than the headings indicate.

The aggregate world price indices, which we construct for our 5 types of goods (MTC 'sections'), are weighted Laspeyres price indices of the published UN indices, with 1980=100. Their construction involves:

i) Associating each of the headings of appendix 5.3 with the appropriate MTC heading it represents (The more detailed (than MTC) SITC has also been used as an aid, to classify precisely the headings of appendix 5.3 into MTC 'categories'/'items'). In some cases more than one MTC 'items' are represented by a single heading of appendix 5.3. In other situations, more than one headings of appendix 5.3 are needed to represent a single item of MTC.

ii) Constructing weights, which are used in the calculation of the Laspeyres price indices. Since the base year in the original indices is 1980, we use the shares of each MTC 'categoty'/'item' in world seaborne quantities of the 'section' (type of good) that it belongs to in 1980, as weights. That is, the world seaborne quantity of each 'item' in 1980, is divided by the total world seaborne quantity of the MTC 'section' it belongs to, to create the weight for that 'item'.

iii) Using these weights, together with the original price indices, to construct the aggregate price indices for each of the 5 'sections' of the MTC (our 5 types of goods). A note should be made here that, whenever the original price indices fell short of covering the 1969-1986 period, in order to avoid sudden jumps in the final price indices, we extrapolated those indices to cover our period of estimation. Thus, if the observations x_t and x_{t+1} were known, to obtain the value of the unknown $\hat{x}_{t+2}$ we used:

$$\hat{x}_{t+2} = (x_{t+1} / x_t)\, x_{t+1} \qquad (5.14)$$

A notable feature of the final price indices is that, by construction, the greater the coverage of 'items' within each 'section' the closer the final index is to 100 in 1980. This is because the original price indices used are 100 in 1980, and also because the weights in each aggregate index are designed to sum-up to one. A quick look at the time series of the constructed final index allows us to infer about the representativeness of the index for the type of 'good' it intends to describe. The time series of the price indices of the 5 type of 'goods' is shown in figures 5.1-5.5, and their representativeness of the type of 'good' they purport to describe is summarised in table 5.8.

Table 5.8.

Percentage Coverage of Price Indices of MTC 'sections'.

Bulk, Dry	79%
Bulk, Liquid	84%
Refrigerated Goods	100%
General cargo, Dry	30%
Other Dry Cargo	56%

Figure 5.1.

BULK DRY WORLD PRICE INDEX

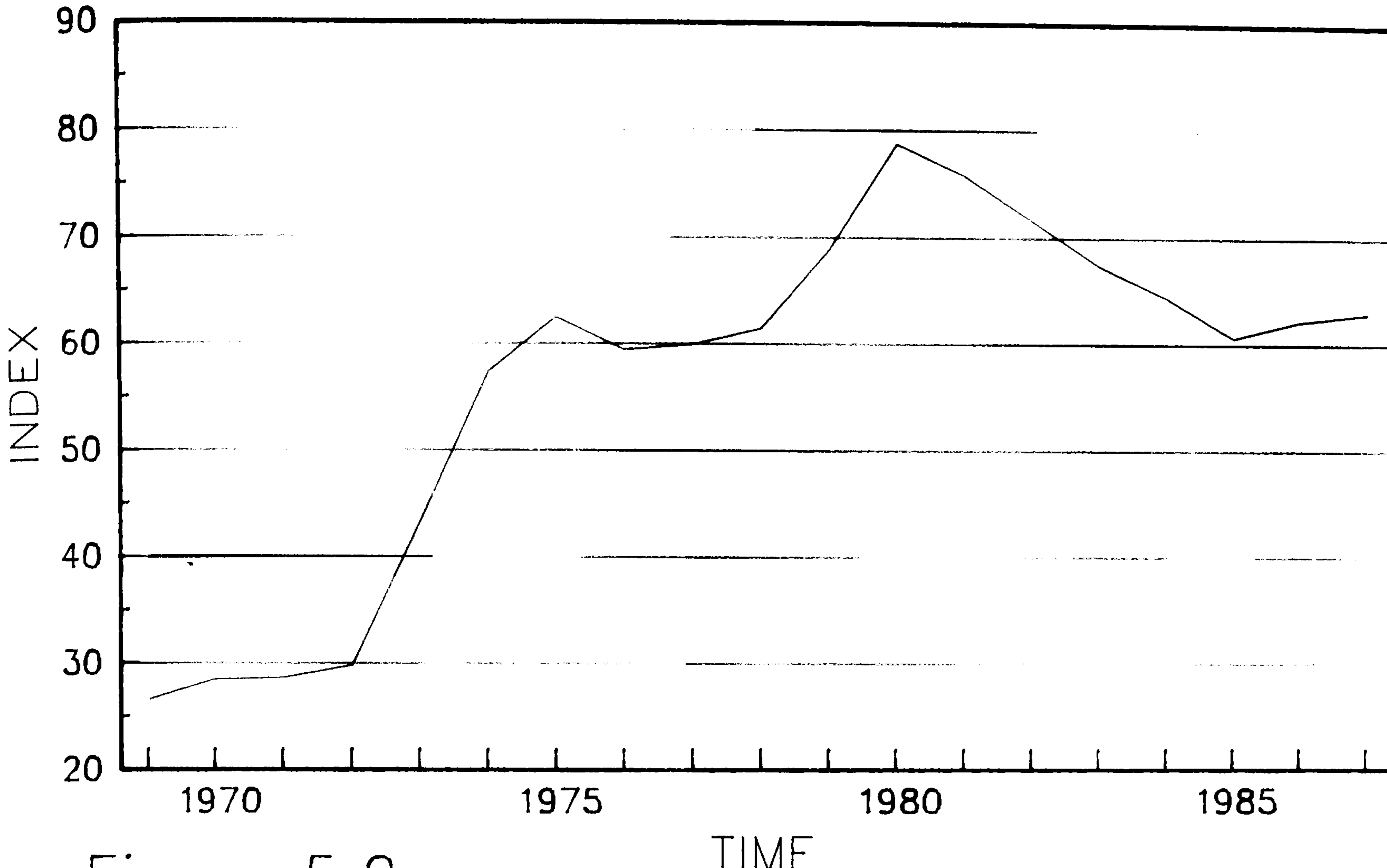
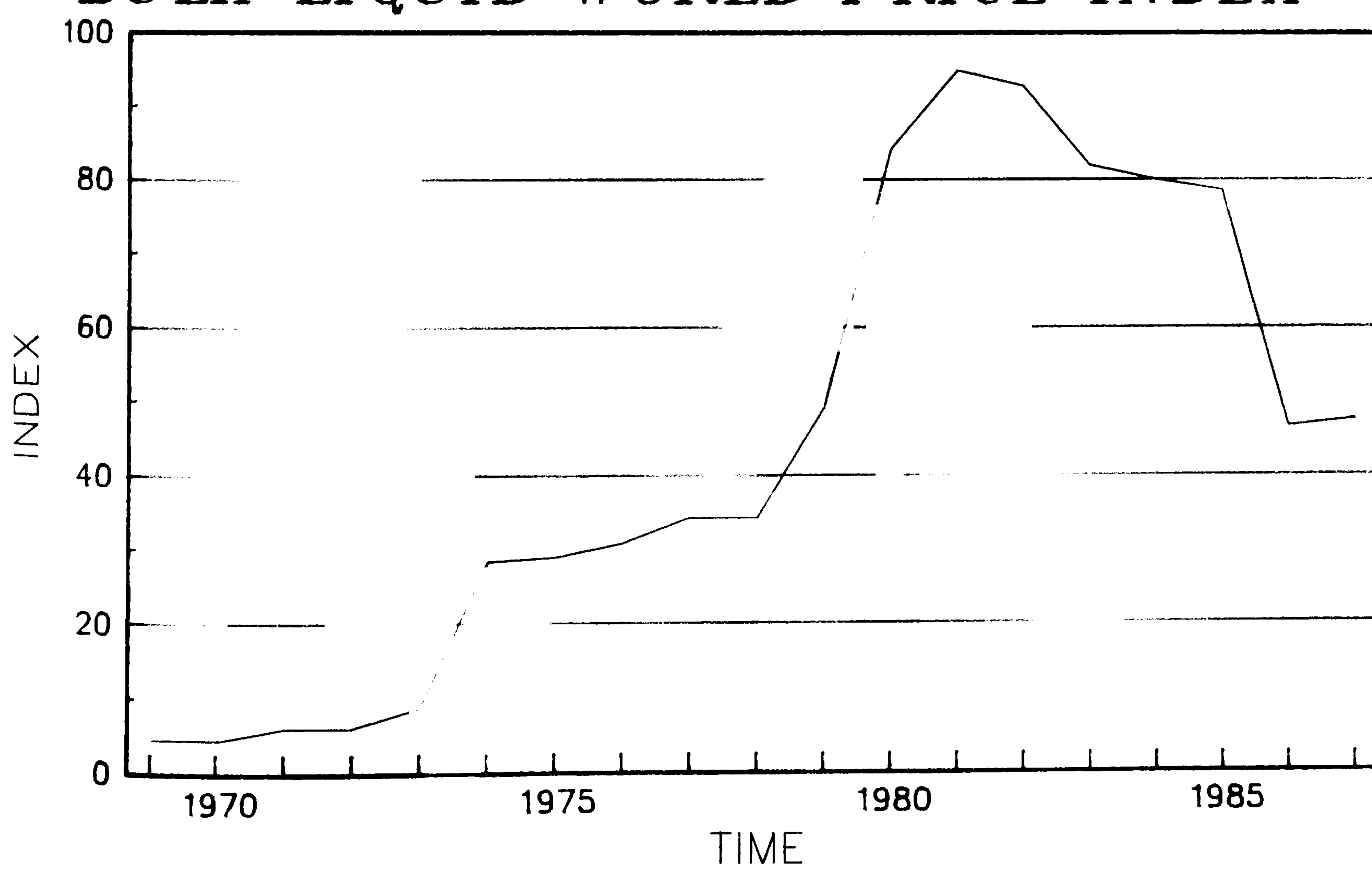


Figure 5.2.

BULK LIQUID WORLD PRICE INDEX



Value of indices for 1980 show % coverage of commodities in each index

Figure 5.3.

REFRIGERATED GOODS WORLD PRICE INDEX

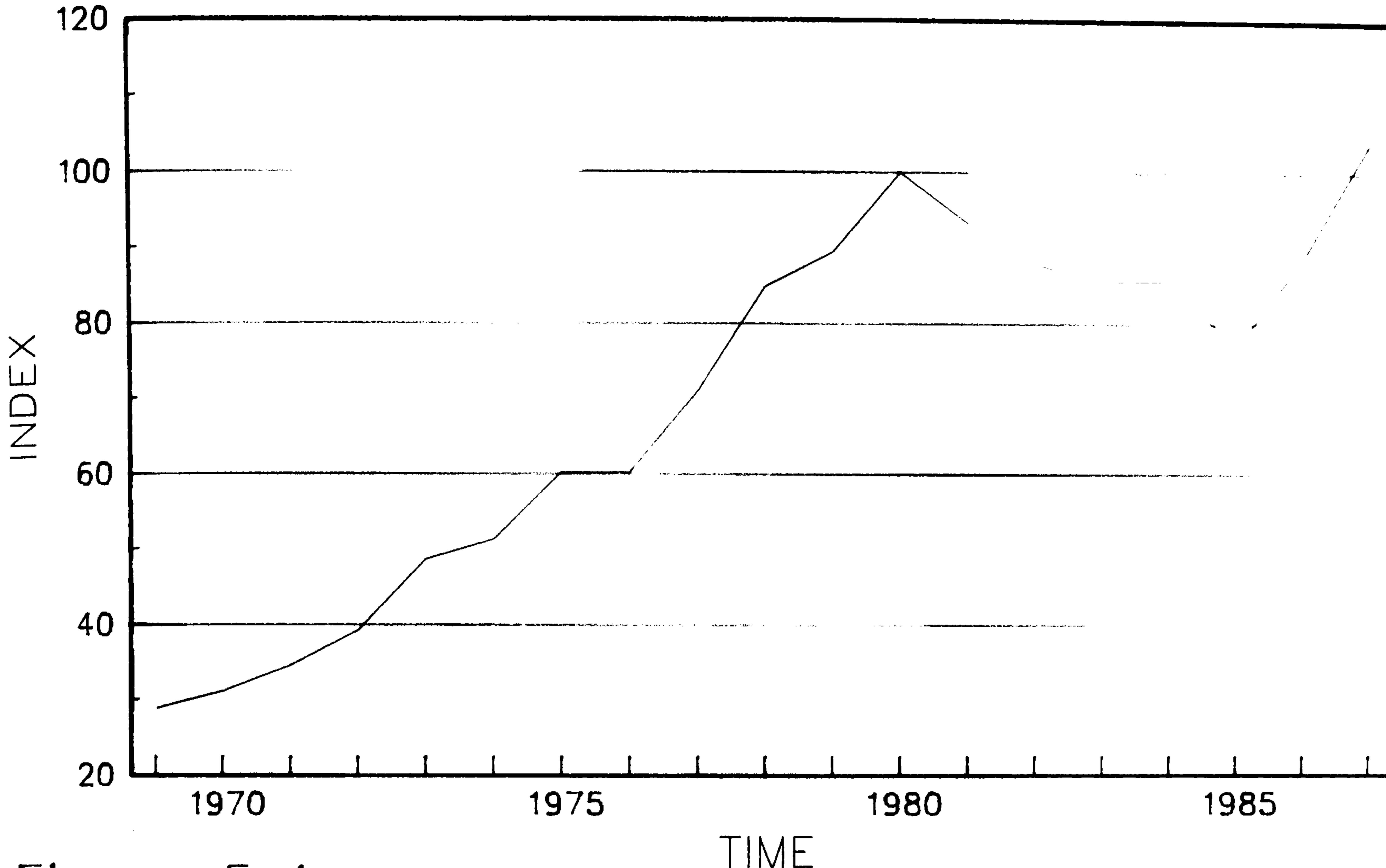
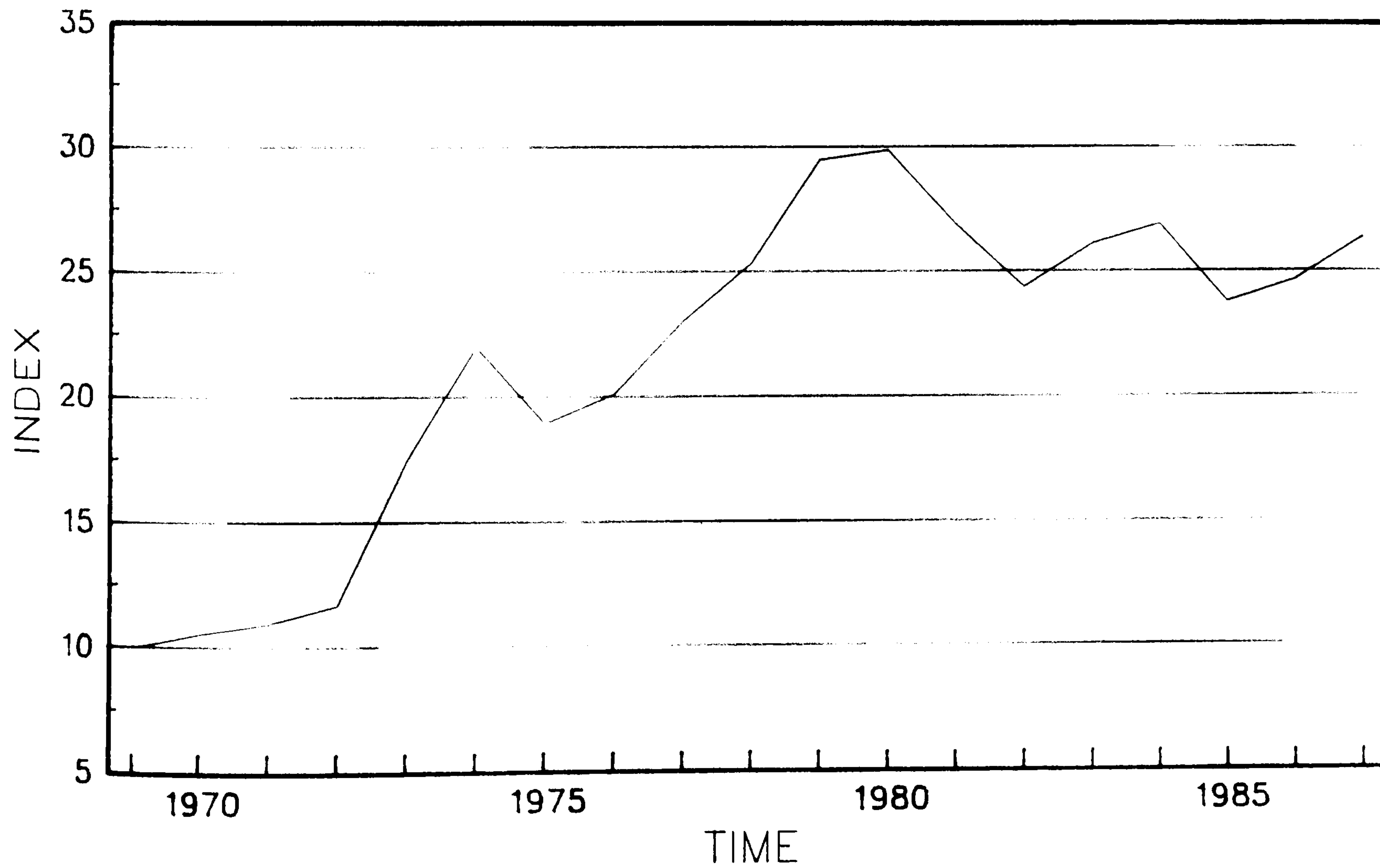


Figure 5.4.

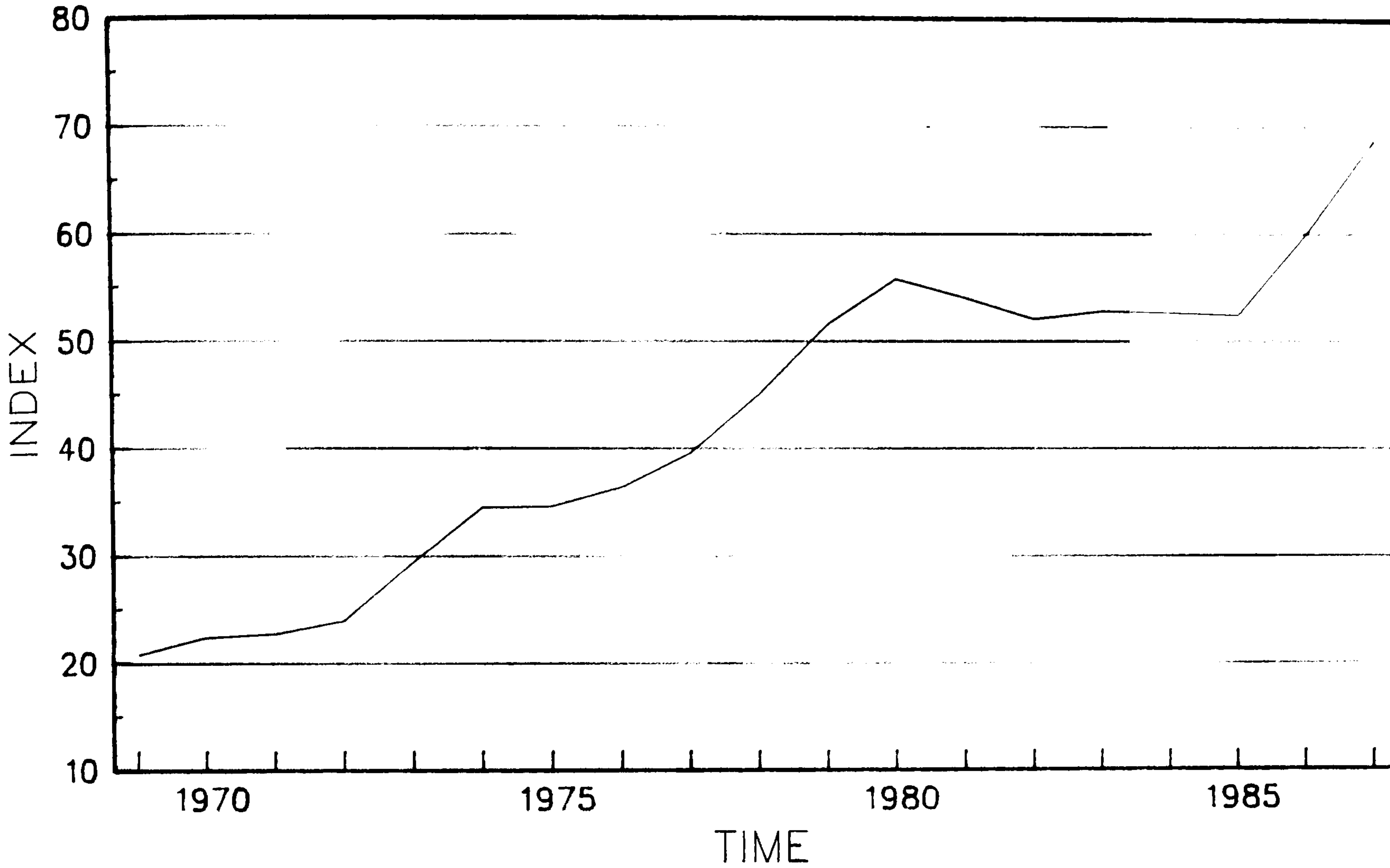
GENERAL DRY CARGO WORLD PRICE INDEX



Value of indices for 1980 show % coverage of commodities in each index

Figure 5.5.

OTHER DRY CARGO WORLD PRICE INDEX



Value of index for 1980 shows % coverage of commodities

Along the lines of our rules above it would be reasonable (due to the absence of data) to construct unit value indices for General cargo Dry (since only 29% of the total is explained by the aggregate real price index constructed), possibly Other Dry Cargo (56% coverage), and use these in our model.

b) Constructing unit value indices for each type of cargo:

We defined the unit value index of a 'commodity' as the ratio of its traded value to the traded volume. World unit value indices for our 5 types of 'goods' are the ratios of the values of each of the world seaborne traded 'goods' to the corresponding world seaborne traded volume of each 'good'. The seaborne traded volumes of each of the 5 types of 'goods' are available from the MTS, as described earlier in section 5.2. However, the values of seaborne traded commodities, to the best of our knowledge, are not available anywhere. Since internationally traded commodities are largely carried by sea, the best proxy available for the latter are total values of international trade, irrespective of the mode of transport.

Values of world trade by commodity (in thousand U.S.dollars), according to the SITC classifications are available at the UN 'Yearbook of International Trade Statistics'. The correspondence between the MTC and the SITC Revised and SITC Revised 2, are listed in appendix 5.1. These classifications are used to classify and collect data for individual headings under the appropriate 'good' type. Finally, the values for each heading obtained, under each 'good' type, are added to give us the total value of world trade, for each of the 5 types of commodities. Note that, we do not have readily available data for volumes of individual MTC 'items' in order to calculate the unit values from relatively more homogeneous 'commodities', and then find an average for our 5 types of 'goods'.

There have been two minor difficulties in the above in terms of the compatibility and availability of data of the SITC Revised and SITC Revised 2 classifications. First, data are not available for some years or at all for certain headings in the more detailed 4 or 5-digit levels (data exist for all 'groups', 3-digit headings). Second, data are only disaggregated up to the 3-digit level for 1969, and that creates a problem of a missing value in 1969 when classifying commodities of greater detail. The solution to both these problems is necessary in order to avoid jumps in the value series (due to missing observations) from one time period to the next.

Our solution to the former problem is to extrapolate back to the years for which data are not available, by using the percentage increase in the first two years for which data are available, as shown in equations (5.14). The value of the headings for which there exist no data at all are often derived by deduction (e.g. subtracting the values of the available 'subgroups' from the value of the 'group' comprising them). This is not possible for certain commodity headings, which however, are of minor importance in the total value of the type of good they belong to.
Our solution to the latter problem consists of finding the share of the higher than 3-digit disaggregated commodity in the 3-digit 'group', it belongs to, in 1970, and using that to calculate its value in 1969.

Having overcome these problems, we divide the total value of world trade (in thousands of US dollars) for each 'good' by the corresponding total seaborne trade quantity (in metric tons). The outcome is a unit value index for each of the 5 'goods' we are interested in. Multiplying the index by 1000 turns out conveniently the unit of measurement to $'s per ton. Thus, the $/ton unit values for 1980 for our 5 goods are: 163 for Bulk Dry, 233 for Bulk Liquid, 1679 for Refrigerated Goods, 2563 for General Dry Cargo and 4594 for Other Dry Cargo.

The question is whether these unit values can be used instead of the price indices, in our model when the coverage of the price indices is low. We attempt a direct comparison by rescaling both the price indices and the unit values, for each good, into new series with 1980=100. This is achieved by multiplying each series with the appropriate factor that makes it 100 in 1980 (for example the unit value series for Bulk Dry has to be multiplied by 0.6134969, and similarly for the other goods). Thus, the original series are shifted up or down without changing the underlying trends.

Both the unit value and price indices for each type of good are shown and contrasted in figures 5.6-5.10. We observe that the unit values and price indices move together for Bulk Dry, Bulk Liquid, Refrigerated Goods and quite close for Other Dry Cargo. The coverage for all these indices is over 56%. However, the unit value index for General Cargo Dry moves differently from the corresponding world price index. The coverage of this price index in terms of the available individual commodity indices is only 30%. Observing the close resemblance of the unit values to the price indices for the goods for which there is a high % coverage, we suggest that unit values can be good substitutes of the price indices for General Dry Cargo and for Other Dry Cargo. As a final note, we should say here that all the final price indices used in the model are rescaled so that they take the value of 1 in the base year, 1980.

Figure 5.6.
Price Index vs Unit Value of Bulk Dry

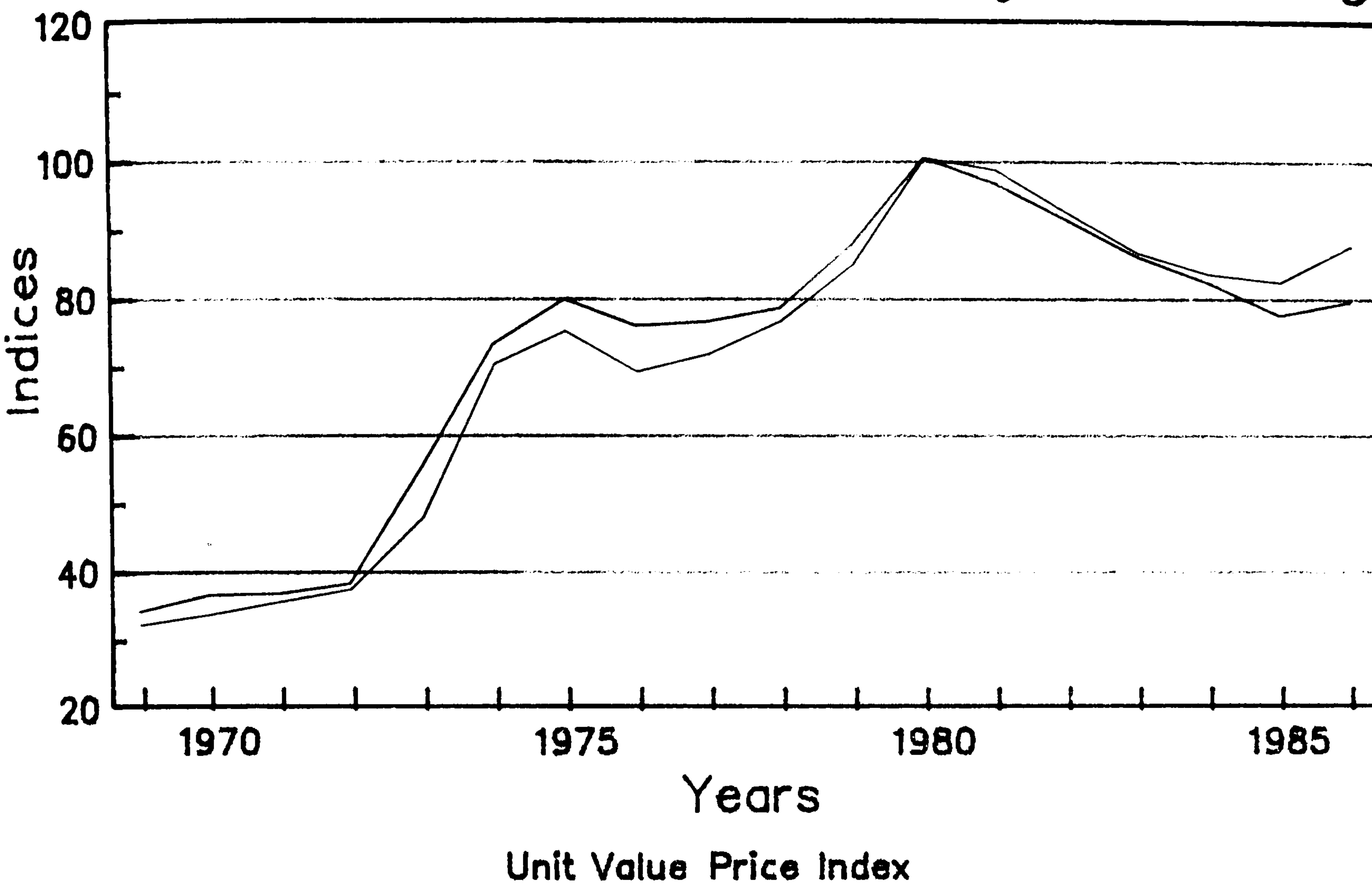


Figure 5.7.
Price Index vs Unit Value of Bulk Liquid

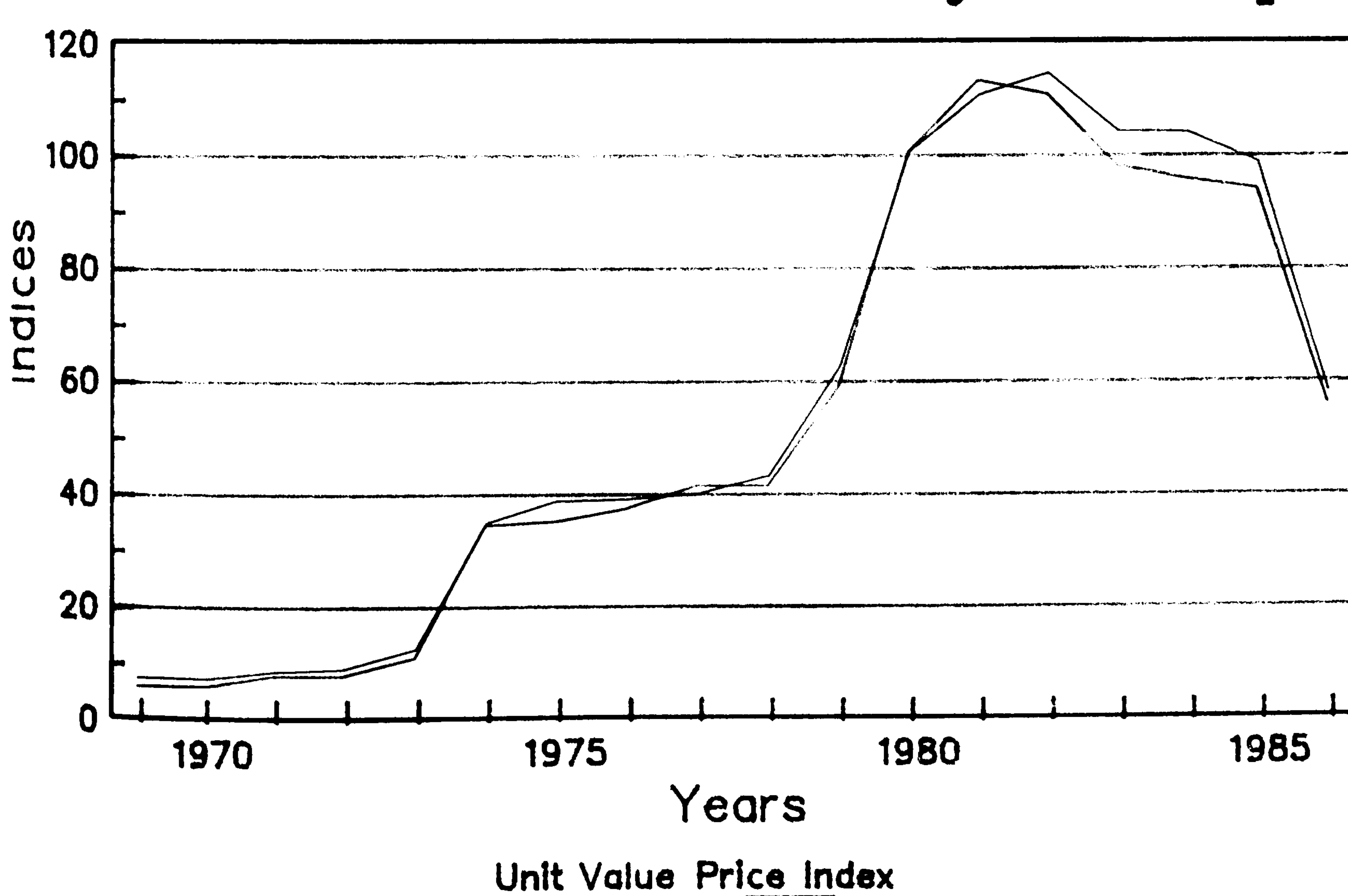


Figure 5.8.

Price Index vs Unit Value of Refrigerated Goods

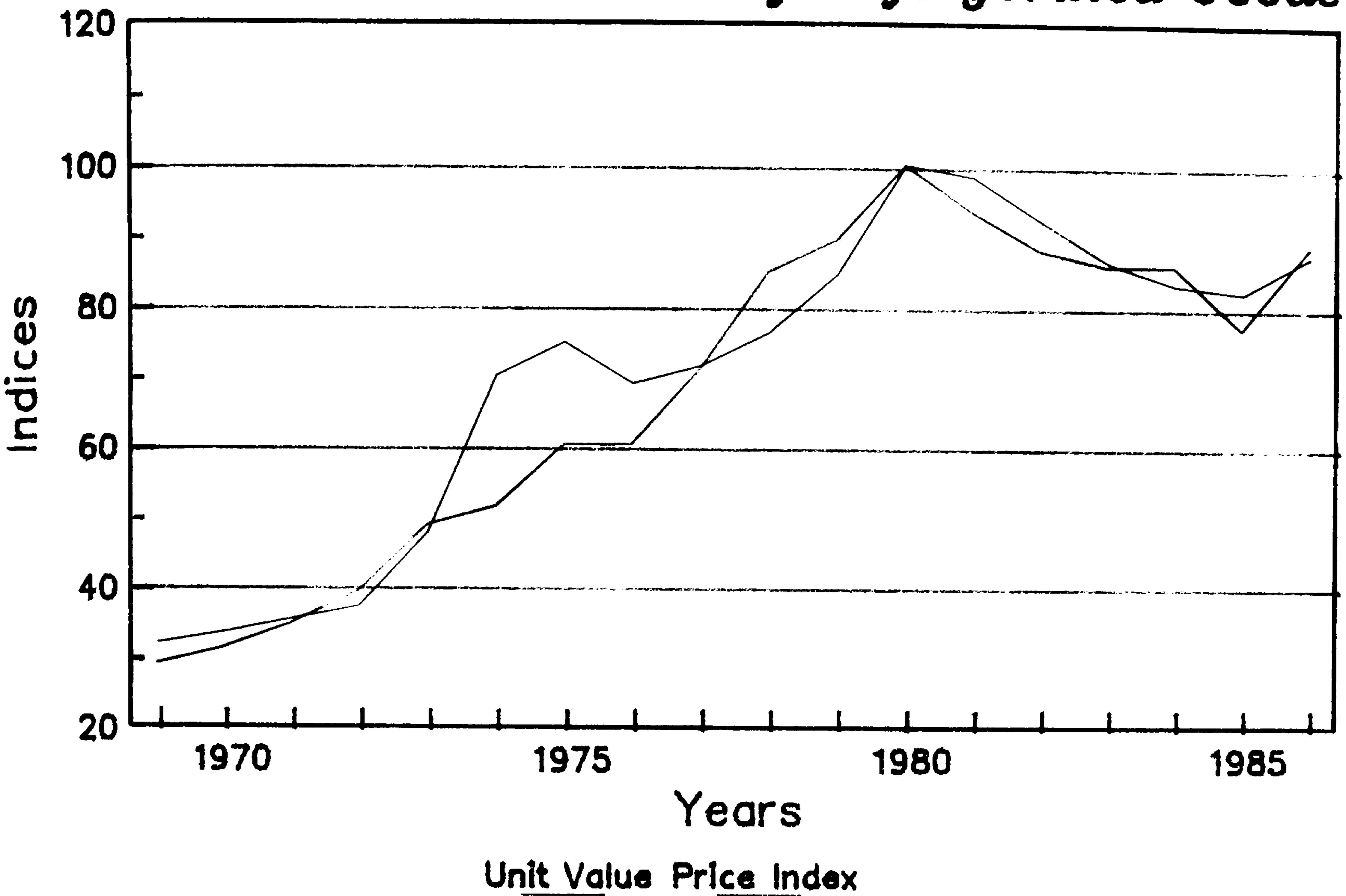


Figure 5.9.

Price Index vs Unit Value of General Dry Cargo

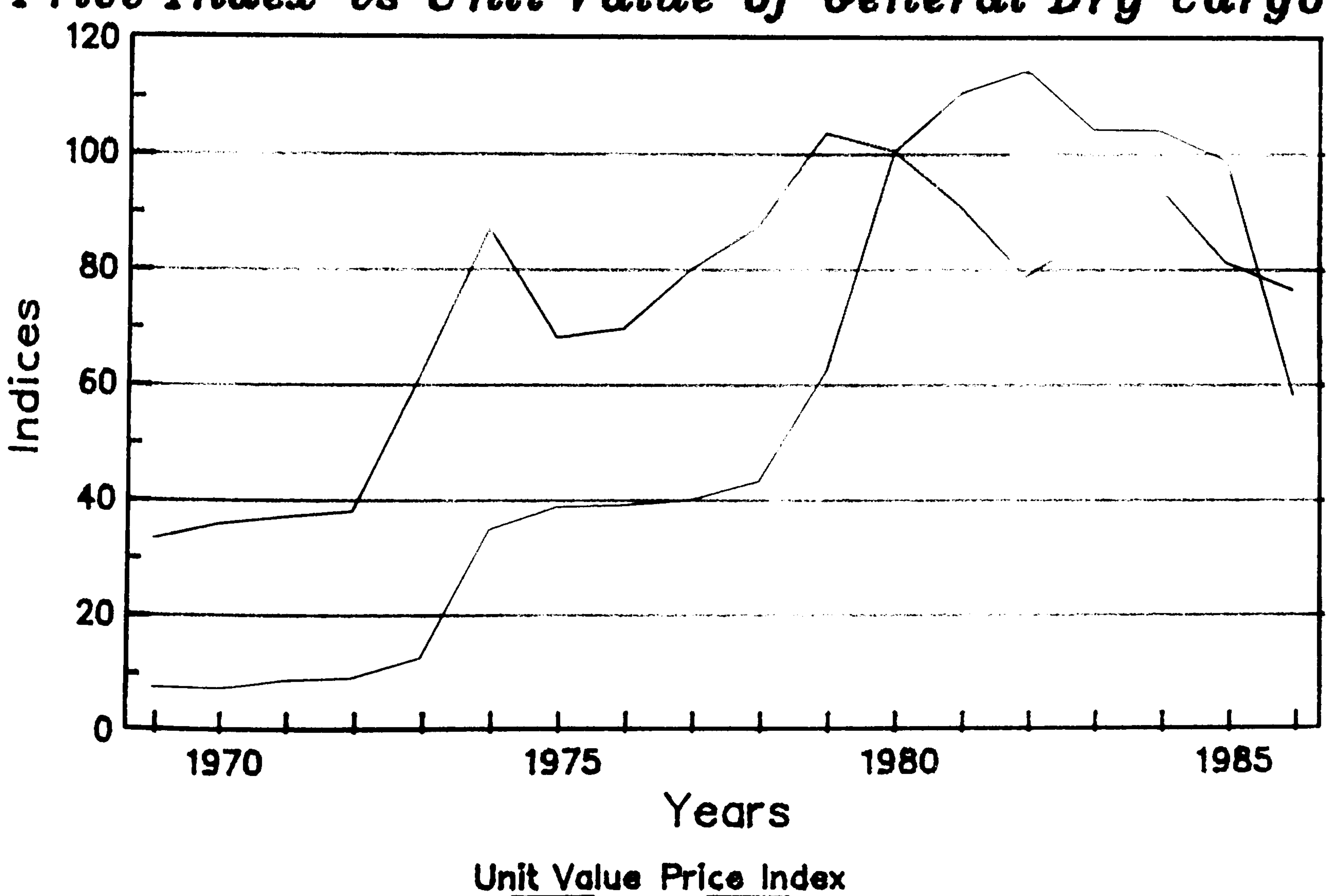
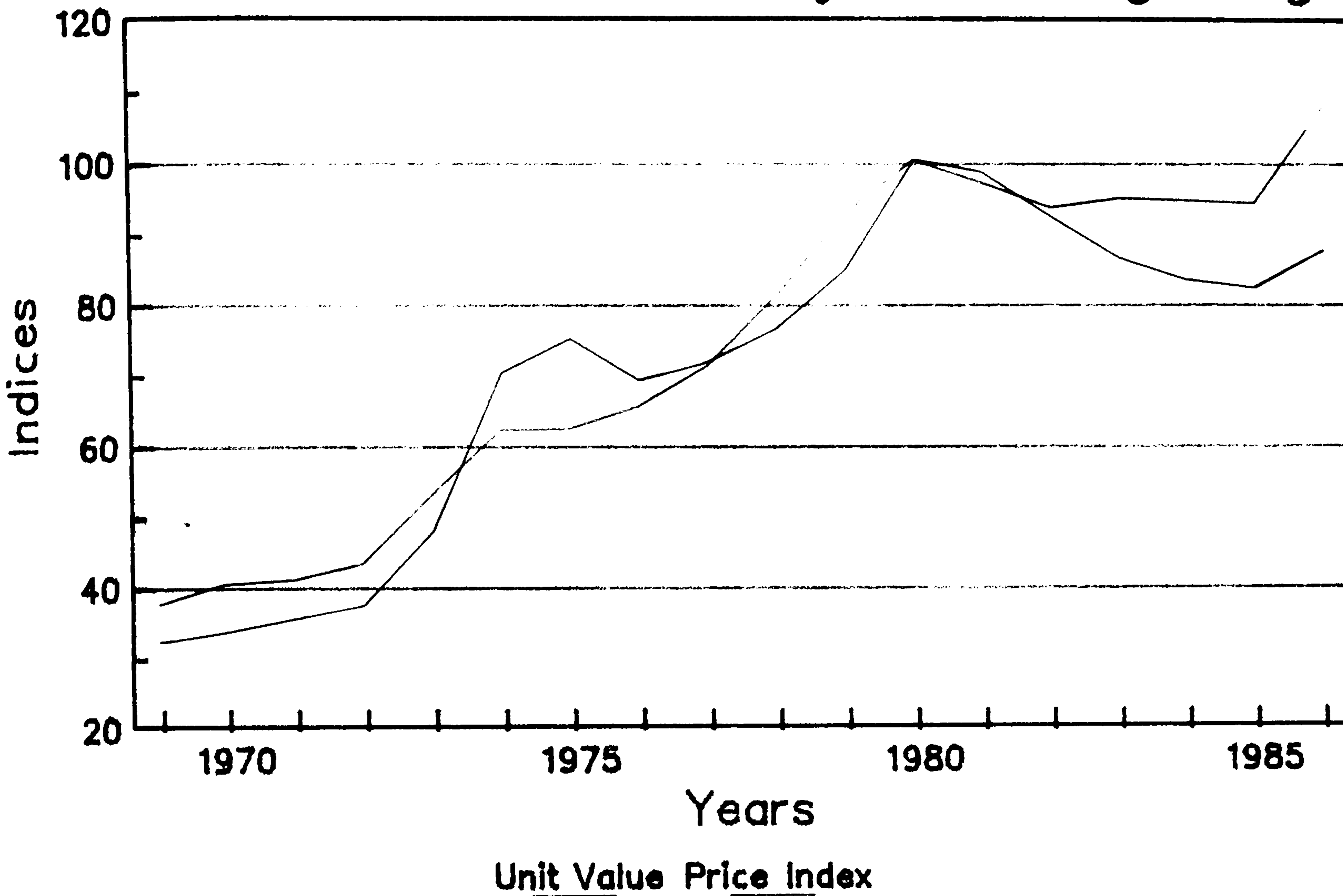


Figure 5.10.

Price Index vs Unit Value of Other Dry Cargo



5.4). Summary and Conclusion.

The aim of this chapter has been to describe the final data used in the estimation of the model, and their construction from the published data. We found it useful to start the chapter by explaining the standard international classifications used, which are related to the data required by our model. Then the availability of the data was examined with respect to the theoretical variables. The major drawback of the available dataset is the lack of bilateral import prices, which are needed in order to explain the bilateral seaborne trade flows of the world economy. In consequence, the model had to be respecified in terms of the available published data.

The advantages and disadvantages of using various weighting schemes in the construction of price index numbers have been examined. The Fishers' price index is a compromise between the Laspeyres and the Paasche indices. On the question of whether to use price indices or unit values, unit value series are considered second best to real price quotations. These considerations have been taken into account when we constructed the final data set of the model. However, the constructed unit values seem to follow the same trends as the corresponding price indices. This allows us to think of unit values as good substitutes for 'goods' for which no price indices are available.

Appendix 5.1. Source: UN(1980)

Commodity Classification for Maritime Transport Statistics (MTC).

CODE	COMMODITY	SITC COVERAGE REVISED	SITC COVERAGE REVISED 2
0	All Commodities		
1	**Bulk, Dry**		
101	Grains		
10101	Wheat and meslin, unmilled	041	
10102	Rice	042	
10103	Cereals n.e.s., unmilled	043-045	
102	Sugar		
10201	Raw sugar, beet and cane	061.1	
10202	Refined sugar etc.	061.2	
103	Oil seeds, nuts & Kernels		
10301	Groundnuts, green	221.1	222.1
10302	Soya beans	221.4	222.2
10303	Oil seeds etc. n.e.s.	221.2-211.3; 221.5-221.9	222.3-222 223
104	Timber		
10401	Pulpwood	242.1	246.01; 246.
10402	Logs, conifer	242.2	247.1
10403	Logs, non-conifer	242.3	247.2
10404	Lumber, shaped	243	248
10405	Other wood, n.e.s.	242.4; 242.9	247.9
105	Ores		
10501	Iron ores	281	
10502	Copper ores	283.1	287.1
10503	Bauxite	283.3; 513.65	287.3
10504	Manganese ores	283.7	287.7
10505	Non-ferrous ores n.e.s.	283.2; 283.9 283.4-283.6; 283.9	286; 287.2 287.4-287.6; 28
106	Metal scrap		
10601	Iron and steel scrap	282	
10602	Non-ferrous metal scrap	284	288; 686.3
107	Coal and coke etc.		
10701	Coal	321.4	322.1; 322.

<table>
<tr><td>10702</td><td>Coke</td><td>321.8</td><td>323.2</td></tr>
<tr><td>10703</td><td>Other solid fuels n.e.s.</td><td>241;321.5-321.7</td><td>245;246.0
322.3;322
323.1</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>108</td><td>Fertilisers</td><td></td><td></td></tr>
<tr><td>10801</td><td>Natural phosphates</td><td colspan="2">271.3</td></tr>
<tr><td>10802</td><td>Natural fertilisers n.e.s.</td><td colspan="2">271.1;271.2;271.4</td></tr>
<tr><td>10803</td><td>Fertilisers, manufactured</td><td>561</td><td>562</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>109</td><td>Ferrous base metals</td><td></td><td></td></tr>
<tr><td>10901</td><td>Pig iron</td><td colspan="2">671.2</td></tr>
<tr><td>10902</td><td>Other ferro-alloys n.e.s.</td><td>671.1;671.3-671.5</td><td>671.3;671</td></tr>
<tr><td>10903</td><td>Products of ferrous base metal</td><td colspan="2">672-679</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>110</td><td>Animal feeding stuff</td><td></td><td></td></tr>
<tr><td>11001</td><td>Animal feeding stuff</td><td colspan="2">081</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>111</td><td>Other bulk, dry</td><td></td><td></td></tr>
<tr><td>11101</td><td>Gypsum, plasters etc.</td><td colspan="2">273.2</td></tr>
<tr><td>11102</td><td>Mineral sands</td><td colspan="2">273.3</td></tr>
<tr><td>11103</td><td>Sulphur</td><td colspan="2">274.1</td></tr>
<tr><td>11104</td><td>Iron pyrites, unroasted</td><td colspan="2">274.2</td></tr>
<tr><td>11105</td><td>Salt</td><td>276.3</td><td>278.3</td></tr>
<tr><td>11106</td><td>Asbestos, crude</td><td>276.4</td><td>278.4</td></tr>
<tr><td>11107</td><td>Other crude minerals n.e.s.</td><td>273.1;273.4;
276 less
276.3-276.4</td><td>273.1;273.
278.2;278
less 278.9
278.5-278</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>Bulk, Liquid</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>201</td><td>Crude petroleum etc.</td><td></td><td></td></tr>
<tr><td>20101</td><td>Crude petroleum etc.</td><td>331</td><td>333</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>202</td><td>Energy petroleum products, liquid</td><td></td><td></td></tr>
<tr><td>20201</td><td>Gasolines</td><td>332.1</td><td>334.1</td></tr>
<tr><td>20202</td><td>Kerosene and jet fuels</td><td>332.2</td><td>332.4</td></tr>
<tr><td>20203</td><td>Distillate fuels</td><td>332.3</td><td>334.3</td></tr>
<tr><td>20204</td><td>Residual fuel oils</td><td>332.4</td><td>334.4</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>203</td><td>Fuel gases, liquefied</td><td></td><td></td></tr>
<tr><td>20301</td><td>Fuel gases, liquefied</td><td colspan="2">341</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>204</td><td>Other bulk liquid</td><td></td><td></td></tr>
<tr><td>20401</td><td>Molasses</td><td colspan="2">061.5</td></tr>
<tr><td>20402</td><td>Oils, distilled from
mineral tars</td><td>521.4</td><td>335.2 less
335.21</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>Refrigerated Foods</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>301</td><td>Refrigerated foods</td><td></td><td></td></tr>
<tr><td>30101</td><td>Meat fresh, chilled or frozen</td><td colspan="2">011</td></tr>
<tr><td>30102</td><td>Milk and cream, fresh</td><td colspan="2">022.3</td></tr>
<tr><td>30103</td><td>Butter and cheese</td><td colspan="2">023-024</td></tr>
<tr><td>30104</td><td>Eggs, fresh</td><td colspan="2">025</td></tr>
<tr><td>30105</td><td>Fish fresh, chilled or frozen</td><td>031.1;031.3</td><td>034;036</td></tr>
</table>

30106	Oranges, tangerines, clementines	051.1		057.1
30107	Bananas, fresh	051.3		057.3
30108	Potatoes, fresh		054.1	
30109	Other fresh fruit, vegetables	051.2;051.4;051.5		054.4-054
		051.9;054.4-054.6		057.92-057.
				057.2;057
4	**General Cargo, Dry**			
401	Coffee			
40101	Coffee		071	
402	Tea and mate			
40201	Tea and mate		074	
403	Other foods			
40301	Meat dried, salted, smoked	012;013		012;014
40302	Milk and cream, non-fresh	022.1;022.2		022.4
40303	Fish dried, salted, smoked	031.2		035
40304	Fish n.e.s. tinned or prepared	032		037
40305	Meal and flour cereals		046;047	
40306	Cereals grains, prepared		048	
40307	Edible nuts, fresh or dried	051.7		057.7
40308	Fruits dry etc.	052;053		057.52;057.
				057.6;058
40309	Dry leguminous vegetables		054.2	
40310	Vegetables n.e.s., preserved	055		056
40311	Sugar n.e.s., confectionery etc.		061.6;061.9;062	
40312	Cocoa and chocolate		072;073	
40313	Spices		075	
40314	Margarine, cooking fats		091	
40315	Food preparations n.e.s.	099		098
40316	Vegetable prods, fresh and dry		054.8	
404	Beverages			
40401	Non-alchoholic beverages		111	
40402	Alchoholic beverages		112	
405	Tobacco			
40501	Tobacco unmanufactured		121	
40502	Tobacco manufactured		122	
406	Crude rubber			
40601	Crude rubber	231		232;233
407	Textile fibres			
40701	Wool and animal hair	262		268
40702	Cotton		263	
40703	Jute		264	
40704	Hard fibres		265.2;265.4;265.5	
40705	Other fibres n.e.s.	261;266;267;		261;266;2
		265.1;265.3;265.8		269;265.1;26
408	Other crude minerals			
40801	Fur skins, undressed		212	
40802	Cork, raw and waste		244	
40803	Cork organic materials n.e.s.		291;292	

409	Non-energy petroleum products		
40901	Non-energy petroleum products	332.5-332.9; 521.1;521.3	334.5;335 335.3;335 335.21
410	Oils and fats		
41001	Olive oil	421.5	423.5
41002	Palm oil	422.2;422.4	424.2;424
41003	Other oils and fats n.e.s.	411;431;421 less 421.5;422 less 422.2 and 422.4	411;431;423les 423.5;424les 424.2 & 424.
411	Chemicals		
41101	Chemicals n.e.s.	59	
41102	Organic chemicals	512	51
41103	Inorganic chemicals	513 less513.65;514	522;523
41104	Radioactive materials	515	524
41105	Dyeing, tanning & colouring materials	53	
41106	Medicinal & pharmaceutical products	54	
41107	Essential oils, perfume materials	55	
41108	Plastic materials	58	
412	Paper etc.		
41201	Paper and paper board	641	
41202	Articles of paper etc.	642	
413	Textiles		
41301	Textiles	65	
414	Machinery		
41401	Electrical equipment	72	716;761;7 77;737.32 741.31;764le 764.99
41402	Other machinery n.e.s.	711;714;717;719	71 less 71 723.48;724; less728.3 a 728.41;736. 736.9;74 l 741.31;75le 751.82 an 759.19
415	Other manufactures		
41501	Leather, rubber manufactures	61;62	
41502	Veneer sheets and plywood	631.1;631.2	634.1;634.
41503	Wood & cork manufactures n.e.s.	63 less 631.1 and631.2	634.3-634 635
41504	Cement	661.2	
41505	Non-metal, mineral manufactures	66less 661.2	
41506	Misc. metallic products	694-698	694-699
41507	Miscellaneous manufactures	8	751.82;759.1 763; 8

5 Other Dry Cargo

501	Woodpulp and paper waste			
50101	Woodpulp and paper waste		251	
502	Crude minerals n.e.s.			
50201	Crude minerals n.e.s.	275;285		277;278.9;
503	Non-ferrous base metals			
50301	Copper		682	
50302	Aluminium		684	
50303	Tin		687	
50304	Non-ferrous base metals n.e.s.	681;685-686; 683;688-689		68less682,68 686.33 &
504	Manufactures of metal			
50401	Finished structures and parts		691	
50402	Metal containers, wire products		692-693	
505	Machinery and equipment			
50501	Agricultural machinery	712		721-722
50502	Metal working & special machinery	715;718		723less723.48; 725-727;728 728.3;728 736.1-736. 737 less737.
50503	Passenger motor cars etc.	732.1;732.6		781
50504	Motorcycles and parts	732.9		785.9
50505	Other road motor vehicles n.e.s	732.2-732.5; 732.7-732.8		782-784
50506	Railway & non-motor vehicles	731-733		785.2-785 786;791
50507	Aircraft, boats and their parts	734-735		792-793
506	Miscellaneous			
50601	Live animals		001	
50602	Hides and skins, undressed		211	
50603	Explosives and pyrotech products	571		572
50604	Commodities n.e.s.		9	

Appendix 5.2. Source: UN(1980)

Coastal Area Classification for Maritime Transport Statistics (MTCAC)

CODE	COASTAL AREA	DESCRIPTION
00	World	
01	Great Lakes	Great Lakes and upper St. Laurence of North America river ports, above Montreal
02	Canada Atlantic	St. Laurence river ports. Montreal and below; Greenland, St Pierre and Miquelon
03	US Norh Atlantic	From Maine to Virginia, inclusive
04	US South Atlantic	From N.Carolina to Miami, Florida inclusive and Puerto Rico and US Virgin islands
05	US Gulf	From Key West, Florida to Texas, inclusive
06	US South Pacific	California and Hawaii
07	North Pacific of North America	Washington, Oregon and Alaska of United States of America and Canadian West Coast
08	Central America	From coasts of Mexico to that of Panama incl
11	Caribbean Area	All the carribean islands and Bermuda, excluding Puerto Rico and US Virgin islands
12	N Coast South America	From Caribbean Colombia to French Guinea inc
13	E Coast South America	Coasts of Brazil, Uruguay and Argentina and the nearby islands
14	W Coast South America	From Pacific Colombia to Chile inclusive
15	British Isles	United Kingdom; Ireland; Iceland & Faeroe isl
16	Northern Europe	Belgium; Netherlands; Germany F R; Denmark; Norway; Sweden and Finland
17	Centr.Planned Eur.Baltic Sea	USSR; Poland and German Dem. Rep.
18	Atlantic Europe	French Atlantic coast; Spanish north coast and Portugal
19	Mediterranean Europe	From Spanish south coast, including the Canary islands to that of Greece inclusive and Malta
20	Centrally Planned Europe Black Sea	Bulgaria, Romania and USSR
21	Mediterranean Asia	From coasts of Turkey (including northern) to that of Israel inclusive, and Cyprus
22	Mediterranean Africa	From Egypt to Morocco inclusive
23	Western Africa	From Western Sahara to Namibia, inclusive, and the nearby islands
24	Southern Africa	Republic of South Africa
25	Eastern Africa	From Somalia to Mozambique, inclusive, and the nearby islands
26	Red Sea Area	Egypt; Sudan; Ethiopia; Djibouti; Israel; Jordan; Yemen; Dem Yemen and Saudi Arabian west coast
27	Persian Gulf Area	Iran, Islamic Republic of; Iraq; Kuwait; Bahrain; Oman; Saudi Arabian east coast; Qatar and United Arab Emirates
28	Southern Asia	From Pakistan to Burma inclusive
29	South East Asia	Malaysia; Singapore; Thailand; Dem Kampuchea Indonesia; East Timor; Phillipines and Brunei Darussalam
30	Centrally Planned North Pacific	Viet Nam; China; Dem. People's Republic of Korea and USSR
31	Far East Asia	Hong Kong; Macau; Japan & Republic of Korea
32	Oceania	Australia; New Zeland and islands of Oceania
33	Unspecified	

Appendix 5.3. Source: UN(1987)

Commodities for which world prices are available.

Primary commodities		
	Food	
		Cereals
		Wheat
		Maize
		Rice
		Barley
		Oats
	Beverage crops	
		Coffee
		Tea
		Cocoa
	Vegetables	
		Tomatoes
		Onions
		Potatoes
		Cassava
		Beans
		Peas
	Meats	
		Beef
		Pork
		Bacon
		Lamb
		Poultry
	Dairy products	
		Butter
		Milk
		Cheese
		Eggs
	Fruits	
	Citrus fruits	
		Oranges
		Lemons
		Grapefruits
	Other fruits	
		Bananas
		Apples
	Animal feed	
		Fishmeal
		Oilseedcake
	Fish	
	Pepper	
	Wine	
	Sugar	
Agricultural non food		
	Fats oils and oilseeds	
		Soyabeans
		Copra
		Groundnuts
		Soyabean oil
		Olive oil
		Palm oil
		Groundnut oil

Coconut oil
Linseeds
Cottonseed oil
Linseed oil
Palm kernel oil
Sunflower oil
Animal fats

Textile fibres

Cotton
Wool
Sisal
Jute
Flax

Forest products

Logs
Lumber
Woodpulp

Natural rubber
Tobacco
Hides

Minerals

Fuels

Crude petroleum
Coal
Natural gas

Iron ore
Manganese ore
Chrome ore
Crude fertilizer

Primary commodities excluding crude petroleum
Non-ferrous base metals

Copper
Nickel
Aluminium
Lead
Zinc
Tin

<u>UN Monthly Bulletin of Statistics Data.</u>

Machinery and transport equipment

Machinery, other than electric

Power generating machinery
Agricultural machinery & Implem
Metal work machinery
Textile & Leather machinery
Special industry machines
Machinery & appliances

Electrical machinery, Apparatus & appliances

Power machinery & switchgear
Telecomunications
Domestic equipment
Other Electr Machin & Apparatus

Transport equipment

Road Motor Vehicles

CHAPTER 6

ESTIMATION METHODS

6.0). Introduction.

In chapter 4 we derived sets of empirical seaborne bilateral import demand equations for a region of the world and a certain type of product. Whether 'static' or 'dynamic' systems are chosen for estimation, there is an adding-up constraint of the sum of the left hand side variables multiplied by the base year shares to equal zero. This fact has implications for the econometric estimation of the system. We explore these implications here.

This chapter is in four main sections. In the first, we turn the system of equations into a stochastic form by attaching a random term which describes the 'non-systematic' behaviour of the importers. We introduce the underlying principles of such a stochastic framework in the context of single equation models. In the second, we generalize the results to systems of equations, and we identify our own model to fall under the class of Seemingly Unrelated Regression Equations (SURE). We examine the appropriate estimation techniques of linear and nonlinear models and their properties. In the third, we examine SURE systems with a singular covariance matrix of the error terms. This singularity is a common problem in import allocation models, under which there is an adding-up constraint requiring bilateral imports to add-up to total imports. It is suggested that the singularity may be removed by reformulating the problem as a restricted Generalized Least Squares problem, or assuming normality, as a Maximum Likelihood estimation problem of a system of (n-1) equations. In the fourth section, we provide test procedures for testing hypotheses on the parameters of interest. Thus, test statistics for contemporaneous correlation and linear restrictions on the coefficients across equations are suggested. The latter provide a framework for testing the theoretical and encompassing properties of the system.

6.1). The Stochastic Environment of Import Allocation Models.

Let us take the simplest form of the empirical import demand equations as derived in the 'static' model in levels, say, the static version of equation (4.50), which we repeat here for convenience.

$$\begin{aligned} y_{it} = c_i T - a_i [xp_i^{\alpha} wp_k^{(1-\alpha)} - \Sigma_h w_h^0 \, xp_h^{\alpha} wp_k^{(1-\alpha)}] \\ + \Sigma_i w_i^0 a_i \{ [xp_i^{\alpha} \, wp_k^{(1-\alpha)}] - \Sigma_h w_h^0 \, [xp_h^{\alpha} \, wp_k^{(1-\alpha)}] \} + \varepsilon_{it} \end{aligned} \qquad (6.1)$$

This specification describes the bilateral seaborne import differences of growth rates, of bilateral imports from partner i (i=1,...,n) and total imports, with respect to the base year, y_{it}, of region j, in terms of the 'systematic' components described by the time trend and relative prices. Furthermore, a 'random' or 'non-systematic' component ε_{it} is included to take account of the unsystematic behaviour of the importer. That is, of all factors other than time and prices that affect his import allocation decision. Thus, (6.1) consists of a set of n equations, one for each trade partner (assuming there are intra seaborne trade movements).

In order to examine the appropriate econometric techniques of estimating such systems of equations, we first introduce the principles underlying the general stochastic framework of single equations. In terms of our model we examine the imports of j from a single partner i. We then extend these principles to multiequation systems, considering all trade partners i=1,...,n, in the importing region j.

Let us assume that observations on import growth rates y from a certain region, are random outcomes of experiments (performed by society), with a probability distribution conditional on the (kx1) vector of fixed variables **x** and associated parameters θ. In terms of

(6.1) $\mathbf{x}$ consists of T, xp_i, wp_k, and θ consists of the coefficient parameters c_i, a_i, α, β and the variance of y, σ^2. That is, the random variable y takes values from the conditional distribution $f(y/\mathbf{x};\theta)$. Since y is a random variable, its value, at any time, is subject to error. Mathematically,

$$y = f(y/\mathbf{x};\theta) + \varepsilon \qquad (6.2)$$

where ε is the random error term.

Assuming for simplicity that the Statistical Generating Mechanism (SGM) (the mathematical form of the function that purports to describe the true Data Generating Process (DGP)), that describes y is a linear function of $\mathbf{x}$ (Linearity of the model (6.1) is true if there are no data constraints, as we saw in chapter 4. The static model then reduces to (4.33)), we can write the linear version of (6.1) or equivalently, (6.2) as:

$$y = \beta'\mathbf{x} + \varepsilon \qquad (6.3)$$

where β is a (kx1) vector of parameters, $\beta'=(\beta_1,...,\beta_k)$. By construction, the non-systematic part ε is orthogonal to the systematic component, $\beta'\mathbf{x}$, of y. The conditional distribution of y is:

$$(y/\mathbf{x}) \sim (\ \beta'\mathbf{x},\ \sigma^2\ ) \qquad (6.4)$$

As a consequence, the distribution of the error term, ε, is,

$$\varepsilon \sim (\ 0,\ \sigma^2\ ) \qquad (6.5)$$

The SGM together with the probabilty model (the assumed family of parametric distributions, where y takes values from) define the statistical model. This provides the theoretical stochastic framework to study the economic phenomenon we are interested in.

6.1.1). Single Equation Regression Estimation.

Let $\mathbf{y}$ be a sample of T observations independently and identically drawn from the above distribution. Then the conditional distribution of the (Tx1) random vector $\mathbf{y}$ is,

$$(\mathbf{y}/X) \sim (\beta'\mathbf{x}_t, \sigma^2 I_T) \qquad (6.6)$$

where the variance-covariance matrix of the distribution of $\mathbf{y}$, $(E[(\mathbf{y}-X\beta)(\mathbf{y}-X\beta)'] = \sigma^2 I_T)$, is due to the assumption of selecting an independent and identical sample from the population. Given the Statistical Model and the Sampling Model (the way the sample is drawn), the elements of the error term are independently and identically distributed with a distribution,

$$\underline{\varepsilon} \sim (\mathbf{0}, \sigma^2 I_T) \qquad (6.7)$$

Given the Statistical Model, the sample observations may be used to estimate the unknown parameter vector $\theta \equiv (\beta, \sigma^2)$. Minimizing the sum of squared deviations of the actual data, $\mathbf{y}$, from their average value (the fitted values), that is minimizing the objective function $S(\beta) = (\mathbf{y}-X\beta)'(\mathbf{y}-X\beta)$, yields the OLS (Ordinary Least Squares) estimator $\mathbf{b}$ of β. The estimator $\mathbf{b}$ is a random variable itself, with a distribution:

$$\mathbf{b} \sim ((X'X)^{-1}X'\mathbf{y}, \sigma^2(X'X)^{-1}) \qquad (6.8)$$

An estimator for σ^2 is:

$$\hat{\sigma}^2 = \hat{e}'\hat{e}/T-k = (\mathbf{y}-X\mathbf{b})'(\mathbf{y}-X\mathbf{b})/(T-k) \qquad (6.8')$$

The OLS estimators of $\theta \equiv (\beta, \sigma^2)$, $\hat{\theta} \equiv (\mathbf{b}, \hat{\sigma}^2)$, are Best Linear Unbiased Estimators (BLUE). They are unbiased (on average they are equal to the true parameters) and are best in the sense that no other estimator of β or σ^2 has smaller variance.

Furthermore, if we are prepared to make a specific assumption about the distribution of y, such as that it is normal, we can write the conditional distribution of **y** as:

$$(\mathbf{y}/X) \sim N(\ \beta'\mathbf{x}_t,\ \sigma^2 I_T\ ) \tag{6.9}$$

and the OLS estimator **b** has a distribution,

$$\mathbf{b} \sim N((X'X)^{-1}X'\mathbf{y},\ \sigma^2(X'X)^{-1}) \tag{6.10}$$

Normality thus, provides us with a more specific probability model for estimation (of θ) and inference.

The assumption of normality of the conditional distribution of y allows us to write:

$$f(y/x)\ = [(2\pi\sigma^2)^{(-1/2)}]\exp\{-(1/2\sigma^2)(y-\mathbf{x}\beta)^2\} \tag{6.11}$$

The assumption of an independent and identical sample of T observations implies that the distribution of the sample vector **y**, or equivalently its Likelihood Function is:

$$L(\theta,\mathbf{y}) \equiv \prod_{t=1}^{T} f(y/x) = [(2\pi\sigma^2)^{(-T/2)}]\exp\{-(1/2\sigma^2)(y-X\beta)'(y-X\beta)\} \tag{6.12}$$

The Maximum Likelihood (ML) rule may be used to provide estimators for β and σ^2. This rule ensures that the parameter vector θ chosen, maximizes the probability of randomly drawing the sample used. Mathematically, θ is chosen by maximizing function (6.12), or more easily the logarithm of the likelihood function. The latter takes the form:

$$\ln[L(\theta,\mathbf{y})] = -(T/2)\ln 2\pi - (T/2)\ln\sigma^2 - (1/2\sigma^2)(y-X\beta)'(y-X\beta) \tag{6.13}$$

Maximizing $\ln[L(\theta,\mathbf{y})]$ with respect to β is equivalent to maximizing $-(1/2\sigma^2)(y-X\beta)'(y-X\beta)$, (since σ^2 is a constant). Given the negative sign and the constancy of σ^2 the above problem is equivalent to minimizing $S(\beta)=(y-X\beta)'(y-X\beta)$. This is the OLS rule for finding β. The corresponding MLE for σ^2 is:

$$\hat{\sigma}^2 = (\mathbf{y}-X\mathbf{b})'(\mathbf{y}-X\mathbf{b})/T \qquad (6.14)$$

If the latter estimator is corrected for the degrees of freedom by replacing the T with (T-k), we have shown that the MLE estimators are equivalent to the OLS estimators under normality.

6.1.2). Significance of the Assumptions and GLS Estimation.

(i). An implicit assumption used so far in the estimation of b, is that Rank(X'X)=Rank(X)=k, where T>k. The Rank of the (Txk) matrix X is defined as the largest in order of all square submatrices of X that has a non-zero determinant. Since T>k, the order of the largest square submatrix of X is (kxk), and therefore the largest possible Rank of X is k. In the latter case we say that the matrix X has Full Rank.

Now, the determinant of the submatrix (kxk) is non-zero if its columns and rows are linearly independent. That is, if there exist a set of scalars $\lambda_1,\dots,\lambda_k$ with $\lambda_1\mathbf{x}_1+\dots+\lambda_k\mathbf{x}_k=\mathbf{0}$, where $\mathbf{x}_i$ are the columns of X, then $\mathbf{x}_1,\dots,\mathbf{x}_k$ are linearly independent if and only if $\lambda_1=\dots=\lambda_k=0$. In words, no single column or row can be derived as a linear combination of the others. $\mathbf{x}_1,\dots,\mathbf{x}_k$ are linearly dependent if at least one $\lambda_i \neq 0$.

Thus, if the k columns of the (Txk) matrix X are linearly independent, the determinant of any square submatrix of order (kxk) is non-zero, and as a result Rank(X)=k. Since (X'X) is (kxk) and X has full rank, then Rank(X'X)=k. That is, its determinant is non-zero and the square matrix (X'X) is invertible. $\mathbf{b}=(X'X)^{-1}X'\mathbf{y}$, and $V(\mathbf{b})=\sigma^2(X'X)^{-1}$ can be computed. Of course, the assumption of T>k, guarantees that the number of parameters, k, can be computed from the available number of observations, T.

(ii). We have also assumed that the covariance matrix of the vector $\mathbf{y}$, and therefore of the vector $\underline{\varepsilon}$, in the SGM, is of the fixed scalar identity type. That is, $E[(\mathbf{y}-X\beta)(\mathbf{y}-X\beta)']=E[\underline{\varepsilon}\underline{\varepsilon}'] = \sigma^2 I_T$. The assumption that the elements of the random vector $\underline{\varepsilon}$ are independent and identically distributed (that is, they are uncorrelated and have identical variance) may be changed, to involve more general structures. Let us assume that $E[\underline{\varepsilon}\underline{\varepsilon}']=\sigma^2\Omega$, where Ω is a known real positive definite symmetric matrix. Depending on the precise form of the matrix Ω, the error term may be heteroskedastic (varying variance, σ^2, between observations), autocorrelated (the elements of the error term are correlated), a combination of both, or perhaps follow complicated VAR (Vector Auto-Regressive) processes.

Thus, assuming that the SGM is $\mathbf{y}= X\beta+ \underline{\varepsilon}$, where the random term $\underline{\varepsilon}$ now has a distribution $\underline{\varepsilon}\sim(\mathbf{0},\sigma^2\Omega)$, OLS estimation of β amounts to minimizing the following objective function $S(\beta)=(\mathbf{y}-X\beta)'\Omega^{-1}(\mathbf{y}-X\beta)$ with respect to β. The result is an estimator with a distribution:

$$\mathbf{b} \sim ((X'X)^{-1}X'\mathbf{y},\ \sigma^2(X'X)^{-1}X'\Omega X(X'X)^{-1}) \tag{6.15}$$

This estimator is unbiased, but its variance is different from the OLS estimator (when the error term is assumed white noise). As a result the estimator will be inefficient. It can be shown, Judge et al(1988, appendix A, section A11), that since Ω is a positive definite matrix, a matrix P with the property $P\Omega P'= I_T$ always exists. This matrix can be used to transform the model to:

$$P\mathbf{y} = PX\beta + P\underline{\varepsilon} \qquad \text{or} \qquad \mathbf{y}^* = X^*\beta + \underline{\varepsilon}^* \tag{6.16}$$

where $\mathbf{y}^*=P\mathbf{y}$, $X^*=PX$ and $\underline{\varepsilon}^*=P\underline{\varepsilon}$. The transformed error vector has a distribution $\underline{\varepsilon}^*\sim(\mathbf{0}, \sigma^2 I_T)$, since $E[\underline{\varepsilon}^*\underline{\varepsilon}^{*\prime}] =\sigma^2 E[P\underline{\varepsilon}\underline{\varepsilon}'P'] =\sigma^2 P\Omega P' =\sigma^2 I_T$. OLS may now be applied to the transformed model. This estimator of β is the GLS (Generalized Least Squares) or Aitken estimator, which has a distribution:

$$\mathbf{b}^* \sim ((X^{*\prime}X^*)^{-1}X^{*\prime}\mathbf{y},\ \sigma^2(X^{*\prime}X^*)^{-1}) \tag{6.17}$$

or, in terms of the original data,

$$b^* \sim ((X'\Omega^{-1}X)^{-1}X'\Omega^{-1}\mathbf{y},\ \sigma^2(X'\Omega^{-1}X)^{-1}) \qquad (6.17')$$

The GLS estimator is BLUE. Furthermore, if we are prepared to assume that the random variable $\mathbf{y}$ is normally distributed, the distribution of $\mathbf{b}^*$ is normal. That is,

$$b^* \sim N((X'\Omega^{-1}X)^{-1}X'\Omega^{-1}\mathbf{y},\ \sigma^2(X'\Omega^{-1}X)^{-1}) \qquad (6.17'')$$

Assuming normality, the latter estimator may be obtained by maximum likelihood methods: The distribution of $\mathbf{y}$ and hence its likelihood function under normality is:

$$L(\theta,\mathbf{y})=[(2\pi\sigma^2)^{(-T/2)}]|\Omega|^{(-1/2)}\exp\{-(1/2\sigma^2)(y-X\beta)'\Omega^{-1}(y-X\beta)\} \qquad (6.18)$$

Following the same arguments as with the OLS estimation (when the variance of ε is $\sigma^2 I_T$), maximizing the logarithm of the above function with respect to θ is equivalent to minimizing the objective function $S(\beta)=(\mathbf{y}-\mathbf{x}\beta)'\Omega^{-1}(\mathbf{y}-\mathbf{x}\beta)$. Therefore, the MLE obtained are equivalent to the GLS estimators under normality.

The assumption of normality provides us with a more specific probability model for estimation and inference. As with the case of the OLS estimator, in order to ensure that $\mathbf{b}^*$ and $V(\mathbf{b}^*)$ can be estimated, the condition of Rank(X)=k must be fulfilled. In addition, Ω has to be inverted to obtain the GLS estimators (see (6.17')). A prerequisite for the inversion of Ω is that Rank(Ω)=T. The latter requires that no column or row of Ω is a linear combination of the others.

6.2). Systems of Equations.

We can extend the single equation framework of the one trade partner to our complete import allocation model of (6.1), which is a system of n equations, one for each trade partner. Since common coefficients appear across equations, the system must be 'pooled' together for estimation. Assuming a sample of T observations for each of the n regions, then we can write the system in stacked form as follows:

$$\begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} X_1 & 0 & \dots & 0 \\ 0 & X_2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & X_n \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix} + \begin{bmatrix} \underline{\varepsilon}_1 \\ \underline{\varepsilon}_2 \\ \vdots \\ \underline{\varepsilon}_n \end{bmatrix} \qquad (6.19)$$

where $\mathbf{y}_i$ and $\underline{\varepsilon}_i$ are (Tx1) vectors, β_i are (kx1) vectors and $\mathbf{X}_i$ are (Txk) matrices, for each of the i=1,...,n equations in the system. Each equation explains the variation of the dependent variable $\mathbf{y}_i$, i=1,...,n, over time, where the definition of the variables and parameters corresponds to that of equation (6.2). Assume, for simplicity, that for each equation, $\underline{\varepsilon}_i \sim (0, \sigma_i^2 I_T)$. That is, the 'classical' assumptions of the single equation model are true. The above system in matrix form becomes:

$$\mathbf{Y} = \mathbf{XB} + \mathrm{E}, \qquad \text{with} \qquad \mathrm{E} \sim (\mathbf{0}, \ \Sigma \otimes \mathbf{I}_T) \qquad (6.20)$$

where $\mathbf{Y}$ and E are (nTx1) vectors of dependent variables and error terms, respectively, $\mathbf{X}$ is the (nTxnk) matrix of explanatory variables and B is the (nkx1) vector of coefficients. Also, Σ is the variance-covariance matrix of the residuals between equations. It takes the form $\Sigma=[\sigma_{ij}]=E[\underline{\varepsilon}_i\underline{\varepsilon}_j']$, $\forall$ i,j=1,...,n, where $[\sigma_{ij}]$ denotes the (nxn) matrix with elements ranked by i,j. More specifically:

$$\Sigma = \begin{bmatrix} E[\underline{\varepsilon}_1\underline{\varepsilon}_1'] & E[\underline{\varepsilon}_1\underline{\varepsilon}_2'] & \dots & E[\underline{\varepsilon}_1\underline{\varepsilon}_n'] \\ E[\underline{\varepsilon}_2\underline{\varepsilon}_1'] & E[\underline{\varepsilon}_2\underline{\varepsilon}_2'] & \dots & E[\underline{\varepsilon}_2\underline{\varepsilon}_n'] \\ \vdots & \vdots & \ddots & \vdots \\ E[\underline{\varepsilon}_n\underline{\varepsilon}_1'] & E[\underline{\varepsilon}_n\underline{\varepsilon}_2'] & \dots & E[\underline{\varepsilon}_n\underline{\varepsilon}_n'] \end{bmatrix} = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \dots & \sigma_{1n} \\ \sigma_{21} & \sigma_{22} & \dots & \sigma_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{n1} & \sigma_{n2} & \dots & \sigma_{nn} \end{bmatrix} \qquad (6.21)$$

If there is no relationship between the individual equations (i.e. if there are no cross-equation correlations in the errors $\Sigma=[\sigma_{ij}]=0$, $\forall$ i≠j in (6.21)), the error term in (6.20) becomes $\mathrm{E} \sim (\mathbf{0}, \sigma_{ii}^2 \otimes \mathbf{I}_T)$. The OLS estimators may be obtained from the 'pooled' system (6.20) by minimizing the objective function $\mathbf{S(B)=(Y-XB)'(Y-XB)}$. The estimators are: $\mathbf{B=(X'X)^{-1}X'Y}$, which are BLUE. These are equivalent to applying

OLS separately to each individual equation, and are the same as the MLE estimators, for the same reasons as with the single equation case. A prerequisite for the estimation of $\mathbf{B}$ is that $\text{Rank}(\mathbf{X}'\mathbf{X})=\text{Rank}(\mathbf{X})=nk$, so that $(\mathbf{X}'\mathbf{X})$ is invertible.

6.2.1). Seemingly Unrelated Regression Equations (SURE).

Often, even though the equations may seem unrelated, if they are used to model a set of related economic functions (e.g. our set of import demand equations), there might be some relationship between the equations not immediately apparent. For example there might be some parameter restrictions across-equations, the variables between equations may be required to satisfy certain constraints, or there might be some common unmeasurable or omitted variable that is included in the error terms. In such cases, the error terms, $\underline{\varepsilon}_i$, are correlated across individual equations.

We can see such a situation with respect to our import allocation models. Take for example the 'static' model of (6.1), a system of n equations. We can write it in a more concrete form as in equation (6.20). More generally, to allow for the fact that the model in its estimating form (as well as the dynamic models) is nonlinear (see chapter 4) we write:

$$\mathbf{Y} = \mathbf{F}(\mathbf{X},\Theta)+ \mathbf{E} \tag{6.22}$$

where the definitions of $\mathbf{Y}$, $\mathbf{X}$ and $\mathbf{E}$ are the same as in (6.20), and $\Theta\equiv(\mathbf{B},\Sigma)$ are the parameters of interest.

Apart from the common coefficients, there is an adding up constraint across the individual equations in the system. As we showed in chapter 4, all our systems satisfy the following constraint.

$$w'\mathbf{Y} = w'\ \mathbf{F}(\mathbf{X},\Theta) \equiv 0 \tag{6.23}$$

where $w'=(w_1^0,...,w_n^0)$, is the vector of base year shares. (6.23) is equivalent to:

$$w'[\mathbf{Y} - \mathbf{F}(\mathbf{X},\Theta)] \equiv 0 \qquad (6.24)$$

As a result $w'\mathbf{E}\equiv 0$. In words, the fact that $w'\mathbf{Y}\equiv 0$ in the system makes the left hand side nonstochastic. Hence the right hand side is nonrandom and $w'\mathbf{E}\equiv 0$. The error terms are linearly dependent. Also, apart from the common coefficients across equations the constraint $\Sigma_i w_i^0 b_i=0$ is placed across the time trend parameters of the estimating systems. Therefore, because of the adding-up constraint amongst the observable random variables, contemporaneous correlation is introduced in the error terms. In order to improve the efficiency of the estimates the equations must be estimated jointly to take account of these correlations.

The simplest assumption one can make is that the errors are correlated across equations at a given point in time (contemporaneous correlation), but errors are not correlated across-equations over time. When cross-equation correlations are allowed in the covariance, the system of equations is known as SURE (Seemingly Unrelated Regression Equations), Zellner(1962).

6.2.2). Estimation of General SURE Systems.

Just as with the single equation case (when the covariance matrix of the vector $\underline{\varepsilon}$ is not of the fixed scalar identity type), OLS estimators in a SUR model are unbiased and consistent, but their efficiency can be improved by using the information contained in the contemporaneously correlated errors, and in the possible inter-relationships between the explanatory variables across equations. This contemporaneous correlation is reflected in the error term $E_{\sim}(\mathbf{0}, \Omega)$, where $\Omega=\Sigma\otimes I_T$ (with $\Sigma\neq 0$, for some $i\neq j$) is some known real positive definite symmetric matrix of order (nTxnT). Then, estimating the equations jointly by GLS yields the BLUE, Zellner(1962). The SURE estimators are obtained by minimizing the objective function $S(B)=(Y-XB)'(\Sigma^{-1}\otimes I_T)(Y-XB)$. They are distributed as:

$$B^* \sim ((X'\Omega^{-1}X)^{-1}X'\Omega^{-1}Y,\ (X'\Omega^{-1}X)^{-1}) \tag{6.25}$$

or in terms of the original data:

$$B^* \sim ((X'(\Sigma^{-1}\otimes I)X)^{-1}X'(\Sigma^{-1}\otimes I)Y,\ (X'(\Sigma^{-1}\otimes I)X)^{-1}) \tag{6.25'}$$

Analytically:

$$B^* \equiv \begin{bmatrix} \beta_1^* \\ \beta_2^* \\ \vdots \\ \beta_n^* \end{bmatrix} = \begin{bmatrix} \sigma^{11}X_1'X_1 & \sigma^{12}X_1'X_2 & \dots & \sigma^{1n}X_1'X_n \\ \sigma^{21}X_2'X_1 & \sigma^{22}X_2'X_2 & \dots & \sigma^{2n}X_2'X_n \\ \vdots & \vdots & \ddots & \vdots \\ \sigma^{n1}X_n'X_1 & \sigma^{n2}X_n'X_2 & \dots & \sigma^{nn}X_n'X_n \end{bmatrix}^{-1} \begin{bmatrix} \Sigma_i \sigma^{1i}X_1'y \\ \Sigma_i \sigma^{2i}X_2'y \\ \vdots \\ \Sigma_i \sigma^{ni}X_n'y \end{bmatrix} \tag{6.25''}$$

where σ^{ij} is the i,jth element of Σ^{-1} in (6.25'). Also,

$$V(B^*)=(X'\Omega^{-1}X)^{-1}= \begin{bmatrix} \sigma^{11}X_1'X_1 & \sigma^{12}X_1'X_2 & \dots & \sigma^{1n}X_1'X_n \\ \sigma^{21}X_2'X_1 & \sigma^{22}X_2'X_2 & \dots & \sigma^{2n}X_2'X_n \\ \vdots & \vdots & \ddots & \vdots \\ \sigma^{n1}X_n'X_1 & \sigma^{n2}X_n'X_2 & \dots & \sigma^{nn}X_n'X_n \end{bmatrix}^{-1} \tag{6.26}$$

Assuming that Y follows a multivariate normal distribution, the SURE estimators (6.25) are distributed as:

$$B^* \sim N((X'(\Sigma^{-1}\otimes I)X)^{-1}X'(\Sigma^{-1}\otimes I)Y,\ (X'(\Sigma^{-1}\otimes I)X)^{-1}) \tag{6.27}$$

The GLS estimators of (6.25) are equivalent to the MLE: Assuming normality of Y we can write its distribution as:

$$F(Y/X,\Theta)=[(2\pi)^{(-n/2)}]|\Omega|^{(-1/2)}\exp\{-(1/2)(Y-XB)'\Omega^{-1}(Y-XB)\} \tag{6.28}$$

Taking a sample of T idependent and identically distributed random variables Y, the likelihood function of the sample is:

$$L(Y/X,\Theta)=[(2\pi)^{(-nT/2)}]|\Omega|^{(-1/2)}\exp\{-(1/2)(Y-XB)'\Omega^{-1}(Y-XB)\} \tag{6.29}$$

or equivalently:

$$L=[(2\pi)^{(-nT/2)}]|\Sigma^{-1}|^{(-T/2)}\exp\{-(1/2)(\mathbf{Y}-\mathbf{XB})'(\Sigma^{-1}\otimes \mathbf{I})(\mathbf{Y}-\mathbf{XB})\} \qquad (6.29')$$

Maximizing the logarithm of (6.29') with respect to $\mathbf{B}$ is equivalent to minimizing the objective function:

$$\mathbf{S}(\mathbf{B})=(\mathbf{Y}-\mathbf{XB})'(\Sigma^{-1}\otimes \mathbf{I})(\mathbf{Y}-\mathbf{XB}) \qquad (6.30)$$

A result which is a direct extension of the single equation GLS estimation of the previous section. Thus, assuming normality, the ML and GLS estimators are equivalent.

The MLE of Σ is an (nxn) matrix with elements:

$$\sigma_{ij}= (\mathbf{y}_i-\mathbf{X}_i\beta_i^*)'(\mathbf{y}_j-\mathbf{X}_j\beta_j^*)/T \qquad (6.31)$$

An unbiased estimator of Σ is obtained by replacing T with (T-k) in the denominator of the above, assuming that k explanatory variables are used in each equation.

Normality of the multivarite distribution of $\mathbf{Y}$ allows one, apart from the ability of using ML methods, to use a more specific stochastic framework to draw inferences about the estimated parameters.

Again, a prerequisite for the estimation of $\mathbf{B}^*$ and $V(\mathbf{B}^*)$ is that Rank($\mathbf{X}$)=nk, with nT>nk (i.e. with T>k). In addition, Σ must be invertible, that is, its columns must be linearly independent. Mathematically, Rank(Σ)=n. In terms of Ω, Rank(Ω)=nT.

6.2.3). SURE Estimation with Unknown Covariance Matrix.

In most cases Σ is unknown and $\mathbf{B}^*$ cannot be estimated. An estimate of Σ must be formulated. Then $\hat{\mathbf{B}}^*$ may be obtained in two stages. In the first stage, run each individual equation in (6.22) by least squares and obtain the residuals $\mathbf{e}_i=(\mathbf{y}_i-\mathbf{X}_i\mathbf{b}_i)$. Use these to find an estimate $\hat{\Sigma}$ of Σ, where $\hat{\Sigma}=[\hat{\sigma}_{ij}]$ for all i, j=1, ...n, and $\hat{\sigma}_{ij}=\mathbf{e}_i'\mathbf{e}_j/T$ are the estimated variances and covariances of Σ in (6.21). In the second stage, use $\hat{\Sigma}$ to obtain $\hat{\mathbf{B}}^*$ as in (6.25′) with Σ replaced by $\hat{\Sigma}$. These are the SUR estimators proposed by Zellner(1962).

In the above two step procedure, $\hat{\sigma}_{ij}$ is biased in finite samples because of the T in the denominator. An unbiased estimator of σ_{ij}, when the number of explanatory variables in each equation are the same, is $\hat{\sigma}_{ij}=\mathbf{e}_i'\mathbf{e}_j/(T-k)$, $\forall$ i, j=1, ..., n. When the number of explanatory variables across equations are different one may find the average number of coefficients per equation (K/n) (where $K=\Sigma_i k_i$), and use (T-(K/n)) as a divisor to obtain an unbiased $\hat{\sigma}_{ij}$.

An alternative, iterative estimator of $\mathbf{B}$ may be obtained as an extension of the above SUR estimator. Thus, given the first two steps above, in the third step use $\hat{\mathbf{B}}^*$ obtained in the second step to find a new estimate of Σ, $\hat{\hat{\Sigma}}$, through $\hat{\hat{\sigma}}_{ij}=(\mathbf{y}_i-\mathbf{X}_i\hat{\beta}_i^*)'(\mathbf{y}_j-\mathbf{X}_j\hat{\beta}_j^*)/T$. In the fourth step use $\hat{\hat{\sigma}}_{ij}$ to find a new estimator for $\mathbf{B}$. This procedure is continued until convergence. Under normality, the estimator obtained is consistent and asymptotically efficient, Gallant(1975). It can be shown, Magnus(1978), that when $\mathbf{E}$ (or equivalently $\mathbf{Y}$) follows a multivariate normal distribution the latter estimator is the MLE. Under appropriate conditions both the SUR and the iterative SUR estimator have the same limiting distribution.

Asymptotically, the choice of the divisor in estimating $\hat{\sigma}_{ij}$ does not influence the properties of $\hat{\mathbf{B}}^*$; it remains an unbiased and consistent estimator of $\mathbf{B}$. The small sample properties have been investigated by a number of authors, with different conclusions. Their common ground is that $\hat{\mathbf{B}}^*$ is more efficient than the OLS estimator, provided the correlation between the disturbances amongst equations is not too low, cfr Judge et al (1985, p469-470).

6.2.4). Nonlinear SUR Estimators.

Once data restrictions are taken into account in our 'static' seaborne import allocation models, or when we consider their 'dynamic' versions (when expectations are incorporated) the systems become nonlinear. The presence of non-linearities in the system requires numerical iterative methods to reach a solution. Such an iterative procedure has just been considered in the previous subsection of SUR estimation for an unknown covariance matrix. A number of other algorithms are suggested in the literature, see Madalla(1977, p171-174), Judge et al(1988, Ch.12), Pindyck and Rubinfeld(1981, p262-265). Thus, the methods of 'direct search', 'steepest descent', 'direct optimization', 'scoring', 'Gauss-Newton', 'Newton-Raphson' etc are possible alternatives. We concentrate here on the 'Gauss-Newton' algorithm which is the most efficient computationally, and is the one we use for estimation. It is based on Taylor approximations of the original nonlinear system.

Assuming a system of equations which has the form of (6.22), obtaining estimates of the parameters $\Theta \equiv (\mathbf{B}, \Sigma)$ involves minimizing the objective function:

$$S(\mathbf{B}) = [\mathbf{Y} - \mathbf{F}(\mathbf{X}, \Theta)]' (\Sigma^{-1} \otimes \mathbf{I}_T) [\mathbf{Y} - \mathbf{F}(\mathbf{X}, \Theta)] \qquad (6.32)$$

We write the function $\mathbf{F}(\mathbf{X},\Theta)$ for convenience as $\mathbf{F}(\mathbf{B})$. The FOC for minimization of the above are:

$$\partial[S(\mathbf{B})]/\partial\mathbf{B} = -2\{\partial[\mathbf{F}(\mathbf{B})]'/\partial\mathbf{B}\} (\Sigma^{-1} \otimes \mathbf{I}_T) [\mathbf{Y} - \mathbf{F}(\mathbf{B})] = 0 \qquad (6.33)$$

$$= \mathbf{Z}(\mathbf{B}) \ (\Sigma^{-1} \otimes \mathbf{I}_T) \ [\mathbf{Y} - \mathbf{F}(\mathbf{B})] = 0 \qquad (6.33')$$

This a system of nk equations. They are evaluated at some initial estimates of $\mathbf{B}$, which we provide, say $\mathbf{B}_0$. Taking a first order Taylor approximation of the model, equation (6.22), around $\mathbf{B}_0$, yields:

$$\mathbf{Y} \simeq \mathbf{F}_0(\mathbf{B}_0) + \{\partial[\mathbf{F}_0(\mathbf{B}_0)]'/\partial\mathbf{B}\} \ [\mathbf{B} - \mathbf{B}_0] + \mathbf{E} \qquad (6.34)$$

$$\therefore \quad \{Y-F_0(B_0)-\{\partial[F_0(B_0)]'/\partial B\}B_0\} \simeq \{\partial[F_0(B_0)]'/\partial B\}\ B + E \qquad (6.35)$$

To simplify the notation write the above as:

$$\bar{Y}_0 = Z_0(B_0)\ B + E \qquad (6.35')$$

where the definitions of $\bar{Y}_0$ and $Z_0(B_0)$ are obvious by comparing (6.35) with (6.35').

Next use least squares in (6.35') to find a second estimate of B, B_1, say. That is, minimize the objective function:

$$S(B)=[Y-Z_0(B_0)B]'(\Sigma^{-1}\otimes I)[Y-Z_0(B_0)B] \qquad (6.36)$$

The FOC of the above yield a second estimate of B, B_1 say. Thus,

$$B_1=\{[Z_0(B_0)]'(\Sigma^{-1}\otimes I_T)[Z_0(B)]\}^{-1}Z_0(B_0)'(\Sigma^{-1}\otimes I_T)\bar{Y}(B_0) \qquad (6.37)$$

$$=B_0+\{[Z_0(B_0)]'(\Sigma^{-1}\otimes I_T)[Z_0(B)]\}^{-1}Z_0(B_0)'(\Sigma^{-1}\otimes I_T)[Y-F(B_0)] \qquad (6.37')$$

Continuing this process we get the nth estimate of B:

$$B_n = B_{n-1} + \qquad (6.38)$$

$$+\{[Z_{n-1}(B_{n-1})]'(\Sigma^{-1}\otimes I_T)[Z_{n-1}(B_{n-1})]\}^{-1}Z_{n-1}(B_{n-1})'(\Sigma^{-1}\otimes I_T)[Y-F(B_{n-1})]$$

When the process has converged the FOC are satisfied, $[Z_{n-1}(B_{n-1})]'(\Sigma^{-1}\otimes I_T)[Y-F(B_{n-1})]=0$, and $B_n=B_{n-1}$.

When Σ is unknown a two step procedure similar to that we described for the linear SUR estimator may be followed. The least squares estimates of the first step are obtained by the nonlinear iterative procedure described above.

Assuming Y is normally distributed, its maximum likelihood function resembles that of (6.29') with $(Y-XB)$ replaced by

$(\mathbf{Y}-\mathbf{F}(\mathbf{X},\Theta))$. The log of the likelihood function becomes:

$$LL=(nT/2)\ln 2\pi-(T/2)\ln|\Sigma|-(1/2)\{(\mathbf{Y}-\mathbf{F}(\mathbf{X},\Theta))'(\Sigma^{-1}\otimes I)(\mathbf{Y}-\mathbf{F}(\mathbf{X},\Theta))\} \quad (6.39)$$

Maximizing the above can be seen to be equivalent to minimizing the objective function (6.32). Thus, under normality, the nonlinear GLS and ML estimators are equivalent.

6.2.5). Properties of SURE Estimators.

There are two conditions under which both the linear and the nonlinear SUR estimators are identical to the OLS:

1). When there is no contemporaneous correlation, in which case the covariance matrix Σ is diagonal and $\Sigma=[\sigma_{ij}]=0$, all $i\neq j$.

2). When the explanatory variables across equations are identical. That is, for all equations $\mathbf{X}_1=\ldots=\mathbf{X}_N = \bar{\mathbf{X}}$ (say), so that the matrix $\mathbf{X}$ of (6.19)/(6.20) becomes $\mathbf{X}=(\mathbf{I}_n\otimes\bar{\mathbf{X}})$. Then $(\mathbf{X}'(\Sigma^{-1}\otimes I)\mathbf{X})$ of (6.25′) becomes: $(\mathbf{X}'(\Sigma^{-1}\otimes I)\mathbf{X}) =(I\otimes\bar{\mathbf{X}}')(\Sigma^{-1}\otimes I)(I\otimes\bar{\mathbf{X}}) =\Sigma^{-1}\otimes(\bar{\mathbf{X}}'\bar{\mathbf{X}})$. Using this in (6.25′) to find $\mathbf{B}^*$ we get: $\mathbf{B}^*=(\Sigma^{-1}\otimes(\bar{\mathbf{X}}'\bar{\mathbf{X}}))^{-1}(I\otimes\bar{\mathbf{X}})(\Sigma^{-1}\otimes I)\mathbf{Y}$ $=(\Sigma\otimes(\bar{\mathbf{X}}'\bar{\mathbf{X}})^{-1})(I\otimes\bar{\mathbf{X}})(\Sigma^{-1}\otimes I)\mathbf{Y} =[I\otimes(\bar{\mathbf{X}}'\bar{\mathbf{X}})^{-1}\bar{\mathbf{X}}']\mathbf{Y}$, which is nothing but the OLS estimator applied to each equation separately.

In either case there is no gain in efficiency by estimating the equations jointly, and it is 'best' if OLS is used.

Another point that is worth making is that, if equations are arranged in two or more groups such that the disturbances of each equation in each group are only correlated with the disturbances of equations in the same group (but are uncorrelated with disturbances of equations in other groups), then the matrix Σ is block-diagonal. Then (6.25) can be applied separately to each group of equations.

So far, we have seen that, if there is any type of relationhip between the equations (such as a system with error related equations in some way), taking account of this information by estimating the equations jointly results in more efficient estimates. More generally, if there are time-invariant or individual-invariant parameters, then 'pooling' the system together results in more efficient estimates (due to the increased degrees of freedom).

There are other ways of estimating 'pooled' data models apart from SURE. In SURE we assumed separate coefficient estimates (but fixed over time) for each exporting region and contemporaneous correlation in the error term. Other 'pooling' methods make alternative assumptions about the disturbance terms and about the way the coefficient vector changes over cross-section or time. Thus, the Dummy Variable (or Covariance) model assumes a white noise error term and an identical coefficient vector, except from the constant terms which are allowed to vary. The Error Components model is an extension of the Dummy Variable model, by assuming that the constant terms are random, effectively providing for more complex structures of the error term. Another alternative is the Swamy(1970) random coefficient model. It can be regarded as an extension of SURE by assuming that the individuals represent a random sample from some larger population (which is not true for our models, since we consider all the regions of the world). It is then appropriate to regard the different coefficient vectors as random drawings from some probability distribution.

6.3). Import Allocation Models as SURE with Singular Covariance Matrix.

Equation (6.22) expresses our import allocation models in a general form, which we repeat here for convenience:

$$Y = F(X,\Theta) + E \,, \qquad E_{\sim}(0,\Sigma\otimes I_T) \quad \text{or} \quad E_{\sim}(0,\Omega) \qquad (6.40)$$

That is, it is assumed that for the error term:

$$E[E]=0 \qquad \text{and} \qquad E[EE']=\Omega \equiv \Sigma\otimes I_T \qquad (6.41)$$

The following functional form constraint applies to the system:

$$w' \; [Y-F(X,\Theta)] \equiv 0 \qquad (6.42)$$

The constraint carries over to the vector of disturbances:

Hence: $$\mathbf{w}'\ E\ [\mathbf{E}] \equiv 0 \qquad (6.43)$$

and $$\mathbf{w}'\Omega = \mathbf{w}'(\Sigma\otimes\mathbf{I}_T) = \mathbf{w}'E[\mathbf{EE}'] = E[\mathbf{w}'\mathbf{EE}'] \equiv 0 \qquad (6.44)$$

That is, the rows and columns of Ω (or equivalently of Σ) are linearly dependent, with Rank(Ω)<nT (equivalently, Rank(Σ)<n). The sum of any row or column of the covariance matrix is zero, and the matrix is singular. This singularity of Ω (Σ) prevents us from finding the SUR estimators of (6.25)/(2.25').

Intuitively, because we are faced with an import allocation problem (with the total imports of a region for a commodity allocated amongst its trade partners), the equations are linearly dependent. It is sufficient to allocate imports to the (n-1) regions, the last being a residual. The nth equation is completely redundant, since, by using the information contained in the (n-1) equations, we can obtain the nth equation as a linear combination of the rest.

The natural solution to the singularity problem is to delete one of the equations in the system. Then $\Sigma_i w_i^0 \varepsilon_{i}=0$, i=1,...,n-1, is not satisfied anymore, the (n-1) errors are independent, and the rank of the covariance of the errors of the (n-1) equations is (n-1); Σ is invertible. It makes no difference which equation is deleted, since the equations may be put in any order.

However, if for a general system, the linear dependence of the error terms implies linear constraints on the parameters, deleting equations leads to loss of information. Ignoring information results in inefficient estimates, unless the implied parameter restrictions are imposed or fulfilled automatically. This suggests approaching the singular covariance matrix problem, as a restricted least squares problem. In this way all the available information (sample and a priori) can be incorporated in the formulation of the problem.

In that direction, we provide a solution by using the generalized inverse of the singular covariance matrix instead of the ordinary inverse (when Σ is invertible) of the restricted GLS formula.

In our import allocation problem, the functional form restrictions imply restrictions on the coefficient vector of b_i, $\Sigma_i w_i^0 b_i=0$, $i=1,\dots,n$ (see Chapter 4). Let us take for convenience the linear SUR model, (6.20), and let there be non-sample information available in terms of exact linear restrictions on the parameters, in the form RB=r. Then, (6.20) can be estimated efficiently by formulating the problem as, minimising the objective function:

$$\mathbf{S(B)=E}'(\Sigma^{-1}\otimes\mathbf{I}_T)\mathbf{E} \qquad \text{subject to} \qquad \mathbf{RB}-r=0.$$

Assuming that the rank conditions are satisfied, the Restricted GLS estimator of $\mathbf{B}$ is:

$$\mathbf{B}_R^*=\mathbf{B}^*+[\mathbf{X}'(\Sigma^{-1}\otimes I)\mathbf{X}]^{-1}R'\{R[\mathbf{X}'(\Sigma^{-1}\otimes I)\mathbf{X}]^{-1}R'\}^{-1}(RB-r) \qquad (6.45)$$

where $\mathbf{B}^*$ is the Unrestricted GLS estimator as defined in (6.25'). Thus, the Restricted GLS estimator differs from the Unrestricted GLS estimator of (6.25'), by a linear function of the restrictions. When the latter are satisfied, that is, when $\mathbf{RB}$-r=0, $\mathbf{B}_R^*$ is equivalent to $\mathbf{B}^*$.

Let us define the generalised inverse (or Moore-Penrose inverse) of the singular covariance matrix Σ as the matrix Σ^+, which satisfies the following four conditions:

i). $\Sigma\,\Sigma^+\,\Sigma = \Sigma$

ii). $\Sigma^+\Sigma\,\Sigma^+ = \Sigma^+$

iii). $(\Sigma\,\Sigma^+)'= \Sigma\,\Sigma^+$

iv). $(\Sigma^+\Sigma)' = \Sigma^+\,\Sigma$

It can be shown that for any matrix Σ, there exists a unique generalized inverse as defined above, Theil(1971, p267). It may be obtained using the orthogonal transformation procedure. This involves diagonalizing Σ. The latter can be achieved by finding the positive eigenvalues of Σ ((n-1), since $\text{Rank}(\Sigma)=n-1$), and forming the F matrix whose columns are the eigenvectors of Σ, corresponding to its positive eigenvalues. Similarly, take the remaining 0 eigenvalue of Σ and form the zero vector G, which corresponds to the 0 eigenvalue. The augmented matrix $U=[F,G]$, whose columns are the characteristic vectors of Σ, is orthogonal and will diagonalize the covariance matrix Σ, with the characteristic roots of the latter on the diagonal. The columns of U ($\underset{-}{x}_i$, say) are the distinct characteristic vectors of Σ, and are orthogonal in the sense that their inner product $\underset{-}{x}_i'\underset{-}{x}_j=0$, $i,j=1,\dots n$. In matrix form, $U=[F,G]$ is orthogonal, since, $U'U=UU'=I_n$. That is,

$$U'U=\begin{pmatrix} F'F & F'G \\ G'F & G'G \end{pmatrix} = \begin{pmatrix} I_{n-1} & 0 \\ 0 & I_1 \end{pmatrix} = I_n \tag{6.46}$$

Thus, the quadratic (or Jordan Canonical) form $U'\Sigma U$ diagonalizes Σ, with the characteristic roots of Σ on the diagonal.

$$\therefore \qquad U'\Sigma U = \Lambda = \begin{pmatrix} \Lambda_{n-1} & 0 \\ 0 & 0 \end{pmatrix} \tag{6.47}$$

where Λ_{n-1} is the diagonal matrix with the (n-1) positive eigenvalues of Σ as its elements.

(6.20) may now be transformed by premultiplying it by U', to get:

$$U'\mathbf{Y} = U'\mathbf{XB} + U'\mathrm{E}, \qquad \text{where} \qquad \mathrm{E}\sim(\mathbf{0},\ \Sigma \otimes \mathbf{I}_T) \tag{6.48}$$

Equivalently,

$$\begin{pmatrix} F'\mathbf{Y} \\ G'\mathbf{Y} \end{pmatrix} = \begin{pmatrix} F'X \\ G'X \end{pmatrix} \mathbf{B} + \begin{pmatrix} F'\mathrm{E} \\ G'\mathrm{E} \end{pmatrix} \tag{6.48'}$$

From (6.47), the covariance of $G'\mathrm{E}$, $E[G'\mathrm{EE}'G] = G'\Sigma G = 0$. That is, $G'\mathrm{E}$ is a random vector 0, and (6.48') can be thought of as estimating,

$$F'\mathbf{Y} = F'\mathbf{XB} + F'\mathrm{E} \tag{6.49}$$

subject to the restrictions:

$$G'\mathbf{Y} = G'\mathbf{XB} \tag{6.50}$$

From (6.47), the covariance of $F'E$ is, $E[F'EE'F] = F'\Sigma F = \Lambda_{n-1}$. We define the generalized inverse of Σ, to be the new matrix $\Sigma^{+}=F\Lambda_{n-1}^{-1}F'$. It can be checked that Σ^{+} satisfies conditions (i)-(iv). Hence, the generalized restricted least squares estimator takes the form (Theil(1971, p285)):

$$\mathbf{B}_R^{*}=\mathbf{B}^{*}+[\mathbf{X}'(\Sigma^{+}\otimes I)\mathbf{X}]^{-1}\mathbf{X}'G\{G'\mathbf{X}[\mathbf{X}'(\Sigma^{+}\otimes I)\mathbf{X}]^{-1}\mathbf{X}'G\}^{-1}(G'\mathbf{Y}-G'\mathbf{XB}) \tag{6.51}$$

where $\mathbf{B}^{*}$ is the unrestricted generalized estimator of $\mathbf{B}$,

$$\mathbf{B}^{*}= [\mathbf{X}'(\Sigma^{+}\otimes I)\mathbf{X}]^{-1}\mathbf{X}'(\Sigma^{+}\otimes I)\mathbf{Y} \tag{6.52}$$

that is,

$$\mathbf{B}^{*}= [\mathbf{X}'(F\Lambda_{n-1}^{-1}F'\otimes I)\mathbf{X}]^{-1}\mathbf{X}'(F\Lambda_{n-1}^{-1}F'\otimes I)\mathbf{Y} \tag{6.52'}$$

assuming that $\mathbf{X}'F$ has full rank.

Also, the variance of $\mathbf{B}_R^{*}$ is:

$$V(\mathbf{B}_R^{*})=(\mathbf{X}'\Omega^{+}\mathbf{X})^{-1}-(\mathbf{X}'\Omega^{+}\mathbf{X})^{-1}\mathbf{X}'G[G'\mathbf{X}(\mathbf{X}'\Omega^{+}\mathbf{X})^{-1}\mathbf{X}'G]^{-1}G'\mathbf{X}(\mathbf{X}'\Omega^{+}\mathbf{X})^{-1} \tag{6.53}$$

It can be seen that the Restricted GLS estimator (6.45) is equivalent to that of (6.51), where the $\mathbf{RB}=r$ have become $G'\mathbf{XB}=G'\mathbf{Y}$, and the covariance matrix Σ^{-1} is reduced to Σ^{+}.

When $G'\mathbf{X}=0$ the constraint (6.50) on the parameters is eliminated. Then $\mathbf{B}_R^{*}=\mathbf{B}^{*}$. If we denote the generalized inverse of Ω by Ω^{+}, where $\Omega^{+}=(\Sigma^{+}\otimes I) = (F\Lambda_{n-1}^{-1}F'\otimes I)$ and assuming that $G'\mathbf{X}=0$, the generalized estimator (6.51) and (6.52) may be written in compact form as:

$$\mathbf{B}^{*} \sim ((\mathbf{X}'\Omega^{+}\mathbf{X})^{-1}\mathbf{X}'\Omega^{+}\mathbf{Y},\quad (\mathbf{X}'\Omega^{+}\mathbf{X})^{-1}) \tag{6.54}$$

The above estimator is also valid if $G'\mathbf{X}\neq 0$ but the restrictions on the parameters are automatically fulfilled in $\mathbf{B}^*$.

In practice, deleting one of the equations makes the rest linearly independent (This automatically imposes the constraint $\Sigma_i w_i^0 c_i=0$ in the import allocation model). The usual procedures can be applied in the subsystem of the (n-1) remaining equations. Thus, we overcome the problem of estimating the generalized inverse Σ^+.

Assuming that the conditional distribution of $\mathbf{Y/X}$ is normal, we can compute confidence intervals and test hypotheses on the parameters.

Furthermore, assuming normality of $\mathbf{Y/X}$, we can formulate the problem in terms of maximizing a restricted likelihood function of (n-1) equations. Thus, the likelihood function (6.29) (or in terms of the nonlinear model the log-likelihood function (6.39)) becomes:

$$L(\mathbf{Y/X},\Theta) = 2\pi^{[-(n-1)T/2]}|\Omega^+| \exp [(-1/2)\mathbf{E}'\Omega^+\mathbf{E}] \qquad (6.55)$$

where Ω^+ is the generalized inverse of Ω^{-1}. That is, the T(n-1) full rank matrix obtained by deleting one of the equations in the system.

Thus, given the functional form constraints (6.24)/(6.24'), the problem of the importer is to maximize (6.55) subject to:

$$\mathbf{w}'\ \Omega \equiv \mathbf{0} \qquad (\text{equivalently,} \quad \mathbf{w}'\Sigma\equiv\mathbf{0}) \qquad (6.56)$$

and $$a_i \geq 0 \qquad \text{(see Chapter 3)} \qquad (6.57)$$

This problem, based on the same arguments as before, can be seen to be equivalent to minimizing the objective function:

$$\mathbf{S(B)} = \mathbf{E}'(\Sigma^{-1}\otimes \mathbf{I}_T)\mathbf{E} \quad \text{subject to (6.56) and (6.57),}$$

or equivalently,

$$\min S(B) = E'(\Sigma^{+}\otimes I_T)E \quad \text{subject to (6.56) and (6.57)}$$

Therefore, the ML and the GLS estimators of B for the 'restricted' problem are equivalent; those of (6.52)/(6.52')/(6.54).

The ijth term of the MLE of Σ is given by:

$$\sigma_{ij}=(y_i-X_i\beta_i)'(y_j-X_j\beta_j)/T \tag{6.58}$$

These principles apply to both linear and nonlinear models.

6.4). Tests of Hypotheses on the Statistical Parameters $\Theta\equiv(B,\Sigma)$.

When there is no type of cross equation correlations in the residuals, then applying OLS separately to each equation gives the BLUE. When the model is 'pooled' together (due, perhaps, to common coefficients across equations), then a diagonal matrix would also give the BLUE estimators, provided there are no cross equation correlations. We suggest tests for the nature of the covariance model here, which is useful in order to determine the 'best' method of estimation.

From the optimization problem of the importer, we observe that the constraint $a_i\geq0$ should be satisfied. In practice, negative a_i's are set to zero. This involves restrictions on the parameters of the model, and should be tested. Also, in chapter 4 we developed a framework of nested models. At the theoretical level, the CRESH model was constrained by placing restrictions on the elasticities of substitution between trade partners. Thus, the CES, the LES, the Cobb-Douglas and the Leontief models were obtained by placing coefficient restrictions across the equations of the system. Similarly, a number of nested models were also suggested as restricted versions of a more general 'Mixed' model by assuming alternative dynamic mechanisms. Such restricted versions of the 'Mixed' system were the AE (Adaptive Expectations), the PA (Partial

Adjustment), the Static models, or systems where the time trend is droped. Effectively, moving from a 'general' to a more 'restricted' model implies coefficient restrictions on the more general model. These coefficient restrictions can be tested statistically and we suggest a number of test statistics for that purpose here.

6.4.1). Tests for Contemporaneous Correlation.

The simplest type of cross-equation correlation is contemporaneous correlation. Tests for contemporaneous correlation (that is, for a diagonal Σ) amounts to testing the following hypothesis.

$$H_0: \ \sigma_{ij}=0 \qquad \forall \ \ i\neq j, \qquad i,j=1,\dots,n$$
$$H_A: \text{ At least one } \sigma_{ij}\neq 0, \ \forall \ i\neq j. \tag{6.59}$$

Assuming normality, Breusch and Pagan(1980) show that a Lagrange multiplier test may be used with a test statistic:

$$\lambda_{LM} = T \sum_{i=2}^{n} \sum_{j=1}^{i-1} r_{ij}^2 \ \underset{H_0}{\overset{as}{\sim}} \ \chi^2((n(n-1))/2) \tag{6.60}$$

where r_{ij} is the correlation coefficient $r_{ij}=\hat{\sigma}_{ij}/(\hat{\sigma}_{ii}\hat{\sigma}_{jj})^{(1/2)}$, with $\sigma_{ij}=(\mathbf{y}_i-X_i\beta_i)'(\mathbf{y}_j-X_j\beta_j)/\mathbf{T}$, and a rejection region specified by $\lambda_{LM}>\chi^2_{\alpha}((n(n-1))/2)$, where α is the prespecified significance level. Note, that n(n-1)/2 is half the off diagonal elements in Σ.

Alternatively, the Maximum Likelihood ratio may be used to test H_0. The test statistic is:

$$\lambda_{LR}= T \ \ln[|\hat{\Sigma}^*|/|\hat{\Sigma}|] \ \underset{H_0}{\overset{as}{\sim}} \ \chi^2((n(n-1))/2) \tag{6.61}$$

where $\hat{\Sigma}^*$ is the constrained MLE of Σ (that is, a diagonal matrix with $\hat{\sigma}_{ii}$ on the diagonal), based on the least squares residuals. $\hat{\Sigma}$ is the unconstrained estimator (the matrix $\hat{\Sigma}$ with at least one $\hat{\sigma}_{ij}\neq 0$, for i≠j) of Σ. It may be adequate to approximate $\hat{\Sigma}$ with an estimator based on the residuals of the SURE estimator. The rejection region remains the same as with the LM test.

When we estimate our complete system with one equation droped, then in all the above results n shoud be replaced with (n-1).

6.4.2). Tests of Restrictions Across Equations.

Tests for the validity of linear restrictions of the coefficients across equations, of the form **RB**=r, are considered here. The test involves a comparison of the residual sum of squares of the restricted and unrestricted models. If the increase in the residual sum of squares, as we move from the unrestricted to the restricted model, is not 'significant' we accept the restricted model, otherwise we reject it. To test the significance of the change in the residual sum of squares we need a test statistic whose distribution is known.

Judge et al(1988, p456-459) show that the appropriate test statistic, when the covariance matrix is of the scalar identity type, is:

$$F = \frac{[(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R)'(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R)-(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)'(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)]/J}{[(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)'(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)]/(nT-K)} \underset{H_0}{\sim} F(J,nT-K) \qquad (6.62)$$

where J are the number of restrictions and (nT-K) are the number of degrees of freedom of the unrestricted model (where $K=\Sigma_i k_i$).

When there is contemporaneous correlation in the residuals (such as the SURE model) the test statistic becomes:

$$F=\frac{[(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R)'(\Sigma^{*-1}\otimes\mathbf{I})(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R)-(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)'(\Sigma^{*-1}\otimes\mathbf{I})(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)]/J}{[(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)'(\Sigma^{*-1}\otimes\mathbf{I})(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)]/(nT-K)} \underset{H_0}{\sim} F(J,nT-K) \qquad (6.63)$$

with the rejection region for both statistics specified by $F>F_{\alpha}(J,nT-K)$.

That is, the test statistic is of the general form:

$$F = [(RRSS-URSS)/J] \ / \ [URSS/(nT-K)] \underset{H_0}{\sim} F(J,nT-K) \qquad (6.64)$$

where

RRSS=Restricted Residual Sum of Squares,

URSS=Unrestricted Residual Sum of Squares,

J =Number of Restrictions,

nT-K=Number of Degrees of Freedom of the Unrestricted Model.

In general Σ is unknown and has to be replaced by $\hat{\Sigma}$, and thus $\mathbf{B}^*_R$ and $\mathbf{B}^*$ need to be replaced by $\hat{\mathbf{B}}^*_R$ and $\hat{\mathbf{B}}^*$, respectively. The above statistics have an approximate F distribution. Note that, when Σ is unknown, in order to avoid deriving a misbehaving F statistic (that is, a negative F statistic), $\hat{\Sigma}$ needs to be held constant between the unrestricted and restricted models.

Also, the denominator in (6.64) converges in probability to one, and we may instead use the following statistic to test our hypotheses (assuming contemporaneous correlation):

$$g_1= [(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R)'\Omega^{*-1}(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*_R) - (\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)'\Omega^{-1}(\mathbf{Y}-\mathbf{X}\hat{\mathbf{B}}^*)]\underset{H_0}{\sim} \chi^2(J) \qquad (6.65)$$

We can write g_1 in terms of the restrictions in the model as:

$$g_2= [(r-\mathbf{R}\hat{\mathbf{B}})'[\mathbf{R}(\mathbf{X}'\Omega^{-1}\mathbf{X})^{-1}\mathbf{R}']^{-1}(r-\mathbf{R}\hat{\mathbf{B}})] \underset{H_0}{\sim} \chi^2(J) \qquad (6.66)$$

In finite samples, dividing either g_1 or g_2, which we may call g, by J yields:

$$\lambda = (g/J) \underset{H_0}{\sim} F(J,nT-K) \qquad (6.67)$$

which gives a more 'cautious' statistic, rejecting the Null in a smaller number of cases.

Asymptotically, the following likelihood ratio test may be used:

$$LR = T \ln[|\tilde{\Sigma}^{*}|/|\tilde{\Sigma}|] \underset{H_0}{\overset{as}{\sim}} \chi^2(J) \tag{6.68}$$

where $\tilde{\Sigma}$ and $\tilde{\Sigma}^{*}$ are the unrestricted and the restricted MLE of Σ, respectively.

6.5). Conclusion.

The aim of this chapter has been to specify the statistical environment of the import allocation models specified in chapter 4. These are systems of n import demand equations with k predetermined variables and common coefficients between equations. As a result, the system needs to be estimated jointly. Furthermore, possible omitted variables (in conjunction with the common coefficients) and functional form conmstraints, introduce cross-equation correlations and this classifies the system as SURE.

The functional form - data - constraint makes these cross equation correlations more specific. It also results in a singular covariance matrix of the error terms, rendering estimation impossible. However, by reformulating the original problem as a restricted GLS problem we are able to obtain the required parameters from a system of (n-1) equations using the usual estimation procedures. Assuming normality, the estimators obtained are equivalent to the MLE. Tests of restrictions on the parameters of the system of n equations are presented. These enable us to provide test procedures for a number of theoretical considerations put forward in the thesis.

CHAPTER 7

RESULTS

7.0). Introduction.

In the previous chapters we have derived three alternative empirical forms of our CRESH seaborne import allocation model. In this chapter we discuss the empirical difficulties in estimating these models, and we let our data decide on the 'best' functional form model in each import market. Bilateral import elasticities of demand are calculated, and we use these to make inferences about the competitiveness of international markets.

This chapter is in five main sections. In the first, we present the alternative functional forms that may be used for estimation of our seaborne import allocation model. In the second, we put together all the points related to estimation, as developed in the previous chapters, to present a program logic for estimation. In the third section, we specify the criteria for selection of the 'best' functional form, and we present the empirical results of this exercise for the 5 goods. In the fourth, we present the coefficient estimates of the selected functional form models related to the calculation of the import elasticities of demand, and we discuss the elasticity estimates. We estimate bilateral import elasticities of demand, with respect to changes in the own export prices of the exporting regions, with respect to changes in prices of other trade partners, and with respect to changes in the world prices of goods. In the fifth section, we discuss results related to trends and dynamics of the estimated systems.

7.1). The Estimating Seaborne Import Allocation Systems.

In chapter 4, we argued that the most general set of systems, which the length of our data allow us to estimate are those of Adaptive Expectations(AE), derived in equations (4.50)-(4.52). Three functional forms are distinguished, levels, logs and logarithmic first differences. Thus, for some import market, defined by the importing region j and the traded good k (the subscripts j, k, omitted throughout), we have the following estimating systems.

a). Variables in Levels:

$$y_{it}= \lambda y_{it-1}+(1-\lambda)b_i t+\lambda b_i-(1-\lambda)a_i\{[xp_i^{\alpha}wp_k^{(1-\alpha)}]-\Sigma_h w_h^0[xp_h^{\alpha}wp_k^{(1-\alpha)}]\}$$
$$+ (1-\lambda)\ \{\ \Sigma_i w_i^0 a_i[xp_i^{\alpha}\ wp_k^{(1-\alpha)}]\ -\ \Sigma_h w_h^0\ [xp_h^{\alpha}\ wp_k^{(1-\alpha)}]\ \} \tag{7.1}$$

b). Variables in Logarithms:

$$y_{it} = \lambda\ y_{it-1} + (1-\lambda)\ b_i\ t + \lambda\ b_i \tag{7.2}$$
$$- (1-\lambda)a_i\{[\alpha \ln xp_i+(1-\alpha)\ln wp_k]-\Sigma_h w_h^0[\alpha \ln xp_h+(1-\alpha)\ln wp_k]\}$$
$$+ (1-\lambda)\{\Sigma_i w_i^0 a_i[\alpha \ln xp_i+(1-\alpha)\ln wp_k]-\Sigma_h w_h^0[\alpha \ln xp_h+(1-\alpha)\ln wp_k]\}$$

c). Variables in Logarithmic First Differences:

$$y_{it}= \lambda\ y_{it-1} + (1-\lambda)\ b_i \tag{7.3}$$
$$- (1-\lambda)a_i\{[\alpha\Delta \ln xp_i+(1-\alpha)\Delta \ln wp_k]-\Sigma_h w_h^0[\alpha\Delta \ln xp_h+(1-\alpha)\Delta \ln wp_k]\}$$
$$+ (1-\lambda)\{\Sigma_i w_i^0 a_i[\alpha\Delta \ln xp_i+(1-\alpha)\Delta \ln wp_k]-\Sigma_h w_h^0[\alpha\Delta \ln xp_h+(1-\alpha)\Delta \ln wp_k]\}$$

where y_{it} in levels, logs and logarithmic first differences is defined, respectively, as:

$$(m_i-w_i^0 m)_t/m_i^0, \qquad \ln(m_i/\bar{w}_i^0\bar{m})_t, \qquad \Delta \ln(m_i/\tilde{m})_t \tag{7.4}$$

where, $w_i^0=m_i^0/m^0$, $\ln\bar{m}_t=\Sigma_i w_i^0 \ln m_{it}$, $\bar{w}_i^0=m_i^0/\bar{m}^0$ and $\Delta\ln\tilde{m}_t=\Sigma_i w_i^0 \Delta\ln m_{it}$.

7.2). The Estimating Program Logic.

Regarding estimation of the above, for each importing region and each commodity group, we are faced with sets of 30 equations to estimate. For 30 importing regions, over three functional forms, there are 90 systems to estimate. Over 5 goods, it involves 450 estimating systems. Economies of scale in computer programming for such a mass operation are vital. With this in mind, we have developed a computer program which is based on the following ideas.

The systems satisfy the functional adding-up constraint of $\Sigma_i w_i^0 y_{it}=0$. As a result, SURE methods should be employed for estimation (see chapter 6), and the restriction $\Sigma_i w_i^0 b_i=0$ is placed on the parameters of each system (see chapter 4). From the definition of the bilateral price index through a Cobb-Douglas function we have the condition $0\le\alpha\le1$ (see chapter 4). Regarding dynamics, the condition $0\le\lambda\le1$ should be satisfied by the definition of the A.E. mechanism (see chapter 4). Finally, the theoretical conditions for the existence of the CRESH composite price index, imply $a_i\ge0$ (see chapter 3).

Thus, for some import market j,k, we estimate each of (7.1)-(7.3) by nonlinear Least Square SURE methods subject to the

adding up condition:	$\Sigma_i w_i^0 b_i=0$,
the condition involving the price proxies:	$0\le\alpha\le1$,
the condition involving dynamics:	$0\le\lambda\le1$,
and the second order conditions of:	$a_i\ge0$.

The following points are important for the estimation of each model:

- The adding-up condition is enforced by excluding one equation from the complete system. The b_i for the excluded equation is obtained through the condition $\Sigma_i w_i^0 b_i = 0$, while the corresponding a_i is estimated directly through the composite price index.
- Since the model is nonlinear in the parameters with contemporaneous correlation of the residuals across equations, we employ the Gauss iterative methods for SURE models outlined in chapter 6.
- Having fewer time series observations (18) than equations (30), we impose an arbitrary constant (across equations) diagonal starting covariance matrix of the form $\sigma^2 \otimes I_T$.
- In practice, the crucial coefficient, in order to reach convergence in these large nonlinear systems, turns out to be α. In our experience, when α is fixed, the systems converge. We start with $\alpha=0.5$ (thus giving an equal weight to xp_i and wp_k), in order to obtain better estimates (than the starting values) of the other coefficient parameters (a_i, b_i and λ) in the system. At the same time, the initial covariance matrix is improved upon (in order to get better estimates of the standard errors of the estimated coefficients), by using $\sigma_{ii}^2 \otimes I_T$ from the results of the first estimation. In fact, $\sigma_{ii}^2 \otimes I_T$ is improved in succesive estimations by using its previous estimating value when we estimate the system again.

Taking into account the above points, we have written a computer program for each import region, the logic of which runs as follows:

1). We estimate the system once (allowing up to 20 iterations) with $\alpha=0.5$ and $\sigma^2 \otimes I_T$ (and some initial values for a_i, b_i and λ), in order to get estimates of the covariance matrix of the residuals and the coefficient parameters a_i, b_i and λ.

2). We estimate the system a second time (up to 20 iterations) with $\alpha=0.5$, starting with the previous covariance matrix estimates $\sigma_{ii}^2 \otimes I_T$ (where σ^2 is now allowed to vary across equations) and coefficient estimates of a_i, b_i, λ. This gives us a more realistic set of estimates of the parameters of interest (with $\alpha=0.5$), as compared to the 'arbitrary' values we have started with.

3). The third time (up to 60 iterations), we let α become a parameter, using the previous estimates of the converged model. This model gives us new estimates of all the coefficient parameters (including α).

4). Next, we test whether α satisfies the condition $0\leq\alpha\leq1$. If α takes a value outside this range then it is set to a constant and equal to its closest boundary (0 or 1). If α is set equal to either 0 or 1, the system converges in the next estimation. If α takes a value within the boundaries, then it remains a parameter in the next estimation with an initial value equal to the value from the previous SURE.

5). Similarly, we test the condition $0\leq\lambda\leq1$. If λ takes a value outside its boundaries, it is set equal to one of them, as with α above. λ has never become greater than 1. Note that, whether λ is constant or not is not important for convergence.

6). Now, we distinguish two possibilities according to whether $0\leq\alpha\leq1$, or not.

6a). When α is set equal to one of its boundaries the model converges very quickly, usually in 2 to 3 iterations. We estimate the system twice to get better estimates of the parameters, corresponding to this new value of α. Next, we impose, succesively, the second order conditions $a_i\geq0$, by seting the negative a_i's to zero, until we are left with only positive ones, and the model has converged.

6b). When α stays within its boundaries then there are two possibilities. The model will have either converged or not.

i). If the model had not converged, then α is set to a constant and equal to its latest estimate. The system will now converge. It is now estimated twice (up to 60 iterations each time) with α as a constant and equal to its previous value, before the negative a_i's are set to 0, in succesive estimations.

ii). If the model converges with α as a parameter, then we go through the same loop described in 6a). That is, the system is estimated twice (up to 60 iterations each time), ensuring that the value of α stays within its boundaries in each estimation. Then the second order condition is imposed by starting to set the negative a_i's to 0, until $a_i \geq 0$, $\forall$ i=1,...,n.

Finally, a word on the excluded equations from each system. These fall into two categories:

i) equations which are dropped from the system due to lack of data over the entire estimation period, which can be identified by the NA (Non Available) entry in the tables of the estimated a_i coefficients, presented later in the chapter.

ii) the equation excluded from each complete system in order to avoid singularity (see chapter 6). Since there is no individual region that is distinguished for its size and no absent trade throughout the import markets, we may drop any region, preferably the same over a single good. A complication that may arise here is to exclude the equation of a region which has zero weight (zero base-year trade-share), and attempt to calculate the missing b_i through $\Sigma_i w_i^0 b_i = 0$. We are careful to avoid such a situation. This excluded equation can be identified in the results by its present b_i coefficient, but the missing corresponding t statistic (which we do not calculate), denoted by NA.

7.3). Selection of the 'Best' Functional Form.

The first choice we have to make during estimation relates to the functional form of the selected system, at each import market. Does the system perform 'better' in levels, in logs or in first differences? The answer to this depends on the nature of the data, and is to be provided by empirical testing. For 5 'goods' and 30 importing regions, over three functional forms, it involves estimating 450 nonlinear systems of 29 equations (at times less, when equations are dropped due to the absence of bilateral trade over the entire period).

The question that naturally arises is the criterion of selection. The fit of the alternative functional forms might provide a criterion for selection. Another criterion might be a combination of fit with the natural fulfilment of the second order conditions ($a_i \geq 0$). The number of significant a_i's may provide extra help. Our a priori expectations of the elasticity estimates can also play a role in our decision. Note, that we refer to the a-priori expectations of the elasticities rather than those of the estimated coefficients a_i. The latter, are used together with the estimated α and the base year shares w_i^0, in order to calculate the elasticities (see (4.53)-(4.55) or (7.7)-(7.9)).

With respect to the criteria of fit, and the combination of fit and fulfilment of the second order conditions $a_i \geq 0$, we have three non-nested models to compare for each import market. The fitted values of the left hand side variables of the systems are not comensurate (see (7.4)), but we may transform them to get back to the original fitted bilateral imports, $\hat{m}_i$. Thus, for each functional form we calculate the CV (Coefficient of Variation), and the MCV (Modified Coefficient of Variation) defined by:

$$CV = 100 \times \{[\Sigma_i \Sigma_t (m_{it} - \hat{m}_{it})^2]/nT\}^{1/2} / (\Sigma_i \Sigma_t m_{it}/nT) \tag{7.5}$$

$$MCV = 100 \times \left[\{[\Sigma_i \Sigma_t (m_{it} - \hat{m}_{it})^2]/nT\}^{1/2} / (\Sigma_i \Sigma_t m_{it}/nT) \right] / A \tag{7.6}$$

where $\hat{m}_{it}$ are the fitted values of the levels of bilateral imports, calculated from the fitted $\hat{y}_{it}$ (see (7.4). m_{it} are the corresponding actual levels of bilateral seaborne imports. A, is the number of a_i coefficients, which satisfy naturally the second order sufficiency condition (that is, without being set to zero during estimation). Thus, the functional form with the lowest value of these statistics is considered as 'best'. Note that, (7.5)-(7.6) are calculated over the n equations of the complete system, including the fitted values of the equation which is excluded in order to avoid singularity of the system.

Complications may arise in the calculation of these statistics, because of the zero seaborne trade for quite a large number of regions and time periods. As a result, it is possible at times, for the average explained variability to be large in relation to the mean, resulting in values of the CV exceeding 100. We interpret this, as the particular functional form behaving less well than its competitors in that import market.

By using the MCV, we combine both the fit of the model and the satisfaction of the second order conditions into a single number. A combination of these measures with the number of significant a_i's as a helping aid enables us to choose the 'best' functional form of our model in each import market. Such 'Tables of diagnostics of all functional forms' for each good are presented in appendix 7.1. Columns of the tables refer to import regions. For each import region we present the estimated α coefficient, the CV, the MCV and the number of significant a_i's at the 5% and 1% levels of significance, for all functional forms. The bottom row of the tables refer to the selected functional form for each import market. Any further results we present (such as the calculation of elasticities etc) will be based on these functional forms.

Table 7.1 summarizes the results on these 'best' selected functional forms for all goods. We observe that for individual goods the functional form in levels comes first in all cases, with either the logarithmic form or the first difference form coming second, depending on the individual good. Over all goods, the levels form comes first by being selected 116 times (or 77%), the logarithmic form comes second best by being selected 22 times (or 15%), while the first difference form comes third with only 12 systems (or 8%) being selected out of the total of 150 selected.

Table 7.1.

Summary Table of the Selected Functional Forms.

FUNCTIONAL FORM	GOOD					
	1	2	3	4	5	All Goods
LEVELS	23	21	25	23	24	116
LOGS	5	4	2	6	5	22
DIFFERENCES	2	5	3	1	1	12

7.4). Estimation Results of the 'Best' Models.

7.4.1). The Estimated α and a_i Coefficients.

In combination with α and the w_i^0, the a_i coefficients are used in the calculation of elasticity estimates. In the tables of appendix 7.2 we present both the estimated a_i and α coefficients and their t statistics. Columns of the tables show the estimated values of these parameters for the related importing regions.

The estimated coefficient α (when it can be estimated) shows the relative importance of the total export prices of a region and the world price of the good, in the import allocation decision of the importer. When α takes a boundary solution, we can estimate either the export price elasticities (α=1) only, or the world price elasticity only (α=0), see (4.53)-(4.55) or equivalently (7.7)-(7.9) below. α turns out to be critical for convergence during estimation, and whether it has been estimated as a parameter or as a constant may be seen by the availability of its t statistic in the tables that follow.

In the 150 selected systems α is estimated as a parameter 9 times only. It falls in the range 0 to 1, 76 times, while on 74 occasions it is set equal to the boundary solutions 0 or 1. In the latter case, it is set to 0 five times and 69 times to 1.

7.4.2). *The Estimated Elasticities of Import Demands.*

By allowing the estimation of a distinct price effect for each trade partner i (i=1,...8,11,...,32), in an import market j,k (j=1,...,8,11,...,32, k=1,...5), we are able to evaluate how the imports of the importing region, j, from its 30 trade partners are affected with changes in the own prices of each of these regions, and also with respect to changes in other regions' prices. By virtue of the introduction of the world price of the good as a determinant of bilateral imports, we are also able to estimate the bilateral effect of changes in world prices of the good on the imports of j from each of its trade partners.

In fact, the sensitivity of the above price effects is calculated in terms of elasticities, using (4.53)-(4.55), repeated here for convenience:

$$e^{xp}_{ii}= \alpha\ e_{ii}=\{\alpha\ [(w_i a_i^2/a)-a_i]\}, \qquad i=1,...,n \qquad (7.7)$$

$$e^{xp}_{ih}= \alpha\ e_{ih}=\{\alpha\ [(a_i w_h a_h/a)]\}, \qquad i\neq h=1,...,n \qquad (7.8)$$

$$e^{wp}=(1-\alpha)e_{ii}=\{(1-\alpha)[(w_i a_i^2/a)-a_i]\}, \qquad i=1,...,n \qquad (7.9)$$

When these elasticities are estimated from the adaptive expectations systems (7.1)-(7.3), they will be interpreted as long run elasticities. The short run equivalents may be obtained by multiplying the long run elasticities by (1-λ). Given the constraint 0≤λ≤1, the short run elasticities will be smaller than their long run counterparts.

For each import market j,k, we calculate long run export (own and cross) and world price elasticities of bilateral seaborne imports from each of its 30 trade partners. For an importing region j then (for some good k), there are 930 estimated elasticities. These are arranged into a table, where columns of the table refer to the import elasticities of j from i (i=1,...,8,11,...,32), with respect to changes in the own export price of the region i, changes in the export prices of other trade partners of j and changes in the world price of the traded good k. The main diagonal of this table reports the own price elasticities, while the off diagonal elements are the cross price elasticities. The bottom row of the table reports the bilateral import elasticities of j from i, with respect to changes in the world price of the good.

Over 30 regions (for some good k), there are 30 of these tables, reporting 27900 elasticities. Such tables for good 1 are shown in appendix 7.3. A number of points are worth making here. The NA entries indicate non availability of the elasticity estimates, due to the absence of the corresponding a_i's (bilateral trade is zero between these regions over the entire period of estimation). Entries of (*****) in tables indicate that the bilateral elasticity corresponding to the cell is infinitely large (a very large number). Also, when the entire bottom row of these tables consists of zero's, the estimated α coefficient is 1 (see (7.9)) and the world price of the good has no role to play in the allocation decision of the importer. The allocation of imports between trade partners then, is determined purely by the total export prices offered in the market (see for example, the corresponding tables of importing regions 02, 04, 05, 22 etc). The opposite is true, when α=0.

Having estimated bilateral seaborne trade import allocation models for 30 regions and 5 goods, it involves calculating 139500 (=27900x5) elasticities. This is too much information to include for the space permitted in this thesis (tables of elasticities for the rest of the goods can be provided on request).

We do not attempt to go too much into the results, besides giving guidelines and an overview of the estimates. The following points emerge by reading the elasticity tables.

The bilateral own import price elasticities are negative, since increases in the own export price of a region i reduces the bilateral amount of imports of j from that region. It is relatively cheaper now to import from the rest of the 29 competitors of i. The bilateral cross import price elasticities are positive, since the bilateral imports of j from i increase if the prices of the competitors of i go up. It is now relatively cheaper for j to import from i than from the competitor of i, h≠i. Similarly, the bilateral world import price elasticities are negative, since increases in the world price of the traded good reduce overall trade, and as a consequence the bilateral amount of imports of j from its trade partners is reduced.

By looking at individual columns of the elasticity tables we observe that the value (in absolute terms) of the own price elasticity (corresponding to a trade partner, in an import market j,k) is larger than the values of the corresponding cross price elasticities. Changes in the own export price of i to j have a much larger impact on the exports of i to j, than changes in the export prices of the other trading regions. The effect of the latter is 'indirect', and is therefore reflected in the smaller cross price elasticities.

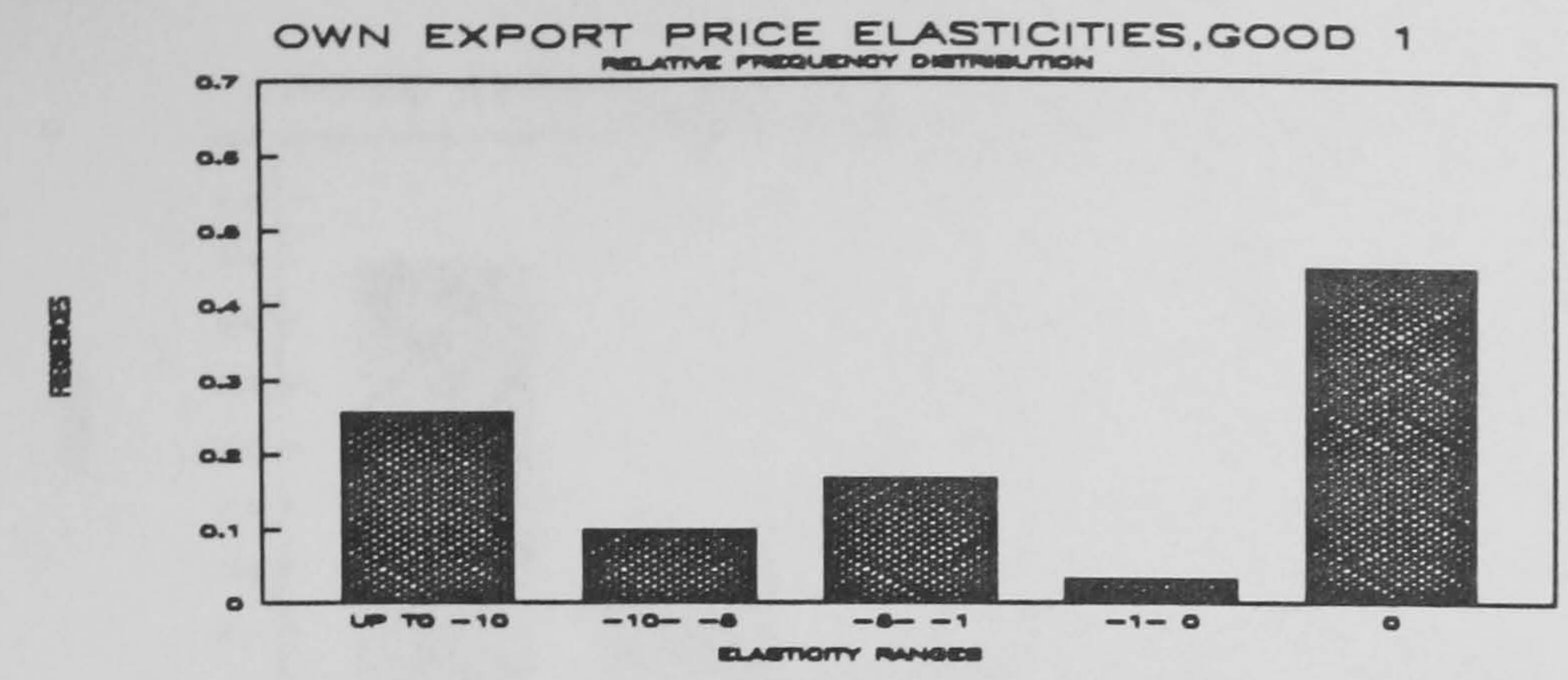
A striking feature of our results is that for each import market (a combination of importing region and traded commodity), there is a wide variation in price elasticities across trading partners (exporting regions). Broadly, price elasticities tend to be relatively low, and import flows relatively stable, for exporters which are on average major suppliers. Price elasticities tend to be high, and trade flows highly variable, for exporters which are on average small suppliers.

For example, import region 15 (British Isles) for Good 1, elasticities from trade partners such as 03, 05, 06, 16 and 19 (with which 15 has great institutional ties), are much lower in absolute value than the corresponding elasticities from regions 28, 30 and 32 (which are quite far from region 15). The latter group of countries need thus, much larger changes in their prices in order to penetrate the British Isles market. A similar story is observed in other import regions, such as in 18 (Atlantic Europe), with trade partners 25, 26, 27, 30 and 31 yielding sets of relatively higher elasticities, as compared to regions 02, 03, 05, 12, 17, 18, 20 and 23, the latter being much closer economically to 18.

It may be argued here that importing regions have some well established sources of imports internationally where they import the bulk of their imports from, while exploiting the relative better terms of trade offered from time to time by other trade partners (suppliers). These latter trade partners would, perhaps, need to offer 'substantial' reductions in prices in order to capture shares in international import markets. This result is reinforced later when we discuss the elasticity results for the rest of the goods.

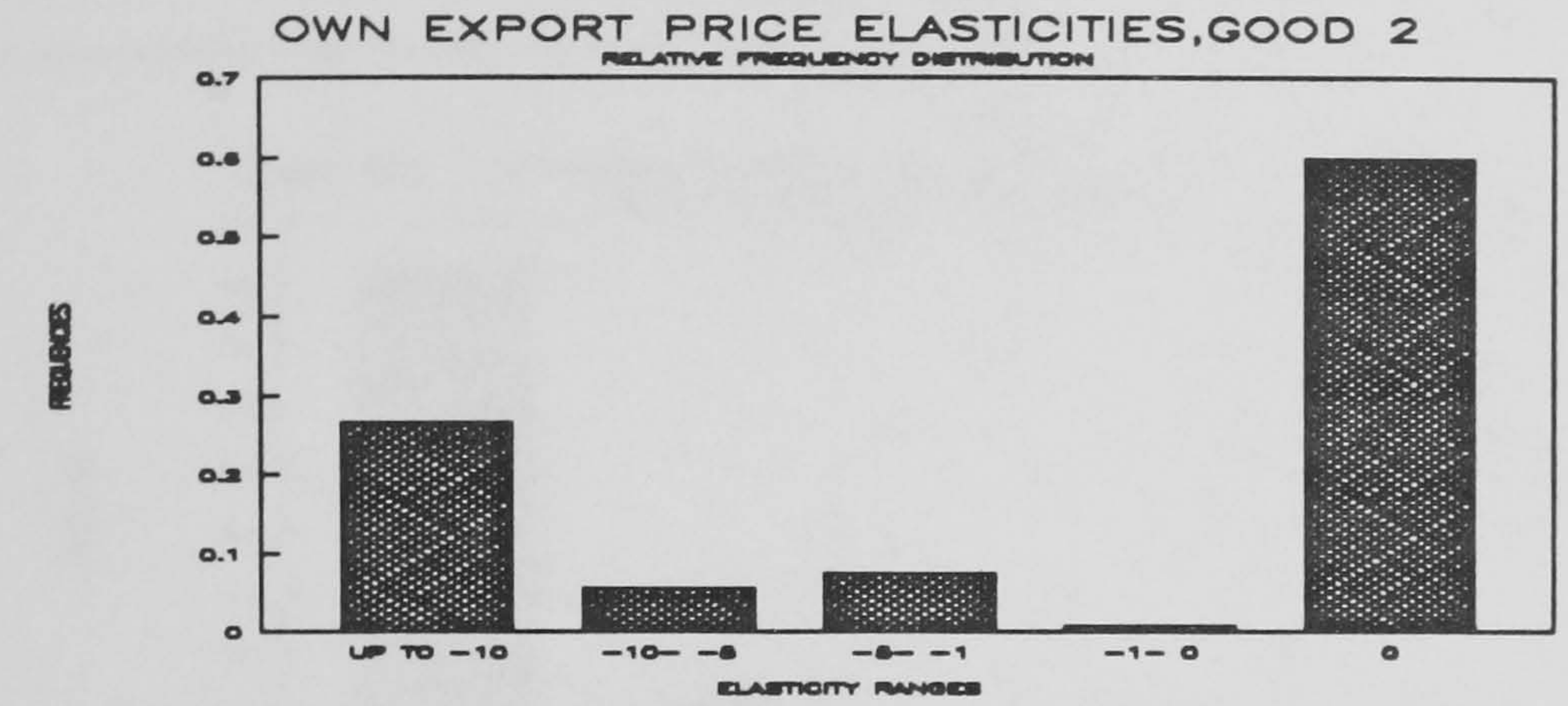
There is no space here to discuss all the results and conclusions that may be derived by examining every elasticity table of appendix 7.3. However, it is useful to summarize these results and the results of the other goods in terms of frequency distributions and the related histograms. Also, a number of statistics such as averages, and measures of variability of the elasticity estimates are presented in the tables/graphs that follow. These graphs and summary statistics help us compare the competitiveness of goods internationally.

The average values and variabilities of the elasticities are calculated from the frequency distributions, by assuming that the average value of the open-ended classes of the distributions is 20 (in absolute terms). In this way, outliers (high value elasticities) are averaged-out, since we are interested in comparing these statistics across individual goods. The results are tabulated below.



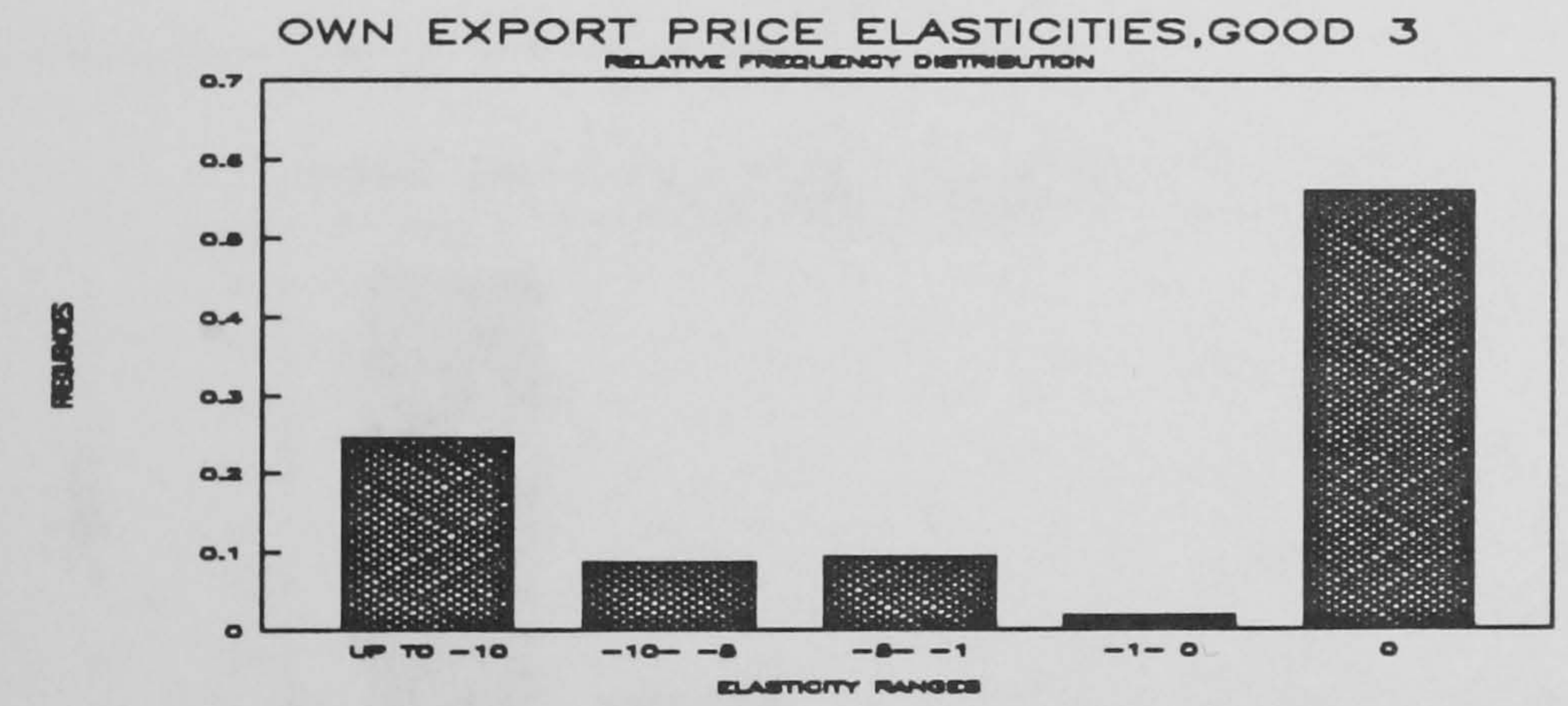
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	225
-10- -5	85
-5- -1	147
-1- 0	28
0	393

STATISTICS	
MEAN	-6.37
S.DEVIATION	8.3
C.VARIATION	1.3



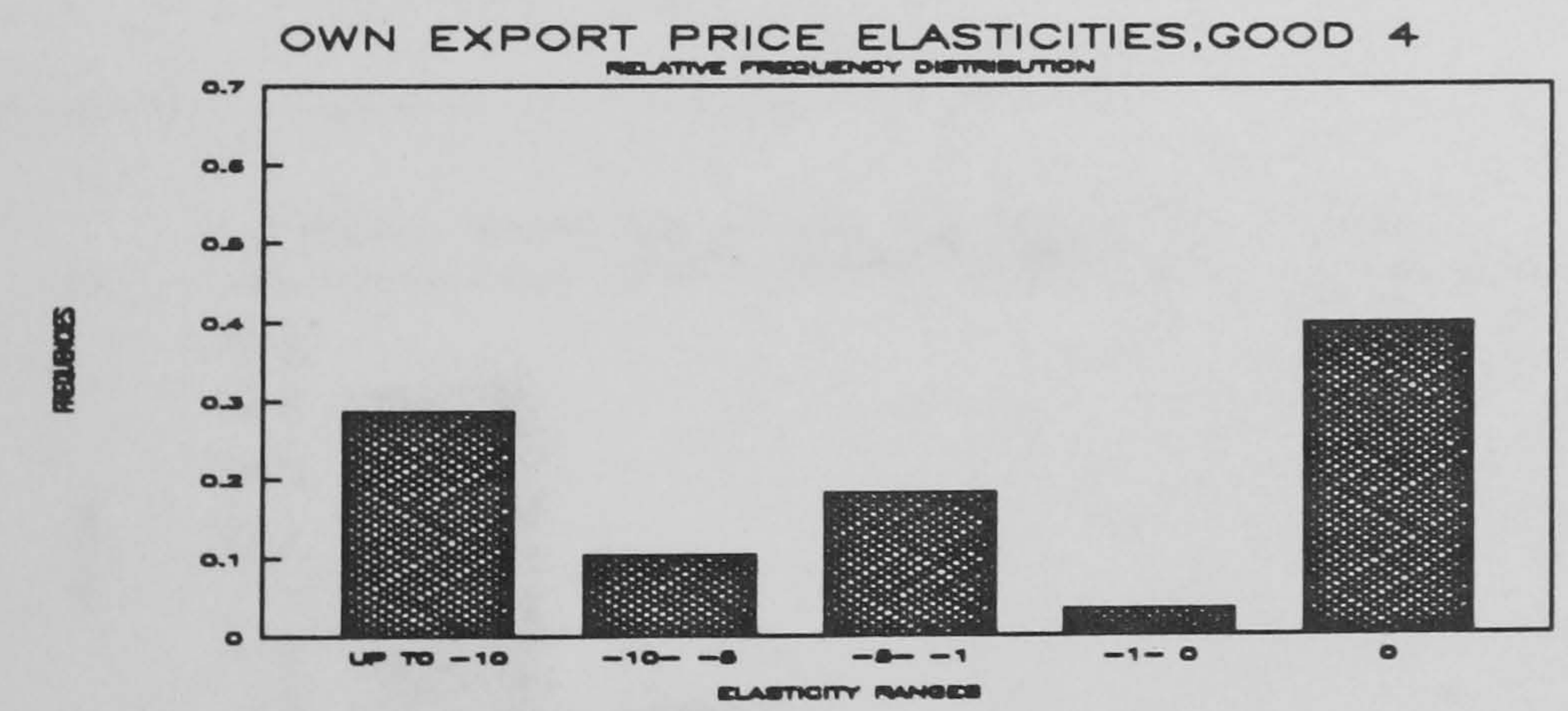
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	219
-10- -5	46
-5- -1	61
-1- 0	6
0	495

STATISTICS	
MEAN	-5.94
S.DEVIATION	8.63
C.VARIATION	1.45



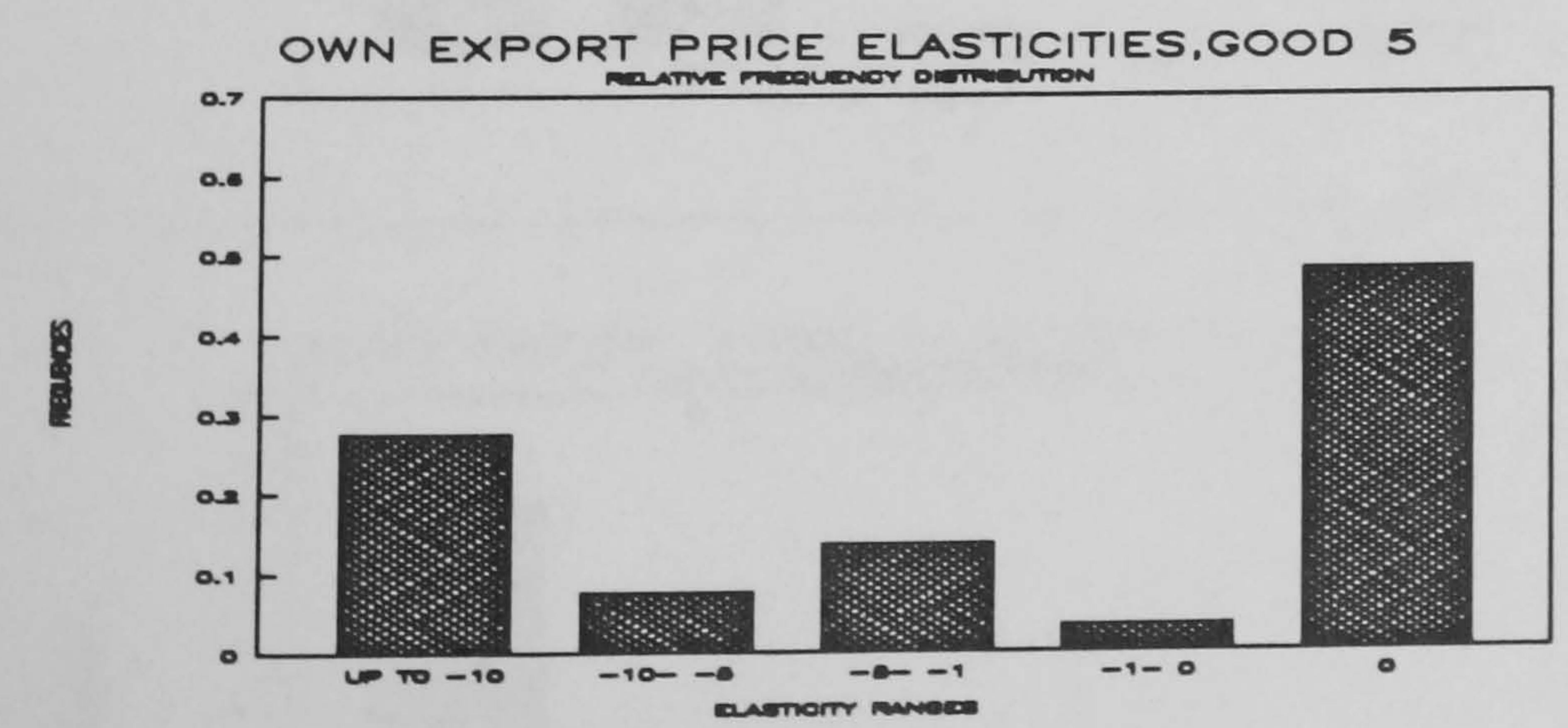
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	188
-10- -5	66
-5- -1	71
-1- 0	13
0	429

STATISTICS	
MEAN	-5.83
S.DEVIATION	8.35
C.VARIATION	1.43



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	252
-10- -5	91
-5- -1	160
-1- 0	29
0	350

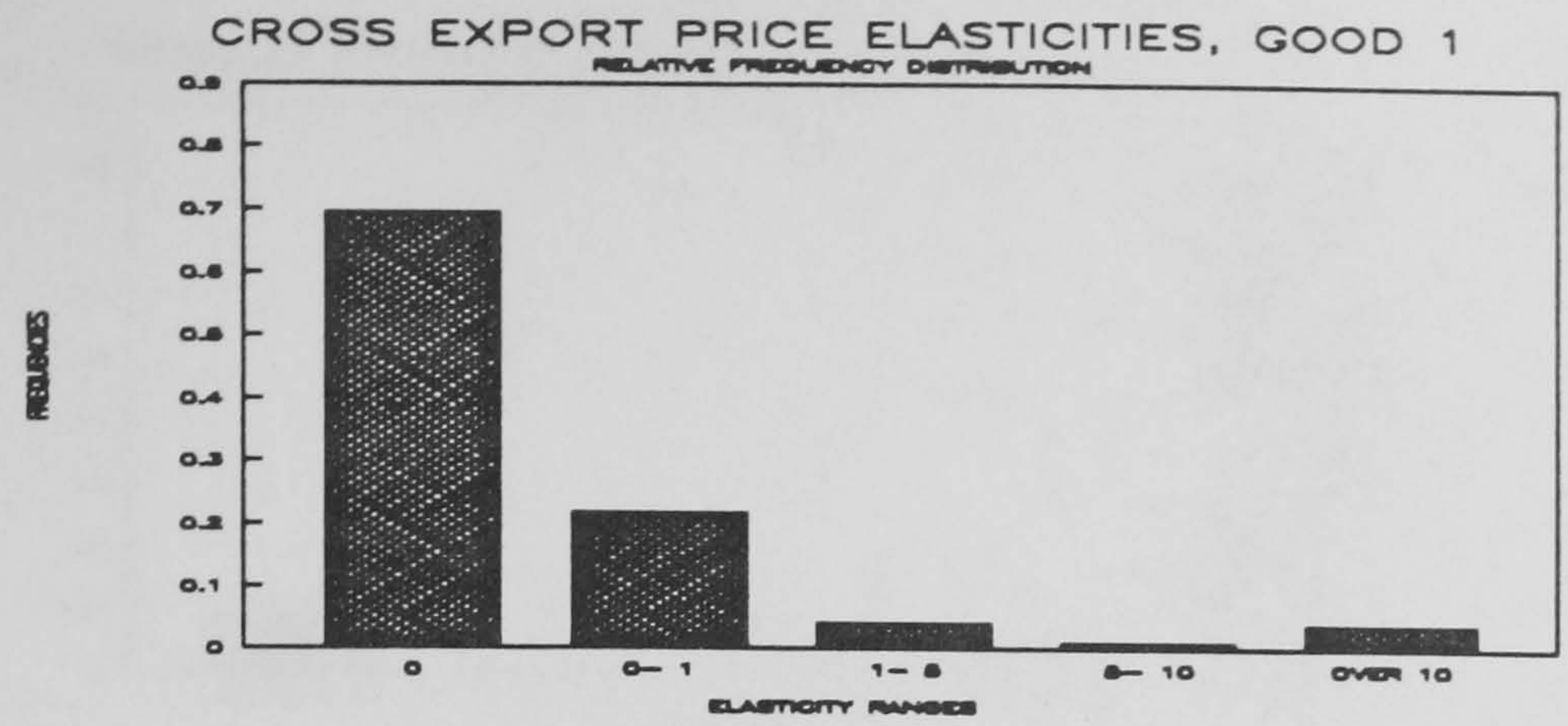
STATISTICS	
MEAN	-7.05
S.DEVIATION	8.49
C.VARIATION	1.2



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	238
-10- -5	65
-5- -1	117
-1- 0	29
0	414

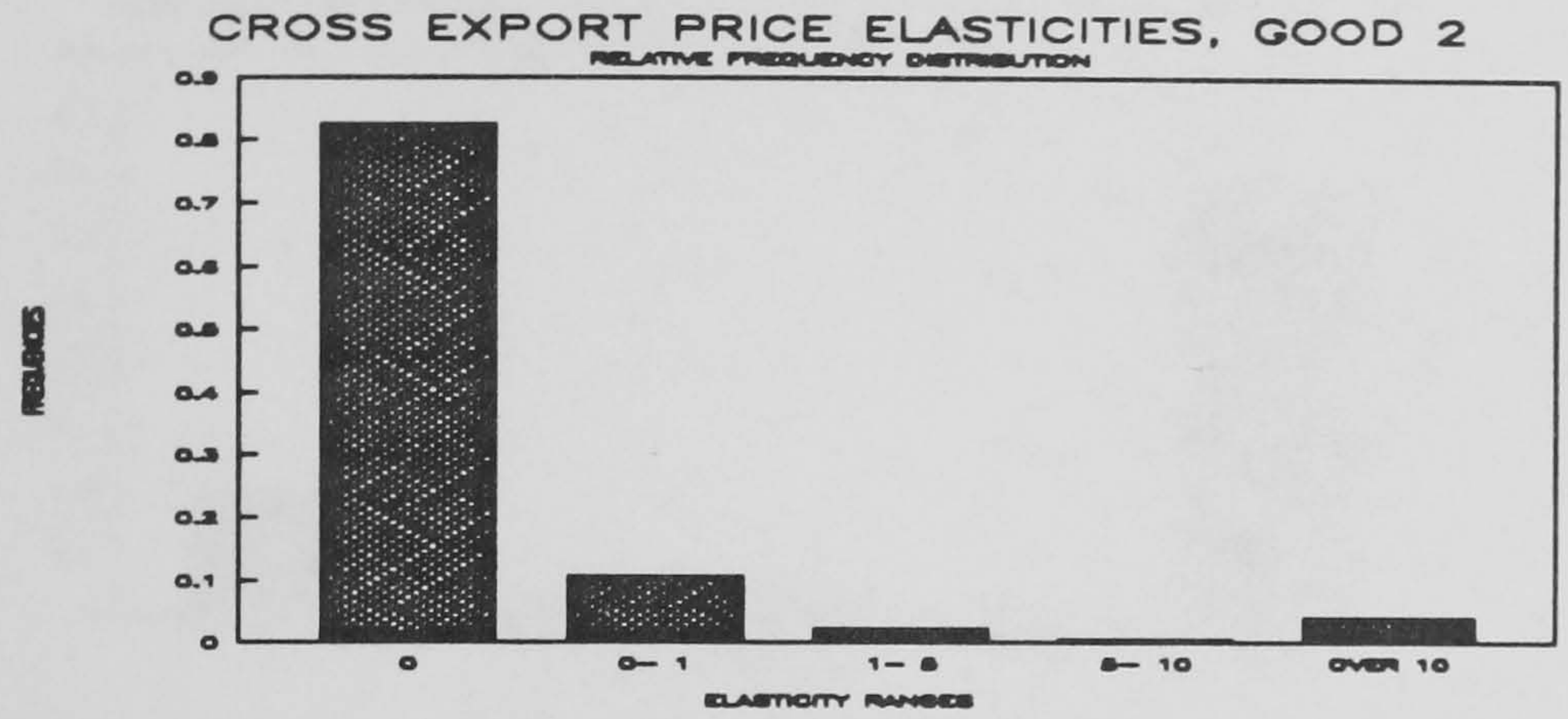
STATISTICS	
MEAN	-6.53
S.DEVIATION	8.6
C.VARIATION	1.32

Table 7.3



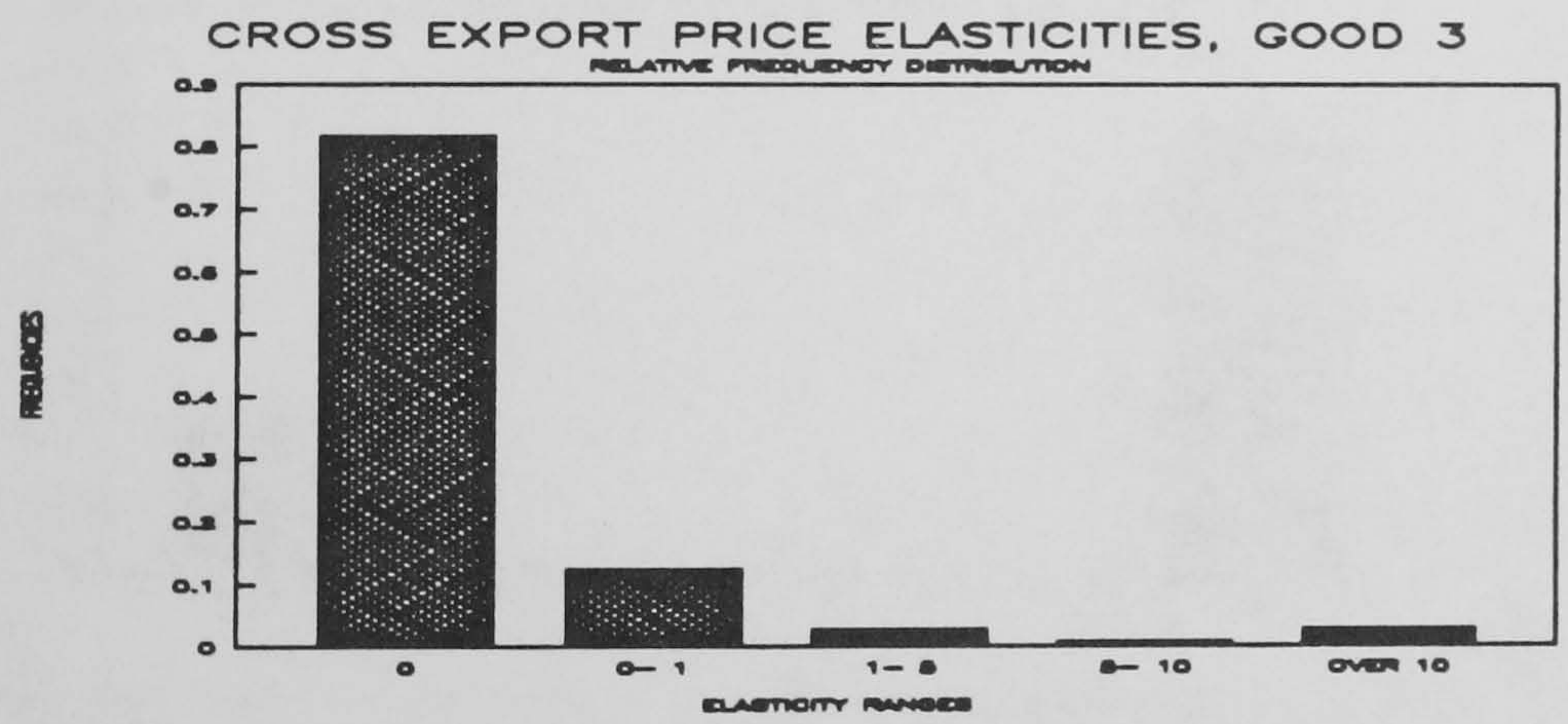
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
0	17333
0-1	5465
1-5	1008
5-10	234
OVER 10	944

STATISTICS	
MEAN	1.06
S.DEVIATION	3.87
C.VARIATION	3.66



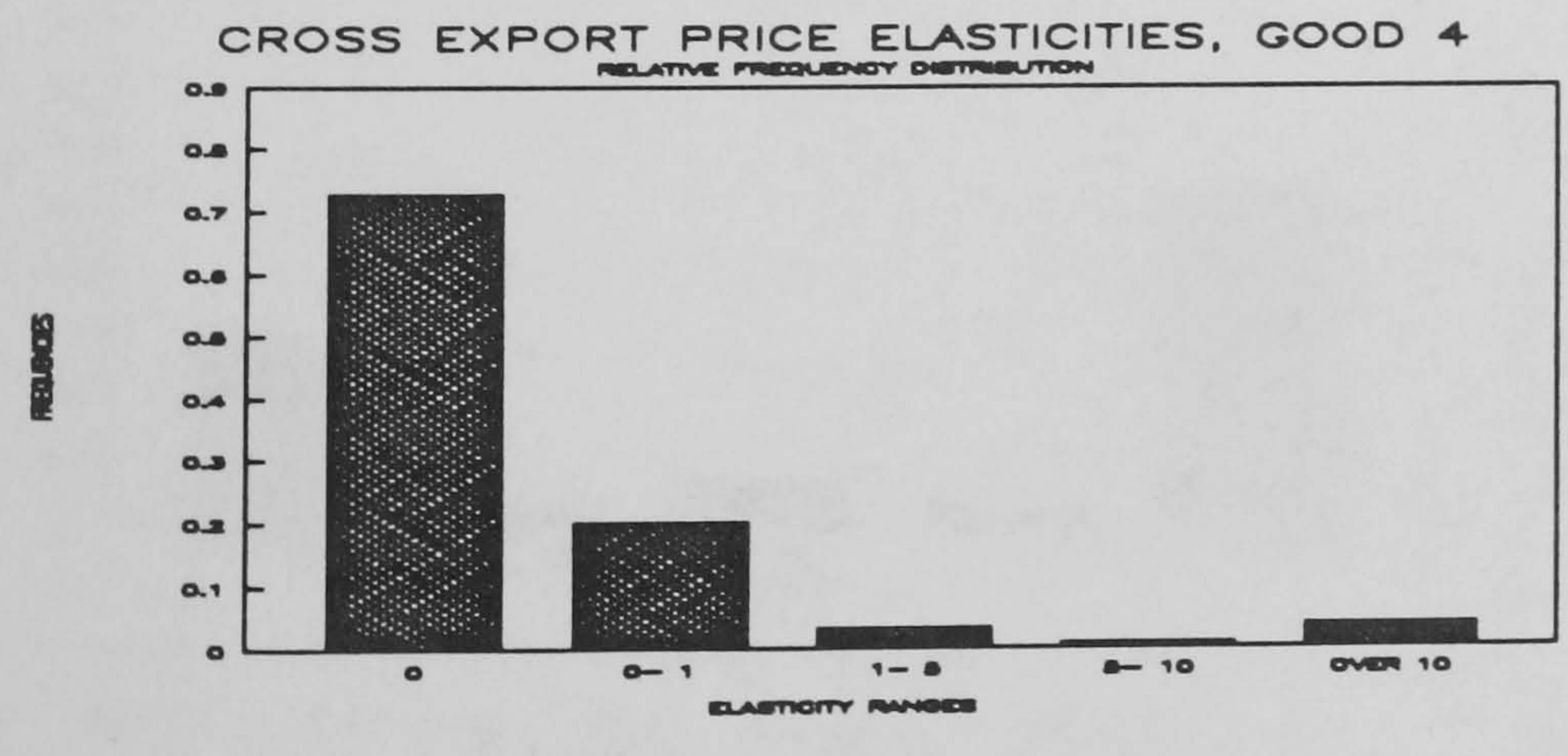
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
0	18556
0-1	2389
1-5	484
5-10	126
OVER 10	930

STATISTICS	
MEAN	0.97
S.DEVIATION	4.01
C.VARIATION	4.07



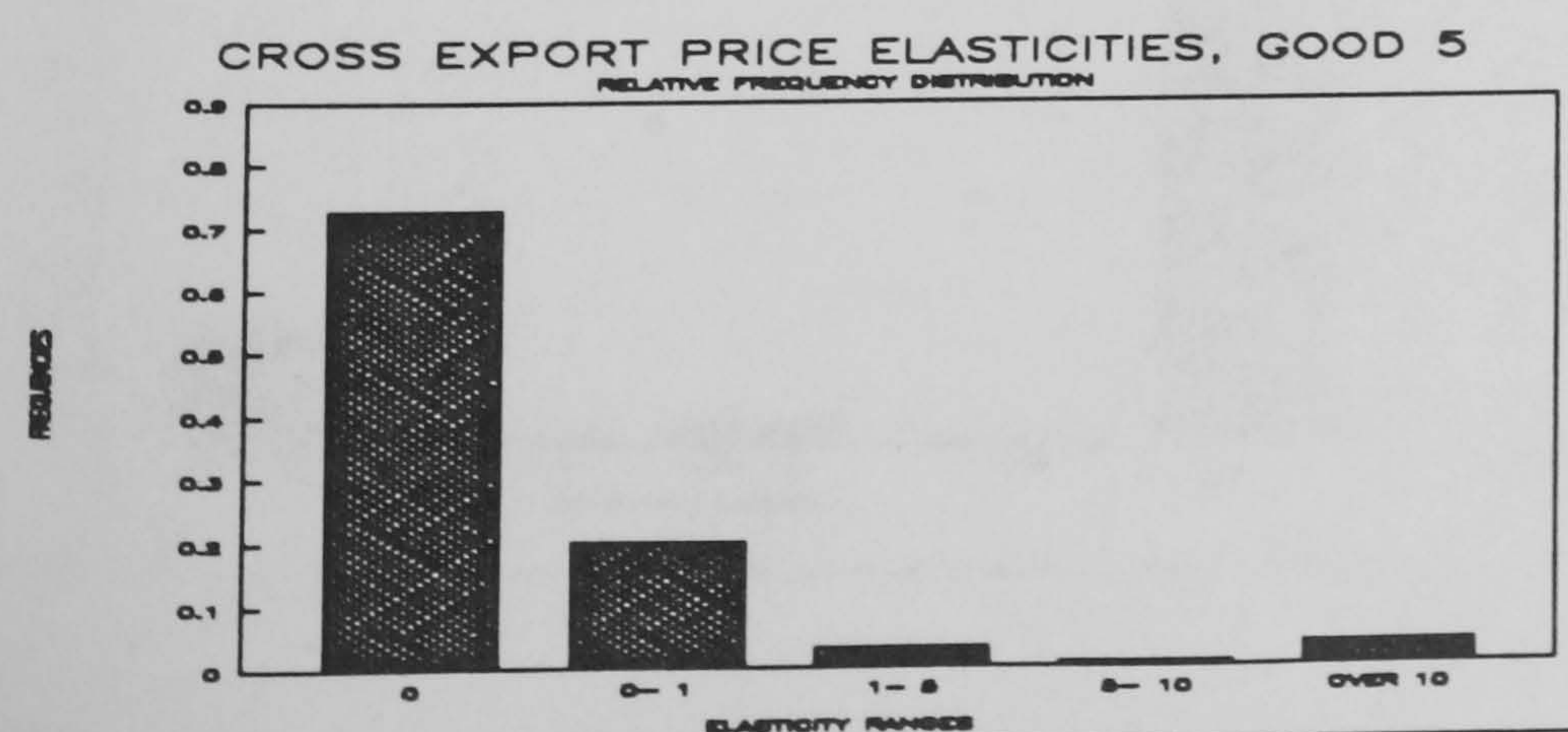
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
0	19264
0-1	2921
1-5	620
5-10	170
OVER 10	661

STATISTICS	
MEAN	0.75
S.DEVIATION	3.36
C.VARIATION	4.46



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
0	15879
0-1	7123
1-5	1089
5-10	265
OVER 10	736

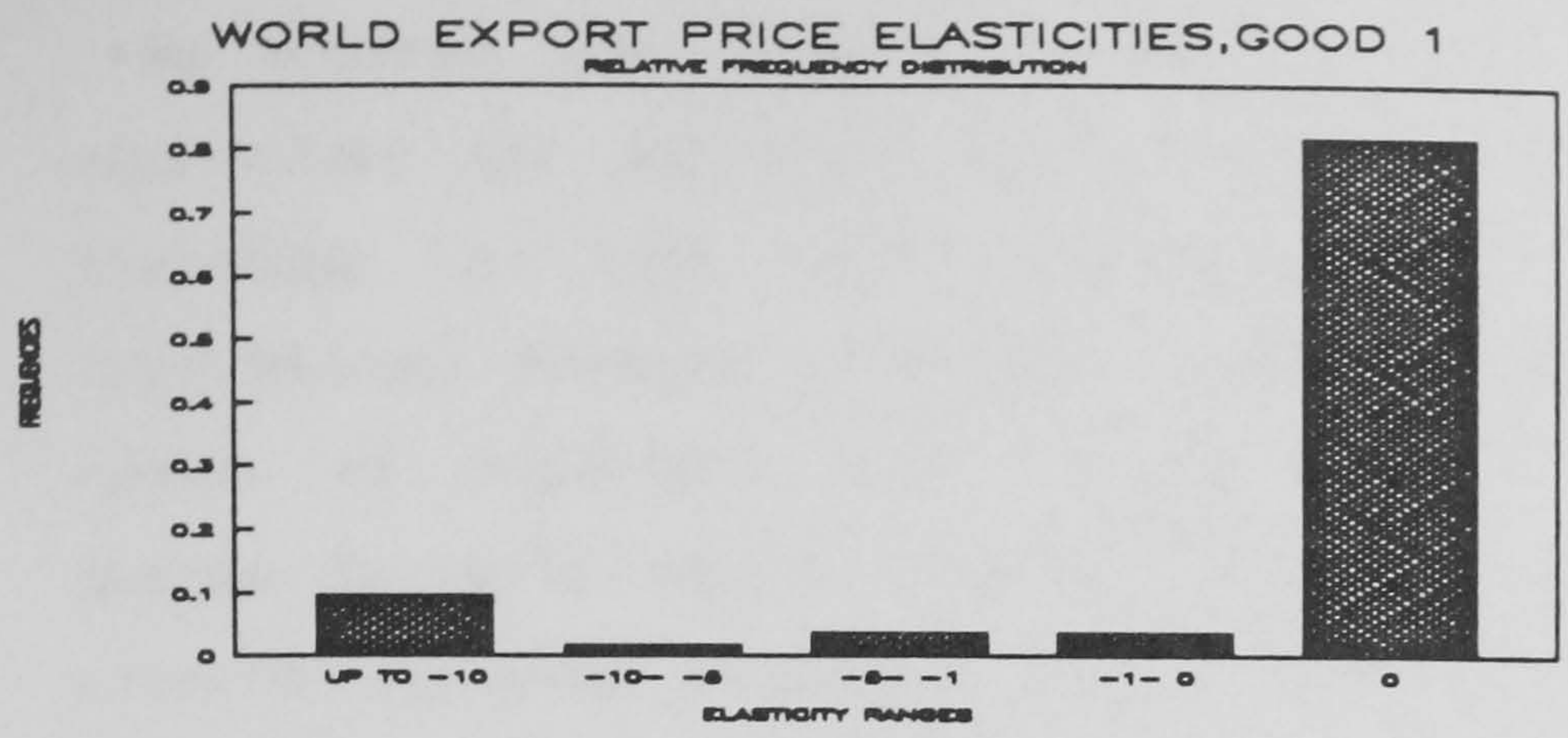
STATISTICS	
MEAN	0.94
S.DEVIATION	3.45
C.VARIATION	3.68



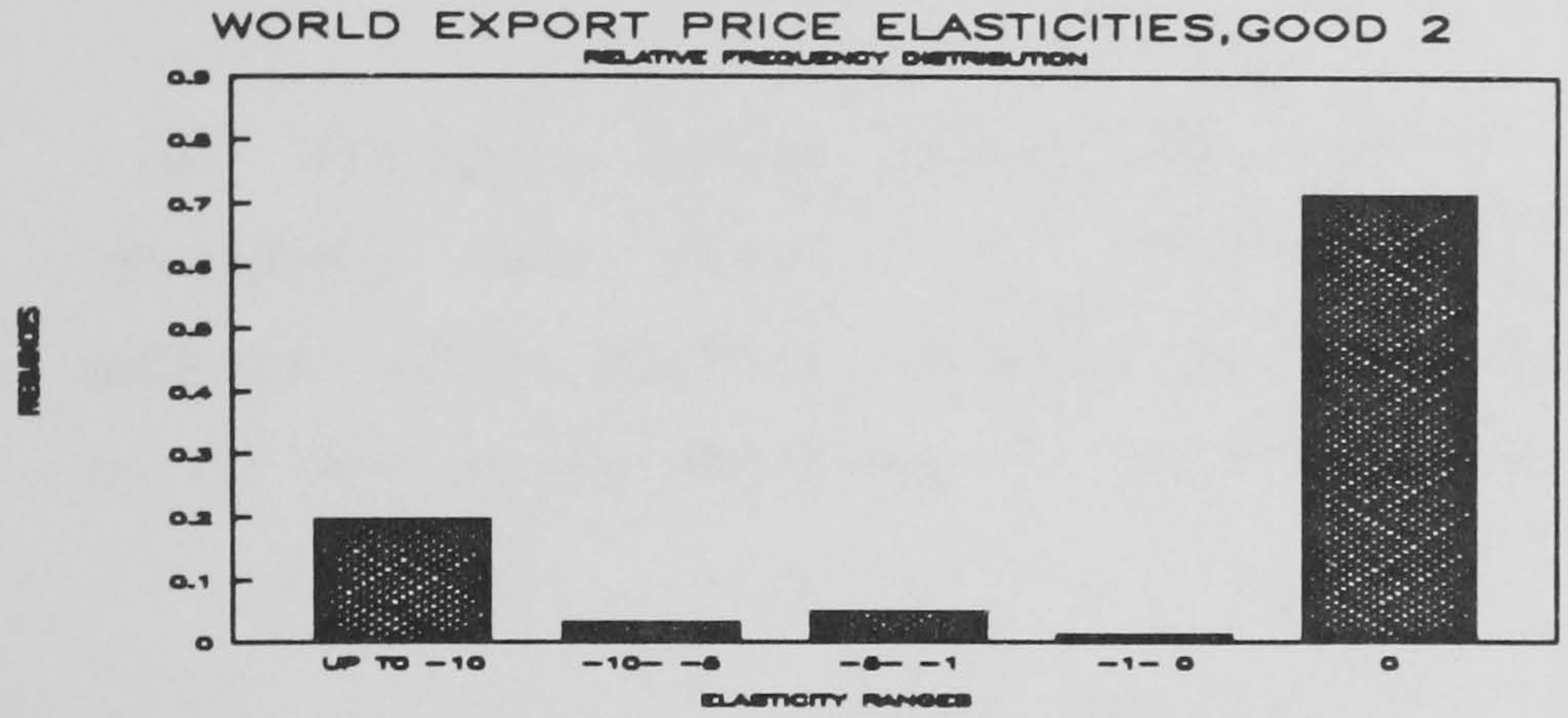
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
0	18297
0-1	5057
1-5	778
5-10	213
OVER 10	872

STATISTICS	
MEAN	0.95
S.DEVIATION	3.71
C.VARIATION	3.91

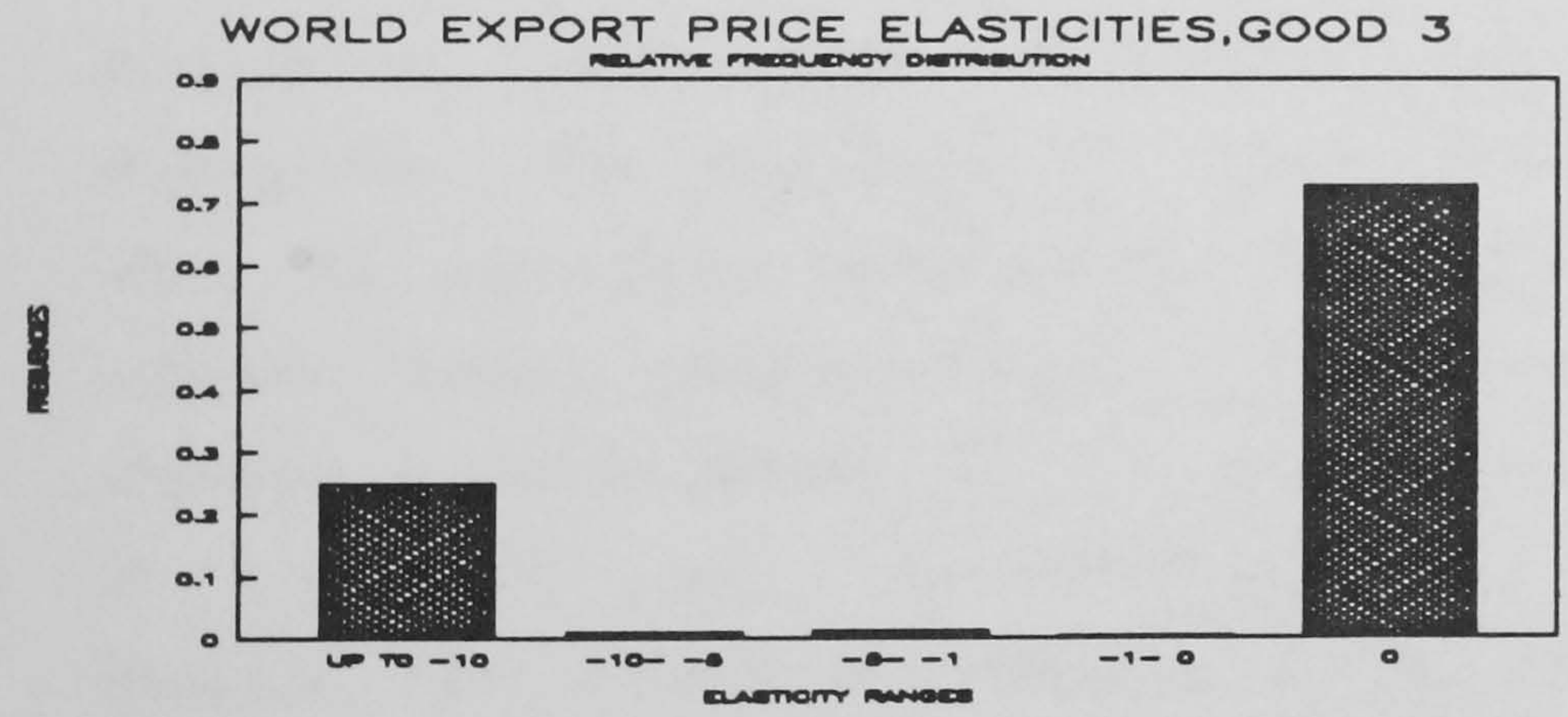
Table 7.4



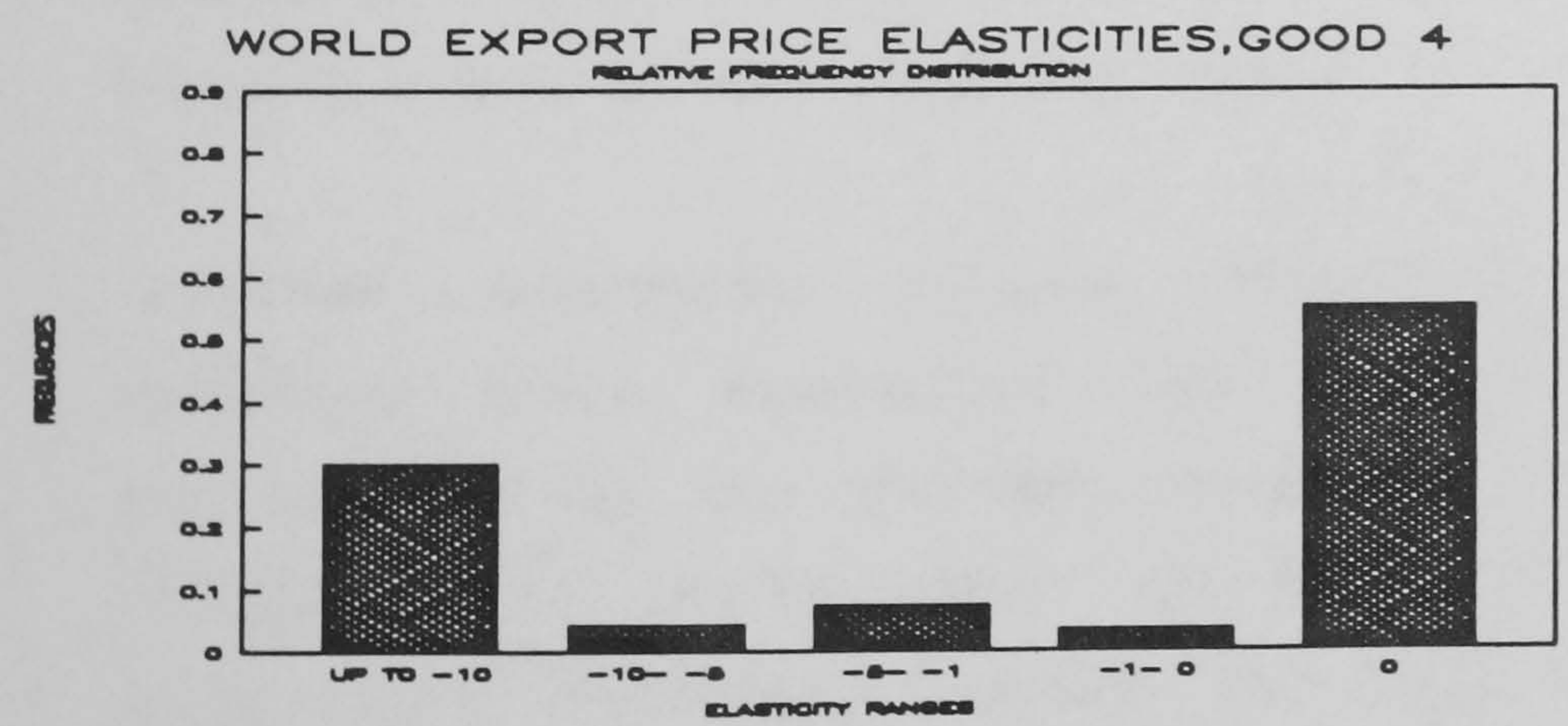
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	84
-10- -5	14
-5- -1	31
-1- 0	32
0	719
STATISTICS	
MEAN	-2.15
S.DEVIATION	5.9
C.VARIATION	2.74



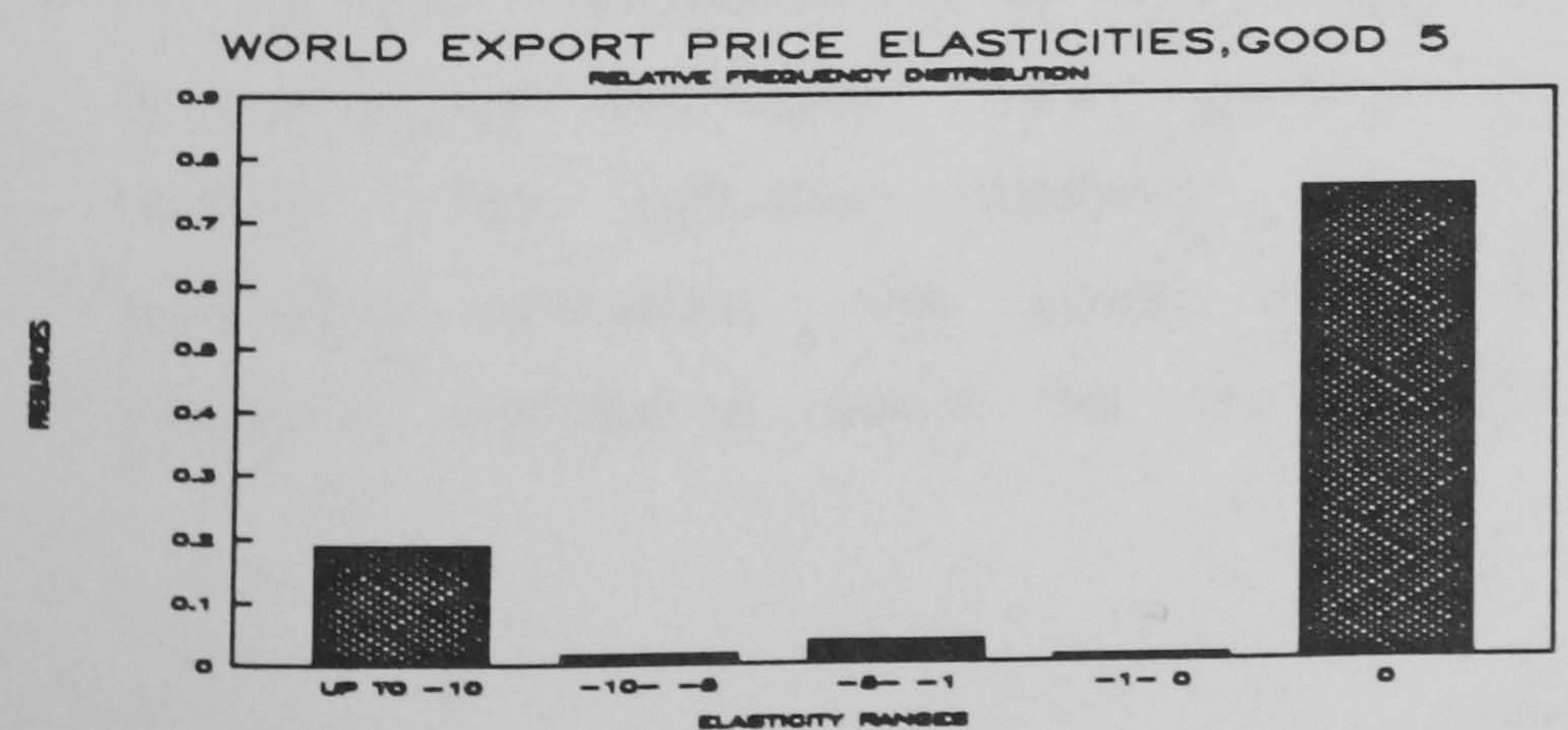
FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	163
-10- -5	26
-5- -1	40
-1- 0	9
0	592
STATISTICS	
MEAN	-4.31
S.DEVIATION	7.88
C.VARIATION	1.83



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	210
-10- -5	8
-5- -1	11
-1- 0	3
0	617
STATISTICS	
MEAN	-5.06
S.DEVIATION	8.6
C.VARIATION	1.7



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	266
-10- -5	37
-5- -1	65
-1- 0	30
0	484
STATISTICS	
MEAN	-6.58
S.DEVIATION	8.96
C.VARIATION	1.36



FREQUENCY DISTRIBUTION	
RANGE	FREQUENCY
UP TO -10	166
-10- -5	14
-5- -1	32
-1- 0	9
0	658
STATISTICS	
MEAN	-4.01
S.DEVIATION	7.79
C.VARIATION	1.94

We observe the average values of the own bilateral import price elasticities for individual goods to vary between -7.07 and -5.83, indicating a high own elasticity of import demand in the international markets. Perhaps, this is because there are a large number of exporters (30) competing to capture increasingly larger shares in world import markets. Even small changes in export prices offered by some exporting region lead in reallocation of imports to alternative sources internationally.

On average, cross price elasticities are close to 1. This reinforces the result of the competitiveness in world import markets; other regions' changes in prices (apart from the exporter i to j) are quite important in the allocation decision of the importer j.

The magnitude of the world price elasticities across import markets is again higher in absolute terms than the cross price elasticities. The magnitude of these elasticities run more in line with the own price elasticities, even though they are smaller in absolute value, ranging between -6.58 and -2.15. The effect of changes in world prices of the traded good affect bilateral imports in a 'direct' way, in comparison to cross price elasticities. However, the effect of changing world prices on bilateral trade is relatively smaller, compared to the effect of changes in the own bilateral prices of the exporting region.

Another interesting measure relates to the variability of the calculated price elasticities for individual goods. Such measures are provided by the standard deviation (s) and the coefficient of variation ($s/\bar{x}$) of the data. The high variability of own, cross and world price elasticities across the international markets is related to the high disaggregation of the traded goods. We suspect that, had we estimated aggregate (over goods) trade models, we would be working with smoother bilateral trade data, returning smoother elasticity estimates. One would also expect that these aggregate elasticity estimates would be an average of the individual good elasticities.

It is instructive to compare the results of our estimated elasticities with previous studies:

- Houthakker and Magee(1969), Adams et al(1969), and Taplin(1967) calculate own price elasticity estimates to be around -1.
- Armington(1969b) working with 11 trade partners finds an average of own price elasticities of -1.9. His estimated cross price elasticities range from 0 to .29 with an outlier of 0.4.
- Branson(1972) calculates an average own price elasticity of -2.9.
- Samuelson(1973) using semi-annual data for 1960-1972, distinguishing between 19 (OECD) trade partners, calculates own elasticities which are typically less than 1 in absolute values.
- Hickman and Lau(1973) estimate elasticities from a CES model using Taplin's(1967) data for the period 1961-1969, they distinguish between 27 partners. In their 'best' model the long run elasticities range between 0 and -9, with an average of -2.5. The estimated short run elasticities are lower, ranging from 0 to -4.5, with an average value of -1.5.
- Resnick and Truman(1975) working with 11 partners (10 European countries and a ROW region), find average own price elasticities for 1958 to average -2.53, and for 1968 -1.9. The estimated cross price elasticities are close to 0, ranging from 0 to 0.389 with outliers (for ROW 2.037 etc).
- Nyhus(1978) working on the INFORUM model, distinguishes between 10 partners and 1 digit SITC commodities with an estimating period 1962-1972. The estimated elasticities range for each commodity between -0.65 and -2.6, returning an average of -1.58.
- Gana et al(1979) compare the elasticity estimates from 7 different models applied to a common set of IMF quarterly data for the period 1971-1977, distinguishing between 7 countries. The elasticity estimates from the estimated systems such as those of the LES, CES etc return elasticities which range from -0.3 to -1.
- Samuelson and Kurihara(1980) working in the EPA model(Japan) distinguish between 15 trade partners. The reported elasticities of their prefered model average -0.65.
- Italianer(1986) estimates a model for 8 partners. His 1975 own

price elasticity estimates range for aggregate trade from -0.5 to -1.5, while for the 5 individual goods distinguished they range between 0 and -4. The corresponding estimated cross price elasticities for aggregate data range from 0 to 0.7, while for individual goods they range between 0 and 2.7.

Thus, from previous studies we observe that on average the own price elasticity estimates range approximately from -0.5 to -2.5, while the cross price elasticities are below 0.5 and close to 0. A much higher degree of competition across world markets is suggested by our own higher elasticity estimates.

These results may be due to the special features of our model. Compared to other studies, there is a high disaggregation of goods and trade partners, we estimate cross price elasticities (very few other studies do), and we do not have a 'large' region playing the role of the Rest of the World(ROW) in the system. With respect to the latter, there is no trade partner (a big monopolist) predominating trade 'artificially' in the international economy (as described by the model), and perhaps distorting the effects of competition in world markets.

7.5). Other Estimated Results.

Besides the price elasticities based on the a_i coefficients, we have estimated the b_i and λ coefficients in each system. Estimates of these have been arranged in the tables of appendix 7.4, one table for each individual good. Columns of the tables refer to import markets. The first row presents the estimated λ coefficient, while the rest of the rows refer to the estimated b_i's (multiplied by 100 in order to show percentages), related to individual exporting regions. A separate set of tables present the estimated t statistics of the above estimated coefficients. We do not attempt to discuss the individual estimates in detail. Instead we give guidelines with examples on the way the coefficients should be interpreted, and let the reader explore the tables.

7.5.1). *Estimated Trends.*

The b_i coefficients are estimated subject to the restriction $\Sigma_i w_i^0 b_i = 0$. They reflect trend like changes in bilateral imports over the estimation period. Since we are dealing with import allocation models, switches in imports towards a trade partner over the time period (indicated by a positive b_i coefficient), is at the expense of some other trade partner(s), and visa versa. It is a zero-sum 'game'. Thus, by comparing the b_i's of a single column we can infer about the percentage changes in the exports of each exporting region over the examined period in the relevant import market.

In general, the b_i coefficients take values between 0 and 100 (in absolute terms), with some exceptions. Very large coefficients are denoted by ****, with a sign in front to indicate the direction of change. Small b_i's for an importing region (and a particular good), indicate that there have been no major changes in the allocation of its imports amongst its trade partners over the examined period. The opposite is true for large b_i's.

It would be instructive to give some examples on how to interpret the tables: Thus, we observe, by looking at the column of importing region 15 (British Isles) for good 1, that imports from the USA regions and also from the EEC areas have increased at the expense of the Commonwealth regions, such as those of Africa the Far East and Oceania. Similar trends are observed for the other goods, columns 15 on the other tables.

Individual rows of the tables reflect the changing strength of exporting regions in international markets. Thus, by looking for example at the 27th row (Persian Gulf) of the table for good 2 we observe almost every coefficient to be negative. This reflects the diminishing importance of Bulk liquid exports from the area during 1969-1986. Other regions have entered the world market for these products capturing increasingly larger shares of world markets at the expense of region 27. On the other hand, for the same good, exporting regions 04, 05 and 15, say, have increased their export shares in world markets, as seen by the number of positive coefficients of the corresponding rows.

7.5.2). Estimated Dynamics and 'Diagnostics'.

The λ coefficient is introduced by virtue of the dynamics (Adaptive Expectations) assumed in chapter 4. It is estimated in each import market subject to the restriction $0 \le \lambda \le 1$. In our experience λ never exceeds 1, and it takes values below zero in very few systems (in 21 out of 150), in which case it is set to 0. It is highly significant in almost all the estimated models. The average (over import regions) values of λ for the individual goods are, for Good 1, .45, Good 2, .28, Good 3, .37, Good 4, .52, and for Good 5, .43.

One may think of λ as reflecting short run adjustments between changes in prices and changes in imports. Short run price elasticities may be obtained by multiplying the long run elasticity estimates of appendix 7.3 by $(1-\lambda)$. Thus, judging from the above average values of λ, $(1-\lambda)$ takes values between .5 and 1. As a result the short run elasticities will be over 1/2 of their long run counterparts, but still substantially lower compared to the latter.

Finally, the mean lag response of imports to changing prices, in each import market, is calculated as $\lambda/(1-\lambda)$, see appendix 7.5. This can be interpreted as the long run adjustment coefficient. We observe that this varies between 0 and 1 to 2 years with some outliers reaching even the very extreme value of 5.65 years.

Besides the estimated coefficients and their t statistics, one might be interested in indications of fit, the satisfaction of the underlying assumptions (such as lack of heteroskedasticity, autocorrelation, tests of mispessified dynamics etc), and tests of restrictions on the coefficient estimates of the selected systems.

Due to lack of space, we only include some of these tests here. These are listed in appendix 7.5 in separate tables for each individual good.

Thus, tests of restrictions on the a_i coefficients in terms of the F statistic suggested in (6.62)-(6.64) are calculated. The first row of the tables refers to the estimated value of the statistic, the second and the third row refer to the critical values of these statistics at the 5% and 1% levels of significance, while the fourth and the fifth row refer to the degrees of freedom. Thus, the fourth row refers to the number of restrictions (the number of a_i's set to zero, while the fifth row refers to the degrees of freedom of the unrestricted model. On average, the restrictions are accepted in 50% of the 150 estimated systems.

The Coefficient of Variation(CV) of each individual system is also presented. It gives an indication of fit of the whole system (adjusted coefficients of multiple determination for each individual equation in each system are estimated, but not presented here). The final row of these tables present the estimated mean lag coefficients $\lambda/(1-\lambda)$.

7.6). Conclusion.

The aim of this chapter has been to focus on the empirical problems encountered during estimation of our seaborne import allocation models, and to discuss the results of this exercise. A computer program logic has been developed, which is used to estimate the systems. The 'best' performing functional form in each import market is determined by the data. Based on that, we derive bilateral seaborne own, cross and world import price elasticities of demand.

Because of the high disaggregation in goods and trade partners and the fact that we do not have a large monopolistic trade partner in the system, the values of the estimated elasticities support the argument that competition in world import markets is intense. The values of own and world price elasticities are several points above 1, in absolute terms, while the cross price elasticities take values as high as 1 for individual goods. These are relatively higher than the elasticities estimated in other similar studies in the literature.

APPENDIX 7.1

5 TABLES OF DIAGNOSTICS OF ALL FUNCTIONAL FORMS

5 GOODS

TABLE OF "DIAGNOSTICS" OF ALL FUNCTIONAL FORMS FOR GOOD 1 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j): V	1	1	0.0201	1	1	1	1	0.0012	1	1	1	1	1	1	0.00511	1	1	1	1	1	1	1	1	1	0.0006	1	0.9967	1	1	1
Alpha(j): L	0.5	1	0.5	0.6396	0.5	0.5697	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1879	0.5	0.3334	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4260	0.5
Alpha(j): D	0.5	0.8752	0.5	0.6149	0.5	0.8877	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5665	0.5	1	0.5	0.4896	0.5	0.5	0.5	0.5	0.5	0.7027	0.5	0.6168	0.71827
CV: V	46.668	74.255	50.202	41.635	30.973	62.508	42.586	74.198	62.863	66.669	55.327	69.660	28.751	19.364	60.9578	36.3544	23.041	84.808	58.422	51.416	45.809	157.23	71.926	77.365	59.050	60.178	29.230	64.702	14.920	38.9054
CV: L	36.525	99.791	44.817	49.465	6E+15	1E+25	165.49	76.976	631.74	133.22	61.240	57.290	29.014	20.000	489.035	423.880	23.571	91.773	55.811	75.995	72.240	162.56	109.71	1E+19	3E+09	60.927	39.747	115.06	14.228	45.3105
CV: D	37.619	154.17	46.006	5E+11	951.98	50.082	16484.	1E+13	84.868	72.451	73.098	66.915	29.647	26.538	115.640	103.913	26.892	106.13	65.636	58.294	70.691	225.36	628.21	8E+14	93.934	72.953	71.875	3E+23	7E+09	NA
MCV: V	3.8890	4.9503	7.1717	2.3131	1.8219	6.2508	2.5050	3.5332	3.9289	3.3334	11.065	3.3171	1.6912	0.9221	3.58575	2.27215	1.5361	5.3005	3.6513	3.2135	3.2721	7.8619	3.2693	5.1576	5.3682	4.0118	1.7194	3.4053	0.9947	3.53685
MCV: L	2.1485	7.6762	8.9635	3.8050	4E+14	1E+24	11.032	5.1317	42.116	8.8818	6.8044	3.3700	1.6119	0.9524	37.6180	28.2587	1.6836	9.1773	3.7207	6.9086	4.5150	11.611	5.4859	7E+17	2E+08	5.0773	2.3380	6.3924	0.9485	4.11913
MCV: D	2.6870	11.012	5.1118	4E+10	79.332	4.1735	1268.0	6E+11	4.9922	14.490	10.442	8.3644	2.1177	1.8956	11.5640	8.65945	2.2410	8.1638	4.3757	5.8294	4.7127	14.085	39.263	4E+13	5.8708	6.0794	4.7917	2E+22	5E+08	NA
5% SIGNIF																														
SGa(ij): V	3	5	0	3	4	4	4	6	5	4	0	12	7	4	2	3	2	5	11	4	7	8	13	4	2	4	0	5	7	2
SGa(ij): L	1	5	1	1	1	2	2	3	4	3	4	6	4	3	5	3	3	5	5	3	4	6	9	5	3	1	5	5	3	3
SGa(ij): D	0	0	2	1	1	0	1	0	2	1	1	0	1	1	1	1	0	0	2	0	1	1	2	5	3	1	5	4	1	0
1% SIGNIF																														
SGa(ij): V	3	8	1	5	5	5	8	9	6	6	0	15	7	5	3	3	2	7	11	8	9	12	14	5	2	5	0	9	8	3
SGa(ij): L	3	5	2	3	3	3	4	5	4	6	4	7	5	4	5	6	4	5	7	3	5	7	10	5	3	2	6	7	3	5
SGa(ij): D	1	0	3	3	3	0	1	1	2	2	1	0	3	1	1	2	0	1	3	1	2	1	3	6	3	1	5	6	1	0
S.F.F.	L	V	D	V	V	D	V	V	V	V	L	V	L	V	V	V	V	V	L	V	V	V	V	V	V	V	V	V	L	V

NOTES:

1). Alpha(j): F are the estimated "Alpha" coefficients from the jth importing region.
where F=V,L,D, and V=levels, L=logarithms, D=logarithmic first differences.

2). CV: F is the estimated Coefficient of Variation for the jth importing region, where F=V,L,D.

3). MCV: F is the estimated 'Modified' Coefficient of Variation for the jth importing region, where F=V,L,D.
MCV is defined as the ratio of CV by the number of Positive a(ij)'s in the jth importing region.

4). SGa(ij): F is the Number of significant a(ij) coefficients, at the 5% and 1% levels of significance, for the jth importing region, where F=V,L,D.

5). S.F.F. is the Selected Functional Form for the jth importing region.

TABLE OF "DIAGNOSTICS" OF ALL FUNCTIONAL FORMS FOR GOOD 2 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16
Alpha(j): V	1	0.0072	0.0054	1	1	1	1	0.0006	0.0013	0.9986	0.9994	0.0204	1	1
Alpha(j): L	0.4920	0.5	0.5	0.5	0.5	0.4192	0.5	0.5	0.5	0.5	0.5691	0.5	0.5	0.5
Alpha(j): D	0.5	0.5	0.5	0.59217	0.5	0.5979	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5
CV: V	109.13	98.418	36.257	196.274	326.43	168.44	127.40	126.34	131.44	186.12	129.07	115.67	89.148	54.849
CV: L	296.12	129.31	48.510	4E+16	114.32	5E+10	283.96	569.82	74.296	405.61	126.34	2611.2	86.652	56.501
CV: D	401.77	193.70	53.019	155848.	230.96	32114.	1244.1	12413.	121.76	580.57	320.24	9906.1	83.048	56.332
MCV: V	9.0947	12.302	2.4171	15.0980	29.675	56.149	15.925	9.7191	13.144	15.510	12.907	11.567	9.9053	4.9863
MCV: L	37.015	21.551	6.0637	2E+15	12.702	9E+09	70.991	56.982	5.3069	45.068	14.038	290.14	7.2210	4.7084
MCV: D	44.641	17.609	3.5346	7792.43	16.497	4014.3	177.73	827.56	7.1626	64.508	26.686	825.51	6.9207	4.3332
5% SIGNIF														
SGa(ij): V	1	2	4	1	2	1	0	3	5	0	4	3	3	6
SGa(ij): L	1	3	3	3	2	3	2	1	2	2	3	3	0	3
SGa(ij): D	0	1	2	1	0	3	2	5	1	0	1	4	1	1
1% SIGNIF														
SGa(ij): V	2	4	5	1	4	1	0	4	5	0	4	4	4	6
SGa(ij): L	2	3	3	7	3	5	2	1	3	4	4	4	1	5
SGa(ij): D	1	1	4	1	0	3	3	5	3	0	2	4	1	3
S.F.F.	V	V	V	V	L	V	V	V	L	V	V	V	D	D

DIAGNOSTICS	IMPORTING REGION j															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j): V	0.02436	0.00072	1	0.0821	1	0.0001	0.0000	1	1	1	1	1	1	1	1	0
Alpha(j): L	0.5	0.5	0.7003	0.5	0.5	0.5387	0.5	0.5	0.5	0.2257	0.5	0.5	0.5	0.5	0.5	0.5
Alpha(j): D	0.5	0.5	1	0.5	0.5	0.5	0.5	0.1732	0.5	0.1032	0.5	0.5	0.5	0.3667	0.6788	0.32496
CV: V	147.451	70.3438	57.733	88.527	155.18	793.12	95.284	377.22	552.67	479.39	310.78	160.47	63.917	1307.5	15.226	26.6492
CV: L	9E+08	111.082	78.756	918.25	511.20	6E+09	1E+19	7E+19	7E+09	1E+09	7E+09	6E+09	45.046	1E+08	20.640	97775.3
CV: D	4E+10	83.2632	73.179	1813.9	627.18	2E+27	9E+27	3E+07	166.89	542.52	7E+29	2E+10	56.125	2E+11	17.953	2907.86
MCV: V	24.5751	5.86198	3.6083	11.065	11.084	79.312	7.3295	53.889	42.513	39.949	23.906	40.119	7.1018	118.86	5.0754	6.66231
MCV: L	5E+07	7.40547	3.7503	83.477	56.800	8E+08	1E+18	6E+18	7E+08	1E+08	5E+08	6E+08	2.3708	2E+07	1.7200	9777.53
MCV: D	2E+09	4.16316	4.3046	139.53	44.798	1E+26	7E+26	8E+06	13.908	135.63	5E+28	1E+09	3.3015	3E+10	1.4961	264.351
5% SIGNIF																
SGa(ij): V	1	5	6	0	7	1	3	2	2	2	7	0	7	0	1	0
SGa(ij): L	4	3	6	3	1	6	3	6	6	3	10	7	8	5	3	4
SGa(ij): D	4	5	3	0	0	3	1	0	1	0	0	2	0	1	2	2
1% SIGNIF																
SGa(ij): V	2	5	6	0	7	3	3	2	4	3	11	0	7	0	2	0
SGa(ij): L	5	5	8	5	3	6	4	7	9	6	10	7	12	5	4	4
SGa(ij): D	7	5	4	1	0	4	1	0	1	0	0	2	0	1	2	3
S.F.F.	V	D	L	V	V	V	V	V	D	V	V	V	L	V	D	V

NOTES:

1). Alpha(j): F are the estimated "Alpha" coefficients from the jth importing region.
where F=V,L,D, and V=levels, L=logarithms, D=logarithmic first differences.

2). CV: F is the estimated Coefficient of Variation for the jth importing region, where F=V,L,D.

3). MCV: F is the estimated 'Modified' Coefficient of Variation for the jth importing region, where F=V,L,D.
MCV is defined as the ratio of CV by the number of Positive a(ij)'s in the jth importing region.

4). SGa(ij): F is the Number of significant a(ij) coefficients, at the 5% and 1% levels of significance, for the jth importing region, where F=V,L,D.

5). S.F.F. is the Selected Functional Form for the jth importing region.

TABLE OF "DIAGNOSTICS" OF ALL FUNCTIONAL FORMS FOR GOOD 3 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j														
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17
Alpha(j): V	0.0006	0.0000	0.0028	1	1	0.0061	0	0	1	1	0	1	0.0259	1	0.00547
Alpha(j): L	0.5	0.5	0.6223	0.5804	1	0.3111	0.5763	0.5	0.4963	0.5	0.5	0.7031	0.5	0.5	0.5
Alpha(j): D	0.2702	0.0738	0.7442	0.5	0.2057	0.2907	0.3496	0.5	1	0.5	0.5	0.3348	0.5	0.5804	0.51699
CV: V	327.81	249.95	27.576	43.870	28.258	56.250	241.09	241.40	73.225	89.194	132.04	91.630	41.966	41.767	99.1438
CV: L	8016.4	5E+08	7E+09	3E+09	4E+26	44.569	222.02	329.71	174.38	97.074	132.93	100.96	610.63	1818.6	2E+27
CV: D	21645.	4E+12	27.309	45.459	31.384	47.551	225.56	1E+11	430.51	104.29	170.25	322.49	118.76	123.02	1E+23
MCV: V	54.635	22.723	2.5069	8.7740	4.7097	6.2500	9.6438	10.495	4.3073	7.4329	4.5531	5.3900	2.3314	2.6104	7.08170
MCV: L	1002.0	6E+07	6E+08	3E+08	3E+25	4.9521	13.060	21.981	12.455	10.786	8.3081	5.9393	33.923	95.716	2E+26
MCV: D	1443.0	2E+11	3.0344	4.5459	3.9231	4.7551	15.037	7E+09	43.051	10.429	14.188	17.916	7.4225	9.4634	8E+21
5% SIGNIF															
SGa(ij): V	0	0	1	1	0	4	23	21	5	4	0	4	6	6	0
SGa(ij): L	2	2	1	1	0	1	4	5	4	3	3	2	3	3	1
SGa(ij): D	1	0	1	0	0	2	1	2	0	0	1	0	0	1	2
1% SIGNIF															
SGa(ij): V	0	0	2	1	0	5	25	22	7	6	26	4	8	7	1
SGa(ij): L	3	2	2	2	0	2	5	6	7	4	5	2	7	5	3
SGa(ij): D	1	0	1	2	1	2	2	4	0	1	2	0	1	1	3
S.F.F.	V	V	V	D	D	D	V	V	V	V	L	V	V	V	V

DIAGNOSTICS	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j): V	0.00233	1	0	0.0016	0	1	1	1	1	1	0.0042	1	1	1	1
Alpha(j): L	0.5	0.4574	0.5	0.5	0.5	0.5331	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6322	0.5
Alpha(j): D	0.5	0.5	0.5	0.5	0.5	0.2298	0.5454	0.4260	0.5	0.5	0.5	1	0.2299	0.5	0.5
CV: V	67.8749	37.320	81.414	66.320	58.584	97.169	207.97	104.17	76.400	59.348	213.72	38.074	149.67	29.688	48.6984
CV: L	74.5333	1E+09	5E+10	105.75	136.14	129.89	5E+10	5E+35	7E+34	3E+31	1E+35	2E+10	1381.8	1E+09	994.351
CV: D	88.1024	2E+11	1059.4	137.36	142.32	137.02	5E+32	2E+27	1E+22	6E+24	1E+13	3E+08	864.06	1E+11	61.4795
MCV: V	4.52499	2.3325	5.8152	4.7371	2.4410	6.0730	14.855	6.5108	6.9455	4.5652	17.810	3.4613	29.934	2.2837	4.05820
MCV: L	3.92280	9E+07	4E+09	7.5536	8.0082	7.2161	3E+09	3E+34	5E+33	2E+30	6E+33	1E+09	138.18	1E+08	58.4912
MCV: D	6.77711	1E+10	75.675	7.2295	10.165	9.7873	6E+31	1E+26	1E+21	5E+23	9E+11	2E+07	72.005	1E+10	3.61644
5% SIGNIF															
SGa(ij): V	2	4	14	5	23	9	5	4	2	2	8	3	2	3	1
SGa(ij): L	4	5	6	4	3	0	3	5	5	7	7	3	0	4	2
SGa(ij): D	1	1	2	2	2	0	0	1	1	2	2	0	0	3	1
1% SIGNIF															
SGa(ij): V	4	5	14	5	23	11	6	4	3	4	9	3	2	4	2
SGa(ij): L	7	8	8	5	4	0	7	5	6	9	8	4	1	6	4
SGa(ij): D	1	1	3	5	2	0	2	1	3	5	2	1	0	3	1
S.F.F.	L	V	V	V	V	V	V	V	V	V	V	V	V	V	V

NOTES:

1). Alpha(j): F are the estimated "Alpha" coefficients from the jth importing region.
where F=V,L,D, and V=levels, L=logarithms, D=logarithmic first differences.

2). CV: F is the estimated Coefficient of Variation for the jth importing region, where F=V,L,D.

3). MCV: F is the estimated 'Modified' Coefficient of Variation for the jth importing region, where F=V,L,D.
MCV is defined as the ratio of CV by the number of Positive a(ij)'s in the jth importing region.

4). SGa(ij): F is the Number of significant a(ij) coefficients, at the 5% and 1% levels of significance, for the jth importing region, where F=V,L,D.

5). S.F.F. is the Selected Functional Form for the jth importing region.

TABLE OF "DIAGNOSTICS" OF ALL FUNCTIONAL FORMS FOR GOOD 4 (30 IMPORTING REGIONS)

DIAGNOSTICS	IMPORTING REGION j														
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17
Alpha(j): V	1	0.0068	0.0124	0.8506	0.0065	0.0103	0.2574	0.0038	1	0.0219	0.9239	0.0073	0.7151	0.0119	0.68314
Alpha(j): L	0.5	0.5	0.5	0.5	0.5	0.5	0.5287	0.5581	0.5	0.5	0.5	0.5	0.5516	0.5	0.5
Alpha(j): D	0.4449	0.1617	0.5	0.5	0.3921	0.8636	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.32127
CV: V	66.684	51.579	26.671	92.318	46.120	23.328	91.204	43.695	99.113	54.422	40.782	33.431	18.251	19.920	57.9650
CV: L	140.79	64.800	25.956	89.950	65.857	3E+27	107.63	71.620	109.27	47.940	51.705	35.531	21.232	23.675	402426.
CV: D	236.36	82.997	27.638	93.875	64.416	3E+30	87.790	64.415	115.49	52.243	55.494	41.376	24.353	23.476	84.7859
MCV: V	5.1295	3.4386	3.8102	5.1288	3.8434	1.4580	6.5145	3.3612	4.5051	3.2013	2.2656	2.2287	1.1407	0.9485	3.22027
MCV: L	12.799	4.9846	2.5956	4.7342	3.1360	2E+26	7.6883	5.9683	6.0707	2.3970	4.3088	2.9609	1.0616	1.3927	23672.1
MCV: D	23.636	5.1873	2.5125	7.2211	4.6011	2E+29	4.8772	4.0259	7.2182	3.0731	4.2688	2.9554	1.2817	1.8058	10.5982
5% SIGNIF															
SGa(ij): V	3	3	1	3	6	2	0	4	7	5	2	6	0	3	0
SGa(ij): L	0	1	4	4	3	2	4	2	6	2	2	5	4	3	3
SGa(ij): D	1	0	0	2	1	2	1	1	2	2	1	1	2	1	2
1% SIGNIF															
SGa(ij): V	4	3	1	6	6	4	0	5	8	6	4	8	1	4	1
SGa(ij): L	2	3	4	5	4	4	6	2	6	2	2	5	7	3	3
SGa(ij): D	1	1	0	2	1	2	4	1	2	2	2	2	3	1	3
S.F.F.	V	V	L	L	L	V	D	V	V	L	V	V	L	V	V

DIAGNOSTICS	IMPORTING REGION j														
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j): V	0.94789	0.0163	0.0013	0.0020	0.0046	0.0008	1	1	0.0142	0.0077	0.0186	1	1	1	1
Alpha(j): L	0.5	0.5	0.5	0.5	0.5	0.2269	0.5	0.3486	0.5	0.5	0.5	0.5390	0.5	0.5	0.5
Alpha(j): D	0.5	0.5	0.5	0.5	0.4501	0.3008	0.6274	0.4698	0.4024	0.5	0.5	0.3561	0.5	0.5	0.5
CV: V	73.6054	31.344	85.346	35.533	47.487	39.699	26.812	51.218	78.109	63.366	65.264	26.662	51.649	38.807	28.8735
CV: L	3E+06	260.69	360.80	39.266	39.605	2851.9	34.344	9E+34	81.831	4E+08	3E+07	24.432	153.66	5316.0	115291.
CV: D	26380.7	167.38	5E+35	49.790	1432.7	392.20	29.413	2E+25	92.328	3E+10	334.35	28.365	5E+32	4E+25	2E+09
MCV: V	5.25753	1.5672	5.0203	1.6920	2.3743	2.3352	1.0312	2.8454	5.2073	3.9604	4.3509	1.6663	3.2280	1.8479	1.60408
MCV: L	147194	14.483	22.550	2.0666	2.4753	135.80	1.7172	6E+33	6.8192	3E+07	2E+06	1.2859	10.244	241.64	7686.12
MCV: D	1551.80	12.876	4E+34	4.1492	95.518	23.070	1.8383	1E+24	6.1552	2E+09	22.290	2.0261	2E+31	2E+24	2E+08
5% SIGNIF															
SGa(ij): V	1	9	4	8	7	3	8	6	5	0	5	9	5	6	6
SGa(ij): L	3	0	5	5	2	3	6	7	5	3	5	6	5	7	6
SGa(ij): D	2	0	3	2	2	1	2	1	1	0	0	2	2	4	4
1% SIGNIF															
SGa(ij): V	6	13	6	8	8	5	13	8	5	3	[illegible]	10	7	7	8
SGa(ij): L	4	0	6	7	3	4	9	8	6	5	7	6	6	9	7
SGa(ij): D	3	0	5	3	3	2	3	3	1	1	2	2	3	5	4
S.F.F.	V	V	V	V	V	V	V	V	V	V	V	L	V	V	V

NOTES:

1). Alpha(j): F are the estimated "Alpha" coefficients from the jth importing region.
where F=V,L,D, and V=levels, L=logarithms, D=logarithmic first differences.

2). CV: F is the estimated Coefficient of Variation for the jth importing region, where F=V,L,D.

3). MCV: F is the estimated 'Modified' Coefficient of Variation for the jth importing region, where F=V,L,D.
MCV is defined as the ratio of CV by the number of Positive a(ij)'s in the jth importing region.

4). SGa(ij): F is the Number of significant a(ij) coefficients, at the 5% and 1% levels of significance, for the jth importing region, where F=V,L,D.

5). S.F.F. is the Selected Functional Form for the jth importing region.

TABLE OF "DIAGNOSTICS" OF ALL FUNCTIONAL FORMS FOR GOOD 5 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j): V	1	1	1	0.00643	0	0.0000	1	1	1	0	1	1	1	0.0204	0	1	1	0.0000	1	0.0096	0	1	0.0020	1	1	1	0.0059	0.0024	1	1
Alpha(j): L	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2375	0.6504	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.46340
Alpha(j): D	0.5	0.4318	0.5	0.11361	0.5	0.0736	0.3757	0.5	0.8390	0.5	0.5	0.5	0.5	0.5	0.32412	0.5	0.5	0.6402	0.3695	0.5875	0.6619	0.3732	0.5	0.5	0.6508	0.4683	0.3932	0.5	0.5	0.62297
CV: V	109.11	68.888	27.517	48.4956	52.849	21.029	20.637	89.644	80.409	42.910	53.984	57.709	28.404	21.605	78.0717	65.6725	43.100	87.640	36.810	31.805	52.03	46.571	39.397	85.894	57.034	47.324	38.883	97.667	30.667	59.1726
CV: L	91.328	97.748	28.590	52.0662	2E+10	2E+13	27.531	86.187	91.022	46.063	52.232	60.715	30.978	24.561	91.0743	58.2004	45.661	211.36	36.624	71.736	56.842	54.115	2E+33	79.310	6E+08	3E+14	3E+27	119.13	40.804	1E+25
CV: D	90.510	171.95	34.476	38.7969	4E+23	3E+11	27.101	96.939	90.741	44.676	64.429	71.672	37.180	29.734	102.793	66.4880	656.76	183.87	45.579	40.118	64.704	63.160	46.544	94.310	2E+11	65.483	30.933	199.74	35.655	3E+11
MCV: V	9.9191	6.2625	1.7198	2.85268	26.424	1.9118	1.2139	4.4822	5.0256	NA	3.5989	3.0373	2.0288	1.2002	4.59245	3.45645	2.2684	5.1552	2.1653	2.4465	1.73	3.1047	2.4623	5.0526	3.0017	2.9577	2.5922	6.9762	2.1905	3.28737
MCV: L	7.0252	7.5191	2.0421	2.89257	2E+09	1E+12	1.8354	4.7881	7.5852	3.8386	3.7309	4.3368	2.2127	1.6374	6.07162	3.06318	2.1743	21.136	3.0520	5.9780	3.5526	4.1627	1E+32	6.1008	4E+07	2E+13	2E+26	7.9423	2.7203	9E+23
MCV: D	7.5425	13.226	2.6520	2.98438	3E+22	2E+10	1.9357	4.6161	6.0494	4.0614	3.5794	4.7781	3.3800	1.8584	11.4214	3.91106	38.633	16.715	3.7982	4.4575	5.8822	4.8585	2.7378	6.7364	1E+10	3.8519	2.0622	13.316	3.2413	2E+10
5% SIGNIF																														
SGa(ij): V	2	5	4	7	1	0	2	6	4	0	6	8	3	2	13	5	7	0	6	8	30	4	4	3	1	4	2	2	2	7
SGa(ij): L	3	3	5	5	3	3	3	5	4	4	6	6	1	5	1	6	5	2	6	4	3	2	4	2	1	3	4	4	3	1
SGa(ij): D	0	0	0	0	4	2	0	4	2	0	4	1	0	0	0	3	3	2	2	0	0	0	0	0	0	0	0	1	2	1
1% SIGNIF																														
SGa(ij): V	5	6	6	7	2	0	2	7	5	0	7	8	3	6	15	11	8	7	7	10	30	4	5	6	2	4	3	4	3	8
SGa(ij): L	3	5	7	5	3	7	5	5	6	6	6	6	2	5	4	11	8	2	8	6	3	4	4	2	2	6	4	5	5	4
SGa(ij): D	0	1	0	1	4	2	1	4	5	0	5	2	0	4	0	5	4	3	2	0	1	0	0	2	0	1	1	2	3	2
S.F.F.	L	V	V	V	V	V	V	V	V	L	V	V	V	V	V	L	L	V	V	V	L	V	V	V	V	V	D	V	V	V

NOTES:

1). Alpha(j): F are the estimated "Alpha" coefficients from the jth importing region.
where F=V,L,D, and V=levels, L=logarithms, D=logarithmic first differences.

2). CV: F is the estimated Coefficient of Variation for the jth importing region, where F=V,L,D.

3). MCV: F is the estimated 'Modified' Coefficient of Variation for the jth importing region, where F=V,L,D.
MCV is defined as the ratio of CV by the number of Positive a(ij)'s in the jth importing region.

4). SGa(ij): F is the Number of significant a(ij) coefficients, at the 5% and 1% levels of significance, for the jth importing region, where F=V,L,D.

5). S.F.F. is the Selected Functional Form for the jth importing region.

APPENDIX 7.2

5 TABLES OF ALPHA(j) AND a(ij) COEFFICIENTS

AND

5 TABLES OF ESTIMATED t STATISTICS FOR THE ALPHA(j) AND a(ij) COEFFICIENTS

TABLE OF ESTIMATED "Alpha(j)" AND "a(ij)" COEFFICIENTS FOR GOOD 1 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	0.5	1	0.5	1	1	0.8877	1	0.0012	1	1	0.5	1	0.5	1	0.0051	1	1	1	0.1879	1	1	1	1	1	0.0006	1	0.9967	1	0.4260	1
01	0	21.742	0	478.00	0	0	191.26	85634.	10.864	40.624	0	0	92.316	87.209	0	21.041	45.391	510.74	0	185.77	0	0	50945.	0	0	475.96	0	199.64	1841.7	12426.
02	0	0	0	0	3.3841	3.3170	2.8269	4656.2	5.0283	14.535	0	3.8217	14.463	2.0430	0	0.8057	2.8592	0	0	0.3061	4.9985	26.379	0	0	0	0	0.7368	0.7241	1.3514	4.1610
03	0	0	NA	NA	NA	NA	0	502.42	0	0	0	1.3698	1.9745	1.5472	440.00	1.0853	3.5577	1.6237	4.0630	1.1023	0	0	3.4593	0	0	0	3.3382	5.1774	13.194	3.1854
04	20.495	3.8853	NA	0	8.7049	NA	0	0	0	1.3833	0	3.7698	0	3.0416	1445.2	0	2.4405	0	35.577	0	2.9326	1.8887	4.9901	0	0	3.6887	0	6.0434	9.1493	0
05	0	3.4548	NA	NA	NA	NA	0.5500	0	0	0	5.1585	0	1.3903	1.4189	131.61	0.2669	0.8079	0	0	0	0	0	1.4242	0	0	0	0	4.1169	0	3.2151
06	0	0	NA	NA	NA	NA	0	4358.6	0	0	2.1251	0	1.2160	2.2040	324.27	0	1.6433	1.1198	0	0	0	6.0580	0	0	0	0	0	6.3730	20.977	1.9647
07	0	1E+08	0	41.849	0	7.3134	15.927	0	1.0804	0	0	3.2440	0	0	0	0	0	14.767	10.376	0	0	6.8982	0	331.61	0	6.5313	0	36.812	11.109	6.3345
08	14.048	0	0	38.403	0	1.0103	3.2214	99931.	15.327	9.6995	0	17.215	30.144	1.1091	0	0	0	2E+07	85.174	86.830	1E+06	*****	3611.3	2E+06	0	0	0	3E+07	0	0
11	6.2580	17.886	2.6286	9.0940	4.3008	1.6442	7.8805	12731.	0	0	0	109.46	0	0	2544.7	0	2.2954	15.420	0	0	0	8E+06	1472.8	98.158	0	0	0	18.229	15.165	0
12	47.082	0	5.1149	18.667	0	0	0	0	1.3460	34.790	0	28.878	8.8557	0	0	2.5188	0	0	426.97	103.18	0	0	0	0	*****	0	0	0	0	0
13	24.323	0.6464	0	0	4.8889	0	0.2514	11739.	0	85.633	8.5346	5.4750	0	1.1633	227.96	0	0	18.150	30.196	7.4192	0	64.195	10.070	0	0	0	6.7284	0	0	0
14	65.529	0	4.4632	2.0337	0	1.8818	0	3478.1	0	5.2175	0	4.9246	1.6184	0	0	0	0	0	0	29.369	0	8731.4	0	10.213	8394.5	10.492	0	16.636	0	0
15	0	0	0	34.692	0	0	5.7301	5150.3	17.620	7.6672	0	17.860	3.7256	2.6191	0	14.003	0	33.074	108.14	43.081	4.7172	0	30.340	203.08	0	4.9476	0	0	0	0
16	27.483	21.223	0	0.9142	31.725	0	12.094	5140.5	10.466	5.6558	0	10.616	6.9209	2.1529	0	0	2.3834	0	27.933	0	0	19.857	16.443	41.328	0	4.7339	6.3989	22.634	0	13.022
17	0	0	0	7.3291	1.5640	0	0	*****	0	0	8.9906	0	0	0	0	3.8871	0	NA	0	0	0	NA	0	0	2577.7	0	0	0	0	0
18	11.097	0	0	7.1021	20.186	10.478	3.8167	6906.9	11.100	19.661	0	9.9303	0	0	3420.6	2.3170	0	24.823	16.675	0	2.6222	182.84	16.395	49.181	7070.4	0	28.674	19.020	53.836	0
19	15.721	0	0	0	20.030	0	0.3671	0	7.8484	0	7.3709	5.6677	3.5840	46.101	42414.	0	0	5.8533	0	0	0	0	10.730	28.906	6215.2	3.4693	15.238	10.473	31.100	0
20	71.572	0	0	0	0	8.4544	0	2E+10	0	0	0	8.4412	0	0	3E+10	2.2726	0	0	14.920	0	0	NA	1.6806	3.3688	0	0	4.1717	1E+07	0	0
21	53.301	0	0	4.2164	0	2.9496	12.786	9775.8	431.08	5162.6	0	1E+06	0	0	5823.1	0	0	0	80.348	0	179.60	2137.9	11.395	31.779	13451.	0	7.1268	0	0	0
22	0	29.883	0	4362.5	1.2308	0	2E+07	2113.7	5.5417	1.7703	0	2E+06	0	1.0550	1890.2	0	0.5141	8.5373	0	9.4960	0	222.48	1E+07	22.365	0	0	1584.6	22.906	0	0
23	0.1407	0	3.9705	171.53	1.5005	32.387	1514.8	0	8217.4	26.697	0	167.07	8.7666	3.4370	0	0.9668	0	0	2.7269	1.8766	0	175.18	25.943	0	0	13.825	1.0616	0	[illegible].6369	46.899
24	0	0	5.7706	0	0	7.5824	0	28181.	58.476	0	6.0397	0	11.413	0	0	0	0	0	62.411	14.871	181.77	NA	48.999	0	*****	1.4447	0	3E+06	0	0
25	14.384	39.729	0	0	5.2003	5.0878	0	3E+10	2330.7	0	0	0	0	7.0750	2070.1	12.211	0	0	0	0	3.3704	0	0	0	4211.6	0	0	12.294	0	0
26	0	2E+06	0	0	0	0	NA	*****	20.056	9E+06	172.76	76098.	0	7.6321	358.52	38.627	20.763	5.3269	0	21.868	643.82	2E+06	0	0	42286.	6.3957	10.208	0	0	16290.
27	9.2371	0	0	4E+06	50259.	0	1E+06	7E+08	0	37777.	0	NA	0	14.864	1429.3	66.184	9.8036	0	0	4.3694	74781.	1152.4	1.2855	8.8669	0	0	4.1393	0	7.0838	0.8352
28	0	896.71	21.738	77.765	29.616	0	0	0	0	1033.2	0	0	25.442	3.2279	1163.9	0	5.4670	0	0	32.811	3.0914	42.664	2.9339	36.615	10923.	54.623	85.508	0	14.253	0
29	209.35	5.0819	0	0	13.545	6.0127	4.0487	2628.3	0	7.7858	0	10.563	9.6722	5.0069	3666.2	0	1.2796	164.54	37.099	0	4.2354	131.96	19.901	0	0	15.455	3.3584	3.9247	0	0
30	306.31	2E+07	25.918	119.73	6.0516	0	0	0	0	0.3662	286.35	86.955	22.540	7.1635	0	13.694	0	78833.	0	0.5055	16.395	*****	16.399	0	0	6.8486	15.513	0	3.3155	41.353
31	32.606	30.505	3.5498	17.632	4.0117	0	5.5092	0	0	2.5560	0	0	10.671	38.898	0	13.810	6.9460	10.547	0	0	0	15.302	8.1789	15.168	0	7.1964	3.4742	22.569	7.8139	0
32	0	14.141	6.8557	3.7002	24.972	0	0	74892.	60.982	717.61	28.157	6.7825	30.259	12.764	*****	4.4548	3.4731	13.208	165.63	1.5202	137.31	545.43	35.343	52.995	31327.	29.141	7.2304	0	2.9623	0

TABLE OF ESTIMATED "Alpha(j)" AND "a(ij)" COEFFICIENTS FOR GOOD 2 (30 IMPORTING REGIONS)

PARTNER I	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	1	0.0072	0.0054	1	0.5	1	1	0.0006	0.5	0.9986	0.9994	0.5	0.5	1	0.0243	0.5	0.7003	0.0821	1	0.0001	0.0000	1	0.5	1	1	1	0.5	1	0.6788	0
01	50.437	0	7E+11	3E+07	0	0	0	10646.	0	1E+09	0	0	0	0	1E+08	0	127.40	NA	381.98	4E+08	4E+08	0	0	0	10.025	NA	0	NA	0	NA
02	3.3025	0	0	0	0	2E+06	2E+06	0	169.46	4562.8	11765.	15.330	16.660	12.000	0	36.295	122.72	NA	8.1908	0	*****	0	3.0517	0	6.4924	7.0782	168.61	NA	0	3E+11
03	0	0	NA	NA	NA	NA	0	0	0	0	5042.0	0	7.7524	0	0	0	2.0256	0	3.3078	1E+09	0	0	0	0	5264.5	0	8.2160	1E+06	0	0
04	0	0	3883.1	9.6681	196.00	NA	0	0	0	0	0	0	36.918	0	NA	0	12.321	0	0	*****	0	0	0	0	0	0	14.475	11.506	3.9616	0
05	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	3.2515	0	0	0	0	0	0	0	4.6982	1.5569	0	6.8828	0	0	0
06	0	0	NA	NA	NA	NA	0	0	0	0	0	77.150	0	0	0	0	0	NA	0	NA	NA	22.563	40.522	5.0749	3.8964	0	14.093	0	0.8037	0
07	56.140	0	5E+10	0	0	0	0	5E+11	0	2E+07	23326.	0	0	0	7E+08	15.450	67.300	NA	NA	4E+09	0	0	NA	NA	9.9537	0	0	146.21	0	0
08	0	0	0	0	0	0	0	*****	0	4E+08	0	93.170	0	0	0	73.151	60.595	0	0	0	6E+07	0	0	0	0	0	0	0	24.480	0
11	0	2402.5	9572.9	14.355	57.827	1.9827	0	0	0	19687.	0	22.400	6.9852	8.6504	0	11.368	21.727	2E+09	16.947	0	0	0	0	0	0	0	104.77	0	0	0
12	0	0	933.25	0	0	0	4.5875	0	0	*****	12370.	0	0	0	0	14.183	20.918	0	7.0693	0	1E+06	7.6850	4.1394	NA	0	13.431	171.11	6E+06	8.3880	0
13	0	0	45570.	0	0	0	0	0	0	0	0	0	0	12.774	4E+08	96.181	30.634	0	0	*****	2E+06	0	0	0	0	0	0	0	9.1526	0
14	*****	0	5890.2	0	0	0	0	0	203.66	0	0	63.231	0	8.5292	0	58.114	148.51	0	0	NA	0	42.284	0	NA	NA	0	95.852	0	6.3293	0
15	6.5244	0	31239.	14.799	132.40	0	0	0	63.708	*****	0	0	0	0	0	3.8183	2.2597	34704.	10.518	0	0	0	4.0621	6.5456	4.0262	0	27.539	0	2.8567	0
16	947.35	0	48810.	0	30.216	0	0	0	95.619	0	0	0	0	0	0	4.6295	0	0	0	0	0	27.228	7.3013	6.5429	5.6723	0	4.0938	19.310	19.726	0
17	NA	0	3E+11	0	0	0	0	39957.	NA	NA	0	38.400	0	0	227.64	8.6326	5.2079	NA	0	*****	0	NA	0	0	NA	0	0	NA	0	0
18	0	0	0	12.368	0	0	0	0	117.51	0	0	35.677	0	0	0	9.1572	7.8232	0	0	0	0	0	11.946	0	0.5353	0	60.942	0	0	0
19	0	2571.1	0	16.086	0	0	5.9158	10347.	45.091	14877.	0	0	4.1091	0	0	0	0	297.12	2.8191	*****	0	37.842	0	4.3492	0	0	22.797	111.07	0	0
20	0	0	0	7.8880	0	0	0	0	0	17897.	0	0	5.1469	0	0	0	0	0	6.6276	0	0	NA	8.5097	3.3396	0	32.567	38.669	NA	0	0
21	NA	0	0	0	0	0	0	1E+11	0	0	0	NA	5.9595	0	0	0	0	0	0	0	0	NA	67.482	4.7665	0	1E+08	80.896	NA	40.658	0
22	0	0	0	188.38	51.074	0	2.9504	0	96.521	0	0	83.980	0	0	0	7.7021	12.648	236.06	0	0	0	NA	55.997	10.911	0	0	136.69	0	6.3727	9E+11
23	NA	62513.	0	47.797	0	0	0	8E+09	0	0	0	0	0	8.5206	0	4.1684	1.8497	0	3E+06	0	0	0	135.08	*****	0	0	137.48	*****	37.366	2E+12
24	0	2E+09	30650.	0	0	0	5.2291	3E+09	0	NA	0	167.85	0	7.1953	NA	27.986	0	NA	76171.	2E+09	4E+10	NA	0	NA	NA	0	191.04	NA	0	0
25	*****	0	0	0	0	0	0.5064	5231.4	27.057	NA	3E+10	NA	5.8030	5.0588	0	0	16.885	56802.	0	0	5E+06	0	0	2.4816	4.9796	0	10.866	85.135	0	0
26	NA	9774.0	0	26.773	30.340	0	NA	0	412.47	NA	2E+12	205.43	61.723	45.520	5E+10	23.064	32.072	870.63	46.330	2E+13	2E+08	0	39.213	0	14.401	0	0	1E+07	0	2E+13
27	6E+06	0	0	0	15.958	204.77	0	0	0	2E+10	14049.	0	0	0	0	0	0	0	10.684	0	0	8E+09	0	0	0	0	0	0	0	0
28	NA	0	3E+08	0	0	0	*****	7E+08	271.00	2E+08	NA	164.63	0	0	0	21.313	5.2796	1E+09	10.001	0	4E+12	NA	0	3.8101	5.6418	0	0	171.94	0	0
29	3E+06	0	0	271.25	18.828	0	0	4E+11	5.3389	2E+11	18712.	80.627	0	2.0321	1E+10	56.124	0	3E+08	1679.0	0	2E+13	0	0	0	0	0	0	0	0	0
30	5E+06	6E+09	3E+08	210.01	128.94	0	0	0	61.716	0	6910.9	0	150.03	16.784	0	112.45	21.459	0	NA	0	1E+10	NA	0	0	9.0998	0	12.454	0	3.1580	0
31	67754.	4243.9	6E+06	0	0	0	0	3E+10	193.70	0	0	0	59.883	0	NA	7.4066	53.019	0	0	0	5E+07	0	0	28.393	0	0	0	128.16	0	0
32	1914.4	5E+08	*****	4.0419	0	0	7E+07	2E+06	128.51	NA	1E+10	0	32.306	68.804	NA	0	225.42	NA	0	9E+10	2E+10	1377.9	1.8211	0	0	0	0	0	0	0

TABLE OF ESTIMATED "Alpha(j)" AND "a(ij)" COEFFICIENTS FOR GOOD 3 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	0.0006	0.0000	0.0028	0.5	0.2057	0.2907	0	0	1	1	0.5	1	0.0259	1	0.0054	0.5	1	0	0.0016	0	1	1	1	1	1	0.0042	1	1	1	1
01	40648.	1E+12	3E+07	0	NA	326.58	2E+11	0	0	0	73.762	2862.1	34967.	0	0	1044.4	0	NA	2E+07	0	6E+06	*****	20249.	NA	30023.	0	95204.	NA	*****	0
02	0	1E+06	0	0	91.282	96.851	3E+11	1E+10	0	0	13.537	0.5530	228.31	2.8146	0	0	0	0	0	2E+12	1.9845	1.5090	1758.8	0	0	0	0	NA	8.7277	121.88
03	3078.3	1E+07	NA	NA	NA	NA	3E+11	1E+10	0	0	0	0	0	1.9778	0	0	0	2E+08	0	2E+12	2.1459	0	0	0	0	0	0	0	0	0
04	0	0	NA	20.287	NA	NA	3E+11	1E+10	0	3.0279	34.570	0.0855	0	2.8215	0	9.4756	6.7282	0	0	2E+12	1.9405	0	8.2865	1.8168	0	0	0	0	3.5625	9.5068
05	NA	0	NA	NA	NA	NA	3E+11	1E+10	0	0	23.759	0	20.546	0.6388	0	8.9400	0	2E+08	3435.2	2E+12	1.6973	3.6156	9.0308	3.7780	0	0	0	0	3.2164	334.27
06	0	0	NA	NA	NA	NA	3E+11	1E+10	0	5.5543	22.320	3.6506	298.05	4.2080	0	13.602	6.0421	0	0	2E+12	NA	2.9535	7.5965	4.3882	4.3778	1065.1	2.1199	0	0.4729	1.9590
07	0	0	17456.	101.43	0	147.39	3E+11	1E+10	2477.2	0	75.353	0	0	0	3E+08	20.703	32.371	0	4E+07	2E+12	6285.9	36.863	40973.	0	23.018	0	0	0	0	15.770
08	0	0	0	0	0	0	3E+11	1E+10	8.2619	835.74	0	6378.8	248.58	0	2E+09	0	0	0	0	0	0	0	0	0	0	4E+06	0	0	13.730	0
11	*****	0	0	1.9169	0	0	3E+11	1E+10	3.9966	47.677	238.76	0	0	21.506	0	6.9762	0	0	0	0	0	0	0	0	0	0	0	0	42.515	0
12	0	0	0	0	0.7741	0	0	0	0	0	0	256.30	384.62	0	0	84.172	44.083	2E+08	0	0	0	123.05	NA	0	0	0	0	NA	0	0
13	0	0	0	0	28.555	36.638	3E+11	1E+10	9.1082	26.363	0	8.4949	0	0	2014.7	0	0	0	0	2E+12	1.2205	15.454	0	0	5.7126	0	0	0	0	0
14	0	0	0	0	0	0	3E+11	1E+10	0	0	40.064	6.1923	0	0	0	35.611	10.914	0	0	2E+12	0	0	211.31	7.3622	2.3851	6131.4	617.14	0	0	3.3081
15	0	0	2910.2	0	0	0	3E+11	1E+10	0	15.583	0	0	0	0	0	13.602	2.1771	2E+08	0	2E+12	0	0	0	0	0	0	8.9880	0	0	0
16	0	0	5772.2	7.5141	16.692	0	3E+11	1E+10	6.8677	0	0	6.5879	477.03	9.6954	2506.2	0	1.3604	2E+08	5359.6	2E+12	28.986	42.367	7.9454	31.269	4.9036	0	29.200	0	24.392	15.046
17	0	0	0	0	NA	NA	3E+11	1E+10	0	18.486	0	0	0	0	NA	23.915	0	NA	7918.9	2E+12	3.7580	30.205	0	0	0	3163.5	0	0	0	0
18	0	7E+06	3477.8	5.5663	0	13.262	3E+11	1E+10	2.0744	8.7435	0	0	165.59	3.2711	3744.3	40.283	0	2E+08	6274.4	2E+12	0	0	0	10.906	0	291.11	0	0	0	0
19	0	2E+07	6549.0	0	0	0	3E+11	9E+09	23.184	19.555	74.134	484.23	4371.7	22.741	1338.0	0	0	2E+08	3478.6	2E+12	9.8811	2.8233	0	10.219	0	0	0	0	40.748	29.648
20	0	0	6873.2	NA	NA	NA	NA	7E+09	3E+07	0	0	0	0	0	NA	98.677	0	2E+08	0	2E+12	0	NA	6.0694	0	0	0	0	NA	0	0.8605
21	0	0	0	90.051	90.494	51.775	0	0	0	9891.8	0	0	0	0	0	12.361	0	2E+08	313.61	2E+12	5.5942	0	0	0	0	4308.7	15.293	0	0	0
22	0	2E+07	0	42.263	0	0	3E+11	1E+10	1678.6	*****	163.42	23434.	0	0	8357.4	0	4.1621	2E+08	0	2E+12	26.145	NA	16694.	0	0.1110	0	22.911	5598.0	10.698	0
23	4560.4	0	7505.3	2.3621	87.486	0	0	1E+10	0	16.041	101.55	0	344.68	10.191	2E+08	3.0184	0	2E+08	41378	2E+12	3.8178	0	67.805	0	0	0	857.88	18158.	44.287	0
24	0	0	0	12.776	79.619	0	3E+11	3E+09	*****	0	47.740	0	278.03	0	NA	0	0	NA	9E+08	NA	0	NA	0	0	2.3404	0	[illegible]914.	NA	8.1552	0
25	NA	1E+08	*****	5.1386	275.35	118.04	2E+11	NA	384.43	0	97.601	5481.8	57.871	6.9652	0	7.6918	5.4174	2E+08	36973.	2E+12	0	0	11.371	12.410	18.739	1859.4	0	0	2.1018	0
26	NA	2E+10	0	0	0	33.137	2E+11	0	0	NA	0	0	*****	149.21	NA	463.68	6.8306	2E+08	880.79	2E+12	0	0	0	15.791	22.520	0	1565.7	0	0	0
27	NA	7E+06	3618.5	0	0	2.7764	0	0	2.4967	0	0	2052.4	0	0	567.36	0	3.6773	0	0	2E+12	152.12	*****	42.237	13.814	8.7386	3610.6	0	10.568	0	0
28	*****	0	0	0	0	55.047	3E+11	0	4.8449	0	314.58	6094.5	1701.1	16.120	22821.	10.007	128.55	0	0	2E+12	0	0	12.135	0	17.093	0	0	17.203	0	51.749
29	0	0	192.64	0	0	0	3E+11	1E+10	*****	0	0	0	1066.3	171.29	1306.5	0	19.947	2E+08	0	2E+12	66.244	8910.6	0	0	0	5353.0	4.4999	6383.6	0	0
30	0	1E+12	0	0	0	0	3E+11	1E+10	76.593	0	47.504	*****	165.83	0	29660.	0	14.707	0	2E+07	0	22.142	12872.	0	0	0	*****	0	0	0	28.024
31	0	5E+06	0	0	0	0	3E+11	1E+10	13.167	0	0	25.833	1157.0	2.8653	2E+07	12.410	14.549	0	31674.	2E+12	0	0	6.5019	8.5729	0	6357.1	0	0	0	12.598
32	*****	0	0	0	0	0	3E+11	1E+10	10.932	0	67.144	25.982	641.13	9.5683	12298.	8.9260	42.727	0	0	2E+12	0	19.204	4.5209	0	7.9849	3463.0	0	0	0	0

TABLE OF ESTIMATED "Alpha(j)" AND "a(ij)" COEFFICIENTS FOR GOOD 4 (30 IMPORTING REGIONS)

IMPORTING REGION j

PARTNER i	01	02	03	04	05	06	07	08	11	12	13	14	15	16
Alpha(j)	1	0.0068	0.5	0.5	0.5	0.0103	0.5	0.0038	1	0.5	0.9239	0.0073	0.5516	0.0119
01	0	0	0	275.68	387.74	2E+07	0	*****	0	0	786.59	0	136.38	7487.5
02	0	682.75	0	11.294	0	0	23.934	1099.0	1.7568	6.9893	0	0	0	109.18
03	0	325.62	NA	NA	NA	NA	4.2866	0	0	0	0.3632	81.272	3.3103	277.63
04	0	0	177.36	158.99	128.06	NA	7.5475	0	0	3.0107	5.7527	0	3.9771	194.10
05	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0.6557	5.6399
06	0	0	NA	NA	NA	NA	13.194	0	3.9715	29.323	1.7941	124.36	0	0
07	0	*****	0	148.54	169.45	5345.6	0	2226.5	2.1681	24.076	27.890	623.36	2.2537	216.76
08	0.5179	9437.5	0	0	0	0	2.1917	12383.	6.8203	3.1095	0	0	0	187.02
11	0	0	0	0	6.5124	0	0	0	6.0094	3.3562	29.987	1876.8	0	3270.7
12	0	0	0	0	51.333	5818.9	48.535	0	3.9737	0	0	0	4.0540	0
13	1.3499	0	7.1400	10.939	1.4376	5193.5	4.8385	1622.5	30.855	9.8079	1.8328	825.90	4.6655	803.47
14	0	0	27.377	0	11.441	3179.0	0	0	0	17.755	0	0	21.460	288.81
15	3.7188	1138.3	5.0139	0	12.310	2540.2	22.653	0	5.9160	19.624	6.6224	334.89	11.251	0
16	5.2954	6853.2	4.3607	10.462	13.759	240.66	0	0	7.2417	5.0772	2.6643	574.01	4.4229	0
17	0	0	17.102	27.886	34.498	6857.6	11.776	0	0	0	7.7846	318.79	0	330.79
18	0	1257.4	0	0	15.626	2271.2	4.3891	0	0.8175	11.532	12.694	2661.8	18.333	0
19	0	2302.5	0	26.393	0	0	0	0	16.372	0	0	242.31	27.110	1448.9
20	7.7299	1443.4	0	110.64	41.811	4498.0	77.830	2097.9	0	7.1688	6.3344	0	0	3262.2
21	0	3540.7	0	13.3[illegible]	27.968	0	0	12364.	65.917	5.2167	14.861	11269.	0	1582.9
22	0	0	0	0	75.777	0	18.584	21491.	0.0192	23.984	5.4512	0	15.205	140.23
23	*****	12199.	1.5579	3.1991	7.8810	17876.	14.495	0	43.207	28.330	0	0	5.3533	297.92
24	0	0	0	5.3505	11.957	0	0.7092	15473.	358.40	8.3644	0	0	0.5759	0
25	49.076	0	0	0	0	6357.0	2.1741	*****	4.1772	0	59.209	0	0	118.74
26	10979.	2E+09	0	57.737	6.8788	23756.	178.09	3756.6	171.75	18.723	0	*****	0	926.83
27	1217.5	0	45.766	48.299	58.016	82405.	5.0104	20722.	186.26	0	123.92	0	9.5063	2282.2
28	14.834	199.91	15.014	6.5721	12.404	0	30.013	916.94	18.031	12.640	0	555.17	4.2891	937.86
29	141.70	0	0	5.7357	11.633	0	0	0	0	2.8782	6.2432	344.33	3.9210	0
30	78002.	4E+07	26.154	21.881	0	0	0	0	1.7726	0	0	0	0	0
31	321.04	0	0	3.0254	0	1708.6	0	0	1.7168	0	0	0	3.3221	0
32	0	6694.8	0	23.313	14.247	12073.	0	0	7.0266	5.3003	11.381	748.57	11.905	596.92

PARTNER i	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	0.6831	0.9478	0.0163	0.0013	0.0020	0.0046	0.0008	1	1	0.0142	0.0077	0.0186	0.5390	1	1	1
01	765.83	5084.7	50149.	0	0	*****	0	61.541	1779.5	0	9E+07	0	0	66017.	9309.9	558.68
02	3.4043	0	369.05	2864.3	0	276.95	0	1.2731	0	25.918	583.42	133.15	6.6744	0	0	0.8815
03	0	0	4.2927	0	285.83	271.55	1809.8	1.3301	0	30.171	153.37	0	5.5021	4.3832	5.3465	3.0356
04	0	2.2891	276.11	0	798.18	0	407.49	1.0594	3.2155	0	0	110.47	6.0490	4.4168	0	2.3597
05	0	0	0	0	561.98	9.0670	0	0.4255	3.1631	0	0	82.094	4.9085	3.5116	0	2.3082
06	0	0.0609	57.737	5101.3	0	0	0	0	0	0	0	129.89	7.6471	2.7530	2.5397	0
07	7922.7	0	0	0	6E+09	30560.	2E+08	68.785	12.861	14541.	8036.6	1448.9	0	37.187	59.566	12.101
08	66.374	0	0	3E+07	52587.	0	*****	48.606	80.835	1656.9	3381.3	0	0	0	7.5509	40.273
11	0	17.312	3888.5	0	2E+06	*****	0	*****	0	0	0	1009.8	4.3239	0	46.093	0
12	0	0	0	0	*****	0	2E+06	513.90	19.099	5299.8	0	0	23.277	0	165.89	0
13	21.552	0	408.49	0	3367.1	7445.1	13000.	25.774	10.208	487.11	1371.6	1380.0	0	0	10.242	8.7779
14	8.3786	0	0	7207.1	0	27182.	16104.	0	0	3602.5	0	12517.	27.931	67.443	4.4970	0
15	0	0	1042.2	8664.6	2149.6	0	13117.	1.9301	0.8339	0	0	0	0	0	0.9596	2.9277
16	18.250	5.5678	561.99	35333.	8737.7	2871.6	0	4.8373	5.2229	2082.3	192.42	144.60	7.5701	7.1383	2.6922	4.0299
17	NA	0	0	NA	0	0	1495.0	13.524	1.7046	0	36.151	0	1.9830	0	0	0
18	34.557	2.5761	1230.9	13534.	0	5309.3	9638.7	5.8273	0	2997.0	2064.2	0	1.7046	0	1.5750	0
19	0	0	259.00	54403.	0	5238.2	0	6.9900	0	0	1392.6	729.43	13.700	0	0.1472	15.732
20	NA	0	934.22	0	11176.	0	0	2118.2	0	1029.5	511.67	221.57	10.708	0	5.9959	0
21	12.689	27.363	2084.9	57664.	23095.	4867.6	0	956.33	1.8770	0	0	0	15.738	44.706	0	1.6931
22	54.436	38.225	0	0	21311.	1640.4	68211.	2.8011	1.7200	406.55	1172.2	0	0	0	0	445.95
23	19.503	4.6356	518.16	88894.	75166.	0	7037.0	3.8709	26.436	0	0	1754.4	4.1037	20.464	4.1282	0
24	NA	7.7410	0	2E+06	*****	73589.	15116.	NA	0	0	13796.	90.531	30.062	20344.	0	0
25	22.959	9.0881	210.37	0	0	0	0	0	0	0	0	1681.7	0	8.1273	9.5751	0.7548
26	47.081	0	0	10153.	69591.	40138.	*****	458.81	0	2501.8	25310.	25335.	19.472	8.8108	0	18.360
27	48.202	0	1213.4	0	8873.7	2687.0	*****	526.09	0	474.02	0	0	0	148.69	49.715	97.543
28	0	0	347.43	9521.6	1993.4	730.72	14197.	2.8860	9.3779	857.56	1443.9	0	0	0	1.5186	3.0031
29	47.089	11.198	77.828	5383.4	8727.2	222.84	10568.	1222.1	3.1582	495.55	678.55	0	0.5964	2.7620	1.9980	1.6467
30	32.864	20.713	523.77	5E+08	5035.8	631.59	0	234.64	39.476	0	0	0	0	0	14.203	0
31	6.6476	5.2820	0	13698.	0	0	0	1.5021	68.042	0	0	0	20.252	25.590	0	0
32	29.920	0	392.53	35430.	9422.1	4739.2	0	17.119	26.132	0	0	0	0	0	4.7269	0

TABLE OF ESTIMATED "Alpha(j)" AND "a(ij)" COEFFICIENTS FOR GOOD 5 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	0.5	1	1	0.0064	0	0.0000	1	1	1	0.5	1	1	1	0.0204	0	0.5	0.5	0.0000	1	0.0096	0.5	1	0.0020	1	1	1	0.3932	0.0024	1	1
01	0	0	0	0	2E+12	0	7587.5	*****	110.16	0	0	83.775	0	0	0	0	142.29	0	0	0	0	0	*****	0	*****	935.21	0	4E+07	4177.8	30287.
02	0	0	0	0	0	0	0	10.165	16.153	0	0	0.0179	1.6566	177.27	7E+07	5.2690	7.9357	0	0	0	5.5548	0	659.01	12.062	5.7478	0	0.5391	0	2.6076	1.2020
03	19.919	0	NA	NA	NA	NA	10.788	0	0	10.023	0	0	0.4512	96.480	0	1.1727	4.8911	5E+07	0	372.34	5.7925	0	1210.1	0.3734	0.4185	0	0	0	0	2.1741
04	39.016	0	11.524	1860.0	0	*****	0	0	0	18.280	0	0.1047	0	0	0	5.8332	1.3393	4E+07	0	215.47	0	0	0	0	0	1.8622	4.8753	0	0	0
05	0	0	NA	NA	NA	NA	0	0	0	5.6248	0	0	0	101.91	0	1.3185	4.4774	5E+07	6.4808	259.14	0	0.7226	0	0	1.1419	0.4812	0	0	2.5747	0
06	0	0	NA	NA	NA	NA	0	0	0	22.670	0	0	0	0	6E+07	0	8.9566	0	0	0	23.985	0	0	0.4845	0	0	1.4988	0	0	1.5025
07	0	1E+06	0	1E+07	1E+13	0	12.678	15.975	0	0	14.374	4.3824	13.338	22.495	7E+07	24.674	0	5E+07	6E+06	668.38	98.991	0	0	366.78	10.431	87.534	0	0	0	0
08	130.10	0	189.39	0	0	3E+06	31.489	16.968	1.0833	0	0.2895	0	0	949.63	0	0	9.5497	0	156.77	97126.	0	*****	0	91.812	291.42	593.35	47.343	*****	0	4182.1
11	126.79	0	55.593	0	0	0	0	2.8927	0	0	1107.8	57.906	0	9319.2	0	76.771	88.215	0	0	0	74.962	14287.	0	0	0	0	0	0	0	31.325
12	0	0	116.47	8052.0	0	0	0	0	34.030	9.6801	3.4298	0	0	0	6E+07	0	6.6098	0	2219.9	5E+06	85.737	0	0	0	0	5.4513	0	*****	0	0
13	0	24.765	0	2093.2	0	0	11.323	0	1.3788	0	6.1832	0	9.1258	765.45	4E+07	22.784	51.346	0	0	0	0	4.4456	9509.8	14.180	2.4937	38.538	24.337	188.15	0.9285	9.5098
14	0	19.692	0	0	0	0	191.00	0	5.2269	0	0	5.2401	0	0	6E+07	24.922	19.034	0	9499.0	0	0	0	0	11266.	0	0	0	5144.5	0	12595.
15	50.459	14.839	0	2168.2	0	0	0.7694	6.1162	0	0	0	16.830	1.5610	0	7E+07	3.2485	0	6E+07	0	0	0	0	0	7.0317	18.183	13.808	0	0	2.2177	0
16	83.115	0	8.8768	4105.6	0	0	0	7.6357	4.8843	11.525	10.347	11.935	11.634	678.15	6E+07	13.039	0	5E+07	16.028	1064.8	23.439	11.061	7598.1	43.104	12.884	47.517	0	34089.	14.729	6.0740
17	78.559	7.3575	2.5841	1280.8	0	0	0	30.382	0	0	0	3.0492	0	0	5E+11	3.8498	0	NA	5.6326	0	0	0	64503.	16.628	2.7417	3.5475	0	0	0	0
18	0	0	6.2659	820.36	0	1E+06	8.0097	67.333	0	10.240	11.538	13.471	0	652.87	5E+07	30.231	8.7814	6E+07	0	0	0	4.9581	0	20.336	0	0	0.9024	0	0	0
19	41.333	0	0	0	0	*****	4.8875	12.623	11.103	0	0	3.1233	8.6546	0	4E+07	0	3.0458	5E+07	9.7018	1006.0	7.7641	5.5414	0	26.636	4.2905	4.0227	6.4214	0	0	0
20	0	0	6.3060	636.24	0	0	NA	13.445	0	0	0	0	0	0	NA	124.23	2.6199	6E+07	4.7634	0	26.563	9111.0	2142.9	0	0	3.1801	13.427	2E+07	4.5887	6.0610
21	0	14.417	0	0	0	0	16.079	126.29	291.98	47.411	185.84	17.759	0	0	0	0	0	4E+07	194.24	0	0	195.00	19413.	287.77	44.704	0	30.512	0	0	0
22	0	0	23.318	73020.	0	3E+09	40858.	27388.	*****	67.868	*****	10523.	0.4893	330.60	0	6.5675	0	6E+07	387.51	5617.2	2.8189	0	1E+06	0	0	1584.1	68.710	3E+08	54.419	1082.6
23	109.46	5.8428	109.22	57914.	0	1E+10	280.30	93280.	77.395	28.158	4.8928	67.846	68.555	232.73	0	14.071	12.580	0	53.800	2001.3	10.566	6.3247	15909.	4.9116	7.8035	0	1.1360	7E+08	0	872.42
24	0	0	0.6253	5686.9	0	2E+06	0	23.417	16443.	0	0	0	0	184.43	NA	0	4.7182	NA	5719.0	2E+08	72.157	NA	7850.0	18.162	1346.0	0	0	NA	18.499	36.737
25	0	0	0	0	0	0	1616.1	634.51	0	70.980	0	0	0	0	0	0	0	4E+07	0	0	11.763	0	2423.0	0	0	0	0	0	2.1944	975.10
26	NA	*****	2.1084	*****	0	2E+08	85377.	452.88	15.797	0	60129.	14671.	0	0	8E+07	20.485	0	6E+07	27.484	0	0	134.75	0	0	33.489	54.308	0	0	0	26558.
27	18.996	7E+06	66.402	10966.	0	2E+07	154.26	0	0	0	6.0916	987.21	2.1644	260.52	0	17.365	4.0118	0	0	1368.5	27.276	1.6489	121.68	2.8769	0	1.6625	0	*****	13.315	0
28	0	0	0	0	0	0	0	12.551	0	0	0	15.286	10.505	33.552	7E+07	0	0	6E+07	8.5161	0	0	0	0	75.679	40.098	0	11.485	0	0	0
29	181.90	0	0	5679.8	0	0	39.613	0	234.06	0	26.877	12.330	17.471	120.46	5E+07	7.3995	23.098	5E+07	48.299	492.71	11.051	1091.2	4319.4	0	0	29.892	7.3023	3822.1	25.860	1.9885
30	177.13	*****	28.045	7624.0	0	7E+06	0	0	11.044	0	38.117	0	0	1073.6	7E+07	0	28.225	NA	0	0	0	0	31214.	0	6.6043	0	0	3E+07	5.7648	15.206
31	0	10.656	14.527	0	0	1E+06	0	2.4468	0	0	0	0	2.2309	28.240	7E+07	0	8.0331	5E+07	9.3948	0	0	0.7989	0	0	3.2530	0	8.9835	11028.	0	2.8272
32	52.455	0	0.4957	1359.1	0	0	21.022	17.460	11.437	28.078	37.088	66.431	22.870	642.78	4E+07	14.086	16.373	5E+07	0	0	21.934	31.057	17618.	0	3.2611	0	0.2432	5044.8	5.9036	0

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Alpha(j)" AND "a(ij)" COEFFICIENTS, FOR GOOD 1 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.7882	NA	NA	NA
01	NA	2.1611	NA	0.6547	NA	NA	1.8103	2.1719	0.7939	1.6183	NA	NA	0.3719	0.7040	NA	0.2392	0.6266	2.1023	NA	2.7740	NA	NA	1.2712	NA	NA	1.2139	NA	0.2420	0.8293	0.3427
02	NA	NA	NA	NA	0.9463	0.7687	1.8759	1.1871	2.9428	1.8095	NA	1.9457	2.1688	0.6784	NA	0.4118	1.2873	NA	NA	0.1274	3.6412	0.2042	NA	NA	NA	NA	0.1900	0.1674	0.1236	1.2175
03	NA	NA	NA	NA	NA	NA	NA	0.2855	NA	NA	NA	1.3246	0.2945	0.8007	1.9546	0.8947	2.3790	1.0980	0.4086	1.2835	NA	NA	2.3770	NA	NA	NA	0.6760	2.2610	3.4134	1.2955
04	0.5049	1.8238	NA	NA	2.8382	NA	NA	NA	NA	0.6607	NA	3.0054	NA	0.7502	4.6077	NA	1.4945	NA	1.9900	NA	4.3427	0.6108	4.4431	NA	NA	1.8232	NA	2.1009	2.2770	NA
05	NA	2.4004	NA	NA	NA	NA	1.2457	NA	NA	NA	1.6972	NA	0.3127	1.1905	0.4170	0.2323	0.6170	NA	NA	NA	NA	NA	1.6394	NA	NA	NA	NA	1.8441	NA	2.3178
06	NA	NA	NA	NA	NA	NA	NA	2.5174	NA	NA	0.1448	NA	0.2246	0.9417	0.3740	NA	0.4185	0.1486	NA	NA	NA	1.8149	NA	NA	NA	NA	NA	3.5449	4.0572	2.1869
07	NA	1.8073	NA	2.3521	NA	0.9876	3.5610	NA	0.2893	NA	NA	4.1291	NA	NA	NA	NA	NA	2.1674	0.1395	NA	NA	1.2294	NA	1.0039	NA	0.4984	NA	2.9470	0.9140	0.8650
08	0.8730	NA	NA	1.3983	NA	0.4077	1.3900	3.1847	2.2373	1.2413	NA	3.8350	1.8920	0.0964	NA	NA	NA	1.6981	1.1290	2.0214	0.4993	0.6058	0.0319	0.7741	NA	NA	NA	0.4559	NA	NA
11	0.3665	1.9023	1.1978	1.6319	0.5817	0.0755	0.8431	3.0331	NA	NA	NA	3.4664	NA	NA	1.6262	NA	0.1928	3.7190	NA	NA	NA	0.3642	2.9857	0.8975	NA	NA	NA	2.1107	0.5349	NA
12	0.4441	NA	2.0794	1.1551	NA	NA	NA	NA	0.2753	3.5680	NA	5.4087	0.5041	NA	NA	0.3112	NA	NA	1.1405	0.7687	NA	NA	NA	NA	0.3887	NA	NA	NA	NA	NA
13	1.5574	0.1162	NA	NA	0.8902	NA	0.0572	1.8891	NA	3.3493	2.2032	3.6635	NA	0.3111	0.2131	NA	NA	0.7807	0.8261	0.4035	NA	2.2167	0.5283	NA	NA	NA	0.6730	NA	NA	NA
14	0.4169	NA	1.2145	0.1721	NA	0.3146	NA	1.5465	NA	0.9377	NA	2.1178	0.0889	NA	NA	NA	NA	NA	NA	1.9640	NA	3.5345	NA	0.7546	0.7893	0.6132	NA	0.7308	NA	NA
15	NA	NA	NA	0.2825	NA	NA	1.5831	1.6814	1.3557	1.1102	NA	3.9258	0.3253	0.6078	NA	2.5838	NA	1.3579	2.2420	3.5474	2.8083	NA	2.4742	2.2372	NA	0.3182	NA	NA	NA	NA
16	1.9732	2.2634	NA	0.2368	1.9670	NA	2.0870	2.8617	3.8177	1.9368	NA	4.4398	0.8908	1.2318	NA	NA	0.8063	NA	2.0364	NA	NA	2.9664	6.4523	5.1903	NA	1.3578	0.5805	1.8819	NA	1.6250
17	NA	NA	NA	1.4945	0.1386	NA	NA	0.8520	NA	NA	1.3072	NA	NA	NA	NA	0.9913	NA	NA	NA	NA	NA	NA	NA	NA	0.3843	NA	NA	NA	NA	NA
18	1.1437	NA	NA	0.7126	2.3952	1.5055	1.3642	3.0487	4.6695	2.4742	NA	4.7119	NA	NA	1.2747	0.3343	NA	1.6921	0.5674	NA	1.4041	1.9811	3.1584	2.8876	0.6693	NA	0.3186	0.8027	1.1145	NA
19	0.7192	NA	NA	NA	2.2218	NA	0.0767	NA	1.3600	NA	1.0188	2.8958	0.2736	5.7380	1.5358	NA	NA	1.6170	NA	NA	NA	NA	2.1399	2.0886	0.5970	0.5968	0.6886	0.6779	1.0204	NA
20	0.8640	NA	NA	NA	NA	0.1740	NA	0.6756	NA	NA	NA	0.5238	NA	NA	0.8240	0.4250	NA	NA	0.8542	NA	NA	NA	0.4395	0.5674	NA	NA	0.5819	0.4695	NA	NA
21	0.1884	NA	NA	0.4822	NA	0.1149	2.1459	0.5965	2.9200	0.8629	NA	0.4813	NA	NA	1.4372	NA	NA	NA	2.2226	NA	2.9414	4.1670	1.9996	0.8500	0.2579	NA	0.3536	NA	NA	NA
22	NA	1.1644	NA	0.7761	0.1439	NA	2.0737	1.8554	1.5269	0.5472	NA	0.4677	NA	0.6357	3.5496	NA	0.2631	2.1953	NA	2.6780	NA	3.0612	2.9207	1.6606	NA	NA	0.7479	2.6555	NA	NA
23	0.0035	NA	1.4938	1.2858	0.8192	1.3499	3.3370	NA	1.7869	0.7803	NA	1.3896	2.9610	2.4658	NA	1.0365	NA	NA	0.2076	2.1000	NA	2.8036	3.0560	NA	NA	2.4885	0.2960	NA	0.9258	0.5168
24	NA	NA	1.4549	NA	NA	0.6592	NA	0.9105	0.5013	NA	0.9662	NA	1.0418	NA	NA	NA	NA	NA	2.2322	3.5178	4.9796	NA	3.3268	NA	2.1643	0.2315	NA	0.5308	NA	NA
25	0.8707	0.9037	NA	NA	1.0263	0.1269	NA	1.6857	1.6669	NA	NA	NA	NA	1.0492	0.5294	2.8376	NA	NA	NA	NA	1.1736	NA	NA	NA	0.4002	NA	NA	0.7008	NA	NA
26	NA	0.3685	NA	NA	NA	NA	NA	0.4856	0.4457	0.7765	4.9216	1.8572	NA	0.8955	0.7457	2.2756	2.8958	3.0689	NA	1.7579	2.0970	1.5188	NA	NA	0.8685	1.5769	0.6638	NA	NA	2.0336
27	0.4211	NA	NA	1.8230	3.8003	NA	1.3014	0.7876	NA	1.0129	NA	NA	NA	0.9476	1.4830	0.8910	1.2972	NA	NA	0.5995	1.3712	1.5835	0.3556	1.2123	NA	NA	0.6534	NA	1.2987	0.0811
28	NA	2.8160	2.9015	1.7704	0.9697	NA	NA	NA	NA	0.7887	NA	NA	1.5129	0.3168	1.3774	NA	1.0427	NA	NA	0.9526	1.3991	1.8193	0.9676	1.5180	0.5457	4.8030	0.7179	NA	1.0035	NA
29	5.1894	0.3280	NA	NA	1.4462	1.3799	2.4837	1.2646	NA	1.3021	NA	2.7980	2.1584	2.1784	0.8982	NA	0.3206	1.1618	2.5880	NA	5.1094	4.9391	5.2959	NA	NA	3.3182	0.7553	0.8246	NA	NA
30	1.8468	0.8129	1.0978	2.1707	0.2773	NA	NA	NA	NA	0.0249	4.6652	1.4354	1.0932	0.9115	NA	0.8334	NA	0.3535	NA	0.0423	2.0248	1.1346	1.6623	NA	NA	0.8170	0.6625	NA	0.3665	1.5129
31	1.4759	1.0047	1.5717	2.1463	0.6691	NA	1.4055	NA	NA	0.8182	NA	NA	0.2863	1.7748	NA	1.3238	0.6585	1.8980	NA	NA	NA	1.9066	2.3643	1.1034	NA	1.1555	0.5575	2.1442	0.5861	NA
32	NA	3.1207	2.8231	0.8520	1.4188	NA	NA	2.1267	0.8560	2.3974	4.5289	3.6320	2.5628	3.2403	0.8432	1.2256	1.7486	2.2972	3.6273	0.9128	2.9636	4.1444	5.0573	3.9419	3.3105	3.1011	0.6798	NA	0.7642	NA

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Alpha(j)" AND "a(ij)" COEFFICIENTS, FOR GOOD 2 (30 IMPORTING REGIONS)

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1707	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
01	0.4943	NA	2.8233	0.7576	NA	NA	NA	0.8515	NA	1.4926	NA	NA	NA	NA	1.1019	NA	2.6220	NA	0.1081	1.0169	0.2900	NA	NA	NA	3.0493	NA	NA	NA	NA	NA
02	0.2206	NA	NA	NA	NA	0.3761	0.9459	NA	1.4984	0.3158	2.7899	0.5474	0.6369	4.3648	NA	1.0108	3.0509	NA	5.7133	NA	1.6447	NA	0.1210	NA	5.4030	0.6026	5.3487	NA	NA	0
03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.7873	NA	0.5918	NA	NA	NA	0.5473	NA	2.6301	2.0581	NA	NA	NA	NA	2.5510	NA	1.4806	0.8311	NA	NA
04	NA	NA	1.0573	0.8005	2.9660	NA	NA	NA	NA	NA	NA	NA	1.3037	NA	NA	NA	0.7643	NA	NA	0.9730	NA	NA	NA	NA	NA	NA	1.5560	0.0658	0.2352	NA
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1559	NA	NA	NA	NA	NA	NA	NA	7.1453	1.7637	NA	1.1159	NA	NA	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5747	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.2824	3.1275	7.7087	6.6052	NA	1.8488	NA	0.1510	NA
07	0.5959	NA	0.4614	NA	NA	NA	NA	3.4669	NA	1.4664	2.2458	NA	NA	NA	1.7585	0.5575	1.1863	NA	NA	0.2596	NA	NA	NA	NA	3.0489	NA	NA	0.7489	NA	NA
08	NA	NA	NA	NA	NA	NA	NA	3.0275	NA	0.5776	NA	0.8962	NA	NA	NA	1.0801	1.7046	NA	NA	NA	0.5349	NA	NA	NA	NA	NA	NA	NA	0.6062	NA
11	NA	2.0523	1.5760	1.0501	2.3772	0.6354	NA	NA	NA	0.1572	NA	0.6195	1.1818	2.6471	NA	2.2307	3.6324	0.1607	2.8405	NA	NA	NA	NA	NA	NA	NA	2.3374	NA	NA	NA
12	NA	NA	0.1620	NA	NA	NA	0.0791	NA	NA	0.8423	2.5255	NA	NA	NA	NA	3.2569	9.3004	NA	0.7994	NA	3.6810	0.0762	0.0576	NA	NA	0.3573	3.7130	0.5258	2.7950	NA
13	NA	NA	1.8577	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.0868	0.9320	2.8526	5.0116	NA	NA	0.8310	2.2150	NA	NA	NA	NA	NA	NA	NA	0.2675	NA
14	0.3076	NA	0.5027	NA	NA	NA	NA	NA	3.8928	NA	NA	1.6578	NA	1.4940	NA	0.8147	2.2920	NA	NA	NA	NA	0.5656	NA	NA	NA	NA	2.3416	NA	0.2700	NA
15	0.1211	NA	3.6644	1.0336	1.7673	NA	NA	NA	1.5662	0.9285	NA	NA	NA	NA	NA	0.7983	0.5026	0.1524	2.4202	NA	NA	NA	0.2554	1.4407	1.7762	NA	2.0940	NA	0.1323	NA
16	0.1746	NA	1.0776	NA	0.4315	NA	NA	NA	1.3571	NA	NA	NA	NA	NA	NA	1.3326	NA	NA	NA	NA	NA	0.2505	0.9658	1.1628	3.4217	NA	0.4515	0.0724	1.3615	NA
17	NA	NA	1.3375	NA	NA	NA	NA	0.3027	NA	NA	NA	0.6818	NA	NA	1.3487	1.6315	0.9874	NA	NA	0.6105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	NA	NA	NA	0.9372	NA	NA	NA	NA	1.7746	NA	NA	0.2912	NA	NA	NA	2.1577	2.0517	NA	NA	NA	NA	NA	0.9333	NA	0.1469	NA	3.8925	NA	NA	NA
19	NA	1.5746	NA	0.7473	NA	NA	0.1105	0.3355	0.7195	0.0739	NA	NA	0.7814	NA	NA	NA	NA	0.1488	0.5097	0.7804	NA	0.4611	NA	1.0559	NA	NA	1.7031	0.4389	NA	NA
20	NA	NA	NA	1.1074	NA	NA	NA	NA	NA	0.4898	NA	NA	0.3787	NA	NA	NA	NA	NA	2.3099	NA	NA	NA	0.1862	1.6180	NA	0.3233	1.5618	NA	NA	NA
21	NA	NA	NA	NA	NA	NA	NA	0.6047	NA	NA	NA	NA	0.3149	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.6087	0.4642	NA	0.1950	1.8158	NA	0.6712	NA
22	NA	NA	NA	3.0947	0.5161	NA	0.0445	NA	1.3780	NA	NA	0.4702	NA	NA	NA	0.8035	1.4439	0.1525	NA	NA	NA	NA	0.6657	1.8116	NA	NA	3.3378	NA	0.8886	0
23	NA	2.0359	NA	0.1288	NA	NA	NA	0.5358	NA	NA	NA	NA	NA	2.2860	NA	0.8881	0.5275	NA	0.4115	NA	NA	NA	1.7317	0.2525	NA	NA	1.9233	0.0330	3.1394	0
24	NA	0.4358	1.7190	NA	NA	NA	0.0402	0.3874	NA	NA	NA	2.3975	NA	0.3226	NA	0.3343	NA	NA	0.3097	0.1839	0.3120	NA	NA	NA	NA	NA	2.2569	NA	NA	NA
25	0.3563	NA	NA	NA	NA	NA	0.0093	1.2582	0.1460	NA	0.9115	NA	1.1339	1.6502	NA	NA	1.2245	0.1663	NA	NA	0.1280	NA	NA	0.4186	1.6649	NA	2.2824	0.2323	NA	NA
26	NA	0.9209	NA	0.2439	0.0760	NA	NA	NA	1.7089	NA	0.6500	2.6795	1.1027	0.4444	1.4827	0.4390	1.5383	0.1689	2.8349	1.9472	1.1746	NA	0.7314	NA	2.6930	NA	NA	0.2020	NA	0
27	1.2412	NA	NA	NA	0.8509	4.7373	NA	NA	NA	0.7297	0.7453	NA	NA	NA	NA	NA	NA	NA	3.9154	NA	NA	4.3270	NA	NA	NA	NA	NA	NA	NA	NA
28	NA	NA	0.1012	NA	NA	NA	0.2459	0.9311	1.4363	0.9990	NA	3.3284	NA	NA	NA	1.6388	0.2893	0.1712	0.8542	NA	1.6258	NA	NA	0.5789	1.8174	NA	NA	0.4146	NA	NA
29	2.1476	NA	NA	0.9102	0.1987	NA	NA	2.1420	0.0918	0.7498	1.1780	0.5342	NA	0.0314	2.4796	2.3381	NA	0.1665	1.4765	NA	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
30	1.7122	2.5788	0.8191	1.3249	1.0138	NA	NA	NA	0.5493	NA	0.6065	NA	2.3101	2.4962	NA	1.3628	0.2517	NA	NA	NA	3.1653	NA	NA	NA	1.8337	NA	1.1641	NA	1.3809	NA
31	1.0678	2.3983	3.1976	NA	NA	NA	NA	1.9497	3.2010	NA	NA	NA	0.9769	NA	NA	0.1234	1.2899	NA	NA	NA	0.2396	NA	NA	0.0717	NA	NA	NA	0.5739	NA	NA
32	1.9967	0.1688	2.1657	0.0816	NA	NA	0.5756	0.1575	0.7596	NA	0.4003	NA	0.3544	2.4006	NA	NA	1.9635	NA	NA	2.5237	1.1916	0.1231	0.0326	NA	NA	NA	NA	NA	NA	NA

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Alpha(j)" AND "a(ij)" COEFFICIENTS, FOR GOOD 3 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	0.6098	0.3084	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
01	0.7887	0.3274	1.0361	NA	NA	1.6268	2.1202	NA	NA	NA	0.4890	2.2826	0.6187	NA	NA	1.7873	NA	NA	0.2444	NA	4.4393	8.0916	0.6278	NA	1.3083	NA	1.2930	NA	0.8128	NA
02	NA	0.0868	NA	NA	1.8774	1.6652	2.9586	3.9905	NA	NA	0.2292	0.1887	1.5512	1.1974	NA	NA	NA	NA	NA	2.4905	0.4536	0.6358	3.7292	NA	NA	NA	NA	NA	1.0090	1.0427
03	0.3805	0.3046	NA	NA	NA	NA	2.9589	4.0921	NA	NA	NA	NA	NA	1.2980	NA	NA	NA	2.9864	NA	2.4906	3.6634	NA	NA	NA	NA	NA	NA	NA	NA	NA
04	NA	NA	NA	1.3396	NA	NA	2.8523	4.0930	NA	1.8793	1.2653	0.0415	NA	3.6178	NA	1.7858	5.1075	NA	NA	2.4905	2.2447	NA	4.4119	0.1998	NA	NA	NA	NA	1.7612	1.5975
05	NA	NA	NA	NA	NA	NA	2.9461	4.0915	NA	NA	0.7064	NA	0.1739	0.3993	NA	1.7042	NA	2.9804	5.2222	2.4905	1.7909	2.4864	5.4953	1.6621	NA	NA	NA	NA	1.3733	0.5682
06	NA	NA	NA	NA	NA	NA	2.9589	4.0883	NA	3.4391	3.6656	2.5241	2.8001	3.5465	NA	2.2562	4.4643	NA	NA	2.3222	NA	2.0889	3.7467	2.0623	2.8090	3.9252	1.7210	NA	0.5304	0.6583
07	NA	NA	0.5122	0.5848	NA	0.7735	2.9589	4.0342	1.8674	NA	0.8033	NA	NA	NA	0.2194	1.5427	1.7942	NA	1.2786	1.2717	1.1030	0.3653	1.1260	NA	1.7911	NA	NA	NA	NA	0.3264
08	NA	NA	NA	NA	NA	NA	2.9061	4.0508	0.8650	0.8595	NA	2.7167	0.6526	NA	0.9331	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.7892	NA	NA	0.5672	NA
11	0.1374	NA	NA	0.6285	NA	NA	2.7205	4.0908	0.9028	3.7025	1.8000	NA	NA	0.7958	NA	0.2876	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8618	NA
12	NA	NA	NA	NA	0.1442	NA	NA	NA	NA	NA	NA	0.8840	0.4573	NA	NA	1.6847	2.2707	2.7811	NA	NA	NA	0.1916	NA	NA	NA	NA	NA	NA	NA	NA
13	NA	NA	NA	NA	1.3313	1.3177	2.9588	4.0921	1.3799	1.1287	NA	0.6242	NA	NA	0.9090	NA	NA	NA	NA	2.4905	0.2613	1.3288	NA	NA	1.0706	NA	NA	NA	NA	NA
14	NA	NA	NA	NA	NA	NA	2.9582	4.0745	NA	NA	1.3674	0.6466	NA	NA	NA	1.3454	1.4891	NA	NA	2.4902	NA	NA	0.3353	0.8527	0.2944	5.4082	0.4846	NA	NA	0.2112
15	NA	NA	1.3377	NA	NA	NA	2.9589	4.0933	NA	1.7251	NA	NA	NA	NA	NA	2.3252	0.2573	2.6527	NA	2.4905	NA	NA	NA	NA	NA	NA	1.1693	NA	NA	NA
16	NA	NA	2.0542	1.9672	1.3226	NA	2.9589	4.0891	2.7599	NA	NA	1.5521	1.1189	2.6260	1.0744	NA	0.1817	2.2487	3.9971	2.4905	7.0997	2.1580	0.7165	3.0250	0.9260	NA	2.8415	NA	3.1094	1.9573
17	NA	NA	NA	NA	NA	NA	2.9492	4.0935	NA	0.5511	NA	NA	NA	NA	NA	2.0059	NA	NA	3.7378	2.4905	2.0364	0.1200	NA	NA	NA	4.8069	NA	NA	NA	NA
18	NA	0.2267	0.5946	0.4840	NA	1.5469	2.9589	4.0920	0.5100	1.9833	NA	NA	0.5067	0.7562	0.5096	1.7153	NA	2.9044	0.5800	2.4905	NA	NA	NA	1.5841	NA	0.1754	NA	NA	NA	NA
19	NA	0.2686	1.0719	NA	NA	NA	2.9589	3.9817	3.3028	3.3651	1.4141	0.8822	2.6844	1.3587	0.3938	NA	NA	2.7781	1.2650	2.4905	3.5682	0.4145	NA	2.7212	NA	NA	NA	NA	2.7555	2.8789
20	NA	NA	2.4972	NA	NA	NA	NA	2.1078	1.0699	NA	NA	NA	NA	NA	NA	2.2459	NA	2.7158	NA	2.4905	NA	NA	1.2188	NA	NA	NA	NA	NA	NA	0.1406
21	NA	NA	NA	1.9047	0.6363	3.1621	NA	NA	NA	0.7729	NA	NA	NA	NA	NA	1.0750	NA	2.7433	0.0396	2.4905	0.2625	NA	NA	NA	NA	2.2272	2.2743	NA	NA	NA
22	NA	0.2324	NA	0.7551	NA	NA	2.9589	4.0599	1.1266	1.5300	2.0499	0.0631	NA	NA	2.0836	NA	1.1969	2.7662	NA	2.4905	3.0139	NA	0.0480	NA	0.0071	NA	0.6990	0.2735	1.2199	NA
23	0.4836	NA	1.4013	0.4809	0.5910	NA	NA	4.0906	NA	2.4047	4.1166	NA	2.0495	2.8235	0.5497	0.6977	NA	2.7178	1.3289	2.4900	4.1901	NA	0.9685	NA	NA	NA	0.1380	1.1646	4.0188	NA
24	NA	NA	NA	1.7241	0.6734	NA	2.9589	0.4608	3.1449	NA	0.9524	NA	2.9573	NA	NA	NA	NA	NA	4.8948	NA	NA	NA	NA	NA	0.2448	NA	1.6077	NA	1.0820	NA
25	NA	0.2602	1.4645	0.3716	1.6756	1.1403	1.9757	NA	0.7647	NA	1.6256	0.5359	0.3426	0.7099	NA	0.5327	1.1514	2.9417	0.8837	2.4901	NA	NA	1.4942	0.7455	1.5567	1.9455	NA	NA	0.3009	NA
26	NA	0.2959	NA	NA	NA	0.3354	2.2660	NA	NA	NA	NA	NA	2.7502	2.9975	NA	2.9317	0.1462	2.9244	0.0861	2.4905	NA	NA	NA	1.4055	2.2772	NA	3.2144	NA	NA	NA
27	NA	0.2498	0.8530	NA	NA	0.0601	NA	NA	0.7137	NA	NA	1.1437	NA	NA	1.1109	NA	0.4694	NA	NA	2.4905	1.1788	2.2545	0.9353	0.6405	1.2786	4.9353	NA	1.0140	NA	NA
28	0.5728	NA	NA	NA	NA	2.5959	2.9578	NA	0.4682	NA	2.2875	0.2817	1.9440	0.8368	0.0699	0.1188	1.6749	NA	NA	2.4906	NA	NA	0.8008	NA	1.7216	NA	NA	2.2940	NA	0.6429
29	NA	NA	0.0405	NA	NA	NA	2.9588	4.0940	0.9400	NA	NA	NA	4.4915	1.9759	0.2494	NA	1.1365	2.9990	NA	2.4906	2.3992	1.3387	NA	NA	NA	2.5077	1.[illegible]794	4.4745	NA	NA
30	NA	0.2935	NA	NA	NA	NA	2.9571	4.0945	2.6168	NA	0.4375	0.6654	0.4100	NA	1.4844	NA	0.9399	NA	1.5423	NA	2.7707	0.1277	NA	NA	NA	1.1714	NA	NA	NA	0.7599
31	NA	0.0297	NA	NA	NA	NA	2.9588	4.0828	2.0364	NA	NA	1.1199	1.5933	0.3885	1.0648	0.9818	0.9531	NA	2.8725	2.4904	NA	NA	0.5326	0.2897	NA	4.1113	NA	NA	NA	0.6339
32	0.5423	NA	NA	NA	NA	NA	2.9589	4.0928	7.4404	NA	0.9749	3.8327	2.5454	2.6823	0.4236	0.6234	2.7703	NA	NA	2.4905	NA	2.3217	1.5159	NA	1.9275	3.2671	NA	NA	NA	NA

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Alpha(j)" AND "a(ij)" COEFFICIENTS, FOR GOOD 4 (30 IMPORTING REGIONS)

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.2868	NA	NA	NA	2.1360	5.5601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
01	NA	NA	NA	0.3728	1.5820	0.7329	NA	1.1114	NA	NA	0.5113	NA	0.7598	1.1109	0.5185	3.0220	2.4952	NA	NA	4.4019	NA	0.6836	0.4587	NA	1.4138	NA	NA	0.7590	0.7718	1.5718
02	NA	1.2361	NA	1.7329	NA	NA	1.7171	0.8301	1.0889	1.3118	NA	NA	NA	1.0164	0.7281	NA	1.8084	1.1363	NA	0.8560	NA	0.2865	NA	0.1582	1.8495	1.6962	0.7785	NA	NA	0.2709
03	NA	0.3539	NA	NA	NA	NA	0.1522	NA	NA	NA	0.4688	0.8538	2.2287	5.7441	NA	NA	0.0651	NA	0.8618	1.8109	3.2096	1.8368	NA	0.6188	1.1415	NA	5.5794	3.1810	3.9737	4.7927
04	NA	NA	3.8486	5.1322	4.2357	NA	0.4863	NA	NA	0.7496	2.4001	NA	2.7304	3.4312	NA	1.5591	3.6137	NA	1.3677	NA	0.2768	0.9795	3.3903	NA	NA	1.3578	2.7730	2.9846	NA	2.6670
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4174	0.1130	NA	NA	NA	NA	1.2951	0.0368	NA	0.5387	4.9920	NA	NA	2.3664	2.8053	3.1700	NA	3.3396
06	NA	NA	NA	NA	NA	NA	2.6466	NA	1.0363	2.9796	1.0722	0.8590	NA	NA	NA	0.0138	0.3457	2.5894	NA	NA	NA	NA	NA	NA	NA	2.2927	7.6629	2.1397	2.7645	NA
07	NA	2.7395	NA	1.0247	0.5975	1.6355	NA	2.4824	0.4078	1.7410	1.7103	1.7519	0.1884	0.2830	1.5018	NA	NA	NA	1.0318	1.5643	1.6535	3.3469	0.0936	0.9429	1.9344	0.7858	NA	1.1805	2.0001	2.0634
08	0.0722	0.8532	NA	NA	NA	NA	0.1640	2.2999	0.4623	0.3422	NA	NA	NA	0.6272	1.0115	NA	NA	0.5245	1.4189	NA	2.1618	0.6819	0.2220	0.9772	0.4582	NA	NA	NA	2.1936	2.3643
11	NA	NA	NA	NA	0.3340	NA	NA	NA	1.4090	0.4047	0.9639	2.7349	NA	0.6255	NA	0.6882	1.8442	NA	3.0549	1.3839	NA	3.2845	NA	NA	NA	0.4528	0.2441	NA	4.3677	NA
12	NA	NA	NA	NA	0.5349	0.5180	0.7491	NA	0.5881	NA	NA	NA	0.1611	NA	NA	NA	NA	NA	2.6368	NA	0.8586	0.6554	0.2302	0.2093	NA	NA	0.5059	NA	0.5070	NA
13	0,2698	NA	1.3792	0.9364	0.1062	1.8052	0.6264	1.9737	5.5326	0.9081	0.8332	2.9298	1.5231	0.9591	1.2739	NA	0.8677	NA	1.1322	3.6860	0.8244	2.0351	1.0476	0.3249	1.0210	3.2621	NA	NA	1.5870	0.8374
14	NA	NA	2.3624	NA	0.7881	1.8060	NA	NA	NA	0.9744	NA	NA	0.9787	0.3199	0.1745	NA	NA	0.1194	NA	2.6133	0.6539	NA	NA	1.1695	NA	1.9463	0.8151	0.4937	0.7469	NA
15	0.7593	0.5202	0.8027	NA	0.6999	1.4473	1.9119	NA	2.7115	2.2054	1.8013	1.9144	1.3219	NA	NA	NA	2.5735	0.3645	0.6982	NA	0.9013	0.8552	0.2182	NA	NA	NA	NA	NA	0.4538	0.7590
16	0.4943	4.7608	0.8984	0.8906	0.9169	0.2316	NA	NA	5.8875	1.5179	1.7830	4.3932	1.3465	NA	1.2029	1.2217	2.7558	1.8000	7.7472	4.4518	NA	3.6478	2.2990	3.9946	0.2457	0.7582	1.5191	1.9238	1.1681	1.9493
17	NA	NA	2.5633	2.5764	2.6325	2.7554	0.4786	NA	NA	NA	1.0535	0.2124	NA	0.7013	NA	NA	NA	NA	NA	NA	0.0666	2.0633	0.3813	NA	0.0321	NA	0.6066	NA	NA	NA
18	NA	0.4136	NA	NA	0.8258	1.0461	0.5195	NA	0.8348	0.7995	1.4726	4.9880	2.9298	NA	0.7956	0.2889	3.0787	1.0876	NA	1.5400	1.1463	1.3014	NA	0.8363	0.3940	NA	0.3041	NA	0.2067	NA
19	NA	1.0708	NA	1.8008	NA	NA	NA	NA	3.8933	NA	NA	0.8928	1.9690	1.4053	NA	NA	1.4807	5.1605	NA	5.3229	NA	2.4245	NA	NA	1.3620	1.5590	2.1874	NA	0.0573	2.9950
20	0.3743	0.8439	NA	5.4172	1.9075	2.7506	1.7982	0.4831	NA	0.2813	0.3213	NA	NA	0.4945	NA	NA	2.1309	NA	2.4458	NA	NA	0.2152	NA	2.7030	0.6141	1.3499	1.4313	NA	0.7690	NA
21	NA	0.2827	NA	0.6930	1.2032	NA	NA	2.2064	4.1812	0.2709	1.4179	5.8118	NA	1.0009	0.7221	1.0279	3.0449	1.4079	2.8792	0.1219	NA	3.5459	0.1110	NA	NA	NA	1.1544	0.7838	NA	0.4526
22	NA	NA	NA	NA	1.0821	NA	0.3838	0.8879	0.0019	1.2025	0.9757	NA	1.4761	0.2825	0.3753	1.9943	NA	NA	2.3446	0.1683	2.0651	0.2748	0.4634	0.8657	1.4711	NA	NA	NA	NA	3.3749
23	2.1876	2.4818	0.4373	0.8401	1.5845	0.3065	0.2448	NA	4.4666	1.6007	NA	NA	3.1693	1.9155	1.0174	1.8648	2.0314	2.6407	2.2056	NA	1.9759	0.5110	1.2174	NA	NA	0.9107	0.7678	1.0260	1.7035	NA
24	NA	NA	NA	1.0394	0.9347	NA	0.0466	2.3284	0.8651	0.5078	NA	NA	0.2295	NA	NA	0.9734	NA	0.5942	1.7376	0.6608	1.2602	NA	NA	NA	0.3167	0.0876	1.5901	0.2996	NA	NA
25	0.6245	NA	NA	NA	NA	1.0111	0.0608	1.1644	0.1653	NA	0.6671	NA	NA	0.5582	1.1005	1.7860	1.4810	NA	NA	NA	NA	NA	NA	NA	NA	3.0452	NA	0.6247	1.4851	0.5941
26	2.7444	0.9020	NA	1.2652	0.4527	0.6446	1.5424	0.0446	1.3386	1.0140	NA	2.1110	NA	1.5280	0.5142	NA	NA	0.8126	0.8529	3.1000	1.3825	3.8484	NA	2.2838	0.9944	2.7350	0.8564	1.3632	NA	1.2708
27	0.0896	NA	4.1252	3.1266	2.8119	0.7434	0.1366	0.0372	4.0614	NA	1.7342	NA	1.7308	0.6739	0.9932	NA	0.7783	NA	1.6801	1.1548	0.6634	1.7787	NA	0.5437	NA	NA	NA	1.1503	1.4351	0.9482
28	0.9592	0.1529	1.1819	0.4938	0.5647	NA	1.7966	1.6269	0.9775	0.7517	NA	1.5195	1.1378	3.0183	NA	NA	4.0491	2.0259	1.6332	1.1550	2.1433	1.3975	2.1794	3.7124	0.7786	NA	NA	NA	0.3600	0.5622
29	3.5803	NA	NA	0.8903	1.5533	NA	NA	NA	NA	0.6975	2.3964	1.2257	1.8422	NA	1.5328	1.8897	0.6043	0.8413	4.9125	0.4484	1.7459	4.1605	3.9445	3.1537	1.8436	NA	0.3870	2.0812	2.2873	1.1964
30	1.2408	0.8647	0.4694	0.4896	NA	NA	NA	NA	0.6351	NA	NA	NA	NA	NA	1.8334	1.9894	2.2921	0.2454	0.7367	1.3813	NA	2.9345	2.1924	NA	NA	NA	NA	NA	5.3269	NA
31	1.7894	NA	NA	0.2073	NA	0.8762	NA	NA	0.9254	NA	NA	NA	0.3556	NA	0.4930	0.8972	NA	1.5822	NA	NA	NA	0.9967	1.8167	NA	NA	NA	4.0734	3.9282	NA	NA
32	NA	1.7159	NA	1.5918	0.2931	1.3279	NA	NA	1.8031	0.5550	1.6284	3.5952	2.0039	1.1615	0.8607	NA	3.1417	3.7390	1.0298	3.0809	NA	1.8949	2.1104	NA	NA	NA	NA	NA	0.4240	NA

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Alpha(j)" AND "a(ij)" COEFFICIENTS, FOR GOOD 5 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Alpha(j)	NA	NA	NA	NA	NA	1.7195	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8216	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
01	NA	NA	NA	NA	2.1887	NA	0.4278	2.3575	1.0188	NA	NA	0.4930	NA	NA	NA	NA	0.1484	NA	NA	NA	NA	NA	0.2562	NA	0.5361	0.2163	NA	1.7747	1.3620	3.1446
02	NA	NA	NA	NA	NA	NA	NA	1.0097	3.4018	NA	NA	0.0093	0.7771	1.4196	6.1854	0.8669	0.9885	NA	NA	NA	0.7576	NA	0.5453	1.1208	1.5481	NA	0.0950	NA	0.6087	0.3843
03	0.6365	NA	NA	NA	NA	NA	0.7271	NA	NA	2.0046	NA	NA	0.5495	1.9903	NA	0.6196	1.8498	1.6810	NA	4.9300	2.7264	NA	1.6152	0.2582	0.4390	NA	NA	NA	NA	4.7970
04	0.9279	NA	4.4888	4.5789	NA	1.6822	NA	NA	NA	4.7397	NA	0.1808	NA	NA	NA	1.9198	0.5029	1.4227	NA	1.4592	NA	NA	NA	NA	NA	1.1460	0.8416	NA	NA	NA
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.0853	NA	NA	NA	1.9174	NA	0.2417	1.8780	1.5076	4.3086	3.2430	NA	0.9962	NA	NA	1.7983	0.3519	NA	NA	0.8548	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.1456	NA	NA	NA	NA	3.7779	NA	2.3476	NA	NA	NA	0.6851	NA	NA	0.1388	NA	NA	0.7048	NA	NA	2.9783
07	NA	0.8742	NA	3.4982	1.8287	NA	1.3093	2.4740	NA	NA	3.3771	1.4640	1.2465	0.0516	5.7351	0.3991	NA	1.7283	0.5200	0.6800	0.3101	NA	NA	3.2120	0.7593	3.0638	NA	NA	NA	NA
08	0.9980	NA	1.7594	NA	NA	1.3996	0.6420	1.0626	0.1608	NA	0.1073	NA	NA	1.0268	NA	NA	1.2241	NA	0.2192	2.0228	NA	1.2599	NA	1.8687	0.9489	0.6293	1.4149	1.6272	NA	1.9996
11	0.5395	NA	0.0823	NA	NA	NA	NA	0.9682	NA	NA	1.7858	2.6964	NA	1.2971	NA	2.1559	3.2888	NA	NA	NA	1.0889	0.3901	NA	NA	NA	NA	NA	NA	NA	0.5459
12	NA	NA	1.0594	1.7250	NA	NA	NA	NA	1.0180	0.4493	0.2419	NA	NA	NA	3.7371	NA	0.3709	NA	0.8298	2.1503	0.6742	NA	NA	NA	NA	0.2794	NA	0.1494	NA	NA
13	NA	3.8423	NA	1.5431	NA	NA	1.1319	NA	0.0572	NA	0.9565	NA	1.1167	2.0892	0.6400	2.1594	4.6664	NA	NA	NA	NA	0.4324	1.9365	0.4391	0.2404	1.4817	0.9281	0.0296	0.1000	1.2131
14	NA	2.0006	NA	NA	NA	NA	0.2575	NA	0.7196	NA	NA	1.4698	NA	NA	3.9512	1.8353	1.5878	NA	1.5170	NA	NA	NA	NA	1.3939	NA	NA	NA	0.8093	NA	2.2407
15	1.5928	3.3944	NA	2.4831	NA	NA	0.1233	0.7824	NA	NA	NA	3.1665	0.1974	NA	6.1122	0.3025	NA	2.0210	NA	NA	NA	NA	NA	1.2857	1.4950	3.3239	NA	NA	0.4998	NA
16	5.1868	NA	1.7822	2.4060	NA	NA	NA	4.4835	1.7964	3.8477	3.1101	2.8778	4.2134	5.6063	5.6396	2.6445	NA	1.7903	4.1995	3.6928	2.5188	6.9511	3.4355	4.3293	3.0790	6.2195	NA	5.3832	1.3704	2.1928
17	2.3688	2.8054	0.4136	0.6491	NA	NA	NA	1.3891	NA	NA	NA	0.9848	NA	NA	0	0.1673	NA	NA	0.9492	NA	NA	NA	0.3497	0.6602	0.7069	1.1226	NA	NA	NA	NA
18	NA	NA	1.2016	0.9594	NA	1.6073	1.1872	2.6515	NA	1.6911	0.6110	2.5418	NA	1.6941	4.5457	2.0249	0.3684	2.0033	NA	NA	NA	1.4765	NA	1.8659	NA	NA	0.1176	NA	NA	NA
19	1.0741	NA	NA	NA	NA	1.3036	0.4933	2.9213	2.4896	NA	NA	1.5176	0.6425	NA	2.0110	NA	0.3547	1.7139	1.2586	1.9798	0.5501	2.1788	NA	3.8573	0.8798	0.4305	1.0444	NA	NA	NA
20	NA	NA	0.5338	0.2723	NA	NA	NA	0.7171	NA	NA	NA	NA	NA	NA	NA	3.7165	0.2740	1.9073	0.3638	NA	1.4115	0.9069	0.8871	NA	NA	0.5432	0.7864	0.5150	0.8102	1.6893
21	NA	0.5389	NA	NA	NA	NA	1.6648	1.9162	1.6801	1.6259	2.6000	0.6242	NA	NA	NA	NA	NA	1.2845	0.3481	NA	NA	1.0867	3.0127	0.6940	0.8007	NA	2.0562	NA	NA	NA
22	NA	NA	0.5737	1.3870	NA	0.3753	0.7779	3.3688	0.8830	1.6054	1.0466	0.5467	0.1631	0.8264	NA	2.1093	NA	2.0503	4.0932	2.4603	0.1513	NA	1.6046	NA	NA	1.2236	0.9368	0.3724	0.4798	0.1759
23	1.6998	0.1429	3.5562	0.5584	NA	1.5802	0.0145	1.3803	0.5002	1.2338	1.6133	1.0208	1.0177	1.8108	NA	3.6746	2.7164	NA	3.2452	2.5140	2.7179	0.3348	0.6649	0.3767	0.2559	NA	0.0861	0.9783	NA	2.1725
24	NA	NA	0.1191	2.6814	NA	1.3228	NA	0.7613	0.3237	NA	NA	NA	NA	1.1213	NA	NA	1.6599	NA	3.5984	3.2689	1.1859	NA	0.7453	0.2825	1.5279	NA	NA	NA	2.1330	2.9481
25	NA	NA	NA	NA	NA	NA	1.4704	1.3343	NA	1.1108	NA	NA	NA	NA	NA	NA	NA	1.2665	NA	NA	0.5450	NA	0.6805	NA	NA	NA	NA	NA	0.4895	1.0637
26	NA	2.6487	0.3290	0.8194	NA	1.4676	0.6596	0.3707	0.3694	NA	2.9209	2.2696	NA	NA	6.7454	1.1462	NA	2.0737	0.8015	NA	NA	4.2915	NA	NA	1.2074	0.3401	NA	NA	NA	1.1915
27	1.1883	5.1338	4.3773	3.9278	NA	1.5900	4.4572	NA	NA	NA	0.3060	4.0915	1.1554	1.6446	NA	2.6773	2.1250	NA	NA	2.9323	1.6607	0.2718	0.1461	1.0869	NA	0.8895	NA	1.2087	1.1114	NA
28	NA	NA	NA	NA	NA	NA	NA	0.6881	NA	NA	NA	1.4619	0.3601	0.0154	4.6147	NA	NA	1.7782	0.4687	NA	NA	NA	NA	2.0304	1.4235	NA	0.3263	NA	NA	NA
29	2.8207	NA	NA	3.5295	NA	NA	2.4581	NA	2.9116	NA	2.6730	2.3955	2.3727	0.8140	3.8511	1.8037	5.3258	1.6667	2.4267	1.2202	1.0547	3.6278	1.2655	NA	NA	7.7500	1.3597	1.7001	4.0159	0.7396
30	0.7777	1.7388	1.2283	0.8463	NA	1.2915	NA	NA	2.5211	NA	1.5521	NA	NA	2.7194	6.2006	NA	1.6114	NA	NA	NA	NA	NA	2.9937	NA	1.0076	NA	NA	0.9721	0.6420	1.3143
31	NA	1.5211	2.6280	NA	NA	1.7045	NA	1.5027	NA	NA	NA	NA	0.7368	0.1495	5.7453	NA	0.4018	1.6491	1.8375	NA	NA	0.5453	NA	NA	0.7696	NA	1.3356	2.1089	NA	0.9696
32	0.4370	NA	0.0735	0.3075	NA	NA	1.2470	1.1055	1.4110	2.4529	3.1400	2.6177	3.0566	1.4839	1.9772	1.1508	1.5898	1.7390	NA	NA	1.4547	1.3455	2.7915	NA	1.3557	NA	0.0363	3.3662	1.7651	NA

APPENDIX 7.3

30 TABLES OF ELASTICITY ESTIMATES FOR GOOD 1

30 IMPORTING REGIONS

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 01 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 01 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	-10.21	0	0	0	0.0250	0.0111	0.0838	0.0433	0.1166	0	0.0489	0	0.0197	0.0279	0.1274	0.0948	0	0.0002	0	0.0256	0	0.0164	0	0.3726	0.5452	0.0580	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0.0915	0	0	0	-6.961	0.0279	0.2102	0.1085	0.2925	0	0.1227	0	0.0495	0.0701	0.3195	0.2379	0	0.0006	0	0.0642	0	0.0412	0	0.9347	1.3676	0.1455	0
11	0	0	0	0.2198	0	0	0	0.1506	-3.061	0.5050	0.2609	0.7029	0	0.2948	0	0.1190	0.1686	0.7677	0.5717	0	0.0015	0	0.1543	0	0.0990	0	2.2458	3.2858	0.3497	0
12	0	0	0	1.0514	0	0	0	0.7207	0.3210	-21.12	1.2478	3.3618	0	1.4099	0	0.5693	0.8065	3.6718	2.7344	0	0.0072	0	0.7379	0	0.4738	0	10.740	15.714	1.6728	0
13	0	0	0	0.8945	0	0	0	0.6131	0.2731	2.0548	-11.10	2.8599	0	1.1994	0	0.4843	0.6861	3.1236	2.3262	0	0.0061	0	0.6277	0	0.4031	0	9.1370	13.368	1.4230	0
14	0	0	0	0.0000	0	0	0	0.0000	0.0000	0.0000	0.0000	-32.76	0	0.0000	0	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	5.2018	0	0	0	3.5653	1.5882	11.949	6.1732	16.631	0	-6.766	0	2.8166	3.9900	18.165	13.527	0	0.0357	0	3.6508	0	2.3443	0	53.134	77.741	8.2755	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0.4969	0	0	0	0.3405	0.1517	1.1415	0.5897	1.5887	0	0.6663	0	-5.279	0.3811	1.7352	1.2923	0	0.0034	0	0.3487	0	0.2239	0	5.0758	7.4265	0.7905	0
19	0	0	0	0.2780	0	0	0	0.1905	0.0849	0.6388	0.3300	0.8890	0	0.3728	0	0.1505	-7.647	0.9710	0.7231	0	0.0019	0	0.1951	0	0.1253	0	2.8404	4.1559	0.4423	0
20	0	0	0	0.0258	0	0	0	0.0177	0.0078	0.0593	0.0306	0.0826	0	0.0346	0	0.0139	0.0198	-35.69	0.0672	0	0.0001	0	0.0181	0	0.0116	0	0.2639	0.3862	0.0411	0
21	0	0	0	0.0000	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	-26.65	0	0.0000	0	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0.0010	0	0	0	0.0007	0.0003	0.0024	0.0012	0.0033	0	0.0014	0	0.0005	0.0008	0.0036	0.0027	0	-0.070	0	0.0007	0	0.0004	0	0.0106	0.0156	0.0016	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0.0240	0	0	0	0.0164	0.0073	0.0551	0.0285	0.0768	0	0.0322	0	0.0130	0.0184	0.0839	0.0624	0	0.0001	0	-7.175	0	0.0108	0	0.2454	0.3591	0.0382	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0.0000	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	0.0000	0	2E-10	0	0.0000	0	-4.618	0	0.0000	0.0000	0.0000	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0.0000	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0	0.0000	0	-104.6	0.0000	0.0000	0
30	0	0	0	0.0000	0	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0.0000	0.0000	0.0000	0	0.0000	0	0.0000	0	0.0000	0	0.0000	-153.1	0.0000	0
31	0	0	0	1.9263	0	0	0	1.3203	0.5881	4.4250	2.2860	6.1587	0	2.5830	0	1.0430	1.4775	6.7267	5.0095	0	0.0132	0	1.3519	0	0.8681	0	19.676	28.788	-13.23	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WP(1)	0	0	0	-10.21	0	0	0	-6.961	-3.061	-21.12	-11.10	-32.76	0	-6.766	0	-5.279	-7.647	-35.69	-26.65	0	-0.070	0	-7.175	0	-4.618	0	-104.6	-153.1	-13.23	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 02 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 02 FROM PARTNERS 01–32.																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-7.194	0	0	2.5782	2.3030	0	8E+07	0	11.825	0	0.4676	0	0	14.085	0	0	0	0	0	19.804	0	0	26.740	1E+06	0	594.21	3.2935	1E+07	20.418	9.3639
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0.0735	0	0	-3.839	0.0116	0	*****	0	0.0598	0	0.0023	0	0	0.0712	0	0	0	0	0	0.1001	0	0	0.1352	6743.0	0	3.0051	0.0166	69605.	0.1032	0.0473
05	0.9243	0	0	0.1637	-3.295	0	5E+06	0	0.7511	0	0.0297	0	0	0.8947	0	0	0	0	0	1.2579	0	0	1.6986	84694.	0	37.745	0.2092	*****	1.2970	0.5948
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0.2575	0	0	0.0456	0.0407	0	*****	0	0.2093	0	0.0082	0	0	0.2493	0	0	0	0	0	0.3505	0	0	0.4733	23603.	0	10.519	0.0583	*****	0.3614	0.1657
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	2.8160	0	0	0.4989	0.4456	0	1E+07	0	-15.38	0	0.0904	0	0	2.7258	0	0	0	0	0	3.8326	0	0	5.1750	*****	0	114.99	0.6373	3E+06	3.9514	1.8121
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0.2159	0	0	0.0382	0.0341	0	1E+06	0	0.1754	0	-0.691	0	0	0.2089	0	0	0	0	0	0.2938	0	0	0.3967	19783.	0	8.8168	0.0488	*****	0.3029	0.1389
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	1.5559	0	0	0.2756	0.2462	0	8E+06	0	1.2644	0	0.0500	0	0	-19.54	0	0	0	0	0	2.1175	0	0	2.8592	*****	0	63.537	0.3521	1E+06	2.1832	1.0012
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.1144	0	0	0.0202	0.0181	0	*****	0	0.0930	0	0.0036	0	0	0.1108	0	0	0	0	0	-29.43	0	0	0.2103	10488.	0	4.6743	0.0259	*****	0.1606	0.0736
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0.1286	0	0	0.0227	0.0203	0	*****	0	0.1045	0	0.0041	0	0	0.1245	0	0	0	0	0	0.1750	0	0	-39.72	11786.	0	5.2529	0.0291	*****	0.1804	0.0827
26	0.0045	0	0	0.0008	0.0007	0	23603.	0	0.0036	0	0.0001	0	0	0.0043	0	0	0	0	0	0.0061	0	0	0.0083	*****	0	0.1848	0.0010	4282.4	0.0063	0.0029
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0.2183	0	0	0.0386	0.0345	0	1E+06	0	0.1774	0	0.0070	0	0	0.2113	0	0	0	0	0	0.2971	0	0	0.4012	20005.	0	-879.0	0.0494	*****	0.3063	0.1404
29	0.0489	0	0	0.0086	0.0077	0	*****	0	0.0397	0	0.0015	0	0	0.0473	0	0	0	0	0	0.0666	0	0	0.0899	4484	0	1.9983	-4.910	46286.	0.0686	0.0314
30	0.0467	0	0	0.0082	0.0073	0	*****	0	0.0379	0	0.0015	0	0	0.0452	0	0	0	0	0	0.0636	0	0	0.0858	4282.4	0	1.9085	0.0105	*****	0.0655	0.0300
31	0.1870	0	0	0.0331	0.0296	0	*****	0	0.1520	0	0.0060	0	0	0.1810	0	0	0	0	0	0.2545	0	0	0.3437	17140.	0	7.6390	0.0423	*****	-30.25	0.1203
32	0.6020	0	0	0.1066	0.0952	0	3E+06	0	0.4892	0	0.0193	0	0	0.5827	0	0	0	0	0	0.8194	0	0	1.1063	55166.	0	24.585	0.1362	*****	0.8448	-13.60
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980

FOR BILATERAL SEABORNE IMPORTS OF REGION 03 FROM PARTNER i

WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 03 FROM PARTNERS 01–32.																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	NA	NA	NA	NA	0	0	-1.158	0.3031	0	0.2645	0	0	0	0	0	0	0	0	0.2353	0.3420	0	0	0	1.2885	0	1.5362	0.2104	0.4063
12	0	0	NA	NA	NA	NA	0	0	0.5106	-1.563	0	0.8670	0	0	0	0	0	0	0	0	0.7713	1.1210	0	0	0	4.2228	0	5.0348	0.6895	1.3317
13	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	NA	NA	NA	NA	0	0	0.0718	0.1397	0	-2.109	0	0	0	0	0	0	0	0	0.1084	0.1576	0	0	0	0.5938	0	0.7079	0.0969	0.1872
15	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	NA	NA	NA	NA	0	0	0.2227	0.4333	0	0.3781	0	0	0	0	0	0	0	0	-1.648	0.4889	0	0	0	1.8417	0	2.1958	0.3007	0.5808
24	0	0	NA	NA	NA	NA	0	0	0.0533	0.1038	0	0.0906	0	0	0	0	0	0	0	0	0.0806	-2.768	0	0	0	0.4415	0	0.5264	0.0721	0.1392
25	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	NA	NA	NA	NA	0	0	0.0241	0.0469	0	0.0409	0	0	0	0	0	0	0	0	0.0364	0.0529	0	0	0	-10.66	0	0.2377	0.0325	0.0628
29	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	NA	NA	NA	NA	0	0	0.0263	0.0513	0	0.0448	0	0	0	0	0	0	0	0	0.0398	0.0579	0	0	0	0.2182	0	-12.69	0.0356	0.0688
31	0	0	NA	NA	NA	NA	0	0	0.0803	0.1563	0	0.1364	0	0	0	0	0	0	0	0	0.1214	0.1764	0	0	0	0.6646	0	0.7924	-1.666	0.2096
32	0	0	NA	NA	NA	NA	0	0	0.1690	0.3290	0	0.2870	0	0	0	0	0	0	0	0	0.2554	0.3711	0	0	0	1.3982	0	1.6671	0.2283	-2.986
WP(1)	0	0	NA	NA	NA	NA	0	0	-1.158	-1.563	0	-2.109	0	0	0	0	0	0	0	0	-1.648	-2.768	0	0	0	-10.66	0	-12.69	-1.666	-2.986

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 04 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 04 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-386.3	0	NA	0	NA	NA	8.0236	7.3629	1.7435	3.5790	0	0.3899	6.6514	0.1752	1.4051	1.3616	0	0	0.8084	836.42	32.887	0	0	0	*****	14.909	0	22.956	3.3806	0.7094
02	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
04	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07	101.32	0	NA	0	NA	NA	-32.97	8.1404	1.9276	3.9569	0	0.4310	7.3537	0.1937	1.5535	1.5054	0	0	0.8937	924.74	36.360	0	0	0	*****	16.484	0	25.381	3.7376	0.7843
08	23.922	0	NA	0	NA	NA	2.0944	-36.48	0.4551	0.9342	0	0.1017	1.7362	0.0457	0.3667	0.3554	0	0	0.2110	218.33	8.5846	0	0	0	*****	3.8919	0	5.9924	0.8824	0.1851
11	89.483	0	NA	0	NA	NA	7.8343	7.1892	-7.391	3.4945	0	0.3807	6.4944	0.1711	1.3720	1.3295	0	0	0.7893	816.68	32.111	0	0	0	*****	14.557	0	22.415	3.3009	0.6926
12	24.424	0	NA	0	NA	NA	2.1383	1.9623	0.4646	-17.71	0	0.1039	1.7726	0.0467	0.3744	0.3628	0	0	0.2154	222.91	8.7648	0	0	0	*****	3.9735	0	6.1182	0.9009	0.1890
13	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	4.1672	0	NA	0	NA	NA	0.3648	0.3347	0.0792	0.1627	0	-2.015	0.3024	0.0079	0.0638	0.0619	0	0	0.0367	38.032	1.4954	0	0	0	36098.	0.6779	0	1.0438	0.1537	0.0322
15	2.1388	0	NA	0	NA	NA	0.1872	0.1718	0.0406	0.0835	0	0.0091	-34.53	0.0040	0.0327	0.0317	0	0	0.0188	19.520	0.7675	0	0	0	18528.	0.3479	0	0.5357	0.0789	0.0165
16	8.0906	0	NA	0	NA	NA	0.7083	0.6500	0.1539	0.3159	0	0.0344	0.5871	-0.898	0.1240	0.1202	0	0	0.0713	73.840	2.9033	0	0	0	70085.	1.3162	0	2.0266	0.2984	0.0626
17	4.9428	0	NA	0	NA	NA	0.4327	0.3971	0.0940	0.1930	0	0.0210	0.3587	0.0094	-7.253	0.0734	0	0	0.0436	45.111	1.7737	0	0	0	42817.	0.8041	0	1.2381	0.1823	0.0382
18	3.0934	0	NA	0	NA	NA	0.2708	0.2485	0.0588	0.1208	0	0.0131	0.2245	0.0059	0.0474	-7.056	0	0	0.0272	28.232	1.1100	0	0	0	26796.	0.5032	0	0.7748	0.1141	0.0239
19	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	14.193	0	NA	0	NA	NA	1.2426	1.1402	0.2700	0.5542	0	0.0603	1.0300	0.0271	0.2176	0.2108	0	0	-4.091	129.53	5.0931	0	0	0	*****	2.3090	0	3.5552	0.5235	0.1098
22	2.0723	0	NA	0	NA	NA	0.1814	0.1664	0.0394	0.0809	0	0.0088	0.1504	0.0039	0.0317	0.0307	0	0	0.0182	-4343.	0.7436	0	0	0	17951.	0.3371	0	0.5191	0.0764	0.0160
23	36.430	0	NA	0	NA	NA	3.1895	2.9268	0.6930	1.4227	0	0.1549	2.6440	0.0696	0.5585	0.5412	0	0	0.3213	332.48	-158.4	0	0	0	*****	5.9267	0	9.1256	1.3438	0.2820
24	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0.5960	0	NA	0	NA	NA	0.0521	0.0478	0.0113	0.0232	0	0.0025	0.0432	0.0011	0.0091	0.0088	0	0	0.0052	5.4399	0.2138	0	0	0	*****	0.0969	0	0.1493	0.0219	0.0046
28	3.0314	0	NA	0	NA	NA	0.2654	0.2435	0.0576	0.1183	0	0.0128	0.2200	0.0057	0.0464	0.0450	0	0	0.0267	27.666	1.0878	0	0	0	26259.	-77.27	0	0.7593	0.1118	0.0234
29	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	2.0855	0	NA	0	NA	NA	0.1825	0.1675	0.0396	0.0814	0	0.0088	0.1513	0.0039	0.0319	0.0309	0	0	0.0183	19.034	0.7484	0	0	0	18066.	0.3392	0	-119.2	0.0769	0.0161
31	56.120	0	NA	0	NA	NA	4.9133	4.5088	1.0676	2.1916	0	0.2387	4.0730	0.1073	0.8604	0.8338	0	0	0.4950	512.19	20.138	0	0	0	*****	9.1300	0	14.057	-15.56	0.4344
32	10.243	0	NA	0	NA	NA	0.8968	0.8229	0.1948	0.4000	0	0.0435	0.7434	0.0195	0.1570	0.1521	0	0	0.0903	93.490	3.6759	0	0	0	88736.	1.6665	0	2.5659	0.3778	-3.620
WP(1)	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 05 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 05 FROM PARTNERS 01–32.																											
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	-2.504	NA	0.3753	NA	NA	0	0	0.1888	0	0.1858	0	0	1.5054	0.0366	0.8856	0.8955	0	0	0.0713	0.0697	0	0.2368	0	2178.2	1.3013	0.6113	0.2233	0.1517	1.1780
03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
04	0	0.0003	NA	-8.737	NA	NA	0	0	0.0005	0	0.0005	0	0	0.0045	0.0001	0.0026	0.0027	0	0	0.0002	0.0002	0	0.0007	0	6.6201	0.0039	0.0018	0.0006	0.0004	0.0035
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0.7196	NA	2.4025	NA	NA	0	0	-3.187	0	1.1895	0	0	9.6370	0.2348	5.6694	5.7325	0	0	0.4567	0.4465	0	1.5160	0	13943.	8.3299	3.9133	1.4295	0.9715	7.5411
12	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0.1451	NA	0.4844	NA	NA	0	0	0.2437	0	-4.086	0	0	1.9431	0.0473	1.1431	1.1558	0	0	0.0920	0.0900	0	0.3056	0	2811.3	1.6795	0.7890	0.2882	0.1958	1.5205
14	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0.5826	NA	1.9450	NA	NA	0	0	0.9785	0	0.9630	0	0	-27.24	0.1901	4.5899	4.6410	0	0	0.3697	0.3614	0	1.2273	0	11288.	6.7438	3.1682	1.1573	0.7865	6.1052
17	0	0.0041	NA	0.0139	NA	NA	0	0	0.0070	0	0.0069	0	0	0.0559	-0.852	0.0329	0.0333	0	0	0.0026	0.0025	0	0.0088	0	81.002	0.0483	0.0227	0.0083	0.0056	0.0438
18	0	0.1093	NA	0.3652	NA	NA	0	0	0.1837	0	0.1808	0	0	1.4650	0.0357	-19.75	0.8714	0	0	0.0694	0.0678	0	0.2304	0	2119.6	1.2663	0.5949	0.2173	0.1476	1.1463
19	0	0.1487	NA	0.4966	NA	NA	0	0	0.2498	0	0.2459	0	0	1.9922	0.0485	1.1720	-19.66	0	0	0.0944	0.0923	0	0.3133	0	2882.4	1.7220	0.8089	0.2955	0.2008	1.5589
20	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0.0126	NA	0.0423	NA	NA	0	0	0.0213	0	0.0209	0	0	0.1699	0.0041	0.0999	0.1011	0	0	-1.653	0.0078	0	0.0267	0	245.90	0.1469	0.0690	0.0252	0.0171	0.1329
23	0	0.0682	NA	0.2277	NA	NA	0	0	0.1145	0	0.1127	0	0	0.9136	0.0222	0.5375	0.5435	0	0	0.0433	-1.581	0	0.1437	0	1321.9	0.7897	0.3710	0.1355	0.0921	0.7149
24	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0.0340	NA	0.1135	NA	NA	0	0	0.0571	0	0.0562	0	0	0.4555	0.0111	0.2679	0.2709	0	0	0.0215	0.0211	0	-5.442	0	659.08	0.3937	0.1849	0.0675	0.0459	0.3564
26	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0.0104	NA	0.0349	NA	NA	0	0	0.0175	0	0.0172	0	0	0.1400	0.0034	0.0823	0.0833	0	0	0.0066	0.0064	0	0.0220	0	*****	0.1210	0.0568	0.0207	0.0141	0.1095
28	0	0.0744	NA	0.2484	NA	NA	0	0	0.1249	0	0.1229	0	0	0.9963	0.0242	0.5861	0.5926	0	0	0.0472	0.0461	0	0.1567	0	1441.5	-29.43	0.4046	0.1478	0.1004	0.7796
29	0	0.0456	NA	0.1522	NA	NA	0	0	0.0766	0	0.0754	0	0	0.6108	0.0148	0.3593	0.3633	0	0	0.0289	0.0283	0	0.0960	0	883.84	0.5280	-13.98	0.0906	0.0615	0.4780
30	0	0.0219	NA	0.0732	NA	NA	0	0	0.0368	0	0.0362	0	0	0.2937	0.0071	0.1728	0.1747	0	0	0.0139	0.0136	0	0.0462	0	425.07	0.2539	0.1193	-5.155	0.0296	0.2299
31	0	0.1560	NA	0.5210	NA	NA	0	0	0.2621	0	0.2579	0	0	2.0898	0.0509	1.2294	1.2431	0	0	0.0990	0.0968	0	0.3287	0	3023.6	1.8064	0.8486	0.3100	-3.322	1.6353
32	0	0.3714	NA	1.2401	NA	NA	0	0	0.6238	0	0.6139	0	0	4.9743	0.1212	2.9263	2.9589	0	0	0.2357	0.2304	0	0.7825	0	7197.0	4.2996	2.0199	0.7379	0.5014	-23.53
WP(1)	0	0	NA	0	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 06 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 06 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	-2.937	NA	NA	NA	NA	0.0153	0.0021	0.0034	0	0	0.0039	0	0	0	0.0220	0	0.0177	0.0062	0	0.0680	0.0159	0.0106	0	0	0	0.0126	0	0	0
03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
07	0	1.1172	NA	NA	NA	NA	-4.029	0.3403	0.5538	0	0	0.6338	0	0	0	3.5292	0	2.8476	0.9935	0	10.908	2.5539	1.7136	0	0	0	2.0252	0	0	0
08	0	0.6392	NA	NA	NA	NA	1.4093	-0.702	0.3168	0	0	0.3626	0	0	0	2.0192	0	1.6292	0.5684	0	6.2412	1.4611	0.9804	0	0	0	1.1587	0	0	0
11	0	0.0621	NA	NA	NA	NA	0.1370	0.0189	-1.428	0	0	0.0352	0	0	0	0.1964	0	0.1584	0.0552	0	0.6070	0.1421	0.0953	0	0	0	0.1127	0	0	0
12	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0.0310	NA	NA	NA	NA	0.0684	0.0094	0.0153	0	0	-1.653	0	0	0	0.0980	0	0.0791	0.0275	0	0.3030	0.0709	0.0476	0	0	0	0.0562	0	0	0
15	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0.3682	NA	NA	NA	NA	0.8118	0.1121	0.1825	0	0	0.2088	0	0	0	-8.138	0	0.9384	0.3274	0	3.5951	0.8416	0.5647	0	0	0	0.6674	0	0	0
19	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0.0000	NA	NA	NA	NA	0.0000	0.0000	0.0000	0	0	0.0000	0	0	0	0.0000	0	-7.505	0.0000	0	0.0000	0.0000	0.0000	0	0	0	0.0000	0	0	0
21	0	0.0099	NA	NA	NA	NA	0.0219	0.0030	0.0049	0	0	0.0056	0	0	0	0.0313	0	0.0253	-2.609	0	0.0970	0.0227	0.0152	0	0	0	0.0180	0	0	0
22	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0.0019	NA	NA	NA	NA	0.0042	0.0005	0.0009	0	0	0.0010	0	0	0	0.0061	0	0.0049	0.0017	0	-28.73	0.0044	0.0029	0	0	0	0.0035	0	0	0
24	0	0.5471	NA	NA	NA	NA	1.2064	0.1666	0.2712	0	0	0.3104	0	0	0	1.7285	0	1.3946	0.4865	0	5.3427	-5.480	0.8393	0	0	0	0.9919	0	0	0
25	0	0.0000	NA	NA	NA	NA	0.0000	0.0000	0.0000	0	0	0.0000	0	0	0	0.0000	0	0.0000	0.0000	0	0.0001	0.0000	-4.516	0	0	0	0.0000	0	0	0
26	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0.1607	NA	NA	NA	NA	0.3544	0.0489	0.0796	0	0	0.0911	0	0	0	0.5077	0	0.4097	0.1429	0	1.5694	0.3674	0.2465	0	0	0	-5.046	0	0	0
30	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	NA	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WP(1)	0	-0.371	NA	NA	NA	NA	-0.509	-0.088	-0.180	0	0	-0.209	0	0	0	-1.029	0	-0.949	-0.330	0	-3.633	-0.693	-0.571	0	0	0	-0.638	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 07 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 07 FROM PARTNERS 01-32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-118.1	1.0801	0	0	0.2101	0	6.0857	1.2308	3.0110	0	0.0960	0	2.1894	4.6209	0	1.4583	0.1402	0	4.8853	7E+06	578.81	0	0	NA	*****	0	1.5469	0	2.1050	0
02	0.6684	-2.817	0	0	0.0019	0	0.0556	0.0112	0.0275	0	0.0008	0	0.0200	0.0422	0	0.0133	0.0012	0	0.0446	68221.	5.2939	0	0	NA	5021.1	0	0.0141	0	0.0192	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
05	0.5727	0.0084	0	0	-0.548	0	0.0476	0.0096	0.0235	0	0.0007	0	0.0171	0.0362	0	0.0114	0.0010	0	0.0382	58454.	4.5360	0	0	NA	4302.2	0	0.0121	0	0.0164	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
07	94.628	1.3986	0	0	0.2721	0	-8.047	1.5937	3.8988	0	0.1244	0	2.8349	5.9834	0	1.8883	0.1816	0	6.3258	1E+07	749.47	0	0	NA	*****	0	2.0031	0	2.7256	0
08	7.0750	0.1045	0	0	0.0203	0	0.5891	-3.102	0.2915	0	0.0093	0	0.2119	0.4473	0	0.1411	0.0135	0	0.4729	*****	56.035	0	0	NA	53148.	0	0.1497	0	0.2037	0
11	1.4981	0.0221	0	0	0.0043	0	0.1247	0.0252	-7.818	0	0.0019	0	0.0448	0.0947	0	0.0298	0.0028	0	0.1001	*****	11.865	0	0	NA	11253.	0	0.0317	0	0.0431	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
13	0.0265	0.0003	0	0	0.0000	0	0.0022	0.0004	0.0010	0	-0.251	0	0.0007	0.0016	0	0.0005	0.0000	0	0.0017	2704.9	0.2099	0	0	NA	199.08	0	0.0005	0	0.0007	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
15	0.5186	0.0076	0	0	0.0014	0	0.0431	0.0087	0.0213	0	0.0006	0	-5.714	0.0327	0	0.0103	0.0009	0	0.0346	52932.	4.1075	0	0	NA	3895.8	0	0.0109	0	0.0149	0
16	2.7634	0.0408	0	0	0.0079	0	0.2301	0.0465	0.1138	0	0.0036	0	0.0827	-11.91	0	0.0551	0.0053	0	0.1847	*****	21.887	0	0	NA	20759.	0	0.0584	0	0.0795	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
18	0.1469	0.0021	0	0	0.0004	0	0.0122	0.0024	0.0060	0	0.0001	0	0.0044	0.0092	0	-3.813	0.0002	0	0.0098	14997.	1.1637	0	0	NA	1103.7	0	0.0031	0	0.0042	0
19	0.0243	0.0003	0	0	0.0000	0	0.0020	0.0004	0.0010	0	0.0000	0	0.0007	0.0015	0	0.0004	-0.367	0	0.0016	2487.3	0.1930	0	0	NA	183.07	0	0.0005	0	0.0007	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
21	0.0034	0.0000	0	0	0.0000	0	0.0002	0.0000	0.0001	0	0.0000	0	0.0001	0.0002	0	0.0000	0.0000	0	-12.78	356.09	0.0276	0	0	NA	26.208	0	0.0000	0	0.0001	0
22	0.2663	0.0039	0	0	0.0007	0	0.0221	0.0044	0.0109	0	0.0003	0	0.0079	0.0168	0	0.0053	0.0005	0	0.0178	*****	2.1094	0	0	NA	2000.7	0	0.0056	0	0.0076	0
23	0.2996	0.0044	0	0	0.0008	0	0.0249	0.0050	0.0123	0	0.0003	0	0.0089	0.0189	0	0.0059	0.0005	0	0.0200	30587.	-1512.	0	0	NA	2251.2	0	0.0063	0	0.0086	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
27	0.0196	0.0002	0	0	0.0000	0	0.0016	0.0003	0.0008	0	0.0000	0	0.0005	0.0012	0	0.0003	0.0000	0	0.0013	2000.7	0.1552	0	0	NA	*****	0	0.0004	0	0.0005	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
29	0.5012	0.0074	0	0	0.0014	0	0.0417	0.0084	0.0206	0	0.0006	0	0.0150	0.0316	0	0.0100	0.0009	0	0.0335	51156.	3.9697	0	0	NA	3765.1	0	-4.038	0	0.0144	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
31	9.1736	0.1355	0	0	0.0263	0	0.7639	0.1545	0.3779	0	0.0120	0	0.2748	0.5800	0	0.1830	0.0176	0	0.6132	*****	72.656	0	0	NA	68912.	0	0.1941	0	-5.244	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 08 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 08 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-68.26	2.0267	0.2186	0	0	1.8972	0	43.498	5.5415	0	5.1101	1.5139	2.2418	2.2375	59.856	3.0064	0	8E+06	4.2552	0.9200	0	12.266	1E+07	48.011	*****	0	1.1440	0	0	32.599
02	2.8706	-5.582	0.0168	0	0	0.1461	0	3.3499	0.4267	0	0.3935	0.1165	0.1726	0.1723	4.6097	0.2315	0	*****	0.3277	0.0708	0	0.9447	*****	3.6975	24693.	0	0.0881	0	0	2.5105
03	0.8465	0.0460	-0.614	0	0	0.0430	0	0.9879	0.1258	0	0.1160	0.0343	0.0509	0.0508	1.3594	0.0682	0	*****	0.0966	0.0208	0	0.2786	*****	1.0904	7282.2	0	0.0259	0	0	0.7403
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	10.958	0.5958	0.0642	0	0	-4.813	0	12.787	1.6291	0	1.5022	0.4450	0.6590	0.6578	17.596	0.8838	0	2E+06	1.2509	0.2704	0	3.6062	4E+06	14.114	94262.	0	0.3363	0	0	9.5836
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	3.9499	0.2147	0.0231	0	0	0.2010	0	-118.5	0.5872	0	0.5415	0.1604	0.2375	0.2371	6.3428	0.3185	0	*****	0.4509	0.0974	0	1.2998	1E+06	5.0876	33976.	0	0.1212	0	0	3.4544
11	2.2199	0.1207	0.0130	0	0	0.1129	0	2.5905	-15.35	0	0.3043	0.0901	0.1335	0.1332	3.5647	0.1790	0	*****	0.2534	0.0547	0	0.7305	*****	2.8593	19095.	0	0.0681	0	0	1.9414
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	18.106	0.9845	0.1062	0	0	0.9215	0	21.129	2.6917	0	-11.98	0.7354	1.0889	1.0869	29.075	1.4603	0	4E+06	2.0669	0.4469	0	5.9586	6E+06	23.321	*****	0	0.5557	0	0	15.834
14	2.1591	0.1174	0.0126	0	0	0.1098	0	2.5196	0.3209	0	0.2960	-4.198	0.1298	0.1296	3.4672	0.1741	0	*****	0.2464	0.0532	0	0.7105	*****	2.7810	18573.	0	0.0662	0	0	1.8883
15	0.4849	0.0263	0.0028	0	0	0.0246	0	0.5658	0.0720	0	0.0664	0.0196	-6.318	0.0291	0.7786	0.0391	0	99618.	0.0553	0.0119	0	0.1595	*****	0.6245	4171.2	0	0.0148	0	0	0.4240
16	11.592	0.6303	0.0680	0	0	0.5900	0	13.527	1.7233	0	1.5891	0.4708	0.6971	-5.639	18.614	0.9349	0	2E+06	1.3233	0.2861	0	3.8148	4E+06	14.931	99714.	0	0.3557	0	0	10.137
17	0.1807	0.0098	0.0010	0	0	0.0091	0	0.2108	0.0268	0	0.0247	0.0073	0.0108	0.0108	-169.1	0.0145	0	37121.	0.0206	0.0044	0	0.0594	58263.	0.2327	1554.3	0	0.0055	0	0	0.1580
18	3.3448	0.1818	0.0196	0	0	0.1702	0	3.9033	0.4972	0	0.4585	0.1358	0.2011	0.2007	5.3712	-8.242	0	*****	0.3818	0.0825	0	1.1007	1E+06	4.3083	28772.	0	0.1026	0	0	2.9252
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0.6333	0.0344	0.0037	0	0	0.0322	0	0.7390	0.0941	0	0.0868	0.0257	0.0380	0.0380	1.0170	0.0510	0	*****	0.0723	0.0156	0	0.2084	*****	0.8157	5448.0	0	0.0194	0	0	0.5538
21	0.2544	0.0138	0.0014	0	0	0.0129	0	0.2969	0.0378	0	0.0348	0.0103	0.0153	0.0152	0.4086	0.0205	0	52274.	-12.01	0.0062	0	0.0837	82045.	0.3277	2188.8	0	0.0078	0	0	0.2225
22	6.1644	0.3351	0.0361	0	0	0.3137	0	7.1936	0.9164	0	0.8451	0.2503	0.3707	0.3700	9.8969	0.4972	0	1E+06	0.7037	-2.452	0	2.0286	2E+06	7.9400	53026.	0	0.1892	0	0	5.3911
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0.4880	0.0265	0.0028	0	0	0.0248	0	0.5694	0.0725	0	0.0669	0.0198	0.0293	0.0292	0.7836	0.0393	0	*****	0.0557	0.0120	0	-34.57	*****	0.6285	4197.8	0	0.0149	0	0	0.4267
25	0.9940	0.0540	0.0058	0	0	0.0505	0	1.1600	0.1477	0	0.1362	0.0403	0.0597	0.0596	1.5962	0.0801	0	*****	0.1134	0.0245	0	0.3271	*****	1.2803	8550.7	0	0.0305	0	0	0.8693
26	0.0329	0.0017	0.0001	0	0	0.0016	0	0.0384	0.0048	0	0.0045	0.0013	0.0019	0.0019	0.0529	0.0026	0	6770.9	0.0037	0.0008	0	0.0108	10627.	-135.8	283.51	0	0.0010	0	0	0.0288
27	0.0265	0.0014	0.0001	0	0	0.0013	0	0.0309	0.0039	0	0.0036	0.0010	0.0015	0.0015	0.0425	0.0021	0	5448.0	0.0030	0.0006	0	0.0087	8550.7	0.0341	*****	0	0.0008	0	0	0.0231
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0.3394	0.0184	0.0019	0	0	0.0172	0	0.3961	0.0504	0	0.0465	0.0137	0.0204	0.0203	0.5451	0.0273	0	69738.	0.0387	0.0083	0	0.1117	*****	0.4372	2920.1	0	-3.228	0	0	0.2968
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	2.6145	0.1421	0.0153	0	0	0.1330	0	3.0510	0.3886	0	0.3584	0.1061	0.1572	0.1569	4.1984	0.2108	0	*****	0.2984	0.0645	0	0.8604	*****	3.3676	22490.	0	0.0802	0	0	-90.01
WP(1)	*****	-4524.	-497.7	0	0	-3901.	0	*****	*****	0	-9713.	-3402.	-5120.	-4570.	*****	-6679.	0	*****	-9740.	-1987.	0	*****	*****	*****	*****	0	-2616.	0	0	*****

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980

FOR BILATERAL SEABORNE IMPORTS OF REGION 11 FROM PARTNER i

WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 11 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-9.432	0.9477	0	0	0	0	0.2015	2.9340	0	0.2197	0	0	3.2881	1.9927	0	2.1130	1.4854	0	81.919	1.0557	1574.7	11.206	448.26	3.7967	0	0	0	0	0	11.664
02	3.9275	-3.308	0	0	0	0	0.3583	5.2151	0	0.3905	0	0	5.8444	3.5419	0	3.7558	2.6402	0	145.60	1.8765	2799.0	19.919	796.77	6.7485	0	0	0	0	0	20.732
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0.0639	0.0274	0	0	0	0	-1.056	0.0848	0	0.0063	0	0	0.0951	0.0576	0	0.0611	0.0429	0	2.3701	0.0305	45.560	0.3242	12.969	0.1098	0	0	0	0	0	0.3374
08	0.9119	0.3911	0	0	0	0	0.0832	-14.24	0	0.0906	0	0	1.3570	0.8224	0	0.8720	0.6130	0	33.808	0.4357	649.91	4.6250	185.00	1.5669	0	0	0	0	0	4.8138
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.5790	0.2483	0	0	0	0	0.0528	0.7688	0	-1.100	0	0	0.8616	0.5221	0	0.5536	0.3892	0	21.466	0.2766	412.64	2.9365	117.46	0.9949	0	0	0	0	0	3.0564
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0.7274	0.3119	0	0	0	0	0.0663	0.9658	0	0.0723	0	0	-16.24	0.6559	0	0.6956	0.4889	0	26.967	0.3475	518.40	3.6892	147.56	1.2498	0	0	0	0	0	3.8397
16	1.1406	0.4892	0	0	0	0	0.1040	1.5145	0	0.1134	0	0	1.6973	-9.470	0	1.0907	0.7667	0	42.286	0.5449	812.88	5.7848	231.39	1.9598	0	0	0	0	0	6.0209
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	1.2104	0.5191	0	0	0	0	0.1104	1.6072	0	0.1203	0	0	1.8011	1.0915	0	-9.975	0.8136	0	44.874	0.5783	862.63	6.1389	245.55	2.0798	0	0	0	0	0	6.3894
19	0.3059	0.1312	0	0	0	0	0.0279	0.4062	0	0.0304	0	0	0.4552	0.2759	0	0.2925	-7.620	0	11.342	0.1461	218.03	1.5516	62.065	0.5256	0	0	0	0	0	1.6149
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.0622	0.0266	0	0	0	0	0.0056	0.0826	0	0.0061	0	0	0.0926	0.0561	0	0.0595	0.0418	0	-429.3	0.0297	44.362	0.3157	12.628	0.1069	0	0	0	0	0	0.3285
22	0.1285	0.0551	0	0	0	0	0.0117	0.1707	0	0.0127	0	0	0.1913	0.1159	0	0.1229	0.0864	0	4.7674	-5.501	91.646	0.6521	26.087	0.2209	0	0	0	0	0	0.6788
23	0.1210	0.0519	0	0	0	0	0.0110	0.1607	0	0.0120	0	0	0.1801	0.1091	0	0.1157	0.0813	0	4.4880	0.0578	-8210.	0.6139	24.558	0.2080	0	0	0	0	0	0.6390
24	0.0217	0.0093	0	0	0	0	0.0019	0.0288	0	0.0021	0	0	0.0323	0.0196	0	0.0207	0.0146	0	0.8058	0.0103	15.491	-58.93	4.4096	0.0373	0	0	0	0	0	0.1147
25	0.1312	0.0562	0	0	0	0	0.0119	0.1742	0	0.0130	0	0	0.1952	0.1183	0	0.1254	0.0882	0	4.8645	0.0626	93.512	0.6654	-2335.	0.2254	0	0	0	0	0	0.6926
26	0.0007	0.0003	0	0	0	0	0.0000	0.0009	0	0.0000	0	0	0.0011	0.0006	0	0.0007	0.0005	0	0.0278	0.0003	0.5360	0.0038	0.1525	-20.00	0	0	0	0	0	0.0039
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0.1001	0.0429	0	0	0	0	0.0091	0.1330	0	0.0099	0	0	0.1490	0.0903	0	0.0958	0.0673	0	3.7142	0.0478	71.399	0.5081	20.324	0.1721	0	0	0	0	0	-60.92
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980

FOR BILATERAL SEABORNE IMPORTS OF REGION 12 FROM PARTNER i

WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

BILATERAL SEABORNE IMPORTS OF REGION 12 FROM PARTNERS 01–32.

PRICE OF h, WP(1)	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-29.70	4.0898	0	0.3934	0	0	0	2.6386	0	9.4405	23.368	1.5335	2.1061	1.5605	0	5.4424	0	0	1373.2	0.4475	6.4984	0	0	2E+06	10560.	299.40	2.2331	0	0.7079	205.95
02	1.6401	-14.69	0	0.0596	0	0	0	0.3998	0	1.4306	3.5412	0.2323	0.3191	0.2364	0	0.8247	0	0	208.09	0.0678	0.9847	0	0	*****	1600.3	45.371	0.3384	0	0.1072	31.210
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0.2808	0.1061	0	-1.463	0	0	0	0.0684	0	0.2450	0.6064	0.0398	0.0546	0.0405	0	0.1412	0	0	35.639	0.0116	0.1686	0	0	61512.	274.08	7.7704	0.0579	0	0.0183	5.3452
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0.3631	0.1372	0	0.0132	0	0	0	-9.792	0	0.3167	0.7840	0.0514	0.0706	0.0523	0	0.1826	0	0	46.075	0.0150	0.2180	0	0	79525.	354.34	10.045	0.0749	0	0.0237	6.9105
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	5.9501	2.2483	0	0.2163	0	0	0	1.4505	0	-30.16	12.847	0.8430	1.1578	0.8579	0	2.9919	0	0	754.94	0.2460	3.5725	0	0	1E+06	5805.8	164.59	1.2277	0	0.3891	113.22
13	14.462	5.4650	0	0.5258	0	0	0	3.5258	0	12.615	-56.28	2.0492	2.8143	2.0852	0	7.2724	0	0	1834.9	0.5980	8.6835	0	0	3E+06	14111.	400.08	2.9841	0	0.9459	275.21
14	0.8903	0.3364	0	0.0323	0	0	0	0.2170	0	0.7766	1.9224	-5.616	0.1732	0.1283	0	0.4477	0	0	112.97	0.0368	0.5346	0	0	*****	868.79	24.630	0.1837	0	0.0582	16.943
15	0.3574	0.1350	0	0.0129	0	0	0	0.0871	0	0.3118	0.7718	0.0506	-7.817	0.0515	0	0.1797	0	0	45.358	0.0147	0.2146	0	0	78287.	348.82	9.8894	0.0737	0	0.0233	6.8028
16	1.9696	0.7442	0	0.0716	0	0	0	0.4801	0	1.7179	4.2526	0.2790	0.3832	-5.559	0	0.9904	0	0	249.90	0.0814	1.1825	0	0	*****	1921.8	54.485	0.4063	0	0.1288	37.480
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0.9317	0.3520	0	0.0338	0	0	0	0.2271	0	0.8127	2.0117	0.1320	0.1813	0.1343	0	-19.91	0	0	118.21	0.0385	0.5594	0	0	*****	909.14	25.774	0.1922	0	0.0609	17.730
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.1616	0.0610	0	0.0058	0	0	0	0.0394	0	0.1409	0.3489	0.0229	0.0314	0.0233	0	0.0812	0	0	-5121.	0.0066	0.0970	0	0	35394.	157.70	4.4711	0.0333	0	0.0105	3.0756
22	0.0946	0.0357	0	0.0034	0	0	0	0.0230	0	0.0825	0.2042	0.0134	0.0184	0.0136	0	0.0475	0	0	12.004	-1.672	0.0568	0	0	20719.	92.319	2.6172	0.0195	0	0.0061	1.8004
23	0.3070	0.1160	0	0.0111	0	0	0	0.0748	0	0.2678	0.6629	0.0435	0.0597	0.0442	0	0.1544	0	0	38.958	0.0126	-24.15	0	0	67241.	299.61	8.4941	0.0633	0	0.0200	5.8430
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0.0797	0.0301	0	0.0028	0	0	0	0.0194	0	0.0695	0.1720	0.0112	0.0155	0.0114	0	0.0400	0	0	10.112	0.0032	0.0478	0	0	*****	77.770	2.2048	0.0164	0	0.0052	1.5167
27	0.0003	0.0001	0	0.0000	0	0	0	0.0000	0	0.0003	0.0007	0.0000	0.0000	0.0000	0	0.0001	0	0	0.0450	0.0000	0.0002	0	0	77.770	*****	0.0098	0.0000	0	0.0000	0.0067
28	0.1107	0.0418	0	0.0040	0	0	0	0.0270	0	0.0966	0.2391	0.0156	0.0215	0.0159	0	0.0556	0	0	14.052	0.0045	0.0664	0	0	24253.	108.06	-1118.	0.0228	0	0.0072	2.1075
29	0.0648	0.0245	0	0.0023	0	0	0	0.0158	0	0.0565	0.1400	0.0091	0.0126	0.0093	0	0.0326	0	0	8.2276	0.0026	0.0389	0	0	14200.	63.274	1.7938	-8.349	0	0.0042	1.2339
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	1.5736	0.5946	0	0.0572	0	0	0	0.3836	0	1.3725	3.3976	0.2229	0.3062	0.2268	0	0.7912	0	0	199.65	0.0650	0.9448	0	0	*****	1535.4	43.530	0.3246	0	-2.548	29.944
32	0.4675	0.1766	0	0.0169	0	0	0	0.1139	0	0.4077	1.0094	0.0662	0.0909	0.0674	0	0.2350	0	0	59.316	0.0193	0.2806	0	0	*****	456.16	12.932	0.0964	0	0.0305	-762.3
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 13 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 13 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	-1.714	0.3564	0	0	0	0	1.4314	0	0	0	1.5079	0	1.2362	0	0	0	0	1.0130	0	28.975	0	0	0	48.028	0	4.7227
06	0	0	0	0	0.0008	-1.062	0	0	0	0	0.0014	0	0	0	0.0015	0	0.0012	0	0	0	0	0.0010	0	0.0301	0	0	0	0.0499	0	0.0049
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1.1094	0.4570	0	0	0	0	-2.431	0	0	0	1.9336	0	1.5853	0	0	0	0	1.2990	0	37.157	0	0	0	61.589	0	6.0561
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0.4079	0.1680	0	0	0	0	0.6750	0	0	0	-3.784	0	0.5829	0	0	0	0	0.4776	0	13.663	0	0	0	22.648	0	2.2270
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0.0624	0.0257	0	0	0	0	0.1033	0	0	0	0.1088	0	-3.596	0	0	0	0	0.0731	0	2.0923	0	0	0	3.4680	0	0.3410
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0.0098	0.0040	0	0	0	0	0.0163	0	0	0	0.0172	0	0.0141	0	0	0	0	-3.008	0	0.3314	0	0	0	0.5494	0	0.0540
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0.0000	0.0000	0	0	0	0	0.0000	0	0	0	0.0000	0	0.0000	0	0	0	0	0.0000	0	-86.38	0	0	0	0.0000	0	0.0000
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0.0000	0.0000	0	0	0	0	0.0000	0	0	0	0.0000	0	0.0000	0	0	0	0	0.0000	0	0.0000	0	0	0	-143.1	0	0.0000
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0.1233	0.0507	0	0	0	0	0.2040	0	0	0	0.2149	0	0.1761	0	0	0	0	0.1443	0	4.1294	0	0	0	6.8447	0	-13.40
WP(1)	0	0	0	0	-1.714	-1.062	0	0	0	0	-2.431	0	0	0	-3.784	0	-3.596	0	0	0	0	-3.008	0	-86.38	0	0	0	-143.1	0	-13.40

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 14 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 14 FROM PARTNERS 01–32.																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-35.75	1.1578	0.4719	1.0692	0	0	0.8890	4.6523	26.397	8.2630	0.9260	1.0048	5.1522	2.6832	0	2.8770	1.6250	0.8970	*****	*****	44.908	0	0	22113.	NA	0	3.0086	23.845	0	1.4887
02	0.5934	-3.935	0.0191	0.0432	0	0	0.0359	0.1883	1.0687	0.3345	0.0374	0.0406	0.2086	0.1086	0	0.1164	0.0657	0.0363	12351.	22910.	1.8182	0	0	895.34	NA	0	0.1218	0.9654	0	0.0602
03	2.9233	0.2309	-1.529	0.2132	0	0	0.1773	0.9278	5.2649	1.6480	0.1847	0.2004	1.0276	0.5351	0	0.5738	0.3241	0.1789	60842.	*****	8.9569	0	0	4410.5	NA	0	0.6000	4.7559	0	0.2969
04	1.9842	0.1567	0.0638	-3.533	0	0	0.1203	0.6298	3.5735	1.1186	0.1253	0.1360	0.6974	0.3632	0	0.3894	0.2199	0.1214	41296.	76601.	6.0794	0	0	2993.6	NA	0	0.4073	3.2280	0	0.2015
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
07	4.4363	0.3504	0.1428	0.3236	0	0	-2.789	1.4081	7.9898	2.5010	0.2802	0.3041	1.5594	0.8121	0	0.8708	0.4918	0.2715	92331.	*****	13.592	0	0	6693.2	NA	0	0.9106	7.2175	0	0.4506
08	1.6372	0.1293	0.0527	0.1194	0	0	0.0993	-15.48	2.9486	0.9229	0.1034	0.1122	0.5755	0.2997	0	0.3213	0.1815	0.1002	34074.	63206.	5.0163	0	0	2470.1	NA	0	0.3360	2.6635	0	0.1662
11	3.0533	0.2411	0.0983	0.2227	0	0	0.1852	0.9691	-85.30	1.7213	0.1929	0.2093	1.0733	0.5589	0	0.5993	0.3385	0.1868	63547.	*****	9.3552	0	0	4606.6	NA	0	0.6267	4.9674	0	0.3101
12	1.3523	0.1068	0.0435	0.0986	0	0	0.0820	0.4292	2.4355	-27.66	0.0854	0.0927	0.4753	0.2475	0	0.2654	0.1499	0.0827	28145.	52207.	4.1434	0	0	2040.2	NA	0	0.2775	2.2000	0	0.1373
13	6.9976	0.5527	0.2253	0.5104	0	0	0.4244	2.2211	12.602	3.9449	-2.743	0.4797	2.4597	1.2810	0	1.3735	0.7758	0.4282	*****	*****	21.440	0	0	10557.	NA	0	1.4364	11.384	0	0.7107
14	1.9064	0.1505	0.0613	0.1390	0	0	0.1156	0.6051	3.4334	1.0747	0.1204	-3.325	0.6701	0.3489	0	0.3742	0.2113	0.1166	39677.	73598.	5.8411	0	0	2876.2	NA	0	0.3913	3.1015	0	0.1936
15	0.6540	0.0516	0.0210	0.0477	0	0	0.0396	0.2075	1.1778	0.3687	0.0413	0.0448	-17.49	0.1197	0	0.1283	0.0725	0.0400	13611.	25249.	2.0038	0	0	986.73	NA	0	0.1342	1.0640	0	0.0664
16	4.0653	0.3211	0.1308	0.2965	0	0	0.2465	1.2903	7.3216	2.2918	0.2568	0.2787	1.4290	-8.485	0	0.7979	0.4507	0.2488	84609.	*****	12.455	0	0	6133.4	NA	0	0.8344	6.6138	0	0.4129
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
18	1.1458	0.0905	0.0368	0.0835	0	0	0.0695	0.3636	2.0635	0.6459	0.0723	0.0785	0.4027	0.2097	0	-9.671	0.1270	0.0701	23847.	44234.	3.5106	0	0	1728.7	NA	0	0.2352	1.8641	0	0.1163
19	0.9035	0.0713	0.0290	0.0659	0	0	0.0548	0.2867	1.6273	0.5093	0.0570	0.0619	0.3176	0.1654	0	0.1773	-5.489	0.0553	18805.	34882.	2.7684	0	0	1363.2	NA	0	0.1854	1.4699	0	0.0917
20	0.1340	0.0105	0.0043	0.0097	0	0	0.0081	0.0425	0.2414	0.0755	0.0084	0.0091	0.0471	0.0245	0	0.0263	0.0148	-3.077	2790.4	5176.1	0.4108	0	0	202.28	NA	0	0.0275	0.2181	0	0.0136
21	0.0298	0.0023	0.0009	0.0021	0	0	0.0018	0.0094	0.0538	0.0168	0.0018	0.0020	0.0105	0.0054	0	0.0058	0.0033	0.0018	*****	1154.1	0.0915	0	0	45.102	NA	0	0.0061	0.0486	0	0.0030
22	0.0554	0.0043	0.0017	0.0040	0	0	0.0033	0.0176	0.0998	0.0312	0.0035	0.0038	0.0194	0.0101	0	0.0108	0.0061	0.0033	1154.1	*****	0.1699	0	0	83.663	NA	0	0.0113	0.0902	0	0.0056
23	0.1971	0.0155	0.0063	0.0143	0	0	0.0119	0.0625	0.3550	0.1111	0.0124	0.0135	0.0693	0.0360	0	0.0387	0.0218	0.0120	4103.4	7611.7	-153.8	0	0	297.46	NA	0	0.0404	0.3207	0	0.0200
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
26	0.0021	0.0001	0.0000	0.0001	0	0	0.0001	0.0006	0.0039	0.0012	0.0001	0.0001	0.0007	0.0003	0	0.0004	0.0002	0.0001	45.102	83.663	0.0066	0	0	*****	NA	0	0.0004	0.0035	0	0.0002
27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
29	0.3514	0.0277	0.0113	0.0256	0	0	0.0213	0.1115	0.6329	0.1981	0.0222	0.0240	0.1235	0.0643	0	0.0689	0.0389	0.0215	7314.7	13568.	1.0768	0	0	530.25	NA	0	-10.27	0.5717	0	0.0356
30	0.1453	0.0114	0.0046	0.0106	0	0	0.0088	0.0461	0.2617	0.0819	0.0091	0.0099	0.0510	0.0266	0	0.0285	0.0161	0.0088	3025.1	5611.4	0.4453	0	0	219.29	NA	0	0.0298	-81.78	0	0.0147
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0
32	3.1909	0.2520	0.1027	0.2327	0	0	0.1935	1.0128	5.7468	1.7988	0.2016	0.2187	1.1216	0.5841	0	0.6263	0.3537	0.1952	66410.	*****	9.7767	0	0	4814.1	NA	0	0.6550	5.1912	0	-4.796
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 15 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 15 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-39.07	1.1100	0.1515	0	0.1067	0.0933	0	2.3136	0	0.6796	0	0.1242	0.2859	0.5311	0	0	0.2750	0	0	0	0.6728	0.8759	0	0	0	1.9527	0.7423	1.7300	0.8190	2.3224
02	9.6763	-5.715	0.2069	0	0.1457	0.1274	0	3.1596	0	0.9282	0	0.1696	0.3905	0.7254	0	0	0.3756	0	0	0	0.9188	1.1963	0	0	0	2.6668	1.0138	2.3626	1.1185	3.1717
03	0.9677	0.1516	-0.966	0	0.0145	0.0127	0	0.3160	0	0.0928	0	0.0169	0.0390	0.0725	0	0	0.0375	0	0	0	0.0919	0.1196	0	0	0	0.2667	0.1013	0.2363	0.1118	0.3172
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0.2443	0.0382	0.0052	0	-0.691	0.0032	0	0.0797	0	0.0234	0	0.0042	0.0098	0.0183	0	0	0.0094	0	0	0	0.0232	0.0302	0	0	0	0.0673	0.0255	0.0596	0.0282	0.0800
06	0.0024	0.0003	0.0000	0	0.0000	-0.607	0	0.0007	0	0.0002	0	0.0000	0.0000	0.0001	0	0	0.0000	0	0	0	0.0002	0.0002	0	0	0	0.0006	0.0002	0.0005	0.0002	0.0007
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0.1848	0.0289	0.0039	0	0.0027	0.0024	0	-15.01	0	0.0177	0	0.0032	0.0074	0.0138	0	0	0.0071	0	0	0	0.0175	0.0228	0	0	0	0.0509	0.0193	0.0451	0.0213	0.0605
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.9084	0.1423	0.0194	0	0.0136	0.0119	0	0.2966	0	-4.340	0	0.0159	0.0366	0.0681	0	0	0.0352	0	0	0	0.0862	0.1123	0	0	0	0.2503	0.0951	0.2218	0.1050	0.2977
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0.0159	0.0025	0.0003	0	0.0002	0.0002	0	0.0052	0	0.0015	0	-0.808	0.0006	0.0011	0	0	0.0006	0	0	0	0.0015	0.0019	0	0	0	0.0044	0.0016	0.0039	0.0018	0.0052
15	0.7584	0.1188	0.0162	0	0.0114	0.0099	0	0.2476	0	0.0727	0	0.0132	-1.832	0.0568	0	0	0.0294	0	0	0	0.0720	0.0937	0	0	0	0.2090	0.0794	0.1851	0.0876	0.2485
16	8.6047	1.3481	0.1840	0	0.1295	0.1133	0	2.8097	0	0.8254	0	0.1508	0.3472	-2.815	0	0	0.3340	0	0	0	0.8171	1.0638	0	0	0	2.3715	0.9015	2.1009	0.9947	2.8204
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0.4362	0.0683	0.0093	0	0.0065	0.0057	0	0.1424	0	0.0418	0	0.0076	0.0176	0.0327	0	0	-1.775	0	0	0	0.0414	0.0539	0	0	0	0.1202	0.0457	0.1065	0.0504	0.1429
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	1.5553	0.2436	0.0332	0	0.0234	0.0204	0	0.5078	0	0.1492	0	0.0272	0.0627	0.1166	0	0	0.0603	0	0	0	-4.235	0.1922	0	0	0	0.4286	0.1629	0.3797	0.1798	0.5098
24	1.1976	0.1876	0.0256	0	0.0180	0.0157	0	0.3910	0	0.1148	0	0.0209	0.0483	0.0897	0	0	0.0464	0	0	0	0.1137	-5.558	0	0	0	0.3300	0.1254	0.2924	0.1384	0.3925
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0.5096	0.0798	0.0109	0	0.0076	0.0067	0	0.1664	0	0.0488	0	0.0089	0.0205	0.0382	0	0	0.0197	0	0	0	0.0483	0.0630	0	0	0	-12.58	0.0533	0.1244	0.0589	0.1670
29	0.2415	0.0378	0.0051	0	0.0036	0.0031	0	0.0788	0	0.0231	0	0.0042	0.0097	0.0181	0	0	0.0093	0	0	0	0.0229	0.0298	0	0	0	0.0665	-4.810	0.0589	0.0279	0.0791
30	0.3654	0.0572	0.0078	0	0.0055	0.0048	0	0.1193	0	0.0350	0	0.0064	0.0147	0.0273	0	0	0.0141	0	0	0	0.0347	0.0451	0	0	0	0.1007	0.0382	-11.18	0.0422	0.1197
31	0.3692	0.0578	0.0078	0	0.0055	0.0048	0	0.1205	0	0.0354	0	0.0064	0.0149	0.0276	0	0	0.0143	0	0	0	0.0350	0.0456	0	0	0	0.1017	0.0386	0.0901	-5.293	0.1210
32	13.034	2.0421	0.2787	0	0.1963	0.1716	0	4.2562	0	1.2503	0	0.2285	0.5260	0.9771	0	0	0.5060	0	0	0	1.2377	1.6115	0	0	0	3.5923	1.3656	3.1826	1.5067	-10.85
WP(1)	-39.07	-5.715	-0.966	0	-0.691	-0.607	0	-15.01	0	-4.340	0	-0.808	-1.832	-2.815	0	0	-1.775	0	0	0	-4.235	-5.558	0	0	0	-12.58	-4.810	-11.18	-5.293	-10.85

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 16 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 16 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-66.15	0.5375	0.4079	0.8097	0.3743	0.5864	0	0.3074	0	0	0.3196	0	0.7142	0.5888	0	0	12.375	0	0	0.2874	0.9254	0	1.9013	2.0529	3.9909	0.8771	1.3476	1.9313	10.445	3.4315
02	3.0147	-1.936	0.0507	0.1006	0.0465	0.0728	0	0.0382	0	0	0.0397	0	0.0887	0.0731	0	0	1.5382	0	0	0.0357	0.1150	0	0.2363	0.2551	0.4960	0.1090	0.1675	0.2400	1.2983	0.4265
03	2.3990	0.0531	-1.480	0.0800	0.0370	0.0580	0	0.0304	0	0	0.0316	0	0.0706	0.0582	0	0	1.2240	0	0	0.0284	0.0915	0	0.1880	0.2030	0.3947	0.0867	0.1332	0.1910	1.0331	0.3394
04	0.4530	0.0100	0.0076	-3.003	0.0069	0.0109	0	0.0057	0	0	0.0059	0	0.0133	0.0109	0	0	0.2311	0	0	0.0053	0.0172	0	0.0355	0.0383	0.0745	0.0163	0.0251	0.0360	0.1951	0.0640
05	4.4397	0.0983	0.0746	0.1482	-1.326	0.1073	0	0.0562	0	0	0.0585	0	0.1307	0.1077	0	0	2.2653	0	0	0.0526	0.1694	0	0.3480	0.3757	0.7305	0.1605	0.2466	0.3535	1.9120	0.6281
06	0.1281	0.0028	0.0021	0.0042	0.0019	-2.182	0	0.0016	0	0	0.0016	0	0.0037	0.0031	0	0	0.0653	0	0	0.0015	0.0048	0	0.0100	0.0108	0.0210	0.0046	0.0071	0.0102	0.0551	0.0181
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0.0416	0.0009	0.0007	0.0013	0.0006	0.0010	0	-1.145	0	0	0.0005	0	0.0012	0.0010	0	0	0.0212	0	0	0.0004	0.0015	0	0.0032	0.0035	0.0068	0.0015	0.0023	0.0033	0.0179	0.0058
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	3.4618	0.0767	0.0582	0.1155	0.0534	0.0837	0	0.0438	0	0	-1.145	0	0.1019	0.0840	0	0	1.7663	0	0	0.0410	0.1320	0	0.2713	0.2930	0.5696	0.1251	0.1923	0.2756	1.4908	0.4897
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	4.2024	0.0931	0.0706	0.1403	0.0648	0.1016	0	0.0532	0	0	0.0553	0	-2.538	0.1020	0	0	2.1442	0	0	0.0497	0.1603	0	0.3294	0.3556	0.6914	0.1519	0.2335	0.3346	1.8098	0.5945
16	10.587	0.2346	0.1780	0.3534	0.1634	0.2559	0	0.1341	0	0	0.1395	0	0.3117	-1.937	0	0	5.4022	0	0	0.1254	0.4039	0	0.8299	0.8961	1.7421	0.3829	0.5882	0.8430	4.5597	1.4979
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	11.075	0.2454	0.1862	0.3697	0.1709	0.2677	0	0.1403	0	0	0.1459	0	0.3261	0.2688	0	0	-40.47	0	0	0.1312	0.4225	0	0.8681	0.9373	1.8223	0.4005	0.6153	0.8818	4.7695	1.5668
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.5684	0.0125	0.0095	0.0189	0.0087	0.0137	0	0.0072	0	0	0.0074	0	0.0167	0.0138	0	0	0.2900	0	0	-1.064	0.0216	0	0.0445	0.0481	0.0935	0.0205	0.0315	0.0452	0.2448	0.0804
23	5.6290	0.1247	0.0946	0.1879	0.0868	0.1360	0	0.0713	0	0	0.0741	0	0.1657	0.1366	0	0	2.8721	0	0	0.0667	-3.234	0	0.4412	0.4764	0.9262	0.2035	0.3127	0.4482	2.4241	0.7963
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0.1274	0.0028	0.0021	0.0042	0.0019	0.0030	0	0.0016	0	0	0.0016	0	0.0037	0.0030	0	0	0.0650	0	0	0.0015	0.0048	0	-7.077	0.0107	0.0209	0.0046	0.0070	0.0101	0.0549	0.0180
26	0.1640	0.0036	0.0027	0.0054	0.0025	0.0039	0	0.0020	0	0	0.0021	0	0.0048	0.0039	0	0	0.0837	0	0	0.0019	0.0062	0	0.0128	-7.638	0.0269	0.0059	0.0091	0.0130	0.0706	0.0232
27	0.0414	0.0009	0.0006	0.0013	0.0006	0.0010	0	0.0005	0	0	0.0005	0	0.0012	0.0010	0	0	0.0211	0	0	0.0004	0.0015	0	0.0032	0.0035	-14.86	0.0014	0.0023	0.0032	0.0178	0.0058
28	0.3608	0.0079	0.0060	0.0120	0.0055	0.0087	0	0.0045	0	0	0.0047	0	0.0106	0.0087	0	0	0.1841	0	0	0.0042	0.0137	0	0.0282	0.0305	0.0593	-3.256	0.0200	0.0287	0.1554	0.0510
29	1.4882	0.0329	0.0250	0.0496	0.0229	0.0359	0	0.0188	0	0	0.0196	0	0.0438	0.0361	0	0	0.7593	0	0	0.0176	0.0567	0	0.1166	0.1259	0.2448	0.0538	-4.940	0.1185	0.6409	0.2105
30	0.5815	0.0128	0.0097	0.0194	0.0089	0.0140	0	0.0073	0	0	0.0076	0	0.0171	0.0141	0	0	0.2967	0	0	0.0068	0.0221	0	0.0455	0.0492	0.0956	0.0210	0.0323	-7.152	0.2504	0.0822
31	2.5490	0.0564	0.0428	0.0851	0.0393	0.0616	0	0.0323	0	0	0.0335	0	0.0750	0.0618	0	0	1.3006	0	0	0.0302	0.0972	0	0.1998	0.2157	0.4194	0.0921	0.1416	0.2029	-37.83	0.3606
32	14.840	0.3288	0.2496	0.4954	0.2290	0.3588	0	0.1880	0	0	0.1955	0	0.4369	0.3602	0	0	7.5721	0	0	0.1758	0.5662	0	1.1633	1.2560	2.4419	0.5367	0.8245	1.1817	6.3911	-10.69
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 17 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 17 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	-2.189	0.2026	0.0184	0.0454	0	0	0.3567	0	0.0319	0	0	0	0	0.4796	5.9469	5E+06	0.8164	0.2650	0	0	0.2902	0.0502	0.2004	0.1631	0.5140	0	0	35.260
04	0	0	0.0477	-7.236	0.0142	0.0352	0	0	0.2763	0	0.0247	0	0	0	0	0.3714	4.6058	4E+06	0.6323	0.2052	0	0	0.2247	0.0389	0.1552	0.1263	0.3981	0	0	27.309
05	0	0	0.0457	0.1503	-0.659	0.0337	0	0	0.2647	0	0.0237	0	0	0	0	0.3558	4.4122	4E+06	0.6057	0.1966	0	0	0.2153	0.0372	0.1486	0.1210	0.3813	0	0	26.161
06	0	0	0.0009	0.0030	0.0002	-1.658	0	0	0.0054	0	0.0004	0	0	0	0	0.0073	0.0906	73343.	0.0124	0.0040	0	0	0.0044	0.0007	0.0030	0.0024	0.0078	0	0	0.5372
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0.6475	2.1268	0.1936	0.4772	0	0	-9.273	0	0.3355	0	0	0	0	5.0340	62.420	5E+07	8.5697	2.7818	0	0	3.0465	0.5276	2.1035	1.7129	5.3955	0	0	370.10
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0.2565	0.8427	0.0767	0.1890	0	0	1.4838	0	-1.033	0	0	0	0	1.9946	24.732	2E+07	3.3955	1.1022	0	0	1.2071	0.2090	0.8334	0.6787	2.1378	0	0	146.64
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0.6271	2.0600	0.1876	0.4622	0	0	3.6274	0	0.3249	0	0	0	0	-12.62	60.459	5E+07	8.3006	2.6945	0	0	2.9508	0.5110	2.0374	1.6591	5.2260	0	0	358.48
19	0	0	0.1114	0.3661	0.0333	0.0821	0	0	0.6447	0	0.0577	0	0	0	0	0.8665	-206.2	9E+06	1.4752	0.4788	0	0	0.5244	0.0908	0.3621	0.2948	0.9288	0	0	63.712
20	0	0	0.0284	0.0934	0.0085	0.0209	0	0	0.1644	0	0.0147	0	0	0	0	0.2210	2.7414	*****	0.3763	0.1221	0	0	0.1338	0.0231	0.0923	0.0752	0.2369	0	0	16.255
21	0	0	0.0419	0.1377	0.0125	0.0309	0	0	0.2425	0	0.0217	0	0	0	0	0.3260	4.0431	3E+06	-29.23	0.1801	0	0	0.1973	0.0341	0.1362	0.1109	0.3494	0	0	23.972
22	0	0	0.2296	0.7542	0.0686	0.1692	0	0	1.3280	0	0.1189	0	0	0	0	1.7851	22.135	2E+07	3.0389	-8.683	0	0	1.0803	0.1871	0.7459	0.6074	1.9133	0	0	131.24
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0.0014	0.0047	0.0004	0.0010	0	0	0.0083	0	0.0007	0	0	0	0	0.0112	0.1397	*****	0.0191	0.0062	0	0	-10.58	0.0011	0.0047	0.0038	0.0120	0	0	0.8283
26	0	0	0.0087	0.0287	0.0026	0.0064	0	0	0.0505	0	0.0045	0	0	0	0	0.0679	0.8426	*****	0.1156	0.0375	0	0	0.0411	-1.827	0.0283	0.0231	0.0728	0	0	4.9960
27	0	0	0.0013	0.0045	0.0004	0.0010	0	0	0.0080	0	0.0007	0	0	0	0	0.0108	0.1344	*****	0.0184	0.0059	0	0	0.0065	0.0011	-7.307	0.0036	0.0116	0	0	0.7971
28	0	0	0.0713	0.2342	0.0213	0.0525	0	0	0.4124	0	0.0369	0	0	0	0	0.5543	6.8740	6E+06	0.9437	0.3063	0	0	0.3354	0.0581	0.2316	-5.765	0.5941	0	0	40.758
29	0	0	0.0046	0.0152	0.0013	0.0034	0	0	0.0267	0	0.0023	0	0	0	0	0.0359	0.4461	*****	0.0612	0.0198	0	0	0.0217	0.0037	0.0150	0.0122	-18.71	0	0	2.6454
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0.0644	0.2117	0.0192	0.0475	0	0	0.3729	0	0.0334	0	0	0	0	0.5012	6.2158	5E+06	0.8533	0.2770	0	0	0.3033	0.0525	0.2094	0.1705	0.5372	0	0	-1249.
WP(1)	0	0	-425.9	-1407.	-128.3	-322.6	0	0	-1804.	0	-201.0	0	0	0	0	-2455.	*****	*****	-5687.	-1689.	0	0	-2059.	-355.4	-1421.	-1121.	-3641.	0	0	*****

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 18 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 18 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	−21.52	0.1209	0.1662	0	0.0375	0	0	0	0	0.4047	0	0	2.1629	0	0.5887	0.3545	0	0.3485	0	0	0.1549	0	1.9013	5.9976	10.354	0	0	2.1326	2.1418	0.6990
02	0.3735	−0.765	0.0156	0	0.0035	0	0	0	0	0.0380	0	0	0.2033	0	0.0553	0.0333	0	0.0327	0	0	0.0145	0	0.1787	0.5638	0.9734	0	0	0.2004	0.2013	0.0657
03	1.8423	0.0560	−0.989	0	0.0174	0	0	0	0	0.1876	0	0	1.0028	0	0.2729	0.1643	0	0.1616	0	0	0.0718	0	0.8815	2.7809	4.8011	0	0	0.9888	0.9931	0.3241
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0.2048	0.0062	0.0085	0	−0.239	0	0	0	0	0.0208	0	0	0.1115	0	0.0303	0.0182	0	0.0179	0	0	0.0079	0	0.0980	0.3092	0.5338	0	0	0.1099	0.1104	0.0360
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.4357	0.0132	0.0182	0	0.0041	0	0	0	0	−2.553	0	0	0.2372	0	0.0645	0.0388	0	0.0382	0	0	0.0169	0	0.2085	0.6577	1.1356	0	0	0.2339	0.2349	0.0766
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	10.571	0.3219	0.4423	0	0.0999	0	0	0	0	1.0769	0	0	−8.128	0	1.5665	0.9433	0	0.9275	0	0	0.4123	0	5.0589	15.958	27.551	0	0	5.6745	5.6989	1.8601
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	3.0534	0.0929	0.1277	0	0.0288	0	0	0	0	0.3110	0	0	1.6622	0	−3.326	0.2724	0	0.2678	0	0	0.1191	0	1.4611	4.6091	7.9575	0	0	1.6389	1.6460	0.5372
18	0.3080	0.0093	0.0128	0	0.0029	0	0	0	0	0.0313	0	0	0.1677	0	0.0456	−2.248	0	0.0270	0	0	0.0120	0	0.1474	0.4650	0.8028	0	0	0.1653	0.1660	0.0542
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0.3556	0.0108	0.0148	0	0.0033	0	0	0	0	0.0362	0	0	0.1936	0	0.0527	0.0317	0	−2.206	0	0	0.0138	0	0.1701	0.5368	0.9269	0	0	0.1909	0.1917	0.0625
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	1.1863	0.0361	0.0496	0	0.0112	0	0	0	0	0.1208	0	0	0.6458	0	0.1757	0.1058	0	0.1040	0	0	−0.948	0	0.5677	1.7908	3.0917	0	0	0.6367	0.6395	0.2087
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0.3215	0.0097	0.0134	0	0.0030	0	0	0	0	0.0327	0	0	0.1750	0	0.0476	0.0286	0	0.0282	0	0	0.0125	0	−12.05	0.4853	0.8378	0	0	0.1725	0.1733	0.0565
26	0.2300	0.0070	0.0096	0	0.0021	0	0	0	0	0.0234	0	0	0.1252	0	0.0340	0.0205	0	0.0201	0	0	0.0089	0	0.1100	−38.14	0.5994	0	0	0.1234	0.1240	0.0404
27	0.0181	0.0005	0.0007	0	0.0001	0	0	0	0	0.0018	0	0	0.0098	0	0.0026	0.0016	0	0.0015	0	0	0.0007	0	0.0086	0.0273	−66.41	0	0	0.0097	0.0097	0.0031
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0.2371	0.0072	0.0099	0	0.0022	0	0	0	0	0.0241	0	0	0.1291	0	0.0351	0.0211	0	0.0208	0	0	0.0092	0	0.1134	0.3579	0.6180	0	0	−13.56	0.1278	0.0417
31	0.3483	0.0106	0.0145	0	0.0032	0	0	0	0	0.0354	0	0	0.1896	0	0.0516	0.0310	0	0.0305	0	0	0.0135	0	0.1667	0.5258	0.9078	0	0	0.1869	−13.55	0.0612
32	2.0425	0.0621	0.0854	0	0.0193	0	0	0	0	0.2080	0	0	1.1118	0	0.3026	0.1822	0	0.1791	0	0	0.0796	0	0.9773	3.0831	5.3228	0	0	1.0963	1.1010	−4.127
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 19 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 19 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-29.92	1.0349	1.2931	0.8869	0.2887	0.5990	0	0	0.8445	0	0	0	0	0.8824	0	0	0	0	0	0.1930	0	0	0	7.5767	3.5708	2.0207	0.4781	0	2.5754	1.2793
02	4.3190	-2.580	0.3256	0.2233	0.0727	0.1508	0	0	0.2126	0	0	0	0	0.2221	0	0	0	0	0	0.0486	0	0	0	1.9077	0.8991	0.5088	0.1203	0	0.6484	0.3221
03	10.431	0.6293	-2.763	0.5393	0.1756	0.3643	0	0	0.5136	0	0	0	0	0.5366	0	0	0	0	0	0.1173	0	0	0	4.6077	2.1716	1.2289	0.2907	0	1.5662	0.7780
04	0.4166	0.0251	0.0314	-2.412	0.0070	0.0145	0	0	0.0205	0	0	0	0	0.0214	0	0	0	0	0	0.0046	0	0	0	0.1840	0.0867	0.0490	0.0116	0	0.0625	0.0310
05	1.4020	0.0845	0.1057	0.0724	-0.769	0.0489	0	0	0.0690	0	0	0	0	0.0721	0	0	0	0	0	0.0157	0	0	0	0.6193	0.2918	0.1651	0.0390	0	0.2105	0.1045
06	0.0645	0.0038	0.0048	0.0033	0.0010	-1.642	0	0	0.0031	0	0	0	0	0.0033	0	0	0	0	0	0.0007	0	0	0	0.0284	0.0134	0.0075	0.0017	0	0.0096	0.0048
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0.1230	0.0074	0.0092	0.0063	0.0020	0.0042	0	0	-2.312	0	0	0	0	0.0063	0	0	0	0	0	0.0013	0	0	0	0.0543	0.0256	0.0144	0.0034	0	0.0184	0.0091
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	2.9144	0.1758	0.2197	0.1506	0.0490	0.1017	0	0	0.1435	0	0	0	0	-2.272	0	0	0	0	0	0.0327	0	0	0	1.2873	0.6067	0.3433	0.0812	0	0.4375	0.2173
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.5921	0.0357	0.0446	0.0306	0.0099	0.0206	0	0	0.0291	0	0	0	0	0.0304	0	0	0	0	0	-0.523	0	0	0	0.2615	0.1232	0.0697	0.0165	0	0.0889	0.0441
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	1.4741	0.0889	0.1111	0.0762	0.0248	0.0514	0	0	0.0725	0	0	0	0	0.0758	0	0	0	0	0	0.0165	0	0	0	-20.14	0.3068	0.1736	0.0410	0	0.2213	0.1099
27	0.1103	0.0066	0.0083	0.0057	0.0018	0.0038	0	0	0.0054	0	0	0	0	0.0056	0	0	0	0	0	0.0012	0	0	0	0.0487	-9.778	0.0129	0.0030	0	0.0165	0.0082
28	1.3554	0.0817	0.1021	0.0700	0.0228	0.0473	0	0	0.0667	0	0	0	0	0.0697	0	0	0	0	0	0.0152	0	0	0	0.5987	0.2821	-5.386	0.0377	0	0.2035	0.1010
29	0.1879	0.0113	0.0141	0.0097	0.0031	0.0065	0	0	0.0092	0	0	0	0	0.0096	0	0	0	0	0	0.0021	0	0	0	0.0830	0.0391	0.0221	-1.307	0	0.0282	0.0140
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	1.2897	0.0778	0.0972	0.0666	0.0217	0.0450	0	0	0.0635	0	0	0	0	0.0663	0	0	0	0	0	0.0145	0	0	0	0.5696	0.2684	0.1519	0.0359	0	-6.875	0.0961
32	5.2480	0.3166	0.3956	0.2713	0.0883	0.1832	0	0	0.2584	0	0	0	0	0.2699	0	0	0	0	0	0.0590	0	0	0	2.3181	1.0925	0.6182	0.1462	0	0.7879	-3.120
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 20 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 20 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-278.3	0	0.5027	0	0	0.3698	4.9160	6E+06	5.1282	0	8.7464	0	11.567	0	NA	10.242	1.3818	0	0	2.9441	0	0	0	1.7343	0	0	55.865	26550.	3.4816	4.4153
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	6.2280	0	-1.478	0	0	0.0164	0.2184	*****	0.2278	0	0.3886	0	0.5140	0	NA	0.4551	0.0614	0	0	0.1308	0	0	0	0.0770	0	0	2.4824	1179.8	0.1547	0.1962
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0.0299	0	0.0001	0	0	-1.104	0.0010	1367.6	0.0010	0	0.0018	0	0.0024	0	NA	0.0021	0.0002	0	0	0.0006	0	0	0	0.0003	0	0	0.0119	5.6740	0.0007	0.0009
07	8.6924	0	0.0311	0	0	0.0229	-14.37	*****	0.3180	0	0.5424	0	0.7174	0	NA	0.6352	0.0857	0	0	0.1825	0	0	0	0.1075	0	0	3.4647	1646.6	0.2159	0.2738
08	0.3056	0	0.0010	0	0	0.0008	0.0107	*****	0.0111	0	0.0190	0	0.0252	0	NA	0.0223	0.0030	0	0	0.0064	0	0	0	0.0037	0	0	0.1218	57.898	0.0075	0.0096
11	8.7595	0	0.0314	0	0	0.0231	0.3072	*****	-14.99	0	0.5466	0	0.7229	0	NA	0.6401	0.0863	0	0	0.1840	0	0	0	0.1083	0	0	3.4915	1659.3	0.2175	0.2759
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	103.71	0	0.3720	0	0	0.2737	3.6380	5E+06	3.7950	0	-19.64	0	8.5606	0	NA	7.5800	1.0226	0	0	2.1787	0	0	0	1.2834	0	0	41.342	19648	2.5765	3.2674
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	11.990	0	0.0430	0	0	0.0316	0.4205	*****	0.4387	0	0.7482	0	-33.55	0	NA	0.8762	0.1182	0	0	0.2518	0	0	0	0.1483	0	0	4.7792	2271.3	0.2978	0.3777
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	77.684	0	0.2786	0	0	0.2050	2.7248	4E+06	2.8424	0	4.8479	0	6.4118	0	NA	-24.90	0.7659	0	0	1.6318	0	0	0	0.9613	0	0	30.964	14716.	1.9297	2.4473
19	20.920	0	0.0750	0	0	0.0552	0.7337	*****	0.7654	0	1.3055	0	1.7266	0	NA	1.5288	-3.919	0	0	0.4394	0	0	0	0.2588	0	0	8.3386	3962.9	0.5196	0.6590
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	19.658	0	0.0705	0	0	0.0518	0.6895	*****	0.7193	0	1.2268	0	1.6225	0	NA	1.4366	0.1938	0	0	-8.378	0	0	0	0.2432	0	0	7.83[illegible]	3724.0	0.4883	0.6193
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	3.9707	0	0.0142	0	0	0.0104	0.1392	*****	0.1452	0	0.2477	0	0.3277	0	NA	0.2901	0.0391	0	0	0.0834	0	0	0	-5.129	0	0	1.5827	752.20	0.0986	0.1250
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	1.8834	0	0.0067	0	0	0.0049	0.0660	85997.	0.0689	0	0.1175	0	0.1554	0	NA	0.1376	0.0185	0	0	0.0395	0	0	0	0.0233	0	0	-166.0	356.78	0.0467	0.0593
30	0.0012	0	0.0000	0	0	0.0000	0.0000	57.898	0.0000	0	0.0000	0	0.0001	0	NA	0.0000	0.0000	0	0	0.0000	0	0	0	0.0000	0	0	0.0005	*****	0.0000	0.0000
31	7.7571	0	0.0278	0	0	0.0204	0.2720	*****	0.2838	0	0.4840	0	0.6402	0	NA	0.5669	0.0764	0	0	0.1629	0	0	0	0.0959	0	0	3.0920	1469.4	-10.20	0.2443
32	6.7351	0	0.0241	0	0	0.0177	0.2362	*****	0.2464	0	0.4203	0	0.5558	0	NA	0.4922	0.0664	0	0	0.1414	0	0	0	0.0833	0	0	2.6846	1275.8	0.1673	-12.97
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 21 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 21 FROM PARTNERS 01–32.																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	-0.732	0.2697	0	0	0.0786	0.6456	0	3.2368	0.2289	0	0.8198	0.2117	0	0.1264	0	0.1131	0.6091	0	0.0206	0.4731	0	0	0	0	0.2812	0	0	1.2556
04	0	0	0.0368	-6.364	0	0	0.0941	0.7729	0	3.8748	0.2740	0	0.9814	0.2535	0	0.1513	0	0.1354	0.7291	0	0.0247	0.5664	0	0	0	0	0.3366	0	0	1.5031
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0.0033	0.0291	0	0	-1.941	0.0698	0	0.3502	0.0247	0	0.0887	0.0229	0	0.0136	0	0.0122	0.0659	0	0.0022	0.0512	0	0	0	0	0.0304	0	0	0.1358
08	0	0	0.0074	0.0656	0	0	0.0191	-15.85	0	0.7878	0.0557	0	0.1995	0.0515	0	0.0307	0	0.0275	0.1482	0	0.0050	0.1151	0	0	0	0	0.0684	0	0	0.3056
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0.0000	0.0000	0	0	0.0000	0.0000	0	-80.26	0.0000	0	0.0000	0.0000	0	0.0000	0	0.0000	0.0000	0	0.0000	0.0000	0	0	0	0	0.0000	0	0	0.0000
13	0	0	0.2050	1.7951	0	0	0.5235	4.2977	0	21.544	-4.152	0	5.4566	1.4094	0	0.8414	0	0.7528	4.0542	0	0.1375	3.1491	0	0	0	0	1.8719	0	0	8.3575
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0.0751	0.6576	0	0	0.1918	1.5745	0	7.8931	0.5582	0	-18.32	0.5163	0	0.3082	0	0.2758	1.4853	0	0.0504	1.1537	0	0	0	0	0.6858	0	0	3.0619
16	0	0	0.1929	1.6897	0	0	0.4928	4.0454	0	20.279	1.4342	0	5.1363	-3.924	0	0.7920	0	0.7086	3.8162	0	0.1295	2.9643	0	0	0	0	1.7620	0	0	7.8670
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0.0353	0.3092	0	0	0.0902	0.7404	0	3.7117	0.2624	0	0.9400	0.2428	0	-2.989	0	0.1297	0.6984	0	0.0237	0.5425	0	0	0	0	0.3225	0	0	1.4398
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0.0640	0.5610	0	0	0.1636	1.3432	0	6.7336	0.4762	0	1.7054	0.4405	0	0.2629	0	-2.569	1.2671	0	0.0430	0.9842	0	0	0	0	0.5850	0	0	2.6121
21	0	0	0.0808	0.7079	0	0	0.2064	1.6948	0	8.4962	0.6008	0	2.1519	0.5558	0	0.3318	0	0.2969	-13.50	0	0.0542	1.2419	0	0	0	0	0.7382	0	0	3.2959
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0.0039	0.0342	0	0	0.0099	0.0819	0	0.4110	0.0290	0	0.1041	0.0268	0	0.0160	0	0.0143	0.0773	0	-0.509	0.0600	0	0	0	0	0.0357	0	0	0.1594
24	0	0	0.0064	0.0561	0	0	0.0163	0.1345	0	0.6743	0.0476	0	0.1708	0.0441	0	0.0263	0	0.0235	0.1269	0	0.0043	-11.63	0	0	0	0	0.0585	0	0	0.2616
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0.0065	0.0572	0	0	0.0166	0.1369	0	0.6867	0.0485	0	0.1739	0.0449	0	0.0268	0	0.0239	0.1292	0	0.0043	0.1003	0	0	0	0	-6.914	0	0	0.2664
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0.0150	0.1316	0	0	0.0384	0.3152	0	1.5803	0.1117	0	0.4002	0.1033	0	0.0617	0	0.0552	0.2973	0	0.0100	0.2309	0	0	0	0	0.1373	0	0	-30.52
WP(1)	0	0	-3.166	-27.49	0	0	-8.389	-68.48	0	-346.7	-17.93	0	-79.17	-16.95	0	-12.91	0	-11.09	-58.33	0	-2.202	-50.25	0	0	0	0	-29.86	0	0	-131.8

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 22 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

BILATERAL SEABORNE IMPORTS OF REGION 22 FROM PARTNERS 01–32.

PRICE OF h, WP(1)	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-60.97	0.1923	0.7188	0	0	0	0	58.825	0	70.717	4.9524	19.866	29.254	0	0	0	0	0	0	6.4527	1.2868	10.118	0	15.001	3.0177	22.144	0	0.4787	0	1.0646
02	0.6543	-0.281	0.0036	0	0	0	0	0.2955	0	0.3552	0.0248	0.0997	0.1469	0	0	0	0	0	0	0.0324	0.0064	0.0508	0	0.0753	0.0151	0.1112	0	0.0024	0	0.0053
03	5.2024	0.0076	-1.026	0	0	0	0	2.3495	0	2.8245	0.1978	0.7934	1.1684	0	0	0	0	0	0	0.2577	0.0513	0.4041	0	0.5991	0.1205	0.8844	0	0.0191	0	0.0425
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	2.6187	0.0038	0.0144	0	0	0	0	-85.17	0	1.4217	0.0995	0.3994	0.5881	0	0	0	0	0	0	0.1297	0.0258	0.2034	0	0.3016	0.0606	0.4452	0	0.0096	0	0.0214
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.8190	0.0012	0.0045	0	0	0	0	0.3698	0	-103.3	0.0311	0.1249	0.1839	0	0	0	0	0	0	0.0405	0.0080	0.0636	0	0.0943	0.0189	0.1392	0	0.0030	0	0.0066
13	8.6150	0.0127	0.0475	0	0	0	0	3.8907	0	4.6772	-6.943	1.3139	1.9349	0	0	0	0	0	0	0.4267	0.0851	0.6692	0	0.9922	0.1995	1.4646	0	0.0316	0	0.0704
14	2.4069	0.0035	0.0132	0	0	0	0	1.0870	0	1.3067	0.0915	-28.79	0.5405	0	0	0	0	0	0	0.1192	0.0237	0.1869	0	0.2772	0.0557	0.4091	0	0.0088	0	0.0196
15	26.486	0.0391	0.1461	0	0	0	0	11.961	0	14.380	1.0070	4.0397	-36.99	0	0	0	0	0	0	1.3121	0.2616	2.0574	0	3.0506	0.6136	4.5029	0	0.0973	0	0.2164
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	3.1674	0.0046	0.0174	0	0	0	0	1.4304	0	1.7196	0.1204	0.4830	0.7113	0	0	0	0	0	0	-9.316	0.0312	0.2460	0	0.3648	0.0733	0.5384	0	0.0116	0	0.0258
23	0.6234	0.0009	0.0034	0	0	0	0	0.2815	0	0.3384	0.0237	0.0950	0.1400	0	0	0	0	0	0	0.0308	-1.883	0.0484	0	0.0718	0.0144	0.1059	0	0.0022	0	0.0050
24	0.4929	0.0007	0.0027	0	0	0	0	0.2226	0	0.2676	0.0187	0.0751	0.1107	0	0	0	0	0	0	0.0244	0.0048	-14.81	0	0.0567	0.0114	0.0838	0	0.0018	0	0.0040
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0.8332	0.0012	0.0045	0	0	0	0	0.3763	0	0.4523	0.0316	0.1270	0.1871	0	0	0	0	0	0	0.0412	0.0082	0.0647	0	-21.92	0.0193	0.1416	0	0.0030	0	0.0068
27	1.1671	0.0017	0.0064	0	0	0	0	0.5271	0	0.6336	0.0443	0.1780	0.2621	0	0	0	0	0	0	0.0578	0.0115	0.0906	0	0.1344	-4.403	0.1984	0	0.0042	0	0.0095
28	2.0019	0.0029	0.0110	0	0	0	0	0.9041	0	1.0869	0.0761	0.3053	0.4496	0	0	0	0	0	0	0.0991	0.0197	0.1555	0	0.2305	0.0463	-32.16	0	0.0073	0	0.0163
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0.0245	0.0000	0.0001	0	0	0	0	0.0111	0	0.0133	0.0009	0.0037	0.0055	0	0	0	0	0	0	0.0012	0.0002	0.0019	0	0.0028	0.0005	0.0041	0	-0.702	0	0.0002
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	5.8568	0.0086	0.0323	0	0	0	0	2.6450	0	3.1798	0.2226	0.8932	1.3154	0	0	0	0	0	0	0.2901	0.0578	0.4549	0	0.6745	0.1356	0.9957	0	0.0215	0	-1.515
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 23 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 23 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	-3.779	0	0.6656	0	0	0	*****	0	0	0	0	1.0834	0	0	0.6112	0	0	40.967	0	0	41.441	0.7723	146.73	17027.	0.7213	0.9740	3.7534	0	31.320
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0.0271	0	-2.907	0	0	0	6885.0	0	0	0	0	0.0264	0	0	0.0149	0	0	0.9994	0	0	1.0109	0.0188	3.5796	415.39	0.0175	0.0237	0.0915	0	0.7640
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0.0041	0	0.0024	0	0	0	*****	0	0	0	0	0.0040	0	0	0.0022	0	0	0.1534	0	0	0.1552	0.0028	0.5496	63.784	0.0027	0.0036	0.0140	0	0.1173
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0.5517	0	0.3295	0	0	0	*****	0	0	0	0	-4.221	0	0	0.3026	0	0	20.282	0	0	20.517	0.3824	72.647	8430.3	0.3571	0.4822	1.8583	0	15.506
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	1.1980	0	0.7156	0	0	0	*****	0	0	0	0	1.1648	0	0	-2.027	0	0	44.044	0	0	44.554	0.8304	157.75	18306.	0.7755	1.0472	4.0353	0	33.673
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0.4148	0	0.2478	0	0	0	*****	0	0	0	0	0.4033	0	0	0.2275	0	0	-164.6	0	0	15.428	0.2875	54.629	6339.4	0.2685	0.3626	1.3974	0	11.660
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0.1214	0	0.0725	0	0	0	30752.	0	0	0	0	0.1180	0	0	0.0666	0	0	4.4639	0	0	-177.4	0.0841	15.988	1855.4	0.0786	0.1061	0.4089	0	3.4128
25	0	0.0269	0	0.0160	0	0	0	6817.0	0	0	0	0	0.0261	0	0	0.0147	0	0	0.9895	0	0	1.0009	-3.373	3.5442	411.28	0.0174	0.0235	0.0906	0	0.7565
26	0	0.0206	0	0.0123	0	0	0	5221.7	0	0	0	0	0.0200	0	0	0.0113	0	0	0.7579	0	0	0.7667	0.0142	-641.7	315.04	0.0133	0.0180	0.0694	0	0.5795
27	0	0.0002	0	0.0001	0	0	0	63.784	0	0	0	0	0.0002	0	0	0.0001	0	0	0.0092	0	0	0.0093	0.0001	0.0331	*****	0.0001	0.0002	0.0008	0	0.0070
28	0	0.3146	0	0.1879	0	0	0	79687.	0	0	0	0	0.3059	0	0	0.1725	0	0	11.567	0	0	11.701	0.2180	41.430	4807.7	-2.964	0.2750	1.0597	0	8.8435
29	0	0.9254	0	0.5527	0	0	0	*****	0	0	0	0	0.8997	0	0	0.5076	0	0	34.020	0	0	34.415	0.6414	121.85	14140.	0.5990	-3.469	3.1170	0	26.010
30	0	0.1121	0	0.0670	0	0	0	28415.	0	0	0	0	0.1090	0	0	0.0615	0	0	4.1247	0	0	4.1725	0.0777	14.773	1714.4	0.0726	0.0980	-16.10	0	3.1535
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0.0623	0	0.0372	0	0	0	15792.	0	0	0	0	0.0606	0	0	0.0342	0	0	2.2923	0	0	2.3189	0.0432	8.2106	952.79	0.0403	0.0545	0.2100	0	-135.8
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 24 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

BILATERAL SEABORNE IMPORTS OF REGION 24 FROM PARTNERS 01–32.

PRICE OF h, WP(1)	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
02	0	-26.32	0	0.0131	0	0.0447	0.0523	3443.2	59068.	0	0.4879	66.017	0	0.1635	NA	1.3880	0	NA	16.172	1.6831	1.3255	NA	0	15653.	8.7340	0.3240	0.9983	2116.1	0.1169	4.1267
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
04	0	0.0574	0	-1.741	0	0.0128	0.0149	986.43	16921.	0	0.1397	18.912	0	0.0468	NA	0.3976	0	NA	4.6332	0.4821	0.3797	NA	0	4484.3	2.5021	0.0928	0.2860	606.23	0.0335	1.1822
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
06	0	0.4464	0	0.0293	0	-5.826	0.1166	7672.1	*****	0	1.0872	147.09	0	0.3644	NA	3.0928	0	NA	36.035	3.7502	2.9536	NA	0	34877.	19.460	0.7220	2.2244	4715.1	0.2606	9.1950
07	0	2.9772	0	0.1958	0	0.6651	-6.152	51162.	*****	0	7.2506	980.92	0	2.4300	NA	20.625	0	NA	240.30	25.009	19.696	NA	0	*****	129.77	4.8150	14.834	31443.	1.7380	61.318
08	0	0.0053	0	0.0003	0	0.0011	0.0013	*****	1573.9	0	0.0130	1.7591	0	0.0043	NA	0.0369	0	NA	0.4309	0.0448	0.0353	NA	0	417.10	0.2327	0.0086	0.0266	56.387	0.0031	0.1099
11	0	0.0915	0	0.0060	0	0.0204	0.0239	1573.9	*****	0	0.2230	30.177	0	0.0747	NA	0.6345	0	NA	7.3928	0.7693	0.6059	NA	0	7155.2	3.9924	0.1481	0.4563	967.32	0.0534	1.8863
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
13	0	6.3421	0	0.4171	0	1.4169	1.6570	*****	2E+06	0	-49.15	2089.5	0	5.1764	NA	43.934	0	NA	511.89	53.273	41.956	NA	0	*****	276.44	10.256	31.598	66979.	3.7023	130.61
14	0	1.0032	0	0.0659	0	0.2241	0.2621	17239.	*****	0	2.4431	-8409.	0	0.8188	NA	6.9496	0	NA	80.972	8.4268	6.6367	NA	0	78370.	43.728	1.6224	4.9983	10594.	0.5856	20.661
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
16	0	5.6021	0	0.3684	0	1.2516	1.4637	96268.	2E+06	0	13.643	1845.7	0	-17.07	NA	38.808	0	NA	452.17	47.057	37.061	NA	0	*****	244.18	9.0601	27.912	59164.	3.2704	115.37
17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
18	0	0.9229	0	0.0607	0	0.2062	0.2411	15860.	*****	0	2.2476	304.08	0	0.7533	NA	-177.3	0	NA	74.494	7.7527	6.1058	NA	0	72101.	40.230	1.4926	4.5985	9747.3	0.5388	19.008
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
21	0	2.8388	0	0.1867	0	0.6342	0.7417	48783.	*****	0	6.9135	935.31	0	2.3170	NA	19.666	0	NA	-1911.	23.846	18.780	NA	0	*****	123.74	4.5911	14.144	29981.	1.6572	58.467
22	0	0.0245	0	0.0016	0	0.0054	0.0064	421.58	7232.1	0	0.0597	8.0829	0	0.0200	NA	0.1699	0	NA	1.9801	-222.6	0.1623	NA	0	1916.5	1.0693	0.0396	0.1222	259.09	0.0143	0.5052
23	0	0.5523	0	0.0363	0	0.1233	0.1443	9491.0	*****	0	1.3450	181.96	0	0.4507	NA	3.8261	0	NA	44.579	4.6393	-171.8	NA	0	43146.	24.074	0.8932	2.7518	5832.9	0.3224	11.375
24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0
26	0	0.0242	0	0.0015	0	0.0054	0.0063	417.10	7155.2	0	0.0591	7.9969	0	0.0198	NA	0.1681	0	NA	1.9591	0.2038	0.1605	NA	0	*****	1.0579	0.0392	0.1209	256.34	0.0141	0.4998
27	0	0.2654	0	0.0174	0	0.0593	0.0693	4561.4	78251.	0	0.6464	87.456	0	0.2166	NA	1.8388	0	NA	21.425	2.2297	1.7560	NA	0	20736.	-1144.	0.4292	1.3225	2803.3	0.1549	5.4669
28	0	0.0648	0	0.0042	0	0.0144	0.0169	1113.8	19108.	0	0.1578	21.356	0	0.0529	NA	0.4490	0	NA	5.2319	0.5444	0.4288	NA	0	5063.8	2.8254	-42.79	0.3229	684.57	0.0378	1.3350
29	0	0.3447	0	0.0226	0	0.0770	0.0900	5924.3	*****	0	0.8395	113.58	0	0.2813	NA	2.3882	0	NA	27.826	2.8959	2.2807	NA	0	26932.	15.027	0.5575	-130.4	3640.9	0.2012	7.1002
30	0	0.0032	0	0.0002	0	0.0007	0.0008	56.387	967.32	0	0.0079	1.0811	0	0.0026	NA	0.0227	0	NA	0.2648	0.0275	0.0217	NA	0	256.34	0.1430	0.0053	0.0163	*****	0.0019	0.0675
31	0	2.1105	0	0.1388	0	0.4715	0.5514	36268.	*****	0	5.1398	695.35	0	1.7226	NA	14.620	0	NA	170.34	17.728	13.962	NA	0	*****	91.995	3.4132	10.515	22289.	-14.25	43.467
32	0	2.6485	0	0.1742	0	0.5917	0.6920	45513.	*****	0	6.4501	872.62	0	2.1617	NA	18.347	0	NA	213.77	22.247	17.521	NA	0	*****	115.44	4.2834	13.196	27971.	1.5461	-491.7
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NA	0	0	NA	0	0	0	NA	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 25 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 25 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	*****	0	0.0206	0.0297	0.0089	0	0	20.786	8.6479	0	0.0576	0	0.1755	0.0903	0	0.0888	0.0432	0.0091	0.0621	70293.	0.1468	0.2782	0	0	0.0064	0.0147	0.1086	0.0922	0.0437	0.2015
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	944.97	0	−3.547	0.0980	0.0294	0	0	68.507	28.501	0	0.1899	0	0.5785	0.2979	0	0.2928	0.1424	0.0302	0.2048	*****	0.4839	0.9169	0	0	0.0212	0.0487	0.3579	0.3038	0.1441	0.6642
04	429.88	0	0.0309	−5.169	0.0134	0	0	31.165	12.965	0	0.0864	0	0.2631	0.1355	0	0.1332	0.0647	0.0137	0.0932	*****	0.2201	0.4171	0	0	0.0096	0.0221	0.1628	0.1382	0.0655	0.3021
05	2068.5	0	0.1489	0.2147	−1.501	0	0	149.96	62.389	0	0.4158	0	1.2664	0.6521	0	0.6410	0.3117	0.0662	0.4485	*****	1.0594	2.0072	0	0	0.0464	0.1066	0.7835	0.6652	0.3155	1.4539
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	.0692	0	0.0000	0.0000	0.0000	0	0	−3641.	0.0020	0	0.0000	0	0.0000	0.0000	0	0.0000	0.0000	0.0000	0.0000	16.986	0.0000	0.0000	0	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	1677.6	0	0.1207	0.1741	0.0523	0	0	121.62	−1464.	0	0.3373	0	1.0271	0.5289	0	0.5199	0.2528	0.0537	0.3637	*****	0.8592	1.6279	0	0	0.0376	0.0864	0.6355	0.5395	0.2559	1.1792
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	759.84	0	0.0547	0.0788	0.0236	0	0	55.085	22.917	0	−9.945	0	0.4652	0.2395	0	0.2354	0.1145	0.0243	0.1647	*****	0.3891	0.7373	0	0	0.0170	0.0391	0.2878	0.2443	0.1159	0.5340
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2204.8	0	0.1587	0.2288	0.0687	0	0	159.84	66.500	0	0.4432	0	−29.39	0.6951	0	0.6833	0.3322	0.0705	0.4780	*****	1.1292	2.1395	0	0	0.0494	0.1136	0.8352	0.7090	0.3363	1.5497
16	9591.1	0	0.6904	0.9956	0.2991	0	0	695.32	289.27	0	1.9283	0	5.8721	−12.81	0	2.9723	1.4453	0.3070	2.0795	2E+06	4.9122	9.3069	0	0	0.2153	0.4944	3.6331	3.0844	1.4633	6.7413
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	5917.2	0	0.4259	0.6142	0.1845	0	0	428.98	178.47	0	1.1896	0	3.6228	1.8655	0	−13.73	0.8917	0.1894	1.2829	1E+06	3.0306	5.7419	0	0	0.1328	0.3050	2.2415	1.9029	0.9027	4.1591
19	3791.7	0	0.2729	0.3936	0.1182	0	0	274.88	114.36	0	0.7623	0	2.3214	1.1954	0	1.1751	−6.997	0.1213	0.8221	*****	1.9420	3.6794	0	0	0.0851	0.1954	1.4363	1.2193	0.5785	2.6651
20	46.246	0	0.0033	0.0048	0.0014	0	0	3.3527	1.3948	0	0.0092	0	0.0283	0.0145	0	0.0143	0.0069	−1.606	0.0100	11337.	0.0236	0.0448	0	0	0.0010	0.0023	0.0175	0.0148	0.0070	0.0325
21	669.92	0	0.0482	0.0695	0.0208	0	0	48.566	20.205	0	0.1346	0	0.4101	0.2112	0	0.2076	0.1009	0.0214	−10.74	*****	0.3431	0.6500	0	0	0.0150	0.0345	0.2537	0.2154	0.1022	0.4708
22	234.31	0	0.0168	0.0243	0.0073	0	0	16.986	7.0670	0	0.0471	0	0.1434	0.0738	0	0.0726	0.0353	0.0075	0.0508	*****	0.1200	0.2273	0	0	0.0052	0.0120	0.0887	0.0753	0.0357	0.1646
23	184.44	0	0.0132	0.0191	0.0057	0	0	13.371	5.5630	0	0.0370	0	0.1129	0.0581	0	0.0571	0.0277	0.0059	0.0399	45218.	−25.62	0.1789	0	0	0.0041	0.0095	0.0698	0.0593	0.0281	0.1296
24	1896.9	0	0.1365	0.1969	0.0591	0	0	137.52	57.214	0	0.3813	0	1.1614	0.5980	0	0.5878	0.2858	0.0607	0.4113	*****	0.9715	−46.89	0	0	0.0425	0.0978	0.7185	0.6100	0.2894	1.3333
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	38.738	0	0.0027	0.0040	0.0012	0	0	2.8084	1.1683	0	0.0077	0	0.0237	0.0122	0	0.0120	0.0058	0.0012	0.0083	9497.1	0.0198	0.0375	0	0	−1.126	0.0019	0.0146	0.0124	0.0059	0.0272
28	1026.3	0	0.0738	0.1065	0.0320	0	0	74.410	30.957	0	0.2063	0	0.6284	0.3235	0	0.3180	0.1546	0.0328	0.2225	*****	0.5256	0.9959	0	0	0.0230	−2.536	0.3888	0.3300	0.1565	0.7214
29	9130.3	0	0.6573	0.9478	0.2847	0	0	661.91	275.38	0	1.8356	0	5.5899	2.8785	0	2.8295	1.3759	0.2923	1.9796	2E+06	4.6762	8.8598	0	0	0.2049	0.4707	−15.56	2.9362	1.3930	6.4174
30	947.44	0	0.0682	0.0983	0.0295	0	0	68.686	28.575	0	0.1904	0	0.5800	0.2987	0	0.2936	0.1427	0.0303	0.2054	*****	0.4852	0.9193	0	0	0.0212	0.0488	0.3588	−15.84	0.1445	0.6659
31	4687.2	0	0.3374	0.4865	0.1461	0	0	339.80	141.37	0	0.9423	0	2.8697	1.4777	0	1.4526	0.7063	0.1500	1.0162	1E+06	2.4006	4.5483	0	0	0.1052	0.2416	1.7755	1.5073	−6.947	3.2945
32	3689.8	0	0.2656	0.3830	0.1150	0	0	267.50	111.28	0	0.7418	0	2.2590	1.1633	0	1.1435	0.5560	0.1181	0.8000	*****	1.8898	3.5805	0	0	0.0828	0.1902	1.3977	1.1866	0.5629	−32.70
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICTIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 26 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 26 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	-322.4	*****	9.6228	0	0	0.9767	18.666	4.0176	0	4.5767	2.8508	0.3037	2.7657	2.1685	0	0	0	0	0.8634	3.5208	0	0	1.4468	5.2280
08	0	0	0	0	0	0	0.0384	*****	0.0106	0	0	0.0010	0.0206	0.0044	0	0.0050	0.0031	0.0003	0.0030	0.0023	0	0	0	0	0.0009	0.0038	0	0	0.0015	0.0057
11	0	0	0	0	0	0	4.2405	24570.	-97.68	0	0	0.1191	2.2763	0.4899	0	0.5581	0.3476	0.0370	0.3372	0.2644	0	0	0	0	0.1053	0.4293	0	0	0.1764	0.6375
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0.7468	4327.6	0.2066	0	0	-10.01	0.4009	0.0862	0	0.0983	0.0612	0.0065	0.0594	0.0465	0	0	0	0	0.0185	0.0756	0	0	0.0310	0.1122
15	0	0	0	0	0	0	19.262	*****	5.3305	0	0	0.5410	-181.4	2.2255	0	2.5352	1.5792	0.1682	1.5320	1.2012	0	0	0	0	0.4783	1.9503	0	0	0.8014	2.8960
16	0	0	0	0	0	0	83.012	*****	22.972	0	0	2.3317	44.561	-31.68	0	10.925	6.8056	0.7252	6.6025	5.1769	0	0	0	0	2.0613	8.4050	0	0	3.4539	12.480
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	35.670	*****	9.8712	0	0	1.0019	19.148	4.1213	0	-42.32	2.9244	0.3116	2.8371	2.2245	0	0	0	0	0.8857	3.6117	0	0	1.4841	5.3630
19	0	0	0	0	0	0	36.022	*****	9.9685	0	0	1.0118	19.337	4.1619	0	4.7411	-26.33	0.3147	2.8650	2.2464	0	0	0	0	0.8945	3.6472	0	0	1.4988	5.4159
20	0	0	0	0	0	0	1.5523	8994.8	0.4295	0	0	0.0436	0.8333	0.1793	0	0.2043	0.1272	-3.107	0.1234	0.0968	0	0	0	0	0.0385	0.1571	0	0	0.0645	0.2333
21	0	0	0	0	0	0	2.1751	12603.	0.6019	0	0	0.0610	1.1676	0.2513	0	0.2862	0.1783	0.0190	-28.24	0.1356	0	0	0	0	0.0540	0.2202	0	0	0.0905	0.3270
22	0	0	0	0	0	0	0.7198	4170.6	0.1991	0	0	0.0202	0.3863	0.0831	0	0.0947	0.0590	0.0062	0.0572	-22.23	0	0	0	0	0.0178	0.0728	0	0	0.0299	0.1082
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	1.0000	5794.6	0.2767	0	0	0.0280	0.5368	0.1155	0	0.1316	0.0819	0.0087	0.0795	0.0623	0	0	0	0	-8.846	0.1012	0	0	0.0416	0.1503
28	0	0	0	0	0	0	10.755	62322.	2.9765	0	0	0.3021	5.7738	1.2427	0	1.4156	0.8818	0.0939	0.8554	0.6707	0	0	0	0	0.2670	-35.08	0	0	0.4475	1.6171
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	51.940	*****	14.373	0	0	1.4589	27.882	6.0011	0	6.8361	4.2582	0.4537	4.1311	3.2392	0	0	0	0	1.2897	5.2589	0	0	-12.70	7.8091
32	0	0	0	0	0	0	75.336	*****	20.848	0	0	2.1161	40.441	8.7043	0	9.9155	6.1763	0.6581	5.9919	4.6982	0	0	0	0	1.8707	7.6278	0	0	3.1345	-42.38
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 27 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 27 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	-450.0	0	0.0101	0	0	0.0031	0.0085	0.0075	0	0.0163	0	0	0.3558	0.0051	0.0513	0	0.0132	0	0	0	0.0380
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	8.8112	0	-5.376	0	0	0.0328	0.0902	0.0793	0	0.1716	0	0	3.7384	0.0537	0.5396	0	0.1393	0	0	0	0.3998
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	1.4398	0	0.0175	0	0	-1.678	0.0147	0.0129	0	0.0280	0	0	0.6109	0.0087	0.0881	0	0.0227	0	0	0	0.0653
18	0	0	0	0	0	0	0	0	0	32.946	0	0.4006	0	0	0.1230	-4.280	0.2966	0	0.6416	0	0	13.978	0.2009	2.0179	0	0.5210	0	0	0	1.4951
19	0	0	0	0	0	0	0	0	0	43.612	0	0.5303	0	0	0.1628	0.4466	-3.667	0	0.8494	0	0	18.504	0.2660	2.6712	0	0.6897	0	0	0	1.9791
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	1.3966	0	0.0169	0	0	0.0052	0.0143	0.0125	0	-8.755	0	0	0.5925	0.0085	0.0855	0	0.0220	0	0	0	0.0633
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	8.9689	0	0.1090	0	0	0.0334	0.0918	0.0807	0	0.1746	0	0	-187.5	0.0547	0.5493	0	0.1418	0	0	0	0.4070
25	0	0	0	0	0	0	0	0	0	0.7774	0	0.0094	0	0	0.0029	0.0079	0.0069	0	0.0151	0	0	0.3298	-2.746	0.0476	0	0.0122	0	0	0	0.0352
26	0	0	0	0	0	0	0	0	0	4.9341	0	0.0599	0	0	0.0184	0.0505	0.0444	0	0.0961	0	0	2.0935	0.0301	-27.31	0	0.0780	0	0	0	0.2239
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	36.541	0	0.4443	0	0	0.1364	0.3742	0.3289	0	0.7116	0	0	15.504	0.2229	2.2381	0	-6.553	0	0	0	1.6582
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	310.67	0	3.7777	0	0	1.1599	3.1816	2.7968	0	6.0507	0	0	131.81	1.8952	19.028	0	4.9134	0	0	0	-6.365
WP(1)	0	0	0	0	0	0	0	0	0	*****	0	-7815.	0	0	-2439.	-6222.	-5330.	0	*****	0	0	*****	-3992.	*****	0	-9527.	0	0	0	-9252.

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 28 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 28 FROM PARTNERS 01-32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-282.8	0	0	1.5100	0	0	2.6982	0	0	0	0	4.3063	2.0294	1.9474	0	0	1.4236	0	0	0	5.6717	0.5975	0	2.6288	0	22.408	6.3422	2.8165	2.9617	11.957
02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04	2.2308	0	0	-3.665	0	0	0.0306	0	0	0	0	0.0488	0.0230	0.0221	0	0	0.0161	0	0	0	0.0643	0.0067	0	0.0298	0	0.2542	0.0719	0.0319	0.0336	0.1357
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	48.554	0	0	0.3729	0	0	-5.914	0	0	0	0	1.0636	0.5012	0.4810	0	0	0.3516	0	0	0	1.4009	0.1476	0	0.6493	0	5.5348	1.5665	0.6956	0.7315	2.9535
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0.4898	0	0	0.0037	0	0	0.0067	0	0	0	0	-10.49	0.0050	0.0048	0	0	0.0035	0	0	0	0.0141	0.0014	0	0.0065	0	0.0558	0.0158	0.0070	0.0073	0.0297
15	3.4730	0	0	0.0266	0	0	0.0476	0	0	0	0	0.0760	-4.913	0.0344	0	0	0.0251	0	0	0	0.1002	0.0105	0	0.0464	0	0.3958	0.1120	0.0497	0.0523	0.2112
16	27.112	0	0	0.2082	0	0	0.3721	0	0	0	0	0.5939	0.2799	-4.480	0	0	0.1963	0	0	0	0.7822	0.0824	0	0.3625	0	3.0906	0.8747	0.3884	0.4084	1.6492
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	5.1506	0	0	0.0395	0	0	0.0706	0	0	0	0	0.1128	0.0531	0.0510	0	0	-3.434	0	0	0	0.1486	0.0156	0	0.0688	0	0.5871	0.1661	0.0737	0.0776	0.3133
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	3.3053	0	0	0.0253	0	0	0.0453	0	0	0	0	0.0724	0.0341	0.0327	0	0	0.0239	0	0	0	-13.73	0.0100	0	0.0442	0	0.3767	0.1066	0.0473	0.0498	0.2010
24	0.3865	0	0	0.0029	0	0	0.0053	0	0	0	0	0.0084	0.0039	0.0038	0	0	0.0027	0	0	0	0.0111	-1.456	0	0.0051	0	0.0440	0.0124	0.0055	0.0058	0.0235
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	16.994	0	0	0.1305	0	0	0.2332	0	0	0	0	0.3722	0.1754	0.1683	0	0	0.1230	0	0	0	0.4903	0.0516	0	-6.184	0	1.9372	0.5483	0.2435	0.2560	1.0337
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	40.322	0	0	0.3097	0	0	0.5534	0	0	0	0	0.8833	0.4162	0.3994	0	0	0.2920	0	0	0	1.1633	0.1225	0	0.5392	0	-50.05	1.3009	0.5777	0.6075	2.4527
29	20.003	0	0	0.1536	0	0	0.2745	0	0	0	0	0.4381	0.2065	0.1981	0	0	0.1448	0	0	0	0.5771	0.0608	0	0.2675	0	2.2801	-14.82	0.2866	0.3013	1.2167
30	4.7940	0	0	0.0368	0	0	0.0658	0	0	0	0	0.1050	0.0494	0.0474	0	0	0.0347	0	0	0	0.1383	0.0145	0	0.0641	0	0.5464	0.1546	-6.800	0.0722	0.2916
31	30.950	0	0	0.2377	0	0	0.4248	0	0	0	0	0.6780	0.3195	0.3066	0	0	0.2241	0	0	0	0.8929	0.0940	0	0.4139	0	3.5280	0.9985	0.4434	-6.757	1.8826
32	79.080	0	0	0.6074	0	0	1.0854	0	0	0	0	1.7323	0.8163	0.7834	0	0	0.5727	0	0	0	2.2816	0.2403	0	1.0575	0	9.0145	2.5513	1.1330	1.1914	-24.35
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980

FOR BILATERAL SEABORNE IMPORTS OF REGION 29 FROM PARTNER i

WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 29 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	–0.733	0.0057	0	0	0	0	0	0	0	0.0115	0	0	0.0110	0	0.0493	0.0262	0.0071	0.0122	2.7293	0.0018	0	0	0.0175	0.0071	0.1472	0.0057	0.0267	0.0059	0.0124
03	0	0.0033	–3.312	0	0	0	0	0	0	0	0.0305	0	0	0.0290	0	0.1300	0.0691	0.0189	0.0323	7.1862	0.0048	0	0	0.0462	0.0187	0.3877	0.0152	0.0703	0.0157	0.0327
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0.0705	0.3194	0	0	0	0	0	0	0	–6.062	0	0	0.6124	0	2.7443	1.4584	0.3992	0.6820	151.66	0.1016	0	0	0.9769	0.3961	8.1836	0.3214	1.4846	0.3325	0.6919
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0.0326	0.1480	0	0	0	0	0	0	0	0.2983	0	0	–6.094	0	1.2716	0.6758	0.1850	0.3160	70.277	0.0470	0	0	0.4527	0.1835	3.7921	0.1489	0.6879	0.1540	0.3206
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0.0015	0.0071	0	0	0	0	0	0	0	0.0144	0	0	0.0137	0	–28.52	0.0327	0.0089	0.0153	3.4081	0.0022	0	0	0.0219	0.0089	0.1839	0.0072	0.0333	0.0074	0.0155
19	0	0.0170	0.0774	0	0	0	0	0	0	0	0.1560	0	0	0.1484	0	0.6652	–14.83	0.0967	0.1653	36.762	0.0246	0	0	0.2368	0.0960	1.9836	0.0779	0.3598	0.0805	0.1677
20	0	0.0035	0.0163	0	0	0	0	0	0	0	0.0328	0	0	0.0312	0	0.1400	0.0744	–4.137	0.0348	7.7396	0.0051	0	0	0.0498	0.0202	0.4176	0.0164	0.0757	0.0169	0.0353
21	0	0.0016	0.0074	0	0	0	0	0	0	0	0.0149	0	0	0.0141	0	0.0635	0.0337	0.0092	–7.088	3.5131	0.0023	0	0	0.0226	0.0091	0.1895	0.0074	0.0343	0.0077	0.0160
22	0	0.0214	0.0971	0	0	0	0	0	0	0	0.1958	0	0	0.1862	0	0.8347	0.4436	0.1214	0.2074	–1533.	0.0309	0	0	0.2971	0.1204	2.4891	0.0977	0.4515	0.1011	0.2104
23	0	0.0005	0.0024	0	0	0	0	0	0	0	0.0048	0	0	0.0046	0	0.0207	0.0110	0.0030	0.0051	1.1459	–1.057	0	0	0.0073	0.0029	0.0618	0.0024	0.0112	0.0025	0.0052
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0.0154	0.0700	0	0	0	0	0	0	0	0.1411	0	0	0.1342	0	0.6016	0.3197	0.0875	0.1495	33.252	0.0222	0	0	–9.961	0.0868	1.7943	0.0704	0.3255	0.0729	0.1517
27	0	0.0017	0.0077	0	0	0	0	0	0	0	0.0156	0	0	0.0148	0	0.0666	0.0354	0.0096	0.0165	3.6818	0.0024	0	0	0.0237	–4.116	0.1986	0.0078	0.0360	0.0080	0.0167
28	0	0.1597	0.7237	0	0	0	0	0	0	0	1.4588	0	0	1.3874	0	6.2171	3.3040	0.9045	1.5452	343.58	0.2301	0	0	2.2133	0.8974	–66.69	0.7281	3.3635	0.7532	1.5676
29	0	0.0786	0.3564	0	0	0	0	0	0	0	0.7185	0	0	0.6833	0	3.0620	1.6273	0.4454	0.7610	169.22	0.1133	0	0	1.0901	0.4420	9.1312	–2.988	1.6566	0.3710	0.7721
30	0	0.0742	0.3362	0	0	0	0	0	0	0	0.6777	0	0	0.6445	0	2.8883	1.5350	0.4202	0.7178	159.62	0.1069	0	0	1.0282	0.4169	8.6133	0.3382	–13.90	0.3499	0.7283
31	0	0.1166	0.5286	0	0	0	0	0	0	0	1.0655	0	0	1.0133	0	4.5410	2.4133	0.6606	1.1286	250.95	0.1681	0	0	1.6166	0.6555	13.541	0.5318	2.4567	–2.912	1.1450
32	0	0.1342	0.6081	0	0	0	0	0	0	0	1.2257	0	0	1.1657	0	5.2237	2.7761	0.7599	1.2983	288.68	0.1934	0	0	1.8596	0.7540	15.577	0.6118	2.8260	0.6329	–5.889
WP(1)	0	–0.002	–0.010	0	0	0	0	0	0	0	–0.019	0	0	–0.019	0	–0.092	–0.047	–0.013	–0.022	–4.956	–0.003	0	0	–0.032	–0.013	–0.215	–0.009	–0.044	–0.009	–0.019

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980

FOR BILATERAL SEABORNE IMPORTS OF REGION 30 FROM PARTNER i

WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 30 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-263.9	0.0660	0.6064	0.7106	0.4763	0.7501	4.5251	4E+06	2.2221	0	0	2.0264	0	2.7707	0	2.3399	1.3078	1E+06	0	2.7641	0	*****	1.4902	0	0	0	0.4916	0	2.7413	0
02	0.3063	-0.550	0.0051	0.0060	0.0040	0.0063	0.0385	33474.	0.0189	0	0	0.0172	0	0.0235	0	0.0199	0.0111	11009.	0	0.0235	0	2569.5	0.0126	0	0	0	0.0041	0	0.0233	0
03	2.8204	0.0051	-5.009	0.0557	0.0373	0.0588	0.3547	*****	0.1742	0	0	0.1588	0	0.2172	0	0.1834	0.1025	*****	0	0.2167	0	23654.	0.1168	0	0	0	0.0385	0	0.2149	0
04	1.1262	0.0020	0.0189	-5.902	0.0149	0.0234	0.1416	*****	0.0695	0	0	0.0634	0	0.0867	0	0.0732	0.0409	40471.	0	0.0865	0	9445.4	0.0466	0	0	0	0.0153	0	0.0858	0
05	13.029	0.0239	0.2196	0.2573	-3.798	0.2717	1.6390	1E+06	0.8048	0	0	0.7340	0	1.0036	0	0.8475	0.4737	*****	0	1.0012	0	*****	0.5398	0	0	0	0.1780	0	0.9929	0
06	4.3630	0.0080	0.0735	0.0861	0.0577	-6.163	0.5488	*****	0.2695	0	0	0.2457	0	0.3360	0	0.2838	0.1586	*****	0	0.3352	0	36592.	0.1807	0	0	0	0.0596	0	0.3325	0
07	124.49	0.2286	2.0989	2.4592	1.6484	2.5960	-22.06	1E+07	7.6901	0	0	7.0129	0	9.5888	0	8.0979	4.5263	4E+06	0	9.5659	0	1E+06	5.1574	0	0	0	1.7015	0	9.4873	0
08	0.1861	0.0003	0.0031	0.0036	0.0024	0.0038	0.0234	*****	0.0114	0	0	0.0104	0	0.0143	0	0.0121	0.0067	6688.6	0	0.0143	0	1561.0	0.0077	0	0	0	0.0025	0	0.0141	0
11	5.3937	0.0099	0.0909	0.1065	0.0714	0.1124	0.6785	*****	-18.19	0	0	0.3038	0	0.4154	0	0.3508	0.1961	*****	0	0.4144	0	45237.	0.2234	0	0	0	0.0737	0	0.4110	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	1.6012	0.0029	0.0269	0.0316	0.0212	0.0333	0.2014	*****	0.0989	0	0	-16.80	0	0.1233	0	0.1041	0.0582	57541.	0	0.1230	0	13429.	0.0663	0	0	0	0.0218	0	0.1220	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	11.927	0.0219	0.2011	0.2356	0.1579	0.2487	1.5004	1E+06	0.7368	0	0	0.6719	0	-22.18	0	0.7758	0.4336	*****	0	0.9165	0	*****	0.4941	0	0	0	0.1630	0	0.9089	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	3.8825	0.0071	0.0654	0.0766	0.0514	0.0809	0.4884	*****	0.2398	0	0	0.2187	0	0.2990	0	-19.25	0.1411	*****	0	0.2983	0	32562.	0.1608	0	0	0	0.0530	0	0.2958	0
19	3.5390	0.0064	0.0596	0.0699	0.0468	0.0738	0.4451	*****	0.2186	0	0	0.1993	0	0.2725	0	0.2302	-10.77	*****	0	0.2719	0	29681.	0.1466	0	0	0	0.0483	0	0.2697	0
20	0.0612	0.0001	0.0010	0.0012	0.0008	0.0012	0.0077	6688.6	0.0037	0	0	0.0034	0	0.0047	0	0.0039	0.0022	*****	0	0.0047	0	513.42	0.0025	0	0	0	0.0008	0	0.0046	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	4.7294	0.0086	0.0797	0.0934	0.0626	0.0986	0.5949	*****	0.2921	0	0	0.2664	0	0.3642	0	0.3076	0.1719	*****	0	-22.68	0	39665.	0.1959	0	0	0	0.0646	0	0.3604	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0.0142	0.0000	0.0002	0.0002	0.0001	0.0002	0.0017	1561.0	0.0008	0	0	0.0008	0	0.0011	0	0.0009	0.0005	513.42	0	0.0010	0	*****	0.0005	0	0	0	0.0001	0	0.0010	0
25	0.1169	0.0002	0.0019	0.0023	0.0015	0.0024	0.0147	12774.	0.0072	0	0	0.0065	0	0.0090	0	0.0076	0.0042	4201.4	0	0.0089	0	980.55	-12.42	0	0	0	0.0015	0	0.0089	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	3.4118	0.0062	0.0575	0.0673	0.0451	0.0711	0.4291	*****	0.2107	0	0	0.1921	0	0.2627	0	0.2219	0.1240	*****	0	0.2621	0	28614.	0.1413	0	0	0	-4.052	0	0.2600	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	82.944	0.1523	1.3984	1.6385	1.0983	1.7296	10.434	9E+06	5.1237	0	0	4.6725	0	6.3887	0	5.3954	3.0157	3E+06	0	6.3735	0	*****	3.4362	0	0	0	1.1336	0	-16.53	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 31 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 31 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	-525.1	0.1903	1.8586	1.2888	0	2.9549	1.5649	0	2.1363	0	0	0	0	0	0	7.5837	4.3810	0	0	0	0.7940	0	0	0	0.9978	2.0077	0	0.4670	1.1007	0.4173
02	1.0930	-0.574	0.0078	0.0054	0	0.0124	0.0065	0	0.0090	0	0	0	0	0	0	0.0319	0.0184	0	0	0	0.0033	0	0	0	0.0042	0.0084	0	0.0019	0.0046	0.0017
03	78.974	0.0579	-5.054	0.3923	0	0.8995	0.4763	0	0.6503	0	0	0	0	0	0	2.3085	1.3336	0	0	0	0.2417	0	0	0	0.3037	0.6111	0	0.1421	0.3350	0.1270
04	2.4258	0.0017	0.0173	-3.885	0	0.0276	0.0146	0	0.0199	0	0	0	0	0	0	0.0709	0.0409	0	0	0	0.0074	0	0	0	0.0093	0.0187	0	0.0043	0.0102	0.0039
05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06	51.761	0.0379	0.3708	0.2571	0	-8.346	0.3122	0	0.4262	0	0	0	0	0	0	1.5130	0.8740	0	0	0	0.1584	0	0	0	0.1990	0.4005	0	0.0931	0.2196	0.0832
07	167.02	0.1225	1.1965	0.8297	0	1.9024	-3.725	0	1.3753	0	0	0	0	0	0	4.8824	2.8205	0	0	0	0.5112	0	0	0	0.6424	1.2926	0	0.3006	0.7086	0.2686
08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1.1579	0.0008	0.0082	0.0057	0	0.0131	0.0069	0	-6.451	0	0	0	0	0	0	0.0338	0.0195	0	0	0	0.0035	0	0	0	0.0044	0.0089	0	0.0020	0.0049	0.0018
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	1.1484	0.0008	0.0082	0.0057	0	0.0130	0.0069	0	0.0094	0	0	0	0	0	0	-22.90	0.0193	0	0	0	0.0035	0	0	0	0.0044	0.0088	0	0.0020	0.0048	0.0018
19	2.7826	0.0020	0.0199	0.0138	0	0.0316	0.0167	0	0.0229	0	0	0	0	0	0	0.0813	-13.20	0	0	0	0.0085	0	0	0	0.0107	0.0215	0	0.0050	0.0118	0.0044
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	3.0806	0.0022	0.0220	0.0153	0	0.0350	0.0185	0	0.0253	0	0	0	0	0	0	0.0900	0.0520	0	0	0	-2.391	0	0	0	0.0118	0.0238	0	0.0055	0.0130	0.0049
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0.1572	0.0001	0.0011	0.0007	0	0.0017	0.0009	0	0.0012	0	0	0	0	0	0	0.0045	0.0026	0	0	0	0.0004	0	0	0	-3.017	0.0012	0	0.0002	0.0006	0.0002
28	75.587	0.0554	0.5414	0.3755	0	0.8609	0.4559	0	0.6224	0	0	0	0	0	0	2.2095	1.2764	0	0	0	0.2313	0	0	0	0.2907	-5.486	0	0.1360	0.3206	0.1215
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	12.191	0.0089	0.0873	0.0605	0	0.1388	0.0735	0	0.1003	0	0	0	0	0	0	0.3563	0.2058	0	0	0	0.0373	0	0	0	0.0468	0.0943	0	-1.390	0.0517	0.0196
31	24.276	0.0178	0.1739	0.1205	0	0.2765	0.1464	0	0.1998	0	0	0	0	0	0	0.7096	0.4099	0	0	0	0.0742	0	0	0	0.0933	0.1878	0	0.0437	-3.225	0.0390
32	103.48	0.0759	0.7413	0.5140	0	1.1786	0.6241	0	0.8521	0	0	0	0	0	0	3.0248	1.7474	0	0	0	0.3167	0	0	0	0.3980	0.8008	0	0.1862	0.4390	-1.095
WP(1)	-707.5	-0.774	-6.811	-5.235	0	-11.24	-5.019	0	-8.692	0	0	0	0	0	0	-30.85	-17.78	0	0	0	-3.222	0	0	0	-4.065	-7.393	0	-1.873	-4.346	-1.476

TABLE OF EXPORT (OWN AND CROSS) AND WORLD PRICE ELASTICITIES FOR 1980
FOR BILATERAL SEABORNE IMPORTS OF REGION 32 FROM PARTNER i
WITH RESPECT TO A CHANGE IN THE PRICE OF PARTNER h, AND A CHANGE IN THE WORLD PRICE OF GOOD 1.

PRICE OF h, WP(1)	BILATERAL SEABORNE IMPORTS OF REGION 32 FROM PARTNERS 01–32.																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02	0	-3.994	0.0493	0	0.0505	0.0303	0.0898	0.0153	0	0	0	0	0	0.1969	0	0	0	0	0	0	0.7510	0	0	265.89	0.0164	0	0	0.6436	0	0
03	0	0.0373	-3.016	0	0.0287	0.0172	0.0510	0.0087	0	0	0	0	0	0.1119	0	0	0	0	0	0	0.4269	0	0	151.17	0.0093	0	0	0.3659	0	0
04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05	0	0.5305	0.3978	0	-2.713	0.2451	0.7248	0.1234	0	0	0	0	0	1.5885	0	0	0	0	0	0	6.0570	0	0	2144.4	0.1329	0	0	5.1908	0	0
06	0	0.1327	0.0995	0	0.1020	-1.814	0.1813	0.0308	0	0	0	0	0	0.3975	0	0	0	0	0	0	1.5158	0	0	536.66	0.0332	0	0	1.2990	0	0
07	0	2.1239	1.5926	0	1.6328	0.9813	-2.645	0.4941	0	0	0	0	0	6.3599	0	0	0	0	0	0	24.249	0	0	8585.4	0.5322	0	0	20.782	0	0
08	0	0.0015	0.0011	0	0.0012	0.0007	0.0021	-0.944	0	0	0	0	0	0.0047	0	0	0	0	0	0	0.0179	0	0	6.3595	0.0003	0	0	0.0153	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0.2767	0.2075	0	0.2127	0.1278	0.3781	0.0643	0	0	0	0	0	-11.32	0	0	0	0	0	0	3.1599	0	0	1118.7	0.0693	0	0	2.7080	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0.0312	0.0234	0	0.0240	0.0144	0.0427	0.0072	0	0	0	0	0	0.0936	0	0	0	0	0	0	-45.99	0	0	126.46	0.0078	0	0	0.3061	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0.4086	0.3064	0	0.3141	0.1888	0.5583	0.0950	0	0	0	0	0	1.2238	0	0	0	0	0	0	4.6662	0	0	*****	0.1024	0	0	3.9989	0	0
27	0	0.0031	0.0023	0	0.0024	0.0014	0.0043	0.0007	0	0	0	0	0	0.0095	0	0	0	0	0	0	0.0365	0	0	12.931	-1.016	0	0	0.0313	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0.4479	0.3359	0	0.3444	0.2069	0.6120	0.1042	0	0	0	0	0	1.3414	0	0	0	0	0	0	5.1148	0	0	1810.8	0.1122	0	0	-35.34	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WP(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX 7.4

5 TABLES OF LAMDA(j) AND b(ij) COEFFICIENTS

AND

5 TABLES OF ESTIMATED t STATISTICS FOR THE LAMDA(j) AND b(ij) COEFFICIENTS

TABLE OF ESTIMATED "Lamda(j)" AND "b(ij)"x100 COEFFICIENTS FOR GOOD 1 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	0.4405	0.4922	0	0.5521	0.6931	0	0	0.3687	0.3776	0.5711	0.4386	0	0.6706	0.7103	0.4264	0.6007	0.6536	0.5293	0.4444	0.5156	0	0.3251	0.3409	0.6643	0.5769	0.5256	0.6196	0.6293	0.7447	0.5804
01	1.2039	-10.81	-2.167	-344.3	-2.488	59.055	-22.36	-81.84	1.3774	-42.95	5.0160	2.3875	-58.09	-70.71	-6.591	-12.56	-32.90	-318.9	-17.17	-111.7	2.0615	6.2470	-****	21.114	-0.151	-233.8	-0.029	-78.77	-261.0	-579.7
02	-7.072	7.9715	1.9206	3.2662	9.1596	11.694	9.6292	7.0081	10.298	19.183	2.1495	-1.288	11.384	3.5151	-3.207	2.8941	1.6742	16.633	-8.024	-2.571	5.7870	-27.00	-3.067	17.968	-0.756	-2.562	1.9972	0.0784	-1.202	7.8936
03	-19.07	0.7272	NA	NA	NA	NA	-8.878	-1.103	-1.095	-1.985	1.0224	-0.820	0.4484	3.9925	1.5472	0.4792	6.2608	3.3500	15.270	5.0786	-22.38	22.296	6.3635	8.1875	-5.060	12.078	2.3766	1.6526	3.8150	-1.077
04	52.063	13.096	NA	-22.91	13.950	NA	-8.430	1.5654	6.3111	4.7332	0.3759	2.8306	9.7793	6.4844	6.6791	3.8567	1.3525	6.2393	20.929	8.1963	1.7294	7.0583	7.0086	11.695	-355.0	9.3316	-10.88	6.9460	11.646	7.5458
05	-4.558	6.0994	NA	NA	NA	NA	-0.739	1.7416	6.3415	3.5337	0.1591	2.4270	5.2081	1.3900	0.5772	2.1493	0.8237	2.6206	-2.261	5.3488	1.7614	15.179	5.3398	17.162	-4.826	-5.624	-5.083	2.5714	0.6232	7.0422
06	-27.05	+****	NA	NA	NA	NA	0.2324	4.3615	-48.23	-0.076	-15.61	3.3737	0.5112	-3.652	-3.124	4.2317	6.2780	0.5609	-10.73	9.4499	410.48	10.984	543.14	10.795	-8.289	3.2754	-2.245	5.4078	17.980	-0.340
07	7.5097	-****	3.0019	-25.41	10.789	-0.606	-3.663	3.4839	4.3421	7.9561	24.065	-0.737	5.1092	3.7290	2.5076	0.9264	0.4483	4.4619	14.547	6.1634	2.5991	5.5335	1.6060	23.351	-6.979	1.1674	1.3458	-9.406	0.0426	2.0490
08	1.1935	4.9019	-1.906	-32.34	-1.275	-1.165	3.0892	-218.4	-17.97	4.1871	-0.012	-18.15	-17.56	11.604	3.8671	-1.199	-4.174	-****	-15.88	19.302	-****	-****	-****	+****	24.284	15.975	-4424.	-****	-1.480	-33.84
11	17.939	1.4945	3.9399	-5.483	-3.637	24.451	-5.584	2.4146	7.7809	3.0879	53.819	-113.6	0.6569	2.2570	1.9027	-2.713	-2.330	4.8651	-7.438	1.0308	2.4114	-****	-432.8	50.483	-3.746	79.555	-31.97	2.6495	4.8048	-1.675
12	56.064	-48.42	-8.194	20.094	-13.21	3.4363	-1.423	3.4033	-28.60	23.491	2.1243	11.592	-1.379	3.5781	-1.919	11.500	-3.971	2.7771	40.908	-6.201	-9.636	7.2125	7.6177	8.7656	160.16	15.614	154.97	+****	9.0692	-2.671
13	18.975	12.189	2.2219	2.5964	7.1051	8.1473	0.0614	-6.983	10.823	-9.956	-4.339	-2.570	0.0003	4.3144	3.3932	3.9428	-2.606	-0.409	-1.358	5.8384	1.7719	-7.170	0.9883	17.358	12.390	11.278	3.8238	-0.649	1.8414	41.175
14	-23.80	24.004	-11.24	2.8162	-3.185	-4.376	-6.074	-9.529	0.0023	-3.598	1.6249	3.9734	-2.871	6.1778	-26.14	-20.26	0.7016	0.9203	-5.643	5.8927	-9.237	167.61	-5.135	-4.179	3.3563	2.2321	6.8115	6.5303	-2.913	-509.1
15	-9.707	6.3993	-7.577	-94.32	-4.644	7.0022	2.1990	-6.384	-9.895	-8.488	-11.86	-18.39	7.8484	0.4394	3.0659	-0.885	-1.793	16.683	-11.78	-1.974	-7.816	-6.268	-18.47	43.676	0.4016	2.5120	6.8797	48.006	18.919	-18.52
16	2.6967	7.8897	4.7964	-1.906	5.3323	4.1359	4.0829	-3.462	-6.344	-4.724	-8.315	-11.74	0.5335	-0.944	-0.290	1.7890	-5.294	5.0547	-2.571	0.6728	-1.254	-5.478	2.5235	15.658	1.8909	8.6207	9.6106	5.8353	7.7791	5.0330
17	-25.58	-20.76	17.487	6.2930	0.1869	-13.19	-35.00	-340.6	6.5540	4.3312	4.0614	0.7373	-0.511	-1.323	-14.53	-9.117	-5.993	NA	-3.141	-3.685	-47.84	NA	-129.8	-2.152	-6.869	-6.359	0.7511	6.4377	-19.70	-8.946
18	-0.484	16.592	9.7775	18.015	5.4974	28.826	10.158	1.1854	-0.685	-3.927	-3.112	-11.64	3.6282	1.8768	3.5406	-1.938	9.1663	0.2601	-1.066	-0.295	-2.773	-234.5	-0.565	7.4544	-0.357	3.8018	46.667	15.881	24.826	-2.002
19	1.3508	5.7657	10.913	11.672	15.070	13.789	6.7974	1.6113	-0.972	-0.032	-3.378	-1.099	6.0721	-1.320	-146.3	8.2342	6.6573	2.6545	1.4038	-1.512	-0.883	5.0658	4.9063	9.3892	2.1945	7.2579	5.7408	13.232	21.440	8.4761
20	74.453	-122.5	20.045	-1.181	41.642	95.049	+****	-****	-150.3	27999.	-2.200	-38.21	10.670	8.1268	-****	-0.646	-4.546	-1.374	-4.941	-2.946	-84.55	NA	-2.502	-5.646	-12.48	-3.908	0.4839	-****	20.988	-92.68
21	-16.61	18.051	8.4280	4.5548	8.1657	19.954	7.8940	-21.86	-25.46	5531.1	6.8536	-****	1.5949	8.7086	-6.636	5.0972	0.7526	4.6580	-12.22	2.9997	-30.94	164.06	5.9482	22.998	2.7789	59.214	3.6268	317.41	4.5268	50.016
22	16.074	38.609	-16.87	-5252.	2.6532	-4.384	2E+07	0.2971	2.2316	9.2851	-43.03	-****	-5.542	-1.383	-2.540	-0.946	-5.350	-3.240	-7.893	-2.359	-1.842	213.77	+****	11.744	1.5771	4.0758	2661.6	6.8110	-0.377	0.0293
23	25.304	3.4802	-3.520	91.828	8.0370	-7.770	966.35	2.2559	-9381.	57.278	-14.58	-472.6	-5.935	-4.195	0.5796	-5.170	-0.530	1.2217	2.1255	-1.077	0.3948	-474.1	-10.25	4.3142	-25.90	15.684	-0.561	-13.67	-21.27	-13.62
24	11.206	1.0346	4.2734	9.8276	9.0025	10.628	5.4211	-101.8	-54.30	1.1363	-1.443	3.3108	0.5821	4.2928	9.6802	2.0326	11.296	3.1390	34.890	9.7070	-27.14	NA	-42.31	-39.65	-184.1	10.960	2.4922	-****	6.4194	-1.500
25	-8.491	-22.57	-5.438	-2.308	-7.178	-15.37	-****	-****	-3592.	-23.47	-18.87	2.4898	-0.282	-13.66	-9.213	-17.08	-3.087	5.3099	-3.521	0.6307	-7.374	7.5264	2.5321	0.7850	-11.95	4.6913	-2.361	8.1735	-14.60	23.637
26	3.4165	+****	-12.17	+****	-****	-78.84	NA	-285.5	8.1063	-****	3.7482	17789.	-3.717	-7.936	6.5218	-16.59	12.520	9.5451	3.8557	13.344	-296.9	+****	-2.839	-4.909	-21.82	10.975	8.5371	1.8869	7.0533	8329.5
27	-2.438	7.2226	9.7026	+****	74963.	75.860	+****	-****	8.1894	-****	55.626	NA	3.6472	29.614	-26.59	-129.1	-2.192	+****	32.565	11.401	-****	-4688.	-6.520	-23.64	1.4216	1.1105	-0.335	-7.783	6.1487	13.008
28	-16.82	-619.1	-13.62	-56.14	-11.82	1.5030	3.4453	2.7474	7.6885	-1869.	35.819	4.0107	-12.22	-4.169	-18.48	2.0490	0.4995	-0.779	-0.570	-30.09	2.9958	-21.76	-2.220	-30.60	-4.028	-31.05	-30.05	-4.583	-3.231	0.6637
29	-49.93	-19.51	-4.847	7.7333	-13.06	-6.620	-3.921	4.4413	11.544	-3.326	19.099	12.592	1.3319	0.3192	-14.35	-4.475	-4.590	-167.3	11.720	3.8077	4.5262	-221.3	5.9494	1.5428	3.4207	12.364	0.1142	8.7332	-3.730	3.1647
30	-120.9	+****	74.345	-16.29	17.571	82.372	7.3979	-73.33	7.9595	-16.61	-235.2	-133.2	-2.085	7.1164	6.2621	11.969	11.165	-****	73.806	-2.576	-21.23	-****	-44.85	-6.101	0.2090	-7.176	-4.730	-15.13	2.7164	-11.68
31	-20.62	-32.78	-0.367	-10.25	0.0748	-2.928	-0.527	-0.220	-1.350	-10.94	-18.62	-0.303	-7.386	-48.29	-21.59	-24.77	-17.15	2.7975	-15.49	-2.141	-1.482	-24.81	-6.842	-5.790	-0.753	-0.751	-2.531	-5.835	1.5477	-1.395
32	5.0803	-8.755	-0.524	10.284	-25.96	-1.832	5.7497	-52.98	-207.7	-1128.	-5.406	-14.69	-16.46	-5.494	-1810.	1.1612	-0.668	5.2284	-22.66	5.6794	-143.2	-226.3	-49.77	-42.71	-2.073	0.3462	1.6688	3.5962	-0.784	-1.043

TABLE OF ESTIMATED "Lamda(j)" AND "b(ij)"x100 COEFFICIENTS FOR GOOD 2 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	0	0.6333	0.8496	0.4926	0.7351	0	0.2964	0.2098	0.7447	0.2707	0.4590	0	0	0.7009	0.4725	0	0.3838	0.1633	0.0000	0.1082	0.2937	0.0408	0	0	0.0001	0.1661	0.3683	0.3774	0	0.4928
01	-3.154	-****	+****	-****	162.49	+****	+****	11.625	27.148	+****	-1369.	-23.26	-37.47	-****	-****	-40.67	-123.9	NA	-1132.	-1038.	-9245.	-9962.	13.349	4277.2	-9.039	NA	-15.27	NA	46.152	NA
02	3.2221	1.4133	11.044	-163.0	20.200	-****	-****	-****	217.24	8.3530	8.9647	-13.02	60.449	14.786	3272.6	121.62	142.78	NA	8.2164	-****	10.307	+****	76.448	5663.1	2.9509	12.555	127.97	NA	64.902	-****
03	263.69	-****	NA	NA	NA	NA	-0.628	181.60	78.345	-21.44	6.1176	-21.73	-11.84	15.948	-104.5	-3.661	3.6297	382.93	2.2972	+****	13.462	122.54	-8.314	-1.356	1292.8	7.0219	12.562	+****	12.251	5.6779
04	+****	+****	20.767	7.5191	65.750	NA	-0.628	75.284	53.194	937.47	-910.4	71.938	46.571	44.261	NA	97.492	61.746	+****	-****	16.877	+****	1279.0	76.306	373.52	35.956	3325.9	67.801	125.20	94.820	6.9893
05	+****	+****	NA	NA	NA	NA	+****	37.643	77.369	34.142	45.434	7.2079	11.849	101.28	-****	20.178	18.707	+****	125.99	289.01	1415.4	-471.4	-32.35	0.1654	-1.824	40.272	25.010	18598.	12.655	24.456
06	+****	+****	NA	NA	NA	NA	-16.29	21.921	125.33	1966.4	-162.0	41.553	111.72	96.705	+****	91.628	104.05	NA	1757.7	NA	NA	141.66	40.657	-0.343	0.8309	1591.9	60.136	12446.	5.6509	148.99
07	9.6460	+****	+****	+****	176.49	-****	4.7417	-****	186.42	2700.3	3.0696	70.966	12.560	39.640	-****	-5.527	-64.78	NA	NA	+****	268.09	3731.2	NA	NA	-8.875	+****	101.40	-87.55	2.7971	2111.3
08	11.534	25.656	23.873	13.749	28.357	-172.7	-25.14	-22.53	51.044	-****	14.737	-14.51	59.547	50.653	-****	66.801	16.700	-****	1.2417	-****	-168.3	-1530.	13.349	-847.7	-1476.	-****	41.668	-****	52.938	-****
11	-9.807	4.0416	-5.744	-9.317	4.6115	-3.890	-17.03	4.6438	22.275	-1.199	-16.49	-18.47	9.2282	-0.290	-****	-3.273	8.3949	+****	1.9984	-****	-5.745	-****	-72.99	-****	-****	-****	-92.07	2647.4	-10.69	11.189
12	6.1522	-6.094	-5.199	-29.32	21.338	-44.89	-5.105	-4.253	19.119	9.4005	0.9606	-25.40	0.6693	10.291	23.521	-5.118	0.2469	+****	-2.343	-10.37	9.1175	75.377	14.001	NA	-****	5.8424	-40.33	+****	-0.823	-197.6
13	-****	+****	108.66	28.214	36.020	-****	+****	+****	-1.717	23.556	0.1658	56.259	14.894	0.0115	+****	4.0286	-18.30	2.3664	+****	-6.125	10.248	+****	13.349	+****	+****	-****	32.982	+****	-3.971	+****
14	+****	+****	22.981	26.015	27.303	-60.31	-****	-70.94	-193.4	13.190	-2.787	-41.62	0.3097	0.2557	7.9431	-13.12	-72.55	-4362.	+****	NA	12.104	122.26	13.349	NA	NA	-256.1	-37.57	+****	119.52	-****
15	19.905	194.22	41.058	5.9126	60.081	+****	+****	-17.26	48.703	-7.617	-132.7	7.5058	26.109	11.015	376.78	22.647	16.976	345.13	-3.849	-44.86	-3.088	-96.60	19.512	-5.397	0.7119	8.4839	-8.437	340.27	40.491	-52.00
16	-104.2	21.105	112.06	-16.69	29.029	+****	879.62	19.161	57.737	7.9420	-120.5	13.591	12.577	-1.626	-1851.	19.946	1.5744	5.6476	6.1942	-16.75	5.1528	109.98	14.198	-3.386	0.9865	9.2363	5.8246	-16.25	0.2953	5.7645
17	NA	-****	+****	-****	2.1174	+****	+****	124.40	NA	NA	+****	-26.12	26.868	6.3706	4.0823	4.6621	-11.58	NA	-****	-63.42	-****	NA	13.349	-1498.	NA	-****	-27.52	NA	-2.226	71.149
18	-****	3282.6	157.87	-4.756	-1.596	-****	-****	-****	41.920	552.75	11148.	-17.25	14.106	6.4657	-****	18.009	0.6894	+****	-23.92	31.652	7.2203	3185.2	-10.97	5401.7	5.9503	18736.	30.964	+****	52.998	-27.17
19	-****	14.434	28.043	-4.079	8.8620	-****	6.8494	17.669	51.750	-22.64	-44.94	27.622	2.6513	-6.793	-10.32	4.4135	2.3164	-1.695	-5.504	-7.124	1.1556	105.28	19.543	3.0389	14.779	9.8117	10.640	7.2066	35.941	2.4963
20	-****	+****	324.01	-7.665	67.361	-****	-0.628	-****	26.489	3.7302	+****	-23.02	18.266	-18.72	-****	1.7062	3.3457	-1.104	-2.330	-32.49	-****	NA	-85.43	1.8281	-87.33	-16.54	83.634	NA	10.026	13.492
21	NA	-****	7.0051	-****	65.521	-****	+****	-****	74.649	-****	+****	NA	3.3989	311.10	-****	-4.654	-7.423	-1.334	-113.8	-330.9	4887.7	NA	9.0643	4.5098	8235.7	+****	38.760	NA	72.141	-****
22	12.261	-16.14	-6.312	20.716	-25.13	-8.847	8.5387	-10.67	14.085	0.6039	19.142	104.22	4.2299	24.102	-6.453	-3.476	4.9584	7.6282	10.144	-141.0	-3.035	NA	120.32	-1.518	+****	-1714.	122.17	-****	9.1604	-****
23	NA	-180.4	2.0944	242.25	3.1612	3.9548	-****	-****	1.5961	-0.218	4.0200	84.884	4.9810	-3.079	10.717	0.5985	3.8452	3.4946	-****	-0.151	1.2087	10855.	-26.07	-****	-****	-****	-25.16	-****	-11.42	+****
24	-****	+****	-49.10	-****	66.951	-****	-2.969	-****	-5.124	NA	-117.8	-55.20	22.343	-1.217	NA	0.0385	36.292	NA	89546.	+****	-****	NA	86.939	NA	NA	+****	-113.4	NA	28.216	-5.312
25	-****	+****	71.229	-****	-60.84	-****	-0.742	12.687	-64.61	NA	+****	NA	21.049	-0.380	-****	-2.195	16.134	-3134.	2.2732	-57.13	-740.6	382.98	-1.025	-6.638	-2.837	-****	-7.600	-9.218	-36.45	-****
26	NA	-0.658	181.37	-18.84	29.664	-****	NA	20.040	-26.87	NA	+****	55.571	-10.39	-8.091	-****	17.923	12.745	13.954	-3.874	+****	-2486.	+****	50.222	230.96	-8.833	-****	2.2422	-****	-8.640	-****
27	+****	-5.456	-16.47	-1.516	-26.59	-138.4	-5.895	15.637	-17.12	-****	-3.169	-131.1	-9.198	-7.526	1.2163	-4.053	-10.79	-1.141	1.6776	-6.016	-11.46	-****	-3.749	-4.931	-1.019	-0.088	-3.877	28.046	-2.593	-3.850
28	NA	+****	+****	61.775	157.29	+****	-****	-****	-165.9	-****	NA	-63.74	21.086	13.406	+****	7.7786	-2.927	-****	-5.296	162.09	-****	NA	13.349	-3.524	-9.443	8.4468	12.265	-121.0	-3.954	4.1562
29	1E+06	4.5293	102.15	24.419	42.384	5.3606	3.5020	-****	18.546	-****	3.9656	67.773	26.603	6.9661	-****	-3.167	26.250	-****	-2828.	-1.566	-****	121.56	36.465	-5.176	12.746	11.099	4.0709	-770.3	3.3732	6.5814
30	-****	-****	+****	-111.1	51.637	22.356	201.22	-****	9.9822	+****	15.533	78.675	-94.54	-13.36	69898.	-72.63	102.83	2.5393	NA	10238.	-****	NA	31.066	734.26	-10.63	-2969.	19.552	-****	9.7208	13.237
31	-****	-5.153	-1996.	+****	59.566	-70.76	-7353.	-****	-80.92	-****	-0.404	78.675	25.645	-2364.	NA	-7.850	-10.86	2.5400	+****	-****	-2496.	-****	13.349	-37.54	61149.	7.0353	-0.314	-78.88	4.6639	95.361
32	320.21	-****	-62.81	48.352	30.437	80.106	+****	-1019.	-25.70	NA	-****	-23.02	3.2838	-43.28	NA	-45.43	-209.7	NA	-4.734	-****	-****	-****	50.156	-215.6	2238.3	8.9195	4.4635	+****	14.782	5.1907

TABLE OF ESTIMATED "Lamda(j)" AND "b(ij)"x100 COEFFICIENTS FOR GOOD 3 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	0.1767	0.2649	0.7726	0	0	0	0.0359	0.1434	0.4011	0.3751	0.4615	0.2908	0.7237	0.5439	0.5403	0.6056	0.6338	0.1885	0.1809	0.3399	0	0.3914	0.4293	0.5605	0.6033	0.0005	0.6555	0.1977	0.6824	0.7845
01	7.4079	-****	-6819.	-3.160	NA	-36.52	-6404.	7071.6	-7.278	-282.6	-51.12	-866.8	-373.7	-6.695	+****	-625.6	-549.8	NA	-****	-****	-****	-****	-818.1	NA	-9258.	547.84	17773.	NA	-****	-****
02	-227.6	6.9308	-19.08	-16.33	-28.58	48.843	2.8814	-20.61	3.7595	2.4866	14.972	6.0169	16.232	7.5695	28.434	22.852	0.5154	37.339	8.0571	2.9763	3.3014	14.602	2272.3	+****	5.3187	-19.15	-3.679	NA	21.939	215.52
03	-2.854	9.7388	NA	NA	NA	NA	-26.95	-5.936	-3.365	-82.84	27.886	-10.39	2.1307	0.9905	149.55	5.8570	-3.229	4.7176	-1.158	-1.593	-1.156	15.933	479.09	1.6283	0.2552	-14.84	1.4608	5967.8	0.0910	39.590
04	10238.	-385.2	NA	10.111	NA	NA	4671.3	-4.625	4.2882	6.3839	30.543	8.4841	52.943	10.259	4.4088	30.380	17.394	-****	16.774	5.2983	2.8078	17.903	8.0615	1.9324	6.1971	-4.243	33.908	28608.	3.3827	9.5916
05	NA	-1985.	NA	NA	NA	NA	-1497.	-8.185	8.4957	-0.626	26.550	-0.945	-7.373	0.9857	-****	-6.145	-10.30	4.8131	5.0615	4.5642	1.2870	16.370	8.3622	-0.051	-6.238	-****	16.140	+****	-0.777	751.05
06	133.72	-3262.	NA	NA	NA	NA	5.2430	-1.983	10.797	3.5067	15.926	9.7599	4.7687	3.6250	-51.81	-10.33	15.635	-****	13.150	-7717.	NA	15.859	6.4953	-0.329	4.8936	7.1156	1.3815	-****	3.1219	3.8041
07	10.321	-****	7.2797	32.114	29.980	-20.71	0.9409	65.188	-2984.	-1.977	-39.57	4.5890	4.7173	0.9481	+****	-2.356	-5.592	1117.4	-****	-****	-6706.	2.0311	-****	0.2962	-3.089	327.81	9.0656	7.4504	8.5851	-4.165
08	-****	15.174	-3.817	0.1286	-2.509	-0.999	-3225.	66.798	-4.831	-743.2	-7.305	2736.1	2.8672	-0.689	-****	0.6976	-1.285	-****	0.5017	-****	-****	-****	+****	-3.076	-14.59	6489.6	4955.5	-4504.	-8.715	279.43
11	-604.3	-6.361	8.3319	3.7469	1.4064	20.224	-****	-5.611	5.6365	-26.87	137.06	545.25	6.1894	2.2339	4.2015	1.1597	0.9455	-****	7788.4	-****	3.8447	13.303	3975.4	-15.35	-4.359	-25.04	14.789	-93.49	21.752	126.74
12	-****	+****	7.3744	7.7617	11.170	71.737	+****	4047.5	-1.906	4.2609	11.617	145.15	2.2020	6.9357	2.4257	29.139	21.381	7.5221	1.2512	-****	-****	27.966	NA	38.820	-111.8	246.76	151.88	NA	5.2607	-6224.
13	-****	15.714	8.4076	1.4359	-4.406	-10.76	-5.852	-10.67	1.1685	-56.35	-5.555	4.9641	15.366	0.1195	-0.061	0.2587	-6.179	25.223	-3.811	6.5024	1.4266	13.520	-****	4.1808	0.8884	-****	249.13	+****	0.0537	179.34
14	34474.	268.20	13.251	-5.870	0.9601	0.4868	54.634	30.660	-166.6	-3.435	13.471	1.2676	4.7477	1.2018	0.4919	-10.57	-0.031	-****	0.0805	-210.5	0.0111	11.501	15.451	-5.762	-1.620	-0.732	750.40	0.2469	-54.19	-9.562
15	-****	18.572	-1.708	-14.34	-28.11	-3.563	4.2157	-2.749	4.5018	3.0318	11.283	6.7327	5.8942	2.8560	4.8220	7.5415	-4.504	12.614	-7.419	4.0595	1.1251	-4.221	13.259	36.409	14.917	24.111	-0.480	-****	4.4701	-20.09
16	-102.1	7.9379	5.6270	5.0991	12.948	2.0162	3.4725	-12.03	-3.448	-1.475	2.5129	-1.453	6.2870	4.4793	4.4519	12.509	2.2729	12.021	0.9532	2.5477	2.6603	13.954	-5.399	5.0898	3.3953	-6.650	10.172	-8.605	16.391	10.139
17	-****	-****	1.5574	-5.387	NA	NA	1229.9	-3.554	3.3182	-84.22	-24.90	-50.17	18.349	-0.615	NA	-4.422	23.737	NA	-2.077	-8.681	-4.112	-63.41	-****	-2.028	-15.41	-1.445	-34.82	-****	25.209	1526.0
18	-4241.	11.812	8.3406	-4.768	1.5769	8.1050	3.3644	-5.254	3.0257	-4.896	-2.120	-20.77	-1.779	1.5655	-6.312	-17.18	-7.955	5.4082	-13.87	-6.464	-0.151	44.631	2.2771	0.8399	1.3646	-9.394	14.440	-****	-5.178	36.033
19	-5.365	11.915	23.852	-5.512	-6.425	12.433	-3.195	77.625	-15.74	-30.21	10.523	-248.1	18.637	-11.83	-10.93	14.496	5.7285	0.3150	2.0668	-5.224	0.0971	16.692	4.0477	1.0744	-1.724	1.4579	51.189	-32.70	-0.957	12.639
20	-341.1	38.790	1.4669	NA	NA	NA	NA	-816.2	-****	-4078.	23.480	-****	-99.63	-44.47	NA	-103.9	-108.4	-3.058	+****	-1.832	-10.98	NA	-3.514	-1.661	-11.52	2035.6	-3193.	NA	184.38	-13.12
21	-****	-26.48	5.0801	66.014	-3.288	10.397	+****	7387.6	2.6360	-****	-4.794	6893.2	-4.632	-2.328	-10.53	-13.17	1.8525	2.9289	1.4760	2.8316	-4.942	+****	37.762	10.676	15.942	4.7579	2.7032	+****	9.2821	53.018
22	9.3240	29.735	12.304	74.563	-3.134	-5.371	-2.059	48.821	-2451.	-****	63.842	+****	-1.313	-1.287	-27.41	-2.344	-0.430	-2.837	1.8087	-15.58	10.203	NA	-****	-0.738	4.3604	8588.8	3.9967	22611.	35.854	-8.326
23	4.1988	7.1087	-2.904	-8.258	-7.409	-83.91	-****	-18.90	-****	12.448	45.144	6.7079	-23.03	7.9998	-****	-5.847	4.4603	-1.968	49.829	-155.0	1.3503	2.8092	-137.6	-5.513	-70.26	238.97	-1611.	-2047.	39.829	-0.634
24	7.3323	0.0418	8.3980	5.5498	1.2691	-5.371	0.7915	-590.6	-8325.	-****	-31.69	6.4538	-4.460	0.0350	NA	0.2379	3.2823	NA	56956.	NA	-1.111	NA	-2.228	-3.939	-3.210	4.2324	41226.	NA	-11.39	1.9767
25	NA	119.83	-240.3	12.860	26.213	23.385	-****	NA	-744.4	4.4438	-31.20	2592.4	-2.870	-5.228	1.7231	-5.704	-2.069	2.3819	1.7121	-446.5	-4.318	12.022	-19.13	-3.942	-8.408	2.3804	4339.5	29.860	-3.858	+****
26	NA	1720.3	-****	55.710	-3.134	-3.811	69964.	-****	3.5528	NA	49.071	5.4220	853.25	-13.25	NA	-152.8	0.0046	5.1365	-11.18	-16.89	-9.219	12.755	-1.260	-24.84	-3.115	1.1425	-435.8	991.04	-6.478	-11.41
27	NA	5.8365	-8.743	12.792	-55.42	58.713	-****	-****	3.9238	-0.183	30.540	448.60	3.9677	2.4371	9.7900	-4.302	3.4268	-****	-5.639	-14.67	-338.0	-****	-188.6	-46.40	-3.512	13.321	-5.213	-1.583	-5.394	-10.43
28	-15.07	4.7863	-3.826	1.5782	-0.344	-3.581	118.69	-****	-19.70	1.9488	-62.84	3798.8	5.0370	-6.035	-346.4	7.6574	-5.033	-1485.	-0.625	-0.919	-1.873	12.797	-16.58	1.8054	-6.293	5.3398	10.981	0.0359	2.0056	26.591
29	-1.107	3.3190	-4.735	-14.56	0.3634	-4.664	-14.85	-2.316	-****	9.6900	82.107	23144.	9.7844	-281.4	-10.29	2.7122	-0.778	4.5911	3.6168	0.1069	34.051	-1665.	1.4420	-4.645	-1.066	11.688	4.3449	4237.0	-1.096	20.172
30	-9839.	-****	-3.579	41.797	-3.134	65.663	199.67	-5.584	-56.16	1.5341	-13.18	-****	-7.975	-2.010	-71.18	31.319	-6.497	-****	-8636.	85170.	-11.24	145.76	-8.099	-13.90	-2.204	-1155.	-7.[illegible]52	-0.844	1.7730	4.5126
31	-****	6.3482	-4.990	2.8868	-1.739	-0.267	-0.564	-22.76	-1.765	-0.577	16.017	4.5094	-4.856	1.3327	-****	-6.830	-17.94	31563.	-80.32	9.2976	-5.143	9.9757	-6.297	-6.012	21.119	-12.05	-0.477	-29.40	0.1011	-7.954
32	-170.5	4.0899	-4.282	-4.673	-5.225	1.4050	-1.412	-5.739	-14.16	-0.154	37.433	-16.82	-22.24	-2.644	-86.36	-9.920	-32.63	-****	-0.668	7.0283	-5.730	-19.24	-7.442	-3.867	1.2147	-15.86	-3.586	-0.941	-1.371	-2.560

TABLE OF ESTIMATED "Lamda(j)" AND "b(ij)"x100 COEFFICIENTS FOR GOOD 4 (30 IMPORTING REGIONS)

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	0.4164	0.6560	0.7199	0.5573	0.6670	0.8211	0	0.4402	0.2822	0.6517	0.5082	0.3403	0.6129	0.5940	0.5691	0.7221	0.6137	0.5236	0.4902	0.4971	0.4571	0.4382	0.3804	0.4298	0.5577	0.3999	0.5387	0.5390	0.6081	0.5075
01	3.5788	5.2981	6.2182	-138.6	-84.76	12386.	35.993	-576.4	0.1128	6.7563	-613.2	1.3339	-80.30	-33.92	-179.9	-2942.	-377.4	-1.103	-51.52	-671.1	3.3034	-44.73	-852.2	13.378	-****	-14.43	-12.41	-****	-4449.	-253.5
02	-11.82	7.1186	-6.701	8.0471	-5.195	12.804	17.980	-5.292	-0.701	6.7496	2.2646	2.1388	-9.670	-1.648	9.3755	-0.974	4.4751	9.8737	-4.133	4.1534	2.0638	-2.887	12.066	4.0708	5.0234	-2.358	11.444	15.619	-2.720	-7.186
03	-48.24	-6.311	NA	NA	NA	NA	-28.65	-4.945	-3.760	-10.50	1.3098	-2.642	-1.994	0.0699	-6.215	-1.175	-1.774	9.2695	-3.166	-3.520	-0.176	-0.056	-1.855	-0.638	-0.401	-4.570	-0.000	9.0071	4.5941	-0.512
04	-1052.	47.269	109.11	95.976	85.485	NA	46.035	3.4961	4.8120	6.9088	9.3188	0.1147	3.8896	-0.143	8.2803	5.5122	5.5031	38.389	4.9213	3.8066	3.6593	4.6738	6.7279	2.7585	5.7961	4.3386	16.193	11.463	11.929	6.3842
05	-3.171	-10.89	NA	NA	NA	NA	-4.126	3.5718	-0.218	4.4608	-1.901	2.4826	-2.127	0.1045	-36.10	10.322	12.393	-6.001	2.6814	2.7122	-2.314	4.9833	9.1052	0.9064	-4.189	-2.627	1.7648	9.4261	7.0254	4.0004
06	262.62	696.99	NA	NA	NA	NA	3.1660	4.9628	5.3733	1.4638	8.6438	0.5337	-1.904	-0.588	28.974	2.5958	-1.599	11.895	-10.51	3691.0	13.294	-5.484	-104.5	14.318	-0.926	-3.476	11.483	7.4456	3.7749	2.6277
07	0.5656	-38.70	39.651	-43.29	31.312	-12.67	-7.234	-19.98	-0.044	-25.17	-24.40	-1.919	-5.808	2.1826	-732.2	-3.069	3.0812	7.0970	-****	-33.47	-****	-15.75	-7.166	-27.74	-21.93	-26.23	1.5328	-9.859	-48.23	-0.529
08	3.6391	-41.35	6.0444	10.648	10.946	82.015	10.459	-84.62	-41.09	-2.244	4.3262	-4.879	3.3041	-5.907	5.4776	0.7404	2.5251	-****	19.838	2.1485	-54.85	-19.53	-109.1	-0.249	-18.09	-45.80	12.364	-1.727	-0.111	-2.481
11	-63.98	11.864	-13.93	-12.36	-8.086	208.94	-43.09	0.0686	4.4259	-4.368	-10.06	-5.674	-21.38	-29.47	121.41	7.0228	-21.05	-156.2	22.609	27.853	-74.85	-****	4.2337	-4.658	31.193	-1.976	-7.390	-****	6.7473	-6.115
12	44.651	355.37	13.203	4.8828	8.3647	5.6005	-0.440	-3.671	-2.965	-0.499	-11.56	0.9362	-11.06	-15.52	5.8181	4.9580	1.8615	-5.303	1.8901	0.3167	-729.8	-154.9	7.7557	-8.261	-30.14	-12.31	1.1834	3.8763	21.444	2.6119
13	0.4438	17.605	5.7069	4.3852	3.6202	13.543	0.0107	-2.374	2.1652	3.5296	4.5355	0.7506	-1.372	1.6900	2.5035	2.5217	0.3302	-1.920	2.1212	2.8517	1.1290	3.8036	5.2307	2.9814	3.8674	2.1043	9.5014	6.8428	5.5255	10.578
14	-****	0.4945	-6.803	3.8418	-4.417	-5.647	-0.608	1.8350	3.2512	2.8201	4.6389	2.2411	-5.227	2.3877	4.8884	-0.207	0.1942	-15.16	3.7158	-2.207	0.6524	6.5795	-593.2	-6.080	1.9199	1.1099	26.689	-54.89	3.6404	8.7581
15	-0.975	-8.080	-5.876	-10.07	-9.309	-13.84	-9.754	-0.336	-8.171	-12.73	-5.412	-3.680	-0.677	1.4053	-0.727	7.3072	-3.639	1.8177	-3.024	-1.447	-2.019	-2.130	-2.168	-0.197	-2.538	-2.711	-0.092	8.7812	4.8528	-5.963
16	3.4704	-1.617	3.1413	0.1748	0.9319	4.2997	-5.298	-3.279	-2.839	-0.368	0.7575	-3.176	2.3632	-0.066	2.0565	2.1585	-5.180	-1.168	-1.844	-0.224	-0.585	0.2251	4.1854	1.1264	-0.410	-0.646	6.6768	8.1167	6.8601	1.7763
17	-11.89	-0.409	-18.43	-10.09	-11.84	24.640	1.6294	-5.052	6.2347	0.9625	-4.043	-11.00	2.4093	-0.094	NA	-7.558	7.1974	NA	3.0828	-0.030	-3.404	-0.893	-4.598	-1.447	-2.530	-3.252	0.4056	123.80	-2.998	-11.26
18	-71.89	14.441	-2.427	4.3670	8.4547	-1.486	-8.406	0.7456	2.2109	-7.082	-7.583	-8.704	3.0814	2.5744	4.5334	-0.674	-9.471	4.0543	-0.885	-6.863	0.5895	-2.063	-0.145	1.5758	-5.442	-4.507	0.9803	-24.04	3.6410	-5.755
19	-8.254	9.5257	7.3986	9.2280	9.1754	12.655	-4.602	3.0142	2.5308	-5.252	-0.342	0.7295	6.2081	-5.362	1.4598	60.072	0.1222	2.2844	1.0560	1.6069	2.7973	2.8012	6.8321	0.5872	2.7425	4.7981	15.736	8.3345	9.6599	9.4279
20	-9.459	13.989	7.2428	14.872	11.929	10.718	69.259	-8.904	-****	-19.51	-13.94	-4.549	-2.816	-18.07	NA	-0.408	-0.774	-3.134	-0.874	1.5734	-75.82	907.66	-2.371	-1.305	-3.054	-2.307	4.3001	-****	-5.816	-28.34
21	-956.3	15.046	3.1586	9.1332	18.214	37.518	-5.968	-7.320	-7.053	5.3560	8.1032	7.3777	-0.689	6.0763	1.0858	2.0225	2.1774	4.5812	-6.092	34.380	-387.8	-24.94	13.194	4.5938	-4.037	14.378	11.169	-22.49	0.1103	3.9094
22	12.055	8.3416	-4.344	2.0629	73.194	67.443	39.403	-50.15	-2.933	21.268	8.8585	-3.000	-0.993	0.6565	-105.6	8.6526	0.9550	0.2060	23.923	-34.90	-5.979	19.854	-12.37	2.5092	1.4779	7.8418	26.386	3.5688	4.6538	343.83
23	-****	-81.22	-5.412	-9.348	-22.14	-166.3	2.2718	5.0669	21.428	1.0257	16.135	6.3760	-3.855	-6.982	-35.37	-2.472	-13.87	-192.5	-123.5	-1.876	-2.795	-13.06	-41.76	-0.747	-0.873	-21.25	20.921	-36.69	0.4188	-10.44
24	0.2421	3.1860	7.7630	3.2961	11.939	-21.93	0.2923	-188.4	-1080.	3.2630	6.2557	7.5899	-4.318	4.2716	NA	-0.355	7.9071	-520.3	153.26	247.96	0.5129	NA	8.9021	-4.582	-169.1	-3.916	2.6541	3496.8	5.1639	3.0511
25	-213.8	-4.940	-18.12	-8.207	-17.01	-35.18	-34.66	-132.8	-40.74	-45.22	-135.8	43.912	-1.874	-1.445	-25.62	-1.269	-3.248	3.5485	-7.134	0.1853	-16.61	-12.17	1.9930	-6.213	-1.295	-10.31	-0.490	-36.67	-25.62	-13.11
26	4836.5	-****	-3.465	-28.13	-16.26	-150.3	13.275	-340.8	-123.8	-23.50	-2208.	-399.1	5.0238	-9.219	-47.72	0.6807	-2.077	-16.48	-80.70	17.331	-155.8	128.70	-6.007	-57.24	-107.7	-438.6	7.9056	-12.52	-5.213	-25.36
27	-****	2.3701	23.171	29.782	49.670	-566.9	-2.226	-2650.	274.97	-48.71	-450.9	-3.254	-17.08	-65.88	-55.50	0.8266	-10.20	2.6155	-14.86	12.012	-632.2	-1577.	-10.35	-8.075	5.5460	-5.927	-4.950	-364.0	-147.3	-750.2
28	-3.536	-1.002	-7.398	-12.96	-19.56	-16.33	-6.442	-1.501	-30.81	-10.11	-7.835	-9.934	-6.689	-5.346	1.8790	0.9189	-0.993	-6.417	2.7643	1.8439	-8.442	-2.967	-1.211	-11.18	-9.605	-1.845	2.5842	2.7622	2.8571	-9.206
29	-150.3	2.8960	1.5577	3.8387	-2.093	-11.19	-0.490	-0.191	3.8073	-4.152	4.5868	-1.726	0.7126	5.1630	-43.72	3.5002	3.9721	-5.671	8.8643	6.5585	10.476	-625.9	6.0837	-1.068	-0.746	3.6150	1.7637	7.5979	6.9477	3.4905
30	-****	58710.	14.251	2.6085	-16.01	-4.864	15.070	-12.36	5.3540	-7.624	7.8272	5.0205	6.8613	2.7247	7.5848	0.2807	9.4379	-****	1.3796	1.5215	-7.140	-52.73	-55.28	-5.798	-3.957	-1.836	5.1189	0.3436	3.9296	4.8783
31	-252.9	8.9166	-0.499	-1.802	-17.15	3.5015	2.3356	0.6704	0.7855	-4.985	-0.489	1.1227	-1.620	0.7679	-5.167	0.9393	3.4143	-1.729	3.2148	3.9306	3.7856	2.1475	-52.93	0.3274	1.3683	2.4730	-5.129	-15.32	6.0921	1.2153
32	8.8100	-62.69	-7.606	-7.057	-11.05	-55.67	-27.94	0.1427	-18.35	10.431	0.1604	-10.82	-14.46	-8.856	-14.85	1.2231	-2.971	-81.93	-3.706	-8.714	-2.102	-39.99	-30.73	-3.649	-4.181	-3.353	-0.975	6.1785	-20.09	1.2964

TABLE OF ESTIMATED "Lamda(j)" AND "b(ij)"x100 COEFFICIENTS FOR GOOD 5 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	0.5503	0.4342	0.6756	0.5554	0	0	0.4394	0.3108	0.3900	0.5725	0.4306	0.2781	0.6022	0.6712	0.2675	0.5565	0.5918	0.2202	0.4362	0.4717	0.5675	0.3350	0.5265	0.5251	0.4570	0.5202	0	0.5097	0.7748	0.2922
01	-5.333	-12.30	-7.645	-1244.	+****	39.722	554.40	-****	-66.62	-17.94	-26.64	-34.58	-2.304	-5.217	-22.96	-18.83	-83.88	-38.93	-19.57	-1.893	-24.69	-6.748	-342.9	-7.408	-****	-330.1	2.2755	-****	-2360.	-7103.
02	-3.491	-2.640	-9.654	-870.5	3036.7	-695.8	+****	12.502	20.330	-0.463	1.9089	-0.149	5.2017	5.0967	2.5551	8.5112	5.2345	228.39	-0.200	-0.490	6.7481	-18.98	5.7205	10.513	7.1686	-6.371	-3.330	3.1803	1.8712	2.7301
03	-8.834	-12.19	NA	NA	NA	NA	-20.56	-3.908	-3.692	-14.75	-2.673	-3.763	0.4302	-1.760	-15.81	-4.323	4.2989	-1.717	-8.805	1.9595	-4.935	-1.902	-0.348	-4.892	-0.514	4.4727	-0.029	14.139	14.343	1.2998
04	58.681	-134.5	14.645	5.9980	3.0981	9.7041	5.9443	-0.891	3.8154	3.9075	-7.957	3.2745	1.2021	4.6264	-1464.	10.913	6.1927	-9.142	10.088	-0.201	-9.172	-0.671	-12.99	5.0200	4.5892	-2.335	13.551	0.4819	25.796	1.3445
05	-54.62	-29.70	NA	NA	NA	NA	-952.1	6.1651	1.6070	0.8995	-1.217	-1.492	-2.462	1.9969	-45.44	0.5000	4.4881	-0.055	8.0027	-0.079	-3.300	2.4547	0.2689	-1.895	-0.217	-1.529	0.3513	1.3740	4.4128	-6.990
06	24.855	+****	NA	NA	NA	NA	292.46	0.9452	-11.39	7.7466	-6.395	-8.575	-6.612	-2.631	18.338	-0.071	5.0169	-****	-45.87	-8029.	39.041	-4.232	-466.5	-0.160	-14.07	8.0588	-3.736	14.760	2.0534	5.7054
07	-40.85	-****	-8.535	1447.3	+****	-203.4	-12.22	-1.919	-14.32	1.5761	-16.43	-7.403	-8.078	-1.889	0.1753	-11.50	1.6552	-3.169	-****	5.7571	-76.89	4.9344	76.989	-82.85	-7.826	-24.97	-0.938	2.3496	-0.464	2.1169
08	-2.575	2.6266	-116.9	-3.968	1.3033	-9.654	41.871	-31.27	-12.91	-11.84	-0.264	-7.072	-2.643	-8.130	-296.9	-9.425	-7.710	-****	365.97	42.306	-33.50	-****	2.5340	28.308	-182.2	-552.0	28.772	-176.3	-1.389	-1113.
11	33.614	292.75	61.582	-9.959	-4.091	-27.85	-****	9.8769	3.8938	-7.841	625.02	-45.88	9.4601	70.227	77209.	13.532	21.821	-122.6	10.457	-1.690	29.100	936.64	-1.164	-4.524	12.428	7.1043	45.748	0.5270	442.16	27.104
12	6.2734	725.94	89.293	33.886	20.249	6.2219	216.32	4.1349	-13.12	-20.48	-3.023	-0.209	1.0603	4.5101	7.2053	6.2810	2.3316	-****	163.54	-1512.	51.685	8483.4	3.7894	1.8987	2.1466	-0.569	-10.69	122.97	1.8694	-38.56
13	17.822	-5.601	27.478	8.0963	10.817	10.140	9.3817	4.6722	-16.65	7.3840	2.4115	2.3660	9.0427	-2.081	-163.1	2.7642	0.2529	-****	-32.78	-0.926	8.3353	5.7614	1.0626	-1.723	2.4507	-1.172	43.510	4.2703	2.2521	10.147
14	-5.002	-4.842	0.4470	15.789	-0.957	-5.451	-103.0	-0.624	1.8324	25.212	4.0536	-0.180	4.1057	2.4227	5.7318	9.2222	-0.666	-****	-900.4	29.873	-11.22	37.555	-1823.	-111.9	14148.	290.18	50.602	3.6528	-1.119	3546.0
15	-4.735	-1.213	-4.676	-4.892	-1.321	-10.26	-8.333	-8.711	-16.24	-7.319	0.3210	-16.23	-1.214	-1.934	1.2945	3.4944	-1.176	2.3959	-3.565	0.3594	-7.157	-1.576	-2.669	-3.169	-4.613	-2.978	-10.17	-26.56	-7.986	-10.15
16	20.463	0.7166	1.1456	5.9747	-3.867	-5.088	-7.414	-2.013	-6.474	-5.797	-4.572	-1.324	1.0793	-0.713	1.7271	-2.825	-7.175	3.2529	0.9843	1.7148	2.2488	2.5528	4.5413	10.285	3.5384	18.388	-3.176	23.586	-3.568	3.3461
17	-30.81	-3.095	-13.62	-18.01	-11.03	-82.51	-694.9	-8.624	6.5064	1.1131	-14.09	2.4412	1.2646	1.4722	-****	-18.19	-10.12	NA	5.9749	-1.431	-13.69	4490.8	-126.0	1.9604	2.7073	-4.754	-0.869	25.461	-2.528	-75.12
18	6.3224	8.1523	1.7995	0.0661	3.4809	-0.092	0.4193	-66.13	7.3733	-1.985	-5.285	0.5542	2.5856	-0.384	-3.893	-4.178	-0.041	7.2673	-3.308	-9.041	-1.012	2.3069	0.2809	-1.053	-4.035	-1.552	5.4738	13.710	77.030	-5.606
19	8.2649	-4.891	-2.995	1.0484	3.7618	-4.518	-9.366	0.2177	-4.703	-3.024	0.4373	0.2090	2.6500	-2.903	-16.64	7.8917	5.4238	4.3822	0.9699	0.4981	0.1610	-0.052	2.4079	8.6188	1.6944	-1.524	1.3162	8.5628	89.799	2.5826
20	-2.645	12.441	8.7685	1.5181	3.1843	+****	NA	-12.46	-1667.	-3.209	-378.8	-262.3	-30.01	20.694	NA	-58.03	-7.136	-5.472	-15.91	-5.223	-60.29	-1290.	0.3787	-3.357	-259.1	-12.58	0.5440	-****	-11.90	-2.528
21	2.6184	3.7960	9.0462	26.464	8.0384	7.1097	5.5752	-44.62	73.298	-8.690	-33.05	12.187	-6.610	7.3871	-1425.	-10.87	-0.498	-36.08	-151.0	-13.68	-11.87	9.0076	3.9418	72.124	13.116	-8.391	15.596	0.9821	12.842	25.532
22	35.929	22.997	6.5284	395.18	2.9449	77119.	57287.	21888.	+****	27.516	-****	8391.9	-0.005	24.892	190.26	-0.717	10.816	7.1258	255.51	4.9603	3.1032	1.5976	2736.7	4.3508	3.9620	998.43	5.1117	-****	6.2586	-3189.
23	-64.58	16.487	-0.004	-554.3	-0.447	78420.	18320.	-****	141.59	-13.03	-10.68	1.6309	-256.1	-3.034	-****	-9.267	-7.754	-****	-13.73	10.794	-8.911	20.816	-64.10	-14.45	-64.62	-14.14	1.2805	-****	-10.72	-510.8
24	15.129	0.3368	9.5214	9.3338	-0.157	9.1178	0.1796	-25.23	-3796.	-36.07	5.1700	4.1742	-1.424	0.4527	NA	1.1791	0.7644	NA	363.99	+****	9.2441	NA	7.3131	5.6540	-2047.	5.3289	26.923	NA	3.5534	5.1001
25	15.345	-935.7	-8.915	-14.24	1.2727	-****	-1800.	-384.8	-0.595	-38.71	8.7728	-10.36	1.4039	-0.498	-2794.	20.012	9.1338	5.7903	8.6788	1.9513	-0.339	9.4943	-19.29	-5.044	-10.30	-12.58	19.593	-87.21	-5.298	371.07
26	NA	19059.	3.1382	4566.5	6.1685	825.46	86363.	-423.3	-13.11	-14.13	18495.	5133.3	3.2607	0.4462	9.8087	-5.711	3.0214	7.4332	29.576	3.3200	-6.488	52.464	2.1324	-6.853	6.7466	38.838	14.418	-1.366	6.7103	11273.
27	5.1009	+****	133.94	161.37	11.301	446.26	349.62	20.652	13.341	-22.81	-14.06	1098.5	4.1052	10.665	-3786.	13.925	11.744	-78.42	4.2674	21.184	13.706	-4.870	8.6624	-6.529	4.2154	7.2871	27.331	-1219.	18.164	17.369
28	-42.87	0.8572	4.1747	-22.90	-22.66	-4.452	-4.499	-24.06	-4.968	17.366	-2.606	1.5545	4.5328	2.4547	-1.198	8.1871	-2.563	-16.83	-14.84	-0.213	-34.38	0.9741	-1.079	-73.88	-37.45	-5.990	-3.484	-4.031	11.216	-8.721
29	-1.269	5.8369	-8.223	21.288	-8.562	-8.582	12.021	6.6146	126.75	20.858	23.283	-4.413	12.103	4.4379	-13.53	-4.468	1.6697	-7.230	30.898	2.5370	21.410	409.14	6.1899	-1.477	3.7843	24.629	3.5311	11.979	19.539	12.474
30	-86.38	-****	-8.617	-8.103	48.040	-14.27	-1.733	3.0425	6.1590	-13.44	-21.08	5.9029	4.4879	-29.35	17.153	9.2674	-15.48	NA	5.0639	0.6919	-14.35	4.7430	-94.46	-7.116	1.2642	1.9938	7.9100	-****	-6.068	5.7916
31	-20.11	-5.432	-1.694	-2.888	-0.393	1.7382	1.5883	1.2524	1.5195	4.5536	2.8593	3.2844	4.1956	3.7708	4.5572	6.0115	1.7667	-1.974	2.4252	0.8993	3.8004	1.0712	2.0669	-3.957	1.7535	3.0922	-0.602	-7.644	-0.059	3.8972
32	37.187	-0.781	-6.117	14.539	-3.311	0.8410	1.3874	2.8143	-39.11	-27.90	-1.883	-37.53	-28.02	-19.92	11.517	-33.11	-11.34	-0.008	-1.947	1.8067	-20.88	-85.17	-58.57	-0.654	1.8221	-0.559	1.8737	5.4765	-3.910	-3.739

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Lamda(j)" AND "b(ij)" COEFFICIENTS FOR GOOD 1 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j														
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17
Lamda(j)	11.438	12.671	NA	12.859	22.141	NA	NA	8.6525	9.6886	14.645	12.101	NA	19.656	25.259	10.270
01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02	-4.316	0.6200	0.5488	1.9481	1.5065	0.3013	3.4245	1.6745	6.2809	2.3811	0.4453	-0.718	1.7463	0.8112	-1.488
03	-2.844	0.2797	NA	NA	NA	NA	-1.523	-0.679	-0.583	-0.444	0.5489	-0.906	0.0503	1.0657	0.8172
04	1.0728	2.8678	NA	-0.078	1.9888	NA	-2.294	0.6063	7.7263	2.0812	0.1378	2.4540	1.5432	0.8431	2.5111
05	-0.779	1.9339	NA	NA	NA	NA	-0.678	1.3694	7.9867	1.7299	0.0832	0.8131	1.0301	0.6006	0.2168
06	-0.676	1.4333	NA	NA	NA	NA	0.2123	2.7239	-0.436	-0.013	-1.551	1.9150	0.0845	-0.822	-0.423
07	0.2311	-0.801	0.4447	-1.661	0.8738	-0.084	-7.096	2.0817	0.9472	1.4958	6.7600	-0.685	1.3360	1.0074	0.9010
08	0.1712	0.9925	-0.191	-1.220	-0.203	-0.214	2.5107	-3.607	-1.915	0.3419	-0.002	-2.502	-2.008	1.0540	1.0650
11	1.8649	0.3422	0.8182	-2.063	-1.792	0.3114	-0.936	0.4285	4.2192	1.4336	3.8115	-3.112	0.1185	0.7758	0.6560
12	1.1394	-1.523	-1.369	2.8325	-3.752	0.1713	-0.713	2.4163	-6.304	2.3018	0.4999	1.8969	-0.246	0.9340	-0.631
13	4.3423	4.5677	0.1913	0.8035	2.5450	0.5328	0.0322	-0.757	8.9102	-0.341	-2.271	-1.459	0.0000	2.0306	1.2210
14	-0.463	1.6833	-1.018	0.3415	-0.944	-0.227	-1.586	-2.748	0.0005	-0.544	0.4335	1.3587	-0.319	0.9018	-1.713
15	-2.481	1.5146	-1.160	-1.279	-0.337	0.4308	1.0802	-1.475	-0.857	-1.153	-4.934	-3.507	1.6044	0.1985	1.0707
16	0.3997	1.4003	0.4947	-0.694	0.7429	0.4751	1.1521	-1.204	-2.143	-1.287	-3.846	-3.589	0.1508	-0.700	-0.240
17	-0.892	-0.667	0.6237	1.2682	0.0168	-0.123	-0.971	-1.411	2.1370	1.4386	0.8934	0.2286	-0.125	-0.524	-3.754
18	-0.148	1.9439	1.3315	2.7109	1.2335	1.3489	5.8414	0.3612	-0.313	-0.448	-0.877	-4.656	1.2827	0.7979	0.5434
19	0.1338	1.7997	0.9388	3.9505	3.7087	0.5762	2.0977	0.9356	-0.186	-0.011	-0.817	-0.479	1.5650	-0.347	-2.537
20	1.4694	-0.441	0.1947	-0.156	3.1163	0.4938	0.7110	-1.191	-3.959	1.2818	-0.300	-2.054	0.9108	0.6264	-0.355
21	-0.216	0.9816	0.7049	1.0656	1.1967	0.2920	2.5870	-1.024	-0.218	0.9280	1.3222	-0.957	0.2843	2.7445	-1.112
22	0.2526	1.7418	-0.263	-1.157	0.4192	-0.022	2.1476	0.1466	0.5064	2.0102	-0.981	-2.642	-2.159	-0.780	-1.014
23	0.6627	1.1528	-0.430	0.4267	4.0733	-0.064	2.1324	0.7190	-1.155	0.8398	-1.780	-1.950	-1.773	-1.997	0.3238
24	2.6379	0.3357	0.3946	2.3426	3.6392	0.3488	3.1691	-1.480	-0.284	0.2241	-0.230	3.1850	0.0752	2.0415	0.5627
25	-0.787	-0.576	-0.595	-0.527	-1.659	-0.100	-1.820	-1.373	-1.785	-0.606	-1.123	1.2617	-0.110	-1.873	-0.471
26	0.0817	0.0634	-0.095	0.2233	-0.087	-0.895	NA	-0.620	0.1229	-0.130	0.1195	0.2505	-0.328	-0.910	2.9584
27	-0.061	1.5830	0.1085	1.0777	3.0362	0.4909	0.8959	-0.239	1.4541	-0.418	1.4812	NA	0.2076	0.9034	-2.524
28	-1.170	-2.706	-0.748	-1.217	-0.541	0.0963	1.6455	1.2560	2.2258	-0.858	0.9487	2.3408	-1.157	-0.406	-5.122
29	-1.564	-1.178	-0.540	1.8085	-1.451	-0.529	-2.704	0.8878	2.8731	-0.280	1.4096	1.6469	0.3282	0.1054	-0.576
30	-1.316	0.3114	1.0669	-0.219	0.7901	0.7574	2.9546	-1.135	2.6894	-0.578	-3.680	-1.122	-0.116	0.6924	2.0145
31	-2.467	-1.564	-0.066	-1.237	0.0182	-1.079	-0.433	-0.215	-0.699	-2.333	-4.945	-0.546	-0.286	-2.312	-4.235
32	1.6532	-1.919	-0.086	1.7511	-1.514	-0.215	5.9241	-0.625	-1.650	-1.915	-0.839	-3.889	-1.795	-1.086	-1.023

PARTNER i	IMPORTING REGION j														
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	15.625	19.597	14.103	10.836	12.663	NA	7.6540	8.5090	22.797	15.735	13.816	17.619	18.786	30.354	17.396
01	NA	NA	NA	NA	NA	NA	NA	-0.680	NA	NA	NA	NA	NA	NA	NA
02	1.0358	0.5488	3.6514	-2.484	-0.755	3.1776	-0.153	NA	1.7272	-0.131	-0.286	0.2607	0.0106	-0.103	1.0858
03	0.1915	2.1253	1.3504	5.2031	3.2336	-5.305	1.1655	2.5340	1.5877	-0.561	1.6140	0.8548	0.3316	0.9418	-0.165
04	0.5901	0.4419	1.7025	3.8411	1.3026	1.4855	1.4497	3.6933	1.4336	-2.692	2.1092	-0.878	1.1034	2.5634	0.9968
05	0.9458	0.3271	0.7142	-0.799	1.2268	6.7273	2.1329	4.1812	4.2285	-1.821	-1.523	-2.502	0.5134	0.3313	1.9836
06	0.2341	0.8518	0.0425	-0.892	1.1308	2.2506	2.0903	0.3975	0.3718	-0.169	0.5571	-0.453	1.3942	3.3100	-0.145
07	0.2857	0.1287	0.7455	0.7706	2.1590	1.5159	1.3636	0.4240	0.1614	-0.518	0.1641	0.7810	-1.951	0.0171	1.6210
08	-0.168	-0.452	-0.766	-0.795	0.4571	-1.306	-1.585	-0.129	0.4675	0.0083	0.6904	-0.278	-1.391	-0.406	-0.968
11	-0.676	-0.402	1.9701	-2.888	0.4705	1.4782	-0.397	-1.975	1.0383	-0.918	1.5113	-1.855	0.5165	0.3591	-0.336
12	3.4537	-2.216	0.7693	0.6255	-0.107	-0.957	1.4850	2.5380	0.1451	0.3448	2.7257	2.3300	1.6041	1.2690	-0.185
13	2.9744	-1.273	-0.027	-0.190	0.5565	0.4129	-0.382	0.0975	0.4472	1.7195	1.2790	1.5395	-0.061	0.6099	1.0116
14	-1.604	0.1217	0.2421	-0.195	0.6611	-2.528	0.1018	-0.504	-0.720	1.0680	0.2684	0.7946	0.6171	-1.309	-0.318
15	-0.299	-0.577	1.3423	-1.425	-0.368	-9.756	-1.338	-3.180	1.2563	0.0384	0.3579	1.2880	1.6702	1.9408	-3.982
16	1.6785	-2.390	2.5483	-0.996	0.6115	-2.898	-1.075	1.7529	3.9646	1.2883	3.7293	2.1040	0.7536	0.9734	0.8782
17	-2.407	-2.155	NA	-0.975	-0.807	-9.645	NA	-4.898	-0.182	-1.721	-1.165	0.1647	1.3294	-3.306	-0.109
18	-0.459	2.2198	0.0308	-0.216	-0.125	-2.453	-4.171	-0.211	0.9731	-0.104	0.4592	0.8459	1.1902	1.5741	-0.780
19	1.1674	3.3484	1.1712	0.4655	-1.156	-1.743	1.5145	2.0396	1.4109	0.7070	2.2729	0.9899	1.3772	1.7338	1.2433
20	-0.134	-2.455	-0.791	-1.103	-0.845	-4.271	NA	-0.810	-1.038	-1.194	-0.558	0.1119	-0.507	0.8108	-2.771
21	2.8725	0.3219	1.7329	-2.282	0.6778	-1.316	0.7035	2.8610	1.9424	0.2067	1.5227	0.3477	1.6231	0.6905	1.2271
22	-0.679	-2.786	-0.749	-2.260	-0.668	-2.117	2.7605	0.2527	0.9621	0.4357	1.4344	3.2073	0.7962	-0.145	0.0025
23	-3.831	-0.398	0.3335	0.3889	-0.791	0.4438	-4.960	-0.890	0.1974	-0.662	2.3198	-0.168	-2.760	-4.640	-0.148
24	1.0514	4.7660	0.6994	3.7691	1.8284	-0.638	NA	-2.508	-0.953	-3.100	1.8370	0.3795	-0.778	2.5804	-0.653
25	-3.748	-1.675	1.6104	-0.078	0.0935	-2.455	1.3442	1.0148	0.1457	-2.047	1.0873	-0.765	0.4943	-1.256	1.5219
26	-1.013	1.6618	4.6866	0.8571	0.9860	-0.976	0.1784	-1.145	-1.357	-1.366	3.2911	2.6516	0.3723	1.3514	2.3634
27	-0.859	-0.140	0.8638	1.4570	0.7307	-0.681	-2.954	-0.888	-1.662	0.5255	0.3182	-0.044	-1.101	0.7536	0.6821
28	0.4205	0.0940	-0.284	-0.049	-0.842	1.3805	-0.861	-0.843	-2.081	-0.662	-3.775	-2.695	-1.277	-1.095	0.0759
29	-0.932	-0.850	-0.774	2.1340	1.0271	4.2269	-5.746	1.0103	0.2948	1.5584	2.4194	0.1080	1.6336	-2.495	1.7696
30	0.5670	3.2728	-0.648	1.9535	-0.161	-2.061	-0.187	-3.685	-1.380	0.0526	-0.825	-0.709	-2.358	0.7592	-0.833
31	-2.551	-1.665	0.5012	-3.499	-1.283	-1.624	-3.339	-2.545	-0.845	-0.276	-0.178	-1.989	-1.046	0.3901	-0.913
32	0.2446	-0.251	0.6250	-1.401	2.5463	-2.410	-1.187	-5.714	-3.278	-0.463	0.0339	0.6973	1.2113	-0.688	-1.182

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Lamda(j)" AND "b(ij)" COEFFICIENTS FOR GOOD 2 (30 IMPORTING REGIONS).

PARTNER I	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	NA	18.358	50.756	8.5969	32.934	NA	4.6141	6.6108	35.895	4.2993	11.947	NA	NA	27.547	10.557	NA	12.619	2.4065	0.3159	3.5490	7.0916	1.6440	NA	NA	0.0889	3.0237	9.3302	6.0118	NA	12.909
01	-0.375	-0.496	0.3201	-0.225	1.1923	1.0920	0.2528	3.7350	0.7927	0.2795	-0.348	NA	-0.453	-0.409	-0.188	-0.320	-1.844	NA	-0.415	-0.046	-1.253	-1.795	0.1828	0.5774	-1.972	NA	-0.759	NA	0.4553	NA
02	0.1434	0.1951	0.2273	-0.943	0.1631	-0.853	-0.358	-1.119	1.6817	0.3059	2.0906	-0.090	0.4306	2.8349	0.4034	0.5993	2.3970	NA	3.2149	-0.335	1.6899	1.3395	0.5124	1.3668	1.3145	0.5057	2.6008	NA	0.5364	-0.636
03	1.7060	-0.361	NA	NA	NA	NA	-0.016	0.7916	1.8565	-0.693	2.6301	-0.336	-0.179	0.3937	NA	-0.065	0.4441	1.0049	0.7490	NA	0.7931	NA	NA	NA	NA	NA	1.0656	NA	0.4181	2.3219
04	0.0642	1.6571	0.6159	0.2349	0.6362	NA	-0.016	0.5061	3.5088	1.7727	-0.528	0.5132	0.3269	1.1130	NA	1.0542	1.7413	0.8383	-2.022	0.5536	0.8174	0.4455	0.7845	1.3542	1.8769	2.8470	3.4411	0.2411	0.7299	2.4038
05	3.2346	2.2639	NA	NA	NA	NA	0.4664	4.1380	1.8794	1.3978	0.5006	0.0498	0.2396	0.7878	-0.993	0.1797	1.3579	1.7930	0.2262	2.7356	1.8213	-1.788	-0.325	0.0787	-0.797	0.7020	1.9155	0.9626	0.2532	2.5392
06	1.9875	0.7190	NA	NA	NA	NA	-0.384	0.5107	1.1205	1.3103	-0.800	0.2893	0.8219	1.4001	1.4396	0.6068	2.5985	NA	0.0825	NA	NA	4.5409	0.5477	-0.163	0.7267	0.9756	3.6797	1.6818	0.1376	2.9316
07	0.7359	0.2612	0.2045	0.2446	1.6465	-0.080	0.0829	-1.294	1.6514	0.3610	0.9326	0.5074	0.0965	1.6943	-0.269	-0.073	-0.824	NA	NA	0.6473	0.1379	0.2453	NA	NA	-1.823	0.8388	3.3470	-0.353	0.5915	2.1146
08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-0.065	NA	NA	-0.898	NA	NA	-0.346	NA	-0.337	NA	-0.349	0.0722	-0.038	-1.423	-1.025	NA	-0.408	NA	NA
11	-0.263	0.8741	-1.437	-0.843	0.4028	-1.282	-0.304	0.7960	2.7869	-0.064	-1.933	-0.378	0.7172	-0.095	-1.492	-0.242	1.8805	1.1949	0.5267	-2.632	-0.656	-1.794	-0.314	-1.385	-0.728	-1.124	-1.778	0.0315	-0.065	1.0340
12	0.1782	-1.080	-1.233	-3.162	1.8550	-5.682	-0.087	-1.456	3.8211	0.3162	0.5553	-0.425	0.0591	2.1725	1.5224	-0.497	0.1332	0.5544	-0.417	-0.230	4.0580	0.7677	0.0649	NA	-0.613	0.1067	-0.701	0.0173	-0.074	-0.283
13	-0.523	0.4473	3.7909	2.4132	1.1245	-0.108	1.0242	0.2127	-0.084	0.4636	0.0406	0.3061	0.2170	0.0022	0.4110	0.0393	-2.136	0.0860	0.8187	-0.134	1.8413	0.6687	0.0995	1.0381	1.0323	-0.989	0.7246	0.4764	-0.026	0.3095
14	0.5711	0.1697	1.5552	1.5891	1.9946	-2.759	-1.539	-1.491	-3.459	0.4698	-0.244	-0.796	0.0018	0.0394	0.3032	-0.065	-0.868	-0.162	0.3796	NA	0.1190	1.6187	0.0766	NA	NA	-0.325	-0.601	0.2360	1.1717	-0.605
15	0.6876	2.7208	4.3935	0.3700	0.7799	1.3967	1.3464	-0.052	1.0517	-0.180	-0.297	0.0734	2.6833	7.5525	1.0537	1.4921	2.9146	0.3128	-1.081	-1.310	-0.716	-1.349	0.3263	-0.627	0.2090	0.1510	-0.415	0.3068	0.3998	-1.676
16	-0.034	4.3407	1.5762	-0.563	0.8141	2.9029	1.3714	4.1376	1.2543	0.3162	-0.864	0.1942	1.4625	-0.273	-1.959	1.6724	0.3933	NA	1.6334	-0.424	1.6387	1.1855	0.4673	-0.375	0.5325	0.1376	0.5478	-0.046	0.0039	1.0664
17	NA	-0.261	0.7540	-0.516	0.0150	1.6082	0.5648	2.3544	NA	NA	0.4775	-0.221	1.8578	1.4822	1.1110	0.2481	-1.206	NA	-2.930	-1.465	-0.724	NA	0.0857	-0.309	NA	-1.601	-0.722	NA	-0.015	0.3106
18	-1.654	0.5505	2.5987	-0.299	-0.019	-1.286	-0.155	0.4700	0.6167	1.8137	0.3218	-0.072	1.3348	1.2245	-0.276	1.2718	0.1388	1.1589	-1.805	0.8536	2.7565	1.7071	-0.217	0.4250	0.9831	1.9254	1.2757	0.9016	0.3662	-1.392
19	-1.204	1.8864	0.7003	-0.192	0.3773	-1.454	0.1125	2.7671	1.0756	-0.394	-1.040	0.2545	0.1615	-1.027	-1.287	0.4693	1.3896	-0.087	-1.341	-0.166	0.5452	1.2436	0.4206	0.4180	1.5271	0.1627	0.6166	0.0203	0.6156	0.1684
20	-1.445	0.9617	1.9271	-0.664	0.4445	-0.490	-0.010	-0.584	4.1846	0.2101	0.8268	-0.181	0.4268	-1.235	-0.733	0.0916	2.0886	-0.081	-0.631	-0.643	-5.967	NA	-0.452	0.3717	-1.348	-0.058	1.7579	NA	0.0409	0.8910
21	NA	-0.589	0.2706	-0.781	1.0497	-0.540	1.8789	-0.019	0.4766	-0.888	2.3341	NA	0.0772	1.6699	-0.567	-0.269	-2.752	-0.047	-7.609	-0.693	1.0773	NA	0.0632	0.2377	1.3858	0.2833	0.5819	NA	0.2781	-0.738
22	0.3749	-0.353	-0.970	0.6295	-0.484	-0.618	0.1932	-0.428	0.7647	0.0219	0.9807	0.4378	0.2181	1.5426	-1.113	-0.276	2.6342	0.3774	2.1490	-1.349	-0.723	NA	0.7140	-0.241	3.5035	-0.035	4.4345	-0.571	0.5507	-0.279
23	NA	-1.481	0.3064	0.7835	0.4436	0.7792	-0.909	-0.660	0.2985	-0.027	0.8827	0.5105	0.2023	-1.210	2.4924	0.0739	1.4347	0.1731	-1.417	-0.003	0.8656	0.0019	-0.143	-0.083	-1.762	-0.196	-0.474	-0.859	-0.344	0.1922
24	-1.180	0.2260	-0.826	-0.210	0.7724	-0.979	-0.033	-0.885	-0.066	NA	-0.307	-0.564	0.9709	-0.063	NA	0.0002	0.7840	NA	0.5339	0.4369	-0.294	NA	1.3637	NA	NA	1.2148	-1.208	NA	0.5222	-0.483
25	-0.926	0.5465	0.9070	-1.129	-0.499	-0.795	-0.011	8.7063	-0.403	NA	0.3496	NA	1.0988	-0.095	-0.887	-0.214	0.9900	-1.197	0.5715	-0.218	-1.884	1.5380	-0.038	-0.589	-0.598	-2.300	-1.194	-0.014	-0.355	-0.848
26	NA	-0.017	0.7677	-0.230	0.1552	-2.214	NA	5.4310	-0.188	NA	0.0344	0.4829	-0.087	-0.119	-3.367	0.1403	0.7694	0.7788	-0.525	0.5889	-2.222	0.9537	0.2446	2.0838	-1.749	-1.300	0.3616	-1.275	-0.055	-0.937
27	0.2675	-1.636	-1.106	-0.174	-1.258	-2.258	-0.036	2.9108	-1.485	-0.744	-1.986	-1.168	-1.784	-2.916	0.4834	-1.273	-4.518	-0.067	0.4714	-0.089	-1.807	-4.267	-0.820	-0.450	-0.274	-0.001	-4.833	0.0672	-4.230	-0.456
28	NA	1.6606	0.0812	1.3368	0.9781	1.5435	-1.315	-1.812	-0.885	-1.924	NA	-0.802	1.1165	0.7319	1.4357	0.2256	-0.121	-0.539	-0.586	1.3718	-1.328	NA	0.0681	-0.321	-2.346	0.0676	0.6461	-0.214	-0.174	0.2674
29	1.3673	0.5893	2.5645	0.1213	1.1293	3.1442	0.0486	-4.146	0.8384	-0.759	0.9742	0.3258	0.1803	0.1925	-5.498	-0.075	1.7087	-2.258	-4.624	-0.055	-5.107	0.8829	0.9917	-0.620	3.7219	0.0156	2.2271	-1.478	1.5828	3.3562
30	-0.216	-1.556	2.1340	-0.539	0.3745	4.7625	1.1772	-0.919	0.0753	0.1404	3.7253	0.4616	-0.571	-1.627	0.0768	-0.307	0.7644	0.1445	NA	1.3717	-1.423	NA	0.2316	1.7741	-1.456	-0.813	1.1308	-3.605	1.0521	2.2666
31	-2.461	-0.661	-0.492	1.6683	0.5754	-0.534	-0.873	-2.588	-1.148	-0.822	-0.020	0.6894	0.1648	-0.507	NA	-0.044	-0.171	0.1161	1.5627	-1.078	-1.663	-1.134	0.1147	-0.051	2.6978	0.1050	-0.057	-0.236	0.2856	0.7037
32	0.4378	-0.493	-0.326	0.8508	1.4251	0.9314	0.0204	-0.121	-0.167	NA	-1.511	-0.171	0.0145	-1.430	NA	-0.333	-1.483	NA	-1.769	-0.909	-0.892	-2.048	0.2748	-0.521	0.9829	0.1027	0.8285	1.8286	1.3466	2.5289

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Lamda(j)" AND "b(ij)" COEFFICIENTS FOR GOOD 3 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	3.8707	4.1059	32.320	NA	NA	NA	0.8775	2.9911	9.7232	8.9253	11.623	6.8902	31.812	14.400	11.619	19.025	19.149	4.0888	8.7584	7.9039	NA	9.0514	10.075	15.563	16.856	0.6087	19.462	4.2210	22.966	36.344
01	NA	NA	NA	NA	NA	-0.360	-0.126	0.8280	NA	-0.082	-0.930	NA	NA	NA	0.5467	NA	NA	NA	-0.248	-0.105	-2.007	NA	-0.060	NA	-1.195	1.1487	0.9379	NA	NA	-0.396
02	-2.804	0.2891	-2.780	-0.185	-0.271	0.2689	NA	NA	0.5708	NA	NA	1.1867	2.5866	1.9084	NA	1.5099	0.0602	NA	NA	NA	NA	3.5741	NA	0.3445	NA	NA	NA	NA	1.4170	NA
03	-0.284	0.5782	NA	NA	NA	NA	-1.928	-1.929	-0.948	-4.626	1.6214	-0.638	0.2377	0.2950	0.7545	0.8006	-0.230	2.9978	-1.030	-0.355	-0.960	5.0994	0.8734	NA	0.1227	-0.543	0.2045	0.6743	0.0103	0.0868
04	0.8779	-0.298	NA	0.1463	NA	NA	0.9162	-1.241	0.6759	3.1907	0.9365	1.9121	3.4859	6.0816	0.8593	4.2186	5.5844	-0.637	4.0476	1.1746	1.5814	2.0607	1.8367	0.0885	1.5446	-2.538	2.0342	2.6584	0.7055	0.6352
05	NA	-0.429	NA	NA	NA	NA	-0.663	-1.770	3.5862	-0.059	0.6608	-0.193	-1.171	0.2783	-1.100	-0.858	-0.444	3.1730	2.6750	1.9826	0.6615	5.2675	2.1836	-0.009	-0.510	-0.362	0.1741	1.3673	-0.141	0.4981
06	0.0133	-0.597	NA	NA	NA	NA	1.0282	-0.507	0.5458	1.7100	2.1685	3.1624	0.8477	1.4006	-1.924	-1.265	4.9125	-0.637	1.8662	-0.102	NA	5.2266	1.3651	-0.064	1.2095	2.8200	0.4424	-1.412	1.4207	0.5214
07	2.1645	-0.835	0.2675	0.1756	0.5351	-0.215	0.2254	0.7626	-1.919	-0.690	-1.163	1.4225	1.0974	0.4585	0.2553	-0.325	-0.661	0.1637	-2.326	-0.220	-2.085	0.0538	-3.145	0.1021	-0.709	1.5274	0.8390	NA	3.4573	-0.432
08	-1.293	0.0893	-1.543	0.0415	-2.004	-0.188	-0.863	1.6445	-0.388	-0.497	-0.664	1.6058	0.4434	-0.616	-0.907	0.0604	-0.766	-0.804	0.1476	-2.547	-1.093	-0.379	0.4412	-1.285	-0.364	0.6647	1.9072	-0.318	-0.576	0.8134
11	-0.773	-0.353	1.3710	0.6474	NA	NA	-1.941	-1.081	1.7658	-2.550	2.2463	1.0655	0.9252	0.2501	0.9644	0.1657	0.0471	-0.807	1.0754	-0.434	1.1790	1.7012	0.4763	-0.283	-0.351	-0.036	0.3246	-0.676	0.8148	0.2821
12	-1.212	1.5140	0.5213	0.9890	2.5880	0.4359	0.9912	1.1732	-0.804	2.2204	0.8507	1.4836	0.3673	1.1494	0.8185	2.2433	3.3511	2.4804	0.4608	-0.254	-1.332	0.0922	NA	0.3009	-0.199	1.3358	0.3018	NA	1.5000	-0.037
13	-0.547	1.2420	2.0334	0.1722	-0.268	-0.512	-0.902	-2.985	0.2069	-2.417	-1.369	1.8501	1.0192	0.0615	-0.015	0.0560	-1.307	0.4376	-1.016	1.1205	0.8747	3.5129	-0.506	0.6020	0.3260	-0.370	2.6666	0.4928	0.0125	1.9686
14	0.5028	0.3362	5.8254	-0.477	0.0783	0.1129	0.9899	2.2580	-1.609	-0.739	1.9074	0.9724	0.7319	0.5016	0.1596	-0.821	-0.009	-0.760	0.0275	-4.156	0.0020	2.1716	0.0875	-1.771	-0.427	-0.283	0.9621	0.0156	-1.553	-1.077
15	-2.302	1.9540	-0.494	-0.420	-0.634	-0.127	0.8116	-0.717	1.7381	0.3694	0.7464	2.0740	1.5499	1.8425	0.6317	2.5264	-1.059	3.9864	-9.776	2.7947	0.7168	-0.129	0.8722	1.4457	1.4042	0.7049	-0.085	-0.913	0.7195	-0.970
16	-5.922	0.2968	1.3782	0.5930	1.0479	0.2790	0.7681	-4.323	-1.550	-0.920	0.3649	-0.604	1.8480	2.9372	1.0625	3.4044	0.7082	0.7485	1.4666	1.6789	1.5118	1.0104	-1.099	1.3233	1.4605	-2.116	1.4975	-0.133	3.5085	1.8909
17	-2.500	-0.201	0.2042	-0.079	NA	NA	1.4217	-0.853	0.7982	-2.291	-0.526	-1.527	0.8199	-0.156	NA	-0.428	0.6290	NA	-0.896	-1.862	-3.133	-0.324	-0.997	-0.328	-1.145	-0.521	-2.065	-0.156	1.4476	1.2475
18	-0.606	1.0778	0.8214	-0.193	0.0403	0.8933	0.7266	-1.094	0.9758	-1.189	-0.186	-1.264	-0.601	0.8562	-0.579	-1.583	-0.934	3.1367	-2.252	-3.692	-0.068	1.8551	1.1667	0.2692	0.5810	-2.099	2.1301	-2.082	-0.207	3.5436
19	-1.733	0.6594	2.1324	-0.254	-0.193	0.4943	-0.409	0.9603	-2.891	-6.057	0.5408	-0.843	1.4598	-1.879	-2.100	0.9926	0.3754	0.1376	1.8545	-3.530	0.1155	4.1912	0.8524	0.7222	-0.588	0.1845	1.5291	-0.528	-0.107	1.5936
20	-1.340	1.4351	0.2038	NA	NA	NA	NA	-0.244	-1.998	-1.417	0.8787	-1.382	-1.806	-0.793	NA	-2.722	-1.434	-1.950	0.6361	-0.521	-4.362	NA	-0.676	-0.431	-1.628	1.1458	-0.402	NA	0.6888	-1.992
21	-1.196	-2.301	0.2384	0.7631	-0.029	0.7304	1.3460	0.2588	0.3315	-1.150	-0.124	0.5143	-2.510	-2.121	-2.399	-2.733	0.8272	2.3652	0.6410	0.7990	-1.316	0.7976	1.4071	2.8419	2.4862	1.0359	0.5805	0.9607	0.9026	1.1982
22	2.2785	0.7045	0.1405	0.5367	-0.027	-0.035	-0.518	0.9722	-1.415	-1.106	0.8916	0.5773	-0.331	-0.880	-1.404	-0.719	-0.169	-3.060	1.3661	-0.602	1.4099	NA	-0.307	-0.259	0.3143	0.6772	0.1229	0.8979	4.8059	-0.294
23	1.4255	0.4614	-0.197	-0.697	-0.046	-0.881	-1.152	-1.739	-0.712	1.0909	1.8415	1.7247	-4.197	1.8734	-1.431	-1.649	2.2603	-0.255	0.7691	-2.190	1.2033	0.0655	-1.561	-1.129	-0.551	0.6479	-0.271	-0.140	3.2677	-0.044
24	1.9455	0.0041	0.8117	0.6488	0.0182	-0.037	0.0807	-0.069	-0.133	-0.783	-1.017	1.8310	-2.151	0.0360	NA	0.0756	1.6135	NA	0.2022	NA	-0.553	NA	-1.157	-1.015	-0.530	1.6176	1.4676	NA	-1.900	0.2748
25	NA	0.8761	-0.355	0.5523	0.2476	0.1765	-0.494	NA	-1.067	0.9234	-0.839	0.2842	-0.777	-0.630	0.5057	-0.660	-0.565	0.7036	0.0288	-3.443	-1.950	3.4392	-3.075	-0.274	-0.859	0.7522	2.2677	0.0358	-0.590	2.0861
26	NA	0.9602	-0.215	0.5441	-0.035	-0.057	1.4315	-0.165	1.1378	NA	1.8848	1.4680	0.5491	-0.371	NA	-2.679	0.0001	2.1585	-0.835	-1.524	-1.373	3.4423	-0.249	-3.646	-0.645	0.1587	-2.447	0.2157	-1.269	-0.677
27	NA	0.2161	-0.385	0.0933	-0.409	0.6047	-1.398	-0.633	0.4890	-0.016	1.3040	0.1258	0.6400	0.2569	1.6640	-0.311	0.2460	-1.651	-1.605	-1.483	-1.401	-4.103	-2.055	-1.177	-0.279	2.2886	-0.885	-0.088	-0.971	-1.045
28	-1.081	0.2217	-0.294	0.0560	-0.004	-0.235	3.3216	-0.418	-1.382	0.4146	-1.076	0.2688	0.3417	-0.433	-0.272	0.1649	-0.110	-0.908	-0.056	-0.244	-0.804	2.8002	-1.976	0.2512	-1.888	0.9262	1.0348	0.0144	0.8714	1.5113
29	-0.312	0.2371	-0.454	-0.495	0.0028	-0.531	-3.641	-0.683	-0.300	2.4033	2.3963	0.1880	1.5533	-1.790	-0.325	0.3505	-0.044	2.5338	1.8507	0.0448	1.1583	-0.231	0.2265	-1.577	-0.382	2.1608	1.8119	4.6131	-0.538	1.7316
30	-1.273	-0.960	-0.488	0.3947	-0.044	0.7962	1.7842	-1.363	-1.156	0.2623	-0.189	-1.725	-0.818	-0.198	-0.655	2.3645	-0.478	-0.875	-0.520	0.1890	-1.404	0.0016	-0.825	-0.769	-0.643	-1.308	-2.279	-0.254	1.0148	0.2524
31	-3.479	0.0901	-0.879	0.1288	-0.058	-0.032	-0.164	-1.755	-0.212	-0.151	1.3360	0.3141	-0.405	0.2566	-1.339	-0.828	-1.873	0.4875	-6.079	0.3344	-4.692	1.9512	-1.054	-0.337	1.3147	-3.365	-0.245	-1.556	0.0495	-1.098
32	-2.218	0.2856	-1.532	-0.447	-0.463	0.3906	-0.408	-2.082	-6.255	-0.057	0.9017	-2.539	-3.661	-0.747	-0.502	-1.096	-2.511	-2.939	-0.562	1.0125	-3.792	-2.501	-2.929	-2.155	0.4701	-5.661	-1.859	-1.916	-0.620	-0.892

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Lamda(j)" AND "b(ij)" COEFFICIENTS FOR GOOD 4 (30 IMPORTING REGIONS)

PARTNER i	IMPORTING REGION j																													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	10.129	20.052	25.690	15.560	20.951	43.981	NA	11.046	6.9922	19.735	14.245	8.3060	18.932	15.866	14.020	23.579	16.486	14.336	12.794	12.940	11.266	10.365	9.7066	10.644	14.714	10.398	16.842	14.447	18.261	13.490
01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02	-3.362	1.1670	-2.053	1.1354	-0.757	0.0296	0.2570	-1.477	-0.405	1.5685	1.5114	0.9695	-6.169	-0.834	1.7067	-0.098	0.9764	1.8091	-0.914	1.8161	0.6083	-0.496	0.6098	1.0257	1.1275	-0.952	0.9678	3.7029	-0.222	-1.398
03	-4.696	-0.473	NA	NA	NA	NA	-0.234	-4.909	-2.383	-4.682	1.2138	-2.894	-0.973	0.0642	-1.083	-0.431	-0.928	1.1420	-2.593	-2.791	-0.180	-0.075	-0.758	-0.434	-0.167	-2.616	-0.000	3.1989	1.7322	-0.411
04	-1.717	0.3366	1.8389	2.6030	2.1477	NA	0.6832	3.9930	6.5074	2.6920	4.1753	0.1818	1.9207	-0.107	0.6800	1.8606	2.4624	0.9521	2.2167	1.6605	1.4099	3.0580	3.0544	1.1231	2.2631	1.3146	4.9633	3.7777	6.6731	3.5875
05	-0.079	-3.290	NA	NA	NA	NA	-0.037	4.5333	-0.197	1.7873	-1.580	5.5389	-0.987	0.0895	-1.149	3.1942	3.9481	-0.507	1.6818	1.2109	-1.302	5.3813	5.9791	0.3907	-1.495	-1.981	0.6808	4.1705	2.5612	2.8414
06	0.2026	0.8339	NA	NA	NA	NA	0.1451	3.2315	1.0022	0.2218	3.7083	0.3694	-0.529	-0.177	1.0779	0.3016	-0.315	2.1545	-0.707	0.4553	1.5620	-1.130	-1.938	1.7032	-0.218	-1.515	7.3395	2.8720	2.0879	1.0268
07	0.1337	-0.150	1.0905	-0.622	0.3055	-3.011	-1.009	-4.308	-0.007	-2.253	-1.811	-0.708	-0.853	0.4463	-0.619	-0.396	0.8789	1.3049	-1.941	-0.613	-0.566	-0.789	-0.098	-0.307	-2.533	-2.970	0.7450	-0.570	-2.665	-0.157
08	1.0157	-0.835	0.8237	1.3730	2.3311	2.1209	0.4709	-2.660	-2.006	-0.293	2.6222	-0.951	0.9127	-2.346	0.2476	0.1660	0.9827	-0.352	0.3128	0.6173	-0.845	-0.245	-0.523	-0.018	-0.712	-2.419	2.3522	-0.311	-0.038	-0.186
11	-0.530	1.7885	-2.766	-2.784	-0.962	0.8796	-0.502	0.0344	1.2324	-0.832	-0.610	-1.679	-5.281	-2.799	1.5698	0.9881	-2.169	-0.401	0.0940	0.3381	-2.925	-3.470	1.1755	-0.249	0.1934	-0.145	-0.689	-0.621	1.1641	-1.985
12	1.8923	1.0789	0.8061	0.3523	0.2635	0.0888	-0.004	-2.376	-0.352	-0.066	-1.495	0.1796	-1.464	-3.617	2.0284	1.3506	0.7197	-0.603	0.0435	0.0529	-1.917	-0.338	0.3221	-0.105	-0.696	-0.898	0.0517	0.6255	0.1345	0.4208
13	0.2236	2.7475	3.2226	0.8962	0.7916	1.0120	0.0009	-0.735	0.4466	0.5039	3.5663	0.5125	-0.931	0.6674	0.9854	0.7264	0.1213	-0.026	1.1312	1.1746	0.3687	0.4336	1.1282	0.6036	1.2129	0.9041	2.1278	1.1729	1.8958	2.3737
14	-0.327	0.0521	-1.625	0.8292	-0.930	-0.702	-0.038	1.0966	1.2658	0.2207	2.1774	1.9040	-0.506	0.6876	0.4769	-0.042	0.0809	-0.905	0.8095	-0.153	0.1381	1.6007	-1.252	-0.601	0.4369	0.0280	2.1349	-0.833	1.1571	1.5144
15	-0.390	-2.867	-2.982	-2.119	-1.642	-1.510	-0.607	-0.256	-4.906	-2.492	-3.080	-4.070	-0.198	1.5456	-0.379	3.1778	-1.484	0.4346	-1.855	-0.902	-1.357	-2.275	-1.351	-0.104	-1.300	-1.927	-0.040	3.0956	4.1406	-3.540
16	0.5321	-0.465	2.9137	0.0429	0.1830	1.0621	-0.553	-2.987	-2.386	-0.179	0.8947	-3.603	2.3626	-0.099	1.2984	0.9448	-2.646	-0.114	-1.861	-0.223	-0.738	0.3128	4.6548	0.6728	-0.252	-0.495	2.7405	3.4202	4.1132	1.3994
17	-3.212	-0.069	-3.897	-1.257	-1.324	1.2977	0.0310	-1.782	2.0286	0.2422	-0.798	-1.463	1.1392	-0.033	NA	-1.295	1.2082	NA	0.4600	-0.004	-0.383	-0.169	-1.148	-0.334	-0.452	-1.761	0.1656	3.1806	-1.089	-2.070
18	-1.994	2.2369	-0.901	1.1962	1.4460	-0.125	-0.620	0.2920	3.3260	-0.837	-1.487	-2.688	1.3621	2.2213	0.5468	-0.177	-3.058	0.9446	-0.404	-1.569	0.4370	-0.774	-0.079	0.1292	-0.347	-1.845	0.4240	-1.131	0.8433	-2.618
19	-1.570	2.9818	4.0303	2.1670	1.7338	1.3292	-0.465	1.5853	0.7185	-1.101	-0.247	0.4693	2.4926	-1.478	0.2272	2.8955	0.1019	0.7159	1.3091	2.0975	2.8615	1.7916	4.9590	0.2315	1.0102	1.4351	4.9856	2.9653	5.7165	3.4556
20	-0.510	2.4149	0.6589	0.5787	0.6325	0.8455	0.5338	-0.562	-2.803	-0.961	-0.918	-0.796	-0.781	-0.465	NA	-0.106	-0.205	-1.444	-0.214	0.8984	-3.763	0.1146	-0.552	-0.504	-0.739	-1.174	0.7870	-0.565	-0.914	-3.307
21	-1.700	1.3293	1.5591	1.5394	2.6528	4.5893	-0.082	-0.359	-0.615	0.5123	1.7089	0.8297	-0.490	2.1663	0.3649	0.3380	0.7960	1.8981	-2.173	1.0931	-1.429	-0.187	2.2610	0.5334	-0.216	1.5123	2.3275	-1.219	0.0344	3.1624
22	1.9229	1.1774	-0.263	0.2023	1.2118	0.1587	0.3620	-0.511	-0.234	1.0206	1.8556	-1.138	-0.112	0.2498	-1.423	0.6326	0.4948	0.0931	2.2462	-1.410	-0.419	1.8121	-3.898	0.7148	0.4571	4.6729	3.8016	0.8536	0.9712	2.7154
23	-3.828	-2.616	-1.762	-2.241	-4.855	-0.510	0.0135	1.9900	1.2443	0.0461	3.0280	0.9356	-2.106	-3.941	-3.211	-0.890	-3.065	-4.288	-1.601	-0.936	-1.001	-1.070	-1.679	-0.209	-0.187	-0.857	3.9726	-1.449	0.1279	-3.392
24	0.0807	0.9570	2.1448	0.8551	1.8037	-2.739	0.0125	-4.138	-1.588	0.1901	3.1084	3.2890	-2.371	2.4303	NA	-0.045	4.5876	-0.096	0.3558	0.4676	0.0568	NA	4.7359	-0.783	-0.730	-0.300	0.2760	0.0520	1.3615	1.0602
25	-3.307	-0.756	-2.971	-1.027	-2.881	-1.302	-0.387	-0.057	-1.138	-1.661	-1.398	1.5668	-1.177	-0.703	-3.176	-0.301	-1.501	0.9086	-1.076	0.0653	-2.265	-1.053	1.7062	-2.517	-0.373	-1.609	-0.165	-2.892	-3.863	-10.09
26	2.1359	-1.285	-0.507	-1.343	-2.621	-1.523	0.1111	-0.658	-0.651	-1.363	-0.429	-0.793	0.5026	-1.618	-1.173	0.1340	-0.338	-1.242	-0.517	0.3384	-1.244	0.8941	-1.358	-5.575	-1.054	-5.121	0.8198	-2.381	-0.898	-2.023
27	-0.573	0.4109	1.2257	1.1286	1.3631	-0.501	-0.016	-0.660	2.5269	-1.522	-4.079	-1.232	-1.635	-1.260	-1.306	0.1344	-0.288	0.5662	-0.976	0.8057	-1.392	-2.377	-1.668	-0.520	2.2798	-2.039	-0.513	-1.419	-1.947	-3.352
28	-0.615	-0.163	-1.435	-1.895	-2.343	-3.821	-0.561	-0.439	-1.179	-0.650	-1.375	-2.932	-2.984	-1.940	0.5695	0.2499	-1.024	-1.473	1.2633	0.8051	-2.241	-1.353	-0.424	-5.824	-1.456	-0.926	1.2716	0.8441	0.8339	-2.182
29	-4.214	0.6565	0.9961	0.7333	-0.391	-2.149	-0.074	-0.146	0.7090	-0.847	3.2816	-0.551	0.3881	3.1963	-4.454	0.5862	1.6358	-0.655	2.1368	2.6570	2.1695	-1.433	6.3220	-0.555	-0.358	3.1910	1.4242	4.6518	5.9323	2.1017
30	-0.631	0.1732	0.3944	0.0778	-0.600	-0.443	0.5314	-0.920	1.1352	-0.847	1.7293	1.6104	2.3496	1.2343	1.0078	0.0261	2.0789	-0.651	0.0841	0.6925	-1.807	-0.457	-3.187	-2.003	-0.940	-0.687	2.3187	0.1153	1.4222	3.8353
31	-4.275	1.3373	-0.292	-0.221	-3.642	2.9239	0.5072	0.2669	0.3295	-1.786	-0.242	1.1129	-0.253	0.8141	-1.008	0.2134	1.7631	-0.228	1.9682	1.8978	2.0315	1.7667	-2.039	0.1246	0.9315	1.1625	-4.535	-3.623	3.7453	1.6238
32	1.6041	-2.206	-0.913	-0.736	-0.443	-1.229	-1.631	0.0384	-2.700	0.9800	0.0190	-4.350	-3.252	-1.273	-0.737	0.2410	-1.165	-5.902	-0.156	-1.046	-0.181	-2.920	-2.390	-1.282	-1.176	-1.505	-0.530	2.6608	-1.477	0.6836

TABLE OF ESTIMATED "t" STATISTICS FOR THE "Lamda(j)" AND "b(ij)" COEFFICIENTS FOR GOOD 5 (30 IMPORTING REGIONS).

PARTNER i	IMPORTING REGION j																												
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Lamda(j)	15.321	15.264	23.289	14.083	NA	NA	10.782	7.4198	9.2900	17.178	10.089	6.5526	17.698	21.492	7.4892	15.824	18.531	5.4313	10.203	11.800	15.400	7.7128	13.831	14.248	11.083	14.758	NA	12.901	32.964	7.7494
01	NA	NA	NA	NA	0.5781	NA	NA	-2.655	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
02	-0.376	-0.891	-0.817	-0.655	NA	-5.079	0.1679	NA	3.3802	-0.071	0.8624	-0.057	1.4426	1.3404	0.8647	1.3589	0.6301	0.9753	-0.058	-0.166	0.8062	-3.736	1.3922	0.5420	1.1298	-1.879	-0.154	0.6166	0.2957	0.4955
03	-0.217	-1.204	NA	NA	NA	NA	-0.528	-1.756	-1.337	-5.109	-2.530	-3.341	0.2391	-0.977	-0.843	-1.983	1.3879	-0.292	-2.140	1.4139	-1.946	-2.166	-0.114	-1.539	-0.245	1.1400	-0.003	1.6380	3.5128	1.4799
04	1.0760	-1.067	2.2990	1.0112	2.1684	3.0075	0.2309	-0.514	3.7978	1.6802	-2.133	3.4868	0.4439	3.7445	-6.241	3.2646	1.9906	-1.369	2.5262	-0.074	-1.091	-0.255	-2.322	0.6164	0.9027	-0.613	0.7297	0.0362	4.0838	0.4121
05	-1.355	-1.300	NA	NA	NA	NA	-0.891	4.0341	0.7645	0.6627	-0.877	-1.717	-1.357	1.0163	-2.601	0.0835	1.5698	-0.014	2.8528	-0.054	-1.007	1.7707	0.0621	-0.864	-0.153	-0.473	0.0441	0.3094	0.7752	-3.281
06	0.6453	0.5927	NA	NA	NA	NA	0.3653	0.3209	-0.908	1.2414	-0.967	-2.655	-1.365	-0.577	1.5415	-0.015	1.1811	-0.412	-1.324	-0.621	0.9429	-1.176	-0.510	-0.020	-1.418	1.2173	-0.565	2.5796	0.9465	5.6567
07	-0.776	-3.217	-0.442	0.3996	1.0755	-8.228	-7.298	-0.297	-1.490	0.4212	-5.563	-3.196	-1.234	-0.333	0.0325	-0.381	0.2230	-0.519	-0.749	0.9595	-0.610	2.9909	0.2794	-1.716	-1.206	-2.314	-0.156	0.8777	-0.249	1.4919
08	-0.045	0.5240	-1.965	-1.374	0.5805	-1.889	1.4776	-1.652	-1.661	-2.760	-0.113	-1.182	-0.483	-0.546	-0.467	-1.000	-1.814	-1.639	0.5662	0.1192	-2.086	-2.630	0.0653	0.9421	-0.889	-0.980	0.6543	-0.657	-0.326	-0.873
11	0.2543	1.8059	0.1678	-1.200	-0.398	-1.726	-0.649	4.9335	1.2576	-1.798	2.2773	-3.822	1.3054	1.4641	0.4209	0.9326	1.9254	-0.884	0.9750	-0.266	0.9265	0.0592	-0.238	-1.021	1.1171	1.3712	0.7510	0.0907	2.7467	0.8608
12	0.0867	1.5844	1.7243	1.9179	0.9809	0.7902	1.4725	3.0180	-0.612	-1.353	-0.580	-0.121	0.2167	0.9863	0.6145	0.5082	0.3677	-0.766	0.1732	-0.249	1.1095	0.4629	0.6716	0.3287	0.5032	-0.075	-0.124	0.0685	0.4209	-0.875
13	1.2357	-1.903	5.1036	2.5179	4.0310	6.0168	1.7977	3.3032	-0.990	1.9206	0.8905	1.9848	2.2795	-0.600	-2.230	0.7254	0.0597	-1.787	-0.444	-0.281	0.6879	1.4737	0.2894	-0.144	0.5927	-0.123	1.3818	0.8165	0.5225	3.8711
14	-0.065	-1.193	0.0852	1.2818	-0.838	-0.739	-0.253	-0.375	0.3343	5.9684	2.4066	-0.083	1.5404	0.6403	0.5399	1.7880	-0.126	-1.225	-0.255	0.1610	-0.207	0.8903	-0.505	-0.036	0.7347	1.4260	0.5206	0.6098	-0.092	1.6440
15	-0.683	-1.043	-2.057	-1.729	-0.914	-6.357	-1.973	-1.659	-2.426	-1.388	0.1878	-6.248	-0.452	-1.750	0.6837	1.1977	-0.478	1.6793	-2.620	0.3304	-2.580	-1.236	-1.843	-1.710	-0.976	-1.610	-2.008	-1.050	-3.186	-5.600
16	3.4116	0.7692	0.6468	0.8916	-5.340	-4.424	-4.408	-1.347	-2.773	-2.701	-2.218	-0.400	1.2188	-0.758	1.6564	-1.629	-2.843	0.9468	0.6156	2.1791	0.7825	3.3145	2.8294	1.7661	1.6947	4.7731	-0.519	2.0994	-0.450	2.0152
17	-1.655	-1.450	-2.435	-1.740	-3.698	-1.974	-1.302	-0.468	1.4789	0.1380	-1.586	1.1196	0.1750	0.4486	-3.066	-1.229	-1.163	NA	1.2919	-0.367	-1.032	0.9705	-0.471	0.0963	0.8166	-1.650	-0.050	3.5999	-0.121	-1.057
18	0.8728	2.6183	0.7592	0.0227	2.5174	-0.043	0.0887	-3.053	0.8639	-0.502	-0.614	0.1910	1.2984	-0.118	-0.790	-1.063	-0.005	3.7970	-0.710	-4.135	-0.246	2.0070	0.0950	-0.245	-1.316	-0.072	0.5723	0.2929	2.3818	-3.146
19	0.5136	-1.819	-0.838	0.2291	2.1055	-1.289	-1.100	0.0712	-1.547	-1.702	0.3266	0.1712	0.6986	-0.693	-0.910	0.8710	1.8844	2.3743	0.3983	0.6314	0.0465	-0.051	2.3163	3.1244	0.7775	-0.311	0.1478	0.7403	2.0346	0.9358
20	-0.060	3.1333	0.8356	0.1242	2.0820	2.2750	NA	-0.788	-3.743	-0.409	-0.892	-1.420	-2.132	1.2040	NA	-2.391	-1.087	-3.718	-1.515	-1.246	-5.287	-0.189	0.1077	-0.841	-1.405	-2.463	0.0178	-0.510	-2.562	-0.873
21	0.0596	0.4583	1.1063	1.0849	3.1053	2.8082	0.8650	-1.170	0.7817	-0.487	-1.750	1.0872	-1.020	1.1757	-2.524	-1.020	-0.140	-2.137	-0.894	-0.399	-0.585	0.2571	1.4588	0.5785	0.8974	-0.651	0.9959	0.1401	1.2290	0.9698
22	0.6172	1.1057	0.1617	1.0404	0.6665	0.9158	0.9010	2.4320	0.7535	0.5922	-0.149	0.4129	-0.002	3.5064	1.1424	-0.254	4.6347	1.9824	2.9510	0.2428	0.1850	0.1483	2.0644	0.8064	0.7058	0.8495	0.0377	-0.978	0.0556	-0.532
23	-0.997	0.3106	-0.000	-0.687	-0.183	2.9115	0.8247	-1.723	0.5541	-0.433	-2.523	0.0166	-2.944	-0.845	-3.362	-2.348	-1.601	-0.760	-0.593	1.0184	-2.255	0.8062	-1.000	-0.908	-1.742	-2.899	0.0428	-0.891	-2.450	-1.087
24	0.8181	0.0293	2.3434	0.9931	-0.327	2.1498	0.0107	-0.573	-0.052	-2.046	2.2239	1.8869	-0.773	0.1280	NA	0.2494	0.3210	NA	0.1992	0.2030	0.2365	NA	0.3596	0.1013	-2.592	0.1619	0.7746	NA	0.3785	0.5025
25	0.2825	-2.364	-0.781	-1.578	0.5352	-0.911	-1.897	-0.645	-0.090	-0.613	0.7191	-0.494	0.2328	-0.068	-0.607	3.1629	1.8343	0.3075	1.3647	0.3721	-0.024	1.8294	-3.113	-1.582	-0.919	-3.029	0.5886	-0.575	-1.134	0.4739
26	NA	0.6361	0.7574	1.0660	1.0947	5.0031	1.0767	-0.274	-0.241	-0.414	0.9112	0.7316	1.5607	0.1339	3.5826	-0.555	0.8604	2.3847	0.8634	0.9240	-0.207	1.8538	0.7923	-1.717	0.3341	0.3712	0.1878	-0.194	0.3506	0.7459
27	0.1717	3.7135	4.3665	4.0737	2.7123	5.9775	4.9481	0.1522	0.1590	-0.528	-0.339	2.1237	1.1257	1.5470	-1.842	1.1815	3.1031	-2.152	1.2595	2.1870	0.4534	-0.392	2.3781	-1.259	1.7673	1.9785	0.9044	-0.852	0.7342	0.6307
28	-1.188	0.2272	0.1361	-0.669	-2.439	-0.690	-1.864	-1.082	-0.623	1.3747	-0.094	0.1486	0.1970	0.0656	-0.100	0.9924	-0.426	-1.386	-0.843	-0.056	-2.226	0.1300	-0.256	-3.227	-1.985	-1.239	-0.160	-1.156	0.5206	-1.728
29	-0.024	0.2409	-2.523	2.1059	-1.615	-3.488	0.7937	3.1219	1.0114	0.7071	1.7826	-0.611	1.5144	1.2350	-1.485	-1.229	0.4154	-0.927	1.2159	0.5523	2.4901	1.1287	0.8027	-0.340	1.7467	6.1789	0.4878	2.0956	2.3050	4.5295
30	-0.747	-1.333	-0.492	-0.232	1.2306	-1.477	-0.427	0.9598	0.9537	-0.975	-0.712	2.0243	0.2842	-3.271	4.7817	1.3937	-1.114	NA	0.9934	0.2517	-1.083	1.7741	-4.522	-2.342	0.2038	0.6331	0.8029	-0.566	-0.604	0.6189
31	-1.178	-1.189	-0.957	-1.797	-1.092	3.4993	5.4226	0.7365	0.7142	4.0053	1.8638	4.2637	1.9225	1.3043	1.7213	1.5419	0.1476	-0.718	0.5499	0.8642	1.1625	1.2488	1.8518	-2.036	0.8031	2.0737	-0.392	-1.640	-0.022	4.2629
32	0.6073	-0.217	-1.144	0.7467	-2.498	0.4008	0.1376	0.1149	-3.146	-2.099	-0.129	-1.118	-3.505	-1.948	0.5318	-3.714	-1.472	-0.001	-0.306	0.7000	-2.154	-2.971	-4.516	-0.092	0.7832	-0.299	0.3135	1.7703	-1.026	-1.193

APPENDIX 7.5

5 TABLES OF DIAGNOSTICS FOR THE SELECTED FUNCTIONAL FORMS

5 GOODS

TABLE OF ESTIMATED "DIAGNOSTICS" FOR THE SELECTED FUNCTIONAL FORMS, FOR GOOD 1 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j														
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17
F STAT	2.2462	3.0102	0.9868	1.2634	2.9463	1.4771	3.4211	1.5057	2.8314	2.1858	3.8826	4.6687	2.0708	3.1650	2.6931
F (5%)	1.7427	1.6895	1.6521	1.9040	1.8551	1.7201	1.7753	1.9015	1.7146	1.8525	1.5803	1.9605	1.7745	1.9015	1.7427
F (1%)	2.1711	2.0803	2.0174	2.4532	2.3667	2.1330	2.2273	2.4484	2.1230	2.3619	1.8968	2.5538	2.2259	2.4484	2.1711
DF1	13	15	17	9	10	14	12	9	14	10	21	8	12	9	13
DF2	433	433	349	388	388	349	419	433	433	433	433	419	433	433	433
CV	36.525	74.255	46.006	41.635	30.973	50.082	42.586	74.198	62.863	66.669	61.240	69.660	29.014	19.364	60.957
MCV	2.1485	4.9503	5.1118	2.3131	1.8219	4.1735	2.5050	3.5332	3.9289	3.3334	6.8044	3.3171	1.6119	0.9221	3.5857
LL	0.7873	0.9694	0	1.2328	2.2592	0	0	0.5840	0.6067	1.3315	0.7813	0	2.0366	2.4521	0.7436

DIAGNOSTICS	IMPORTING REGION j														
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
F STAT	2.2703	1.0673	4.7318	1.8947	2.4777	5.0743	5.4255	3.1210	3.3257	1.3677	3.9239	1.2988	2.2240	1.0287	3.9799
F (5%)	1.7146	1.6895	1.7436	1.6895	1.7146	1.6668	2.0331	1.9597	1.6895	1.6106	1.6895	1.7428	1.8107	1.6895	1.6106
F (1%)	2.1230	2.0803	2.1726	2.0803	2.1230	2.0418	2.6855	2.5524	2.0803	1.9472	2.0803	2.1712	2.2888	2.0803	1.9472
DF1	14	15	13	15	14	16	7	8	15	19	15	13	11	15	19
DF2	433	433	418	433	433	434	388	433	433	433	433	432	433	433	433
CV	36.354	23.041	84.808	55.811	51.416	45.809	157.23	71.926	77.365	59.050	60.178	29.230	64.702	14.228	38.905
MCV	2.2721	1.5361	5.3005	3.7207	3.2135	3.2721	7.8619	3.2693	5.1576	5.3682	4.0118	1.7194	3.4053	0.9485	3.5368
LL	1.5048	1.8870	1.1245	0.8000	1.0646	0	0.4817	0.5172	1.9795	1.3639	1.1081	1.6288	1.6979	2.9174	1.3834

NOTES:
1). F STAT is the estimated F(J,nT-K) statistic, for a(ij)=0 in the jth importing region, where J=DF1 and (nT-K)=DF2.
2). F(5%), F(1%) are the corresponding critical values of the F STAT at the 5% and 1% levels of significance, respectively.
3). CV is the estimated Coefficient of Variation for the jth importing region.
4). MCV is the estimated 'Modified' Coefficient of Variation for the jth importing region.
MCV is defined as the ratio of the CV by the number of Positive a(ij)'s in the jth import region.
5). LL is the estimated Mean Lag response (=Lambda(j)/(1-Lambda(j)).

TABLE OF ESTIMATED "DIAGNOSTICS" FOR THE SELECTED FUNCTIONAL FORMS, FOR GOOD 2 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j													
	01	02	03	04	05	06	07	08	11	12	13	14	15	16
F STAT	6.4796	0.2771	0.0403	2.7055	0.9087	8.2273	6.7406	4.0940	3.1279	2.6933	1.8166	2.2563	2.2182	1.9940
F (5%)	1.7474	1.5658	1.7765	1.7173	1.6304	1.5582	1.5812	1.6464	1.6903	1.7475	1.6114	1.6703	1.6293	1.6106
F (1%)	2.1799	1.8727	2.2297	2.1280	1.9807	1.8608	1.8983	2.0072	2.0818	2.1800	1.9487	2.0480	1.9788	1.9472
DF1	13	22	12	14	18	23	21	17	15	13	19	16	18	19
DF2	359	451	397	388	388	374	418	433	418	358	418	377	405	433
CV	109.13	98.418	36.257	196.27	114.32	168.44	127.40	126.34	74.296	186.12	129.07	9906.1	83.048	54.849
MCV	9.0947	12.302	2.4171	15.098	12.702	56.149	15.925	9.7191	5.3069	15.510	12.907	825.51	6.9207	4.9863
LL	0	1.7275	5.6518	0.9711	2.7758	0	0.4212	0.2655	2.9183	0.3711	0.8485	0	0	2.3443

DIAGNOSTICS	IMPORTING REGION j															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
F STAT	1.1171	0.9139	2.6840	1.3353	5.5998	6.5077	3.4175	2.5899	1.0488	4.2297	10.874	4.888	1.6235	3.2625	0.8804	2.6573
F (5%)	1.5978	1.8540	1.9015	1.6970	1.7163	1.6295	1.6676	1.6744	1.6489	1.7182	1.7173	1.5324	1.8107	1.7487	1.6293	1.5320
F (1%)	1.9262	2.3648	2.4484	2.0938	2.1262	1.9790	2.0432	2.0553	2.0117	2.1297	2.1280	1.8182	2.2888	2.1822	1.9788	1.8171
DF1	20	10	9	15	14	18	16	16	17	14	14	25	11	13	18	25
DF2	386	405	433	327	403	403	419	328	391	374	388	418	433	343	405	425
CV	147.45	83.263	78.756	88.527	155.18	793.12	95.284	377.22	166.89	479.39	310.78	160.47	45.046	1307.5	17.953	26.649
MCV	24.575	4.1631	3.7503	11.065	11.084	79.312	7.3295	53.889	13.908	39.949	23.906	40.119	2.3708	118.86	1.4961	6.6623
LL	0.8959	0	0.6230	0.1952	0.0000	0.1213	0.4160	0.0425	0	0	0.0001	0.1992	0.5830	0.6062	0	0.9716

NOTES:
1). F STAT is the estimated F(J,nT-K) statistic, for a(ij)=0 in the jth importing region, where J=DF1 and (nT-K)=DF2.
2). F(5%), F(1%) are the corresponding critical values of the F STAT at the 5% and 1% levels of significance, respectively.
3). CV is the estimated Coefficient of Variation for the jth importing region.
4). MCV is the estimated 'Modified' Coefficient of Variation for the jth importing region.
MCV is defined as the ratio of the CV by the number of Positive a(ij)'s in the jth import region.
5). LL is the estimated Mean Lag response (=Lambda(j)/(1-Lambda(j)).

TABLE OF ESTIMATED "DIAGNOSTICS" FOR THE SELECTED FUNCTIONAL FORMS, FOR GOOD 3 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j											
	01	02	03	04	05	06	07	08	11	12	13	14
F STAT	2.0768	1.9471	1.3433	0.7759	1.5722	1.2354	0.2655	0.6447	3.5650	1.5942	5.3574	1.4717
F (5%)	1.5988	1.6106	1.6932	1.6725	1.6990	1.7226	2.3932	2.1202	1.7427	1.6472	1.7146	1.7427
F (1%)	1.9280	1.9472	2.0869	2.0519	2.0974	2.1376	3.3641	2.8451	2.1711	2.0087	2.1230	2.1711
DF1	20	19	15	16	15	14	4	6	13	17	14	13
DF2	372	433	373	349	307	321	419	419	433	418	433	433
CV	327.81	249.95	27.576	45.459	31.384	47.551	241.09	241.40	73.225	89.194	132.93	91.630
MCV	54.635	22.723	2.5069	4.5459	3.9231	4.7551	9.6438	10.495	4.3073	7.4329	8.3081	5.3900
LL	0.2147	0.3605	3.3986	0	0	0	0.0372	0.1675	0.6698	0.6004	0.8571	0.4101

DIAGNOSTICS	IMPORTING REGION j																	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
F STAT	0	0.8567	1.8089	1.3475	0.0449	1.4562	3.4278	2.4847	3.9249	3.4393	2.9249	2.7221	0.0006	3.5844	1.3058	3.2477	1.7646	1.4921
F (5%)	1.7739	1.7146	1.7781	1.8107	1.7140	1.7453	1.6669	2.2355	1.7435	1.7454	1.7436	1.6285	1.6455	1.6277	1.6106	1.5999	1.6464	1.6277
F (1%)	2.2248	2.1230	2.2326	2.2888	2.1218	2.1759	2.0419	3.0611	2.1725	2.1760	2.1726	1.9773	2.0057	1.9758	1.9472	1.9299	2.0072	1.9758
DF1	12	14	12	11	14	13	16	5	13	13	13	18	17	18	19	20	17	18
DF2	445	433	373	433	445	389	433	419	419	388	418	418	449	433	433	358	433	433
CV	41.966	41.767	99.143	74.533	37.320	81.414	66.320	58.584	97.169	207.97	104.17	76.400	59.348	213.72	38.074	149.67	29.688	48.698
MCV	2.3314	2.6104	7.0817	3.9228	2.3325	5.8152	4.7371	2.4410	6.0730	14.855	6.5108	6.9455	4.5652	17.810	3.4613	29.934	2.2837	4.0582
LL	2.6203	1.1926	1.1757	1.5360	1.7313	0.2323	0.2208	0.5150	0	0.6433	0.7523	1.2756	1.5211	0.0005	1.9028	0.2464	2.1492	3.6425

NOTES:
1). F STAT is the estimated F(J,nT-K) statistic, for a(ij)=0 in the jth importing region, where J=DF1 and (nT-K)=DF2.
2). F(5%), F(1%) are the corresponding critical values of the F STAT at the 5% and 1% levels of significance, respectively.
3). CV is the estimated Coefficient of Variation for the jth importing region.
4). MCV is the estimated 'Modified' Coefficient of Variation for the jth importing region.
MCV is defined as the ratio of the CV by the number of Positive a(ij)'s in the jth import region.
5). LL is the estimated Mean Lag response (=Lambda(j)/(1-Lambda(j)).

TABLE OF ESTIMATED "DIAGNOSTICS" FOR THE SELECTED FUNCTIONAL FORMS, FOR GOOD 4 (30 IMPORTING REGIONS)

DIAGNOSTICS	IMPORTING REGION j													
	01	02	03	04	05	06	07	08	11	12	13	14	15	
F STAT	2.7827	4.6331	0.7888	1.2142	2.3385	1.8047	1.7430	3.8711	3.5805	1.9389	2.6440	1.6613	2.0084	
F (5%)	1.6464	1.6895	1.6491	1.9622	2.1219	1.8561	1.7761	1.6464	1.9597	1.8525	1.7746	1.6895	1.8525	
F (1%)	2.0072	2.0803	2.0121	2.5572	2.8486	2.3686	2.2288	2.0072	2.5524	2.3619	2.2260	2.0803	2.3619	
DF1	17	15	17	8	6	10	12	17	8	10	12	15	10	
DF2	433	433	388	388	388	373	405	433	433	433	432	433	433	
CV	66.684	51.579	25.956	89.950	65.857	23.328	87.790	43.695	99.113	47.940	40.782	33.431	21.232	
MCV	5.1295	3.4386	2.5956	4.7342	3.1360	1.4580	4.8772	3.3612	4.5051	2.3970	2.2656	2.2287	1.0616	
LL	0.7136	1.9074	2.5704	1.2592	2.0031	4.5903	0	0.7865	0.3932	1.8714	1.0337	0.5159	1.5834	

DIAGNOSTICS	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
F STAT	1.8315	4.0731	2.5971	3.0299	3.8123	0.8437	3.8003	0.8634	0.1963	1.9028	5.1264	1.9504	2.6937	2.4053	3.1239	1.0592	0.1390
F (5%)	1.9015	1.9040	1.6669	1.8525	1.7753	1.9015	1.8525	1.7427	2.6262	1.7745	1.6895	1.7146	1.6895	1.8107	1.7146	1.9015	1.7740
F (1%)	2.4484	2.4533	2.0420	2.3619	2.2274	2.4484	2.3619	2.1711	3.8287	2.2259	2.0803	2.1230	2.0803	2.2888	2.1230	2.4484	2.2249
DF1	9	9	16	10	12	9	10	13	3	12	15	14	15	11	14	9	12
DF2	433	387	432	433	418	433	433	433	418	433	433	433	433	433	433	433	444
CV	19.920	57.965	73.605	31.344	85.346	35.533	47.487	39.699	26.812	51.218	78.109	63.366	65.264	24.432	51.649	38.807	28.873
MCV	0.9485	3.2202	5.2575	1.5672	5.0203	1.6920	2.3743	2.3352	1.0312	2.8454	5.2073	3.9604	4.3509	1.2859	3.2280	1.8479	1.6040
LL	1.4635	1.3212	2.5995	1.5891	1.0992	0.9619	0.9887	0.8421	0.7802	0.6140	0.7538	1.2610	0.6665	1.1680	1.1695	1.5520	1.0308

NOTES:
1). F STAT is the estimated F(J,nT-K) statistic, for a(ij)=0 in the jth importing region, where J=DF1 and (nT-K)=DF2.
2). F(5%), F(1%) are the corresponding critical values of the F STAT at the 5% and 1% levels of significance, respectively.
3). CV is the estimated Coefficient of Variation for the jth importing region.
4). MCV is the estimated 'Modified' Coefficient of Variation for the jth importing region.
MCV is defined as the ratio of the CV by the number of Positive a(ij)'s in the jth import region.
5). LL is the estimated Mean Lag response (=Lambda(j)/(1-Lambda(j)).

TABLE OF ESTIMATED "DIAGNOSTICS" FOR THE SELECTED FUNCTIONAL FORMS, FOR GOOD 5 (30 IMPORTING REGIONS).

DIAGNOSTICS	IMPORTING REGION j														
	01	02	03	04	05	06	07	08	11	12	13	14	15	16	17
F STAT	3.7083	2.0265	2.9811	1.7730	12.670	4.7715	2.0997	5.4963	3.2761	2.6535	1.2707	1.6524	2.4470	0.0360	2.2949
F (5%)	1.6677	1.6106	1.8133	1.8551	1.5343	1.6696	1.7753	1.8525	1.7146	1.6277	1.6895	1.8107	1.6669	1.7740	1.8123
F (1%)	2.0433	1.9472	2.2936	2.3667	1.8217	2.0467	2.2274	2.3619	2.1230	1.9758	2.0803	2.2888	2.0419	2.2249	2.2917
DF1	16	19	11	10	25	16	12	10	14	18	15	11	16	12	11
DF2	418	433	388	388	390	388	418	433	433	433	433	433	433	444	405
CV	91.328	68.888	27.517	48.495	52.849	21.029	20.637	89.644	80.409	46.063	53.984	57.709	28.404	21.605	78.071
MCV	7.0252	6.2625	1.7198	2.8526	26.424	1.9118	1.2139	4.4822	5.0256	3.8386	3.5989	3.0373	2.0288	1.2002	4.5924
LL	1.2238	0.7677	2.0832	1.2493	0	0	0.7840	0.4509	0.6395	1.3397	0.7562	0.3853	1.5139	2.0417	0.3651

DIAGNOSTICS	IMPORTING REGION j														
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
F STAT	3.3204	2.0310	1.6504	4.1454	3.0304	1.0713	1.7956	1.6081	0.7836	1.6715	1.7581	1.7337	3.6660	1.1929	2.8474
F (5%)	1.8107	1.9015	1.8551	1.7427	1.6464	1.7146	1.7154	1.7146	1.7427	1.8107	1.7146	1.6911	1.6903	1.6669	1.7745
F (1%)	2.2888	2.4484	2.3669	2.1711	2.0072	2.1230	2.1244	2.1230	2.1711	2.2888	2.1230	2.0831	2.0818	2.0419	2.2259
DF1	11	9	10	13	17	14	14	14	13	11	14	15	15	16	12
DF2	433	433	387	433	433	433	418	433	433	433	433	405	418	433	433
CV	58.200	45.661	87.640	36.810	31.805	56.842	46.571	39.397	85.894	57.034	47.324	30.933	97.667	30.667	59.172
MCV	3.0631	2.1743	5.1552	2.1653	2.4465	3.5526	3.1047	2.4623	5.0526	3.0017	2.9577	2.0622	6.9762	2.1905	3.2873
LL	1.2552	1.4498	0.2824	0.7737	0.8929	1.3124	0.5039	1.1122	1.1058	0.8419	1.0843	0	1.0397	3.4416	0.4129

NOTES:
1). F STAT — is the estimated F(J,nT-K) statistic, for a(ij)=0 in the jth importing region, where J=DF1 and (nT-K)=DF2.
2). F(5%), F(1%) — are the corresponding critical values of the F STAT at the 5% and 1% levels of significance, respectively.
3). CV — is the estimated Coefficient of Variation for the jth importing region.
4). MCV — is the estimated 'Modified' Coefficient of Variation for the jth importing region.
MCV — is defined as the ratio of the CV by the number of Positive a(ij)'s in the jth import region.
5). LL — is the estimated Mean Lag response (=Lambda(j)/(1-Lambda(j)).

CHAPTER 8

CONCLUSIONS

8.0). Introduction.

This chapter is a brief summary and conclusion of the thesis. In the first section, we review the contributions to seaborne trade theory by this work. In the second section, we summarize the empirical results from the estimation of the bilateral seaborne trade flow model. The third section suggests fruitful areas of research on this topic.

8.1). Theory.

In order to model the demand for specialized ships over the sea-lanes of the world, we developed a theory of allocation of total seaborne trade, for different cargo types over a number of sources - trade partners. Based on this theory, we estimated econometric models of seaborne trade and quantified responses of demand to changes in prices and tastes.

Since there is no experience in model building of bilateral seaborne trade flows, and since the demand for sea transport is a derived demand which stems from the demand for commodities across borders, we borrowed the principles of allocation of a fixed total over a number of sources, from the theories of consumer behaviour and international trade. The work presented here is novel to seaborne trade.

A major problem in this 'new' approach to detailed seaborne trade, is that at this high level of disaggregation over goods and trade partners, there are not enough degrees of freedom to estimate the models. The problem is solved by the assumption of multi-stage budgeting, which entails the assumptions of separability of preferences and consistent aggregation. Consistent aggregation and separability are enforced by selecting an objective function of a special form.

In particular, the selected CRESH function, by being linear homogeneous, satisfies the assumptions needed for multi-stage budgeting. This function has the rare feature of allowing the estimation of distinct price effects between trade partners, in world import markets. However, the number of estimated coefficients in the systems increase only linearly with the number of trade partners. This has permitted the empirical implementation of our models. Furtheremore, the CRESH function contains most of the known work in trade models as special cases.

We have extended and generalized the known mathematical properties of the CRESH function, in order to take account of factors other than relative prices and time trends, which may be important in the allocation decisions of importers. Factors, such as relative production capacities and capacity utilizations have been introduced, and systems of demand equations have been derived from neoclassical optimization principles.

In order to allow for a richer structure of importers' preferences, in terms of their intertemporal reactions to price changes and/or other variables that enter the system, we introduced dynamics into the model. Thus, a 'mixed' system of an adaptive expectations and partial adjustment framework has been developed. Restrictions on this, resulted in a series of nested empirical models of seaborne trade. Particular attention is paid into ensuring that these systems are derivable from neoclassical optimization principles, and that the theoretical properties of demand equations are still preserved.

8.2. The Econometric Models.

The theoretical dynamic models were turned into empirical econometric models, in order to quantify bilateral seaborne trade flows. Systems of demand equations have been estimated for 150 import markets over the period 1969-1986.

The lack of availability of bilateral import price data has been a major constraint in our models. We used total export prices and world prices of individual goods as proxies for bilateral prices. We were careful in this process to ascertain that the respecified models were compatible with the classical optimization problem of importers. The final data used for estimation were constructed from data on individual units, countries and individual commodities. Problems and implications related to such procedures were examined in the process.

Regarding the estimation methods of these systems, they are identified to fall into the class of complete systems of demand equations, which satisfy functional form constraints. The constraint that bilateral imports should add-up to total imports in each import market, entails restrictions on the coefficient parameters and a singular covariance matrix of the residuals. It is recognized that SURE methods should be employed for estimation, and one of the equations should be deleted in order to permit estimation of the whole system.

Unique features of our estimating systems are, the high disaggregation over goods and trade partners, the absense of a large monopolistic region (a Rest Of the World (ROW) region) in the system, and the estimation of cross price elasticities. These properties have implications for our empirical results.

In trade theory, it is almost axiomatic that trade is so highly price sensitive that a 'law of one price' applies to internationally traded goods. However, empirical studies have consistently failed to support this theory. The own price elasticity estimates in previous studies take average values which vary between -0.5 and -2.5, while the averages of the cross price elasticities take values in the range 0 to +0.5. In our results, the own price elasticities take values, on average, in the range -5.83 to -7.05. The range of values for the cross price elasticities is +0.75 to +1.06. Also, the average values of the elasticities with respect to changes in world prices range from -2.15 to -6.58. These elasticity estimates are much higher than any previous estimates. They suggest that competition in international markets is indeed much higher than previously indicated by empirical studies. Our results provide support for the law of one price in world markets.

Another interesting result is the high degree of variability of individual elasticity estimates. This variability of the elasticities around their average values, as measured by the coefficients of variation for individual cargo groups, range for the own price elasticities between 120% and 145% (see chapter 7). For the cross price elasticities these values are 366% to 446%. This result is also observed by the bimodal nature of the distributions of elasticities (chapter 7).

This is because individual importers seem to have some well established sources of imports where they import the bulk of their imports from, and import the rest from other regions according to the relative prices offered. Thus, in an import region, elasticities are low for the well established regions (relatively low competition), while elasticities are high (price sensitive) for the marginal regions. This reflects the stable pattern of demand for ships over certain sea-lanes, and the 'occasional' demand for transport from the marginal partners.

8.3). Recommendations for Future Research.

It would be naive of us to suggest that every possible facet of modeling bilateral seaborne trade flows has been covered, by the work of this thesis. Space and time limitations have imposed a compromize. However, there are questions left open for further research, and we suggest some here.

Separability of preferences, used in multi-stage budgeting is a maintained hypothesis in the thesis. Such an assumption should be tested for our data. However, this entails finding domestic variables for our categories of goods, for each country (which are then aggregated to give regional aggregates), and test a total allocation model versus the import allocation, which we estimate. Such a task is almost impossible, but interesting to see whether this underlying assumption holds.

The theoretical background for the inclusion of other variables (besides time trends and relative prices), as determinants of bilateral imports has been developed. Thus, we have developed a theoretical structure which enables us to extend the CRESH function to include variables such as relative production capacities, relative capacity utilizations etc, that may influence the allocation decision of the importer. It would be interesting to find how the models perform when such variables are included for estimation.

Another interesting question is also the testing of CRESH versus more simple functional form models, such as the CES, the LES, the Cobb-Douglas and the Leontief systems. In theory, the simpler models are nested versions of CRESH. They are more restrictive since they do not allow for estimation of cross price elasticities. However, if one is not interested in the estimation of bilateral price effects, it might be interesting to test how well these models perform compared to CRESH, for a common set of data.

The high volatility in our data (and in consequence the high variability of the elasticity estimates) is ascribed to the high disaggregation over countries and goods involved. It would be of interest to estimate and compare the results of aggregated (over goods) models with the disaggregated ones. Would the elasticity estimates from the aggregate models be smoother, and provide some kind of average of total world seaborne trade elasticities?

Finally, the CRESH bilateral seaborne trade model could be used, to derive the unavailable bilateral price indices, which correspond to the trade flows described.

CHAPTER 8 ADDENDUM

In the introduction to the thesis, we set as our aim to examine and understand the factors that determine the structure and changing patterns of demand for different ship types on each shipping lane. Since demand for these ships is a derived demand for the commodities ships can carry, we are effectively interested in the structure and changing patterns of demand of world seaborne-trade. We find that relative bilateral prices offered by exporting regions, changing tastes over time, and dynamics of adjustment (in terms of adaptive expectations), are the driving forces in explaining the allocation of demand for each type of ship in international import markets.

The sheer scale of the study, and the high level of disaggregation used, means that we have been obliged to make some simplifying assumptions in developing the model.

In order to implement the problem empirically we had to assume separability of preferences. That is, in each region the demand for each type of commodity-cargo is independent from the demand for any other commodity. For example, the demand for dry cargo is independent from the demand of liquid cargo(tankers) and other goods. It is further assumed that, for each type of cargo, the demand over the part of the good produced domestically is independent(distinct) from the demand over the part of the good imported. Finally, it is assumed that the same types of cargo coming from different geographical regions are imperfect substitutes. We implement our models at this last, disaggregated, stage.

In the estimated model it is assumed that the supply function is horizontal, so no supply factors have been incorporated in the system. However, they can in principle be incorporated. A theoretical model which can allow for supply factors has been developed in the third chapter of the thesis. The mathematical properties of CRESH when relative capacity utilizations or relative export capacities are included in it, are fully explained there. Further research on this front could provide interesting empirical results.

Extensions of the model may also be envisaged in order to incorporate the potential substitutability between seaborne trade and other forms of transport. For example, further developments of the road or railway systems in certain regions may alter the seaborne import allocation decisions of importers.

Our analysis has been geared to explaining the past - to estimating elasticities of demand, trends and dynamics in the allocation decision of importers. It would be very desirable if the model could be used to forecast the future. However, two practical problems arise in such an exercise.

The first issue is that when our systems are estimated in levels form, the possibility of negative values for the forecasts of bilateral tonnages of seaborne trade is not ruled out. The problem does not arise in logs or logarithmic first differences, since bilateral volumes are constrained to take positive values only. A possible solution is to use alternative methods of estimation of the levels form, which allow for truncated dependent variables (see for example Maddala, G. S. (1983) 'Limited-dependent and qualitative variables in economics', Econometric Society Monographs 3).

The second, and more serious problem relates to the availability of data. It is unfortunate that in 1989 the UN stopped producing the detailed data on seaborne trade used here. For forecasting purposes, we therefore need to update our database. It may be possible to do this by obtaining UN data for overall trade, as opposed to seaborne trade, and classifying them into the same aggregate groups as in the Maritime transport study above. The SITC correspondence to the MTC classifications, developed in chapter 5, could be used to guide this task.

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