A MULTISECTORAL BILATERAL WORLD TRADE MODEL

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1. Abstract

This study presents the specification, estimation and historical simulation of a multisectoral bilateral trade model for 120 commodity categories and fourteen countries and two regions covering the rest of the world. The model shows, for each trade flow, the country of origin, the country of destination, and the commodity traded. The primary purpose of the study is to enable the making of long-range annual forecasts of bilateral trade flows within the Inforum international multisectoral modeling system.[1] Besides their own intrinsic interest, the detailed bilateral trade flows ensure rigorous accounting consistency in the trade forecasts and also permit examination of specific changes in international competitive relations. The analysis uses time-series regressions on annual OECD and UN data of international trade by commodity of origin and destination for the 1974-91 period.

2. Overview of the Model

The bilateral trade model differentiates 120 categories of commodity trade (Table 1), and distinguishes fourteen countries and two regions covering the rest of the world. The countries are Canada, the United States, Mexico, Austria, Belgium, France, Germany, Italy, the United Kingdom, Spain, Japan, China, South Korea and Taiwan. The two regions are the rest of the OECD (ROECD) and the rest of the world (ROW). Taiwan, ROECD and ROW excepted, each country has a complete, multisectoral forecasting model in the Inforum family.

Prior to the development of the bilateral trade model, the country models in the Inforum international system were linked through national import and export functions. For instance, the Italian furniture export function connects the total furniture exports of Italy to a weighted average of the furniture imports of all the other countries in the linked system and to the ratio of Italian export prices to a weighted average of domestic furniture price in the other partner countries. Though the relation works at the industry level -- namely, furniture

[1] Inforum originally stood for the INterindustry FORecasting at the University of Maryland, a research group affiliated with the Department of Economics. Since its founding by Clopper Almon in 1967, Inforum has come to designate an international group with partners in Europe, Asia, and North America. This group has created a system of large scale input-output models of the United States and its major trading partners. The models are used extensively by the government and private industry in making policy decisions. For a more complete treatment of the structure, methodology, and applications of the Inforum national models, the reader is referred to a symposium on *Economic Systems Research*, vol. 3, number 1, 1991.

Table 1. Sector Number and Title of the Bilateral Trade Model

SECTOR	SECTOR TITLE	SECTOR	SECTOR TITLE
1	Unmilled cereals	61	Glass
2	Fresh fruits and vegetables	62	Cement
3	Other crops	63	Ceramics
4	Livestock	64	Non-metallic mineral products nec.
5	Silk	65	Basic iron and steel
6	Cotton	66	Copper
7	Wool	67	Aluminum
8	Other natural fibers	68	Nickel
9	Crude wood	69	Lead and zinc
10	Fishery	70	Other Non-ferrous metal
11	Iron ore	71	Metal furnitures and fixtures
12	Coal	72	Structural metal products
13	Non-ferrous metal ore	73	Metal containers
14	Crude petroleum	74	Wire products
15	Natural gas	75	Hardware
16	Non-metallic ore	76	Boilers and turbines
17	Electrical energy	77	Aircraft engines
18	Meat	78	Internal combustion engines
19	Dairy and eggs	79	Other power machinery
20	Preserved fruits and vegetables	80	Agricultural machinery
21	Preserved seafood	81	Construction,mining,oilfield eq
22	Vegetable and animal oils and fats	82	Metal and woodworking machinery
23	Grain mill products	83	Sewing and knitting machines
24	Bakery products	84	Textile machinery
25	Sugar	85	Paper mill machines
26	Cocoa, chocolate,etc	86	Printing machines
27	Food products nec.	87	Food-processing machines
28	Prepared animal feeds	88	Other special machinery
29	Alcoholic beverage	89	Service industry machinery
30	Non-alcoholic beverage	90	Pumps,ex measuring pumps
31	Tobacco products	91	Mechanical handling equipment
32	Yarns and threads	92	Other non-electrical machinery
33	Cotton fabric	93	Radio,TV,phonograph
34	Other textile products	94	Other telecommunication equipment
35	Floor coverings	95	Household electrical appliances
36	Wearing apparel	96	Computers and accessories
37	Leather and hides	97	Other office machinery
38	Leather products ex. footwear	98	Semiconductors & integrated circuits
39	Footwear	99	Electric motors
40	Plywood and veneer	100	Batteries
41	Other wood products	101	Electric bulbs,lighting eq.
42	Furnitures and fixtures	102	Electrical indl appliance
43	Pulp and waste paper	103	Shipbuilding and repairing
44	Newsprint	104	Warships
45	Paper products	105	Railroad equipment
46	Printing, publishing	106	Motor vehicles
47	Basic chemicals ex. fertilizers	107	Motorcycles and bicycles
48	Fertilizers	108	Motor vehicles parts
49	Synthetic resins, man-made fibers	109	Aircraft
50	Paints, varnishes and lacquers	110	Other transport equipment
51	Drugs and medicines	111	Professional measurement instruments
52	Soap and other toilet preparations	112	Photographic and optical goods
53	Chemical products nec.	113	Watches and clocks
54	Petroleum refineries	114	Jewellery and related articles
55	Fuel oils	115	Musical instruments
56	Product of petroleum	116	Sporting goods
57	Product of coal	117	Ordnance
58	Tyre and tube	118	Works of art
59	Rubber products,nec.	119	Manufactured goods nec.
60	Plastic products,nec.	120	Scraps,used,unclassified

-- it says nothing about bilateral trade. That is, it does not show how much Italian furniture is going to Germany, how much to the United States, or how much to France. Conversely, the import functions do not specify from which countries the imports come.

The bilateral trade model builds strict accounting consistency into the linked system. It describes, for each commodity trade flow, the country of origin and country of destination. Furthermore, by linking the Inforum's multisectoral national forecasting models with bilateral trade flows, the bilateral trade model permits the analysis of specific trade effects at a very detailed level. The bilaterally- and sectorally-linked world forecasting system, for instance, can address quantitatively specific questions such as, How will the U.S. exports of Dairy products to the United Kingdom be affected when Canada lowers its price of Dairy products by ten percent? How will German exports of semiconductors and integrated circuits to Italy be affected when Japan speeds up capital investment in its semiconductor industry? What is the industrial impact of eliminating the U.S. quota on the imports of motor vehicles from Japan, or of lowering the Chinese tariff on imports of motor vehicles, or of imposing uniform VAT (Value Added Taxes) rates across countries?

The process with which the bilateral trade model is used to produce forecasts of bilateral trade flows among these countries may be described in the following manner. First, the trade model takes the sector-specific export prices and capital investment from the national models in the national sectoring schemes and converts them into the trade model classification. On the basis of these national projections, the trade model forecasts some 120 commodity-specific trade-shares matrices. Then, it takes as given each national model's import projection in the national sectoring schemes, converts it into the trade model commodity classification, and then allocates them through the trade-shares matrix to their source countries. Summing the allocations to each exporter across importers gives exports by product by exporter in the trade model nomenclature, which are then translated into respective national classification schemes for use in the national models. The process is repeated until an equilibrium solution is arrived.

The centerpiece of the bilateral trade model is the *trade-shares matrix*. It is derived from the trade flow matrix M, defined as follows. For each of the 120 commodities, M is a square, 16 by 16 matrix with a row and a column for each country or region. The i^{th} row of an M matrix shows the exports of country i to each of the other countries. The diagonal elements are all zero, except where intraregional flows exist. The total imports of country j are given by the column sum $M_{.j} = \sum_i M_{ij}$, and total exports of country i is the row sum $M_{i.} = \sum_j M_{ij}$. The trade-shares matrix, S, is obtained by dividing each column of M by its column sum. Hence, S_{ij} is the proportion of goods from country i in country j's imports.

As an example of the matrix M, Table 2 shows the international flows of auto parts for the calendar year 1990 (the base year of the trade model). Each column shows the imports, in millions of U.S. dollars, of the country whose name appears at the top of the column from each country named down the side. The bottom row shows total imports of each country (the M_j). Table 3 shows the S matrix corresponding to the M-matrix of Table 2. As the bilateral trade

model deals with bilateral trade flows in 120 commodities over 18 years (1974-91), there is a total of 2,160 (= 120 x 18) trade flows matrices and trade share matrices, respectively.

A glance at the historical trade-shares matrices quickly reveals that they have been far from constant over time. For example, Figures 1-12 show the course of a few selected shares in Sector 108 ("Auto parts"). They are indicative of the variety one would see in similar graphs for other sectors. Figure 1 displays the evolution of Canadian and Japanese market shares of auto parts in the U.S. import market. While Canada saw its U.S. share shrink from around 60% in the mid-1970s to just above 30% in 1991, Japan nearly doubled its U.S. market share from 20% in 1974 to 38% in 1991. In the Japanese auto-parts import market, the principal exporter -- USA -- saw its market share cut in half between 1974 and 1991, while Germany and Taiwan gained marked ground over the period (Figures 3-4). Changing trade shares were equally evident in Europe. While Germany and Italy have more or less maintained their market shares in France, Spain continues its steady inroads into the French market (Figure 5). In the German import market (Figures 7-8), France lost considerable ground, while Italy, UK, and Japan have strengthened their hold over time. In the Italian import market (Figures 9-10), France again lost ground, while Germany, Belgium, and Spain gained market. In the Spanish import market (Figures 11-12), the Italian share went from 35% in 1975 to a mere 5% in 1991, while market share differentials have narrowed between Germany and France.

It is the main task of the trade model to forecast changes in the trade-shares matrix. The model will develop, cell by cell, econometrically estimated trade-share equations to predict changes in the trade-shares matrix. A typical trade-share equation has three independent variables:

i) an index of relative price;
ii) an index of relative capital stocks;
iii) a sector- and country-specific time-trend-like variable.

So, for instance, the Japanese share of auto parts in the U.S. import market is determined by: a) an index of Japanese auto-parts price relative to the competing prices in the U.S. market; b) a measure of capital stock in the Japanese auto-parts industry relative to its competitors; c) a time-trend-like variable specific to the Japanese auto parts industry. The exact nature of the last variable will be explained Section 4 below.

The rest of the paper is organized as follows. Section 3 discusses the data requirement. Section 4 describes the structure of the model and the estimation methodology. The parameter estimates and equation fits are presented in Section 5. Section 6 examines the trade model in a historical simulation exercise. Section 7 concludes this paper.

TABLE 2
BILATERAL TRADE FLOWS MATRIX FOR MOTOR VEHICLES PARTS (108)
IN MILLIONS OF 1990 U.S. DOLLARS
FOR THE YEAR 1990

	CA	US	MX	AU	BE	FR	GE	IT	SP	UK	JA	CN	SK	TW	RO	RW	TOTEXP
CANADA	0	5886	41	2	5	3	31	1	1	10	34	4	10	0	33	53	6116
USA	8669	0	2176	11	101	163	216	44	36	253	270	83	105	19	495	857	13498
MEXICO	240	1257	0	0	2	7	56	0	3	3	1	0	0	0	1	6	1576
AUSTRIA	77	11	0	0	14	42	553	56	7	24	8	9	1	0	86	66	953
BELGIUM	5	78	1	10	0	172	564	100	28	634	7	4	3	1	811	108	2525
FRANCE	56	695	118	39	838	0	1738	601	1352	1106	34	9	6	76	903	945	8516
GERMANY	136	973	397	739	839	1958	0	1322	936	3089	214	113	64	27	3009	2900	16714
ITALY	47	418	6	80	122	779	1347	0	186	387	65	7	3	9	604	646	4709
SPAIN	14	199	27	15	156	682	648	89	0	398	1	0	2	3	268	93	2595
UK	38	461	26	24	153	310	1226	143	116	0	37	8	10	5	814	673	4045
JAPAN	566	6082	398	34	145	92	390	25	163	424	0	338	404	528	973	2983	13546
CHINA	2	28	6	0	0	1	6	3	0	1	5	0	0	0	3	3062	3118
KOREA	98	129	0	0	0	0	2	2	2	6	37	7	0	31	13	66	395
TAIWAN	19	319	11	1	2	7	6	6	1	9	59	0	4	0	38	213	694
ROECD	80	282	4	68	1105	314	839	190	164	715	96	85	10	15	1513	561	6040
ROW	70	533	62	15	40	195	240	81	11	78	35	2837	2	5	135	NA	NA
TOTIMP	10117	17351	3274	1038	3523	4725	7862	2662	3006	7138	903	3506	626	719	9698	NA	NA

TABLE 3
TRADE SHARE MATRIX FOR MOTOR VEHICLES PARTS (108)
FOR THE YEAR 1990

	CA	US	MX	AU	BE	FR	GE	IT	SP	UK	JA	CN	SK	TW	RO	RW
CANADA	0.00	33.92	1.26	0.18	0.15	0.07	0.39	0.03	0.03	0.14	3.82	0.11	1.62	0.05	0.34	0.40
USA	85.69	0.00	66.46	1.07	2.87	3.45	2.74	1.67	1.19	3.54	29.92	2.36	16.76	2.59	5.11	6.48
MEXICO	2.37	7.24	0.00	0.01	0.06	0.16	0.71	0.01	0.11	0.04	0.08	0.00	0.04	0.00	0.01	0.05
AUSTRIA	0.76	0.06	0.00	0.00	0.39	0.89	7.03	2.10	0.24	0.33	0.89	0.26	0.14	0.04	0.89	0.50
BELGIUM	0.05	0.45	0.03	0.98	0.00	3.63	7.18	3.74	0.93	8.88	0.82	0.11	0.50	0.11	8.36	0.81
FRANCE	0.55	4.00	3.61	3.74	23.78	0.00	22.10	22.58	44.98	15.50	3.74	0.26	0.99	10.60	9.31	7.14
GERMANY	1.34	5.61	12.13	71.20	23.81	41.45	0.00	49.69	31.12	43.28	23.70	3.22	10.24	3.75	31.02	21.91
ITALY	0.47	2.41	0.18	7.75	3.47	16.49	17.14	0.00	6.18	5.43	7.25	0.21	0.52	1.29	6.23	4.88
SPAIN	0.14	1.15	0.83	1.40	4.42	14.43	8.24	3.33	0.00	5.58	0.10	0.00	0.36	0.40	2.76	0.70
UK	0.38	2.66	0.79	2.29	4.35	6.56	15.59	5.37	3.86	0.00	4.12	0.23	1.60	0.73	8.39	5.09
JAPAN	5.59	35.05	12.16	3.29	4.11	1.94	4.97	0.92	5.42	5.95	0.00	9.66	64.57	73.42	10.03	22.55
CHINA	0.02	0.16	0.19	0.02	0.01	0.02	0.08	0.11	0.01	0.02	0.57	0.00	0.00	0.00	0.03	23.14
KOREA	0.97	0.75	0.01	0.00	0.01	0.01	0.03	0.08	0.08	0.09	4.05	0.21	0.00	4.31	0.13	0.50
TAIWAN	0.18	1.84	0.35	0.08	0.05	0.14	0.07	0.21	0.04	0.12	6.52	0.00	0.67	0.00	0.39	1.61
ROECD	0.79	1.62	0.11	6.58	31.38	6.64	10.67	7.13	5.45	10.02	10.60	2.43	1.66	2.08	15.60	4.24
ROW	0.69	3.07	1.88	1.42	1.15	4.13	3.05	3.03	0.37	1.09	3.83	80.94	0.33	0.63	1.39	0.00

Figure 1: Trade Shares (US Market)

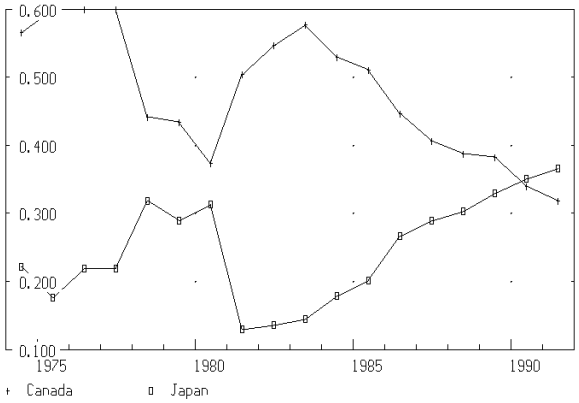

Figure 2: Trade Shares (US Market)

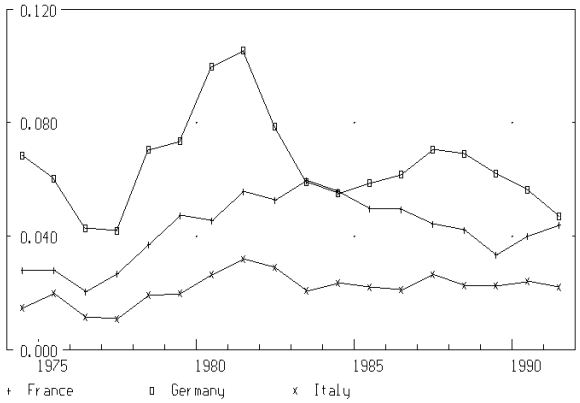

Figure 3: Trade Shares (Japanese Market)

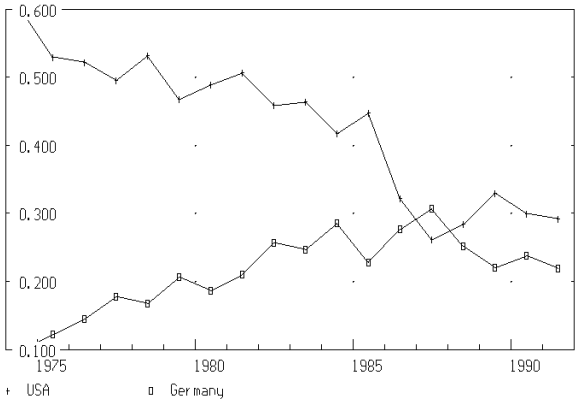

Figure 4: Trade Shares (Japanese Market)

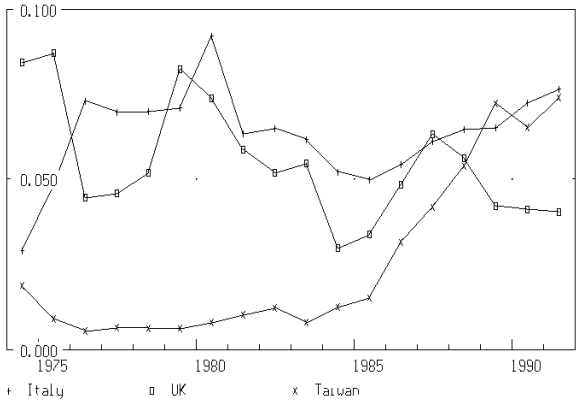

Figure 5: Trade Shares (French Market)

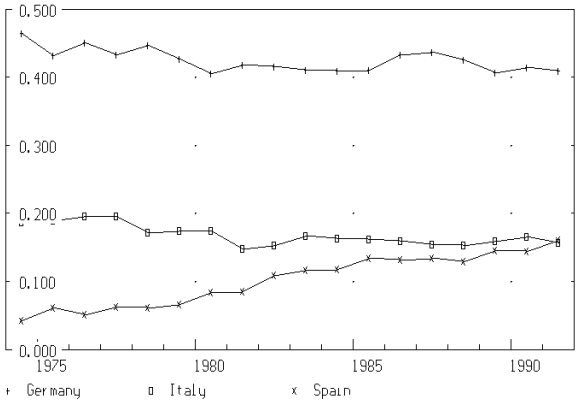

Figure 6: Trade Shares (French Market)

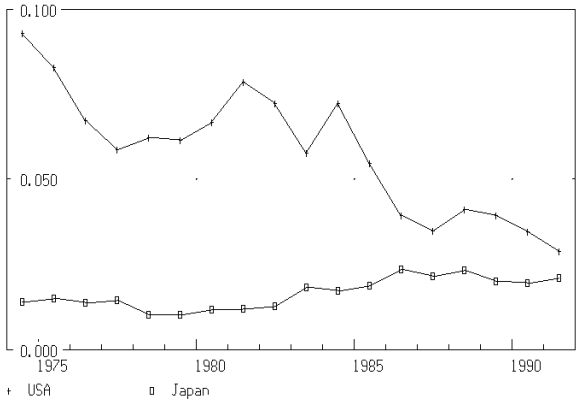

Figure 7: Trade Shares (German Market)

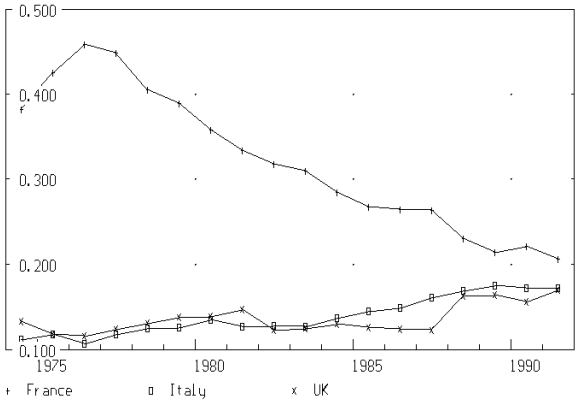

Figure 8: Trade Shares (German Market)

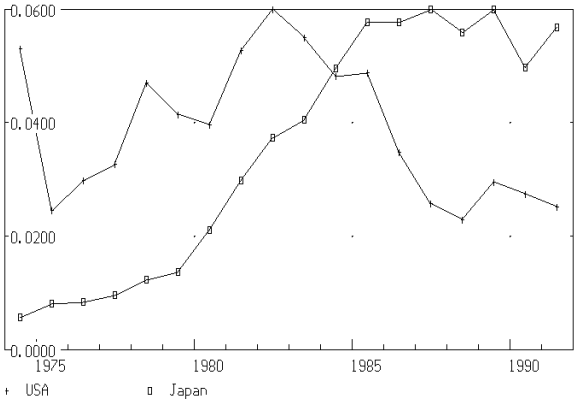

Figure 9: Trade Shares (Italian Market)

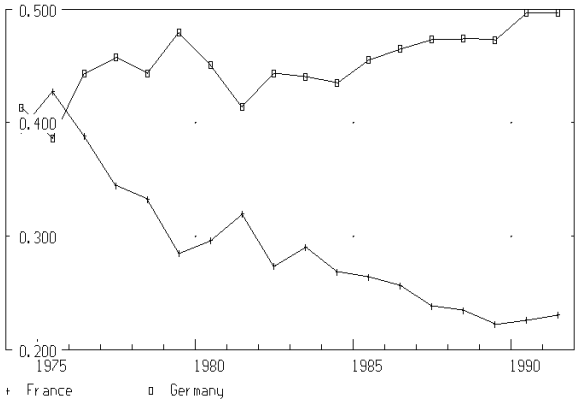

Figure 10: Trade Shares (Italian Market)

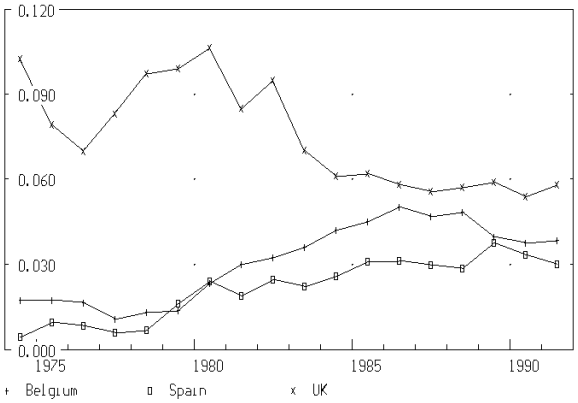

Figure 11: Trade Shares (Spanish Market)

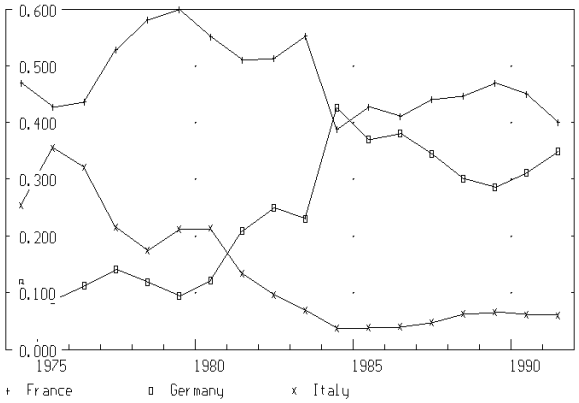

Figure 12: Trade Shares (Spanish Market)

3. The Data

The estimation of the present trade model requires extensive time-series data on the bilateral trade among the 16 countries and regions for each of 120 categories of merchandise trade. In collecting such data, we have processed some 200 OECD and UN trade data tapes, made a number of adjustments to reduce inconsistencies in the raw data, and created a large, consistent bilateral trade data bank that covers 120 commodities, 28 source countries and 60 partner countries over the 1974-91 period.

The main data source is the bilateral trade data tapes prepared by the OECD for its 24 member countries, and by the UN for the three non-OECD countries for which active INFORUM models exist: Korea, Mexico and China. Each year, for each of the OECD countries, data on imports and exports with nearly 200 trading partners are available by complete 5-digit SITC (Standard International Trade Classification) product classes both in physical quantities and in values at current dollar prices.[2] The data represent the entire spectrum of goods that can be bought and sold in the marketplace, including agricultural products, minerals, clothing, chemicals, metals, mechanical machinery, electrical machinery, scrap and waste, secondhand goods, and antiques. They do not include services. The level of product detail thus ensures the creation of trade matrices for products ranging from raw materials ("cotton") to chemical products ("drug and medicines") to hi-tech electronics ("semiconductors").

The data came on over 200 OECD and UN computer data tapes. On average, each year of the OECD trade data was written on twelve computer tapes -- six of export data and six of import data, and on each tape, a country's trade was arranged by 5-digit SITC commodity and within the commodity it was arranged by trading partner. The UN trade data for Mexico, South Korea and China came on two tapes, and each data tape was basically organized like the OECD tapes, although minor differences in tape format still exist.

Downloading and storing the data from these tapes required hundreds of megabytes in computer disk space and a considerable amount of time on a 486 Personal Computer (PC). After reading each of these tapes onto the computer, the data consisted of bilateral flows in complete 5-digit SITC among the 28 source countries and some 200 trading partner countries that make up the entire world.

The raw data set from the OECD and UN is by no means a consistent time-series data bank with which the trade model can be readily estimated. To that end, we have reconciled the

[2] Depending on a particular year, the data are recorded in one of the three "revisions" of SITC schemes. Before 1978, all of the OECD countries reported the trade statistics in SITC Revision I, which distinguishes some 1,400 products. From 1978 through 1987, most of these countries adopted SITC Revision II, which refines and expands the product detail to about 2,000 trading commodities. In 1988, all OECD countries, except for the US and Turkey, switched to SITC Revision III in their trade statistics reporting, which now covers over 3,000 products. The US and Turkey adopted Revision III in the following year.

different commodity classification schemes used in the reported trade data, adjusted the trade flows that are associated with the special SITC codes, and reduced the commodity categories as well as the number of trading partner countries to a more manageable level.

First, by geographic aggregation, we reduced the number of trading partner countries from 200 to about 60. They include the 14 individual countries of the trade model as well as a number of other countries (for instance, the economies in transition in the Eastern Europe, OPEC countries, South Africa, other developing Asian countries, and major South American countries) that may in the foreseeable future be included into the trade model as the respective national forecasting models are developed.

Another adjustment to the raw data concerns the "alphanumeric" SITC codes in the reported data. There were two kinds of alphanumeric SITC codes. First, the OECD introduced a letter "B" at the position where the national code differed from the SITC description. For example, on data from Austria, the OECD listed under code 251BB all commodities of group 251 ("Pulp and waste paper") which do not match a particular SITC. Second, to retain confidentiality in all or part of the SITC at detailed levels, the OECD gave complete data only at the less detailed level of the SITC. The non-confidential data given at a more detailed level in the same product class were subtracted by the OECD from the total of this product class and the remainder was recorded as non-disclosed data on the tape in an alphanumeric codification ending in one to four letters "A." For example, a reporting country provided the OECD with data from division 51 ("Organic chemicals") with complete geographic breakdown. These data were then treated and recorded on the tape under the code 51AAA. In adding up the data recorded under 51AAA and all other data under headings beginning with 51, the total equals that of division 51 as provided by the reporting country. When the reporting country provided total value without a complete geographic breakdown at a detailed level, the difference was recorded under the geographic code "secret" under number 8210.

Table 4 illustrates this process for a given reporting country. Here, the data given under code 51 were obtained by the OECD from the reporting country with a complete geographic breakdown. Data for groups 512, 513, 514 and 515 which made up division 51 were calculated from the 5-digit SITC level, as given by the reporting country. For some of the 5-digit positions, the reporting country has given only the total trade, and this is then registered under "secret" code 8210. The data recorded under heading 51A on the tape were thereafter obtained by subtraction. It should be noted that:

(a) For a given product at 4- or 5-digit level, the reporting country has maintained confidentiality. Non-disclosed trade was included with a complete geographic classification in the data of division 51. The total of this undisclosed trade was +12.

Table 4
An Illustration of Alphanumeric Codes in the OECD Trade Data

	SITC	51	512	513	514	515	51A
PARTNER COUNTRY		a	b	c	d	e	f = a-(b+c+d+e)
Total		596	439	88	56	1	12
XXX1		149	92	28	21	0	8
XXX2		69	48	16	3	0	2
XXX3		44	29	5	2	0	8
XXX4		45	26	2	3	0	14
XXX5		17	12	0	0	0	5
XXX6		76	58	11	3	0	4
Other		196	99	12	21	0	64
Secret		0	75	14	3	1	-93

(b) The total amount in division 51 under code 8210 was zero. This is so because the reporting country provided data for division 51 with a complete geographic breakdown. Given that the sum of the data recorded under geographic code 8210 for SITC headings 512, 513, 514, 515 and 51A must be zero, the OECD placed a negative number in the column 51A for geographic code 8210. This negative number was equal in absolute value to the sum of the figures under code 8210 in columns 512, 513, 514 and 515.

In the data reported for the 1974-91 period, the OECD has resorted extensively to the use of alphanumeric product codes for reasons of confidentiality or incompatibility between national classification and the SITC. The alphanumeric codes used range from one letter ("5111A") to as many as four letters ("6AAAA"). Of course, the more letters in an alphanumeric code, the more aggregated the product class to which it belongs. It may be recalled that the trade model contains a total of 120 sectors, which are aggregated directly from the 5-digit SITC product classes. As will be shown shortly, it is not uncommon that different SITC codes under the same 1-, 2-, 3-, or even 4-digit SITC were not matched up with the same trade sector. In

aggregating the trade data from the SITC product classes to the sectoring plan of the trade model, we could either exclude the non-classifiable and non-disclosed data, or come up with some way of converting the alphanumeric codes into SITC codes. Excluding the data means that total trade at the trade model sector level will not be consistent with the totals as provided in SITC. To maintain such consistency, we adopted an approach in which the data in an alphanumeric code, say 51A, were systematically "re-allocated" over the SITC codes that fall under the same product class 51 (i.e., 512, 513, 514 and 515). We called it a "purification" process.

First, in re-allocating data associated with the alphanumeric SITC codes ending with letters "A", we applied an iterative procedure called rAs method.[3] Here, the row controls and column controls were determined from the raw data, and the initial "guess" matrix were constructed with the 5-digit commodity codes across the top of the column and trading partners down the side. The rAs procedure then would be able to eliminate the alphanumeric code, say 51A, and the "secret" trading partner 8210, without altering the total value of the data under heading 51. For alphanumeric codes ending with letters "B," a reporting country's data were directly distributed to its respective trading partners according to the share of each non-alphanumeric 5-digit SITC code under the same heading.

The last adjustment to the raw data dealt with the aggregation of the 5-digit SITC data into the 120 sectors of the trade model. One of the difficulties lies in the treatment of some SITC codes that are multi-sector. There are essentially two ways of dealing with the problem: assigning each multi-sector commodity entirely to the single trade model sector judged to be most appropriate, or splitting them among all the relevant sectors. We adopt the second method, which was also adopted by the Economics and Statistics Department of OECD, the United Nations Statistical Office and the World Bank. These organizations jointly developed a set of "conversion tables" that distribute each multi-sector 5-digit SITC commodity among the relevant 4-digit ISIC (International Standard Industry Classification) codes according to the industrial composition of trade by Common Market countries in 1975. While this was clearly unsatisfactory because it applied the same fixed allocation factors for all years and to trade by all countries (including non-EEC Members), it nevertheless appears preferable to the alternative approach of allocating multi-industry commodities in their entirety to the single most appropriate sector.

The concordance table used in the present study is based on the OECD "Conversion Tables", however, we have made a number of adjustments to meet the sectoring plan of the trade model. In particular, we have expanded the OECD "Conversion Tables" to cover 17 non-manufacturing sectors. We also reclassified some of the manufacturing sectors to reflect finer breakdown in sectors such as electronics and non-electrical machinery.

With the bilateral trade data bank, we have constructed time-series 16 x 16 trade matrices in

[3]The rAs method (short for Row and Column Sum method) was first applied to input-output tables, discussed in Bacharach (1970). The method uses an initial guess of a matrix and derives a consistent matrix where the rows and columns sum to some given totals.

120 commodities, covering 14 individual countries and 2 regions for the rest of the world. In principle, each trade matrix may be formed from either the import data or the export data, since the data for country A's exports of product i to country B are the same as country B's imports of i from country A. In practice, however, recording discrepancies between the import data and export data do exist, because of differences in valuation (imports are usually valued in c.i.f., while exports in f.o.b.), timing gaps (recording of imports happens one period later than recording of exports), exports of ships to open-registry countries, etc. In the current study, we have derived the trade matrices fundamentally from the *import* statistics. It is my argument that the import data tend to identify the country of origin better than the export data identify the country of destination, because imports loom larger in the collection of customs revenue than exports.

Specifically, the imports of the 28 source countries were aggregated into those of 14 individual countries and a region (the rest of OECD), filling up the first 15 columns of the matrix. For the last column, imports of the rest of the world from each of the 15 countries and region were filled as exports by each of the 15 countries and region to all countries other than those appearing on the first 15 columns.

From the example of the trade matrices shown on Table 2 in Section 2, the reader may have noticed that the matrix is not "closed," in the sense that the intraregional trade flows between the ROW and the ROW are absent. The absence of these intraregional flows is dictated by data availability. Presumably, these flows can be determined in two steps. In the first, total imports of the ROW can be derived from the residuals between the total world imports by commodity and the sum totals of the total imports of the first 15 countries and regions in the aforementioned trade matrix. In the second, the intraregional trade flows between the ROW and the ROW are determined from the residuals between total imports of the ROW and ROW's imports from the first 15 countries and regions in the trade matrix. For the first step, the total world imports at the 5-digit SITC level would be needed to derive total world imports by the 120 trade model sectors. However, we were not able to obtain such statistics in machine-readable format. The UN publishes total world exports and imports in its *Yearbook of International Trade Statistics,* although the data are not printed at the complete 5-digit SITC level. Time constraints prevented us from using them to fill the intraregional flows between ROW and ROW at this time, which would have to be done by hand.

The current-dollar trade flows were converted into constant-dollar flows using a set of export price indices constructed from the national sources. We first collected the export price deflators from the 13 national models to be linked by the trade model. Then, the export price deflators for the rest of OECD (ROECD) were calculated as trade-weighted averages of export deflators of the 10 OECD countries in the trade model, while the export price deflators for Taiwan and ROW were computed as trade-weighted averages of the export deflators of all 13 countries plus ROECD.

The price indices from the national models were, of course, computed in local national currencies and in different base years. The year 1990 was selected as the common base year for

these price indices. Further, a time series of exchange rate vis-a-vis the US dollar was used to make national price indices comparable from one country to another. The exchange rate given by the International Monetary Fund's *International Financial Statistics Yearbook* was chosen because the US dollar -- the common unit of the bilateral trade data -- was used as the numeraire. Finally, these price indices were converted from their national sectors into the 120 trade model sectors.

It may be noted that some of the national price series lacked sufficient history to be used directly in our analysis. Specifically, the Austrian price series began in 1976, while the Chinese and Mexican price series started in 1980. In these cases, we made the following assumptions:

(1) For China and Mexico, we assume that the Chinese and Mexican exporters were price-takers before the year 1980, and we used the U.S. export prices to extend backwards the price series of these two countries.

(2) For Austria, we assume the Austrian export prices were heavily influenced by the German prices, and extended the Austrian price series from 1976 backwards by the German prices.

4. The Model Structure and Estimation Methodology

This section presents the econometric analysis of the multisectoral bilateral world trade model. The trade model, the reader may recall, is primarily developed to channel import demand into export supply in 120 commodity categories among the sixteen countries and regions. Specifically, the trade model takes exogenously the projections of total import demand by industry from each country model and allocates them back to the supplying countries according to each supplier's share of the given import market. Export supply is derived by summing the allocations, by exporter, over all the importing markets. The forecasts of trade flows generated in this way are mutually consistent for all countries.

Key to the above "import-allocation" process is the trade-shares matrix, which gives, for each country importing a certain product, the proportions imported from each source country. This matrix, as we noted in Section 2, is different for each year. Accurate estimation of this matrix is critical to a consistent quantitative prediction of world trade.

A prediction of the typical S_{ij} element of the trade-shares matrix S has been theoretically discussed in the studies of Armington (1969a, 1969b) and Rhomberg (1970) and statistically analyzed by Klein and Van Peeterssen (1972), Moriguchi and Johnson (1972), Taplin (1972), Hickman and Lau (1973), Moriguchi (1973), Nyhus (1975), Marwah (1976), Samuelson (1980), and Parikh (1985). The basic postulate in these studies is that each element of the trade-shares matrix is a function of relative price and non-price factors. The present study shares with the earlier studies the same basic postulate for the trade share function. Its point of departure lies in the specific functional form for the share equations, the choice of non-price factors, and the

restrictions placed on the structural parameters.

There are three independent variables in our share equation: relative prices, relative capital stock as a proxy for quality change of product not reflected in the price indices, and a time-trend-like variable. The rationale for the first explanatory variable -- relative prices -- in the share equation is straightforward. In a given import market, the import shares of the various exporting countries and relative prices of the exporting countries are expected to be inversely related. Suppose, for the sake of simplicity, there are only two exporters in the U.S. import market for auto parts: Japan and Canada. Suppose further that in Year 1, Japan and Canada equally split the U.S. market. Now the Japanese yen appreciates 10% against the U.S. dollar, while the U.S. - Canada exchange rate remains unchanged. Japanese auto parts now appear relatively more expensive in U.S. dollar terms than Canadian auto parts to American buyers, giving Canada a relative price advantage in the U.S. auto-parts import market. U.S. importers, responding to price changes, substitute Canadian auto parts for Japanese auto parts. For any given level of auto parts imports by the U.S., the proportion imported from Japan is thus expected to fall, while the reverse is expected for the rival Canada. In an import market with more than two rival suppliers, we may extend the above analysis concerning the substitution effect as follows. Whereas in the case of two-country rivalry, one exporter (Japan) is explicitly pitted against the other (Canada) in the fight for market share, with multi-country rivalry, a given exporter may be thought of as being pitted against a "representative rival", which does not refer to a specific competitor, but all of its competitors somehow grouped together. In other words, like the exporter Japan in the two-exporter example, the share of a given exporter in the import market with multiple exporters is expected to fall if the product it exports is becoming more expensive relative to a weighted average of the prices of its competitors. It should be noted that in reality, the price effect normally takes more than one year to be completely felt. This suggests that a proper lag structure needs to be built into the price indices. As will be seen shortly, we have built a three-year lag structure into the relative price term.

Note that in this study the relative price term is formulated by using domestic export prices that are available from the country models in the Inforum international system. This means (1) we are assuming no price discrimination on the part of the exporter. That is to say that if, for example, Japan supplies certain goods to the United Kingdom and Canada, she charges both the same price; (2) we are ignoring the impact of tariffs on the prices paid for imported goods. Both assumptions are dictated by data availability. To incorporate the possibility of price discrimination by the exporter, for instance, we would need data on bilateral export prices, which do not presently exist in the Inforum international system.

On the other hand, to determine whether tariffs have had a significant effect on the trading patterns during the 1974-91 period, one would need to include the tariff rates by commodity and by country for the 120 commodity categories and 16 countries and regions in the trade model, annually. One would also need to deal with the many inherent problems in computing tariffs when more than one good is in a trade sector. While this data requirement places the task outside the scope of the current study, we note that the mere existence of tariffs does not,

necessarily, imply any trade diversion among suppliers. This is true if the tariff, such as the Most-Favored-Nation (MFN) tariff, is uniform from country to country. In fact, the principle of MFN tariffs is a major cornerstone of the General Agreement on Tariffs and Trade (GATT) reached in 1948 among the world's major trading nations. Through the past eight rounds of GATT multilateral tariff negotiations, sharp reductions in tariff barriers have been achieved. The same period, of course, has also seen growing bilateralism and regionalism in world trade, most notably the formation and expansion of the European Economic Community (EEC). It is my argument, however, that changes in tariffs have been, on balance, nearly neutral with respect to trade shares, as the substantial tariff cuts achieved through the successive GATT negotiations have largely offset the effects of trade-diversion resulted from various regional and bilateral trade agreements. Hence, the estimations of share equation parameters are not expected to be very biased in general by the ignoring the effect of tariffs and their change in the price term.

In addition to relative prices, temporal variations in bilateral trade shares may be positively related to relative quality change of product in the exporting country not reflected in the price index. Introduction of new capital investment by an exporting country may induce quality changes of its products that may not be reflected in the price indices, yet such quality changes can help an exporting country to maintain or increase its export market share. We may thus use the capital stock as a proxy variable measuring an exporting country's relative non-price competitiveness due to quality change of product. So if Japan's capital stock growth rate in the automobile industry is exceeding the share-weighted average of capital stock growth rates of all competing exporting countries in the U.S. market, *ceteris paribus*, then the share of Japan in the imports of automobiles in United States is expected to go up. It should be noted that to reflect the well-established lag effects of the capital investment, a three-year lag structure is also built into the capital stock indices. Note that capital stock indices are cumulated from capital investment data. The indices are further adjusted by the "Almon unit buckets" (Almon, 1989), because the time series on investment is not long enough to construct capital stock series for the beginning period of the present trade model, which is 1974. The adjusted capital stock, also called "bucket 1 capital stock" by Almon, contains young equipment for which maintenance is unnecessary. It is this capital stock that we use as a proxy for quality change of product not reflected in the price index.

Other non-price factors, including changes in tastes, habits, preferential credit terms, and quantitative trade restrictions are, in most cases, difficult to quantify or predict. We assume these variables have trends, and add an exponential time trend variable to the share equation. Unlike the relative price and relative capital stock terms, the expected sign of the time trend could, of course, be either positive or negative. It should also be noted that the trend variable may present a potential problem, namely, the time trend term, in the long run, may force the bilateral flow to be larger than the total or, in the opposite case, negative. One solution is to adopt a special time-trend-like variable, first formulated by Nyhus (1975) to have time "slow down". The so-called Nyhus trend is cumulated from $(1 - S_{ijt-1})$ with zero decay rate, so that as the share S_{ijt} gets larger, each increment to time variable becomes smaller, thus slowing down the time.

Although S_{ijt-1}, the lagged value of the dependent variable, forms part of the Nyhus trend, the Nyhus trend itself cannot simply be considered a "lagged dependent variable." A lagged dependent variable is generally undesirable in a regression equation because it can lead to very erratic estimates of the coefficients on the other variables. This is because the lagged value of most variables will explain the current value fairly well without any help from other variables. The lagged value by itself explains so much of the variability that there is little to be explained by the other variables. The Nyhus trend, however, is not a "true" lagged dependent variable, because the estimated coefficients on all the past values of S_{ijt} are constrained to be the same. Because of this estimation constraint, the estimated parameter on the Nyhus trend will not act like a "true" lagged dependent variable.[4]

Mathematically, the typical S_{ij} element of the trade-shares matrix is written as follows:

$$S_{ijt} = \beta_{ij0} * \left(\frac{P_{eit}}{P_{wjt}}\right)^{\beta_{ij1}} * \left(\frac{K_{eit}}{K_{wjt}}\right)^{\beta_{ij2}} * e^{\beta_{ij3} T_t} \qquad \textbf{(1)}$$

where,

S_{ijt} = the share of country i in the imports of a given product into a given country j in year t (0 denotes the base year 1990);

P_{eit} = the effective price of the good in question in country i (exporter) in year t, defined as a moving average of domestic market prices for the last there years;

P_{wjt} = the world price of the good in question as seen from country j (importer) in year t (see fuller description below);

K_{eit} = an index of effective capital stock in the industry in question in country i in year t, defined as a moving average of the capital stock indices for the last three years;

K_{wjt} = an index of world average capital stock in the industry in question as seen from country j in year t (see fuller description below);

T_t = Nyhus trend variable, set to zero in the base year.

β_{ij0}, β_{ij1}, β_{ij2}, β_{ij3} are estimated parameters.

The world price, P_{wjt}, is defined as a fixed-weighted average of effective prices in all exporting countries of the good in question in year t:

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[4]A useful test to examine the effect on the equation fit of a lagged dependent variable is to use the predicted values, rather than the actual values, of the dependent variable in a simulation of the equation over the estimation period. Using this test, an equation with a "true" lagged dependent variable often leads to a drastically different regression fit than the one in which actual values of the dependent variable are used throughout the estimation period. In the present study, we have subjected a number of share equations to this test. The two regression fits for each equation are, in most cases, indistinguishable, if not entirely identical. This empirical result reinforces our theoretical assertion that the Nyhus trend is largely free from the defects of a lagged dependent variable.

$$P_{wjt} = \sum_i S_{ij0} P_{eit} \quad ; \quad \sum_i S_{ij0} = 1 \qquad \textbf{(2)}$$

and the world average capital stock, K_{wjt}, is defined as a fixed-weighted average of capital stocks in all exporting countries of the sector in question in year t:

$$K_{wjt} = \sum_i S_{ij0} K_{eit} \qquad \textbf{(3)}$$

The fixed weights in Equations 2-3, S_{ij0}, are the trade shares for the base year 1990. The use of the fixed weights ensures that the share equation satisfies the "homogeneity" condition as suggested by the demand theory. For example, if all effective domestic prices, P_{eit}, are doubled, then a doubling of the world prices as seen by each importing country (or its import prices) leaves the price ratio unchanged.

In estimating the trade-shares matrix, the present study has abandoned the Armington assumption that the price elasticities in a given import market are invariant with respect to each exporter. This assumption is not only contingent upon the assumption that the consumer's preferences are alike for all exporters in a given import market, it is also simply too restrictive to be useful if the purpose is to predict the price/non-price effect on trade shares. For these reasons, we will estimate the trade shares without imposing *a priori* restrictions on the size of the structural coefficients, β_{ij0}, β_{ij1}, β_{ij2}, and β_{ij3}.[5] These parameters will be estimated using Ordinary Least Squares (OLS) in the following specification:

$$\log S = \alpha + \beta_1 \log P + \beta_2 \log K + \beta_3 T \qquad \textbf{(4)}$$

Note that, for the sake of simplicity, we have dropped the time and country subscripts (t, i, j) and let P and K denote the relative price ratio and relative capital stock ratio, respectively.

Because these share equations will be used in a forecasting system, it is particularly important that the equation parameters are sensible and of expected signs. We searched the parameter space for estimates of β_{ij0}, β_{ij1}, β_{ij2}, and β_{ij3}, and included only estimates with correct signs. The search procedure explored seven alternative functional forms as follows, beginning with the form in Eq. (4). If the estimated price parameter or capital parameter was of the wrong sign, various combinations of a subset of the three explanatory variables were then used in the regression. If either price parameter or capital parameter still had a wrong sign, then the share equation was regressed on the Nyhus trend variable alone, because there was no sign restriction on the Nyhus trend variable.

It should also be noted that in any forecast period each trade share must be non-negative, and

[5]By relaxing the restrictive assumption on the size of the estimated structural coefficients, we may risk introducing a higher degree of instability in the estimation of β_{ij0}, β_{ij1}, β_{ij2}, β_{ij3}, and bilateral trade flows. We will examine the model's performance under this risk in a 12-year historical simulation exercise in Chapter 6.

that the sum of shares from all sources in a given market must add up to 1 (i.e. $\sum_i S_{ij} = 1$ for all j and t). The non-negativity condition is automatically satisfied through the use of the logarithmic functional form, but the adding-up condition is not. Methods must, therefore, be found for modifying the forecast trade shares so that the adding-up condition is met. One suggested method relies upon the "residual-share" approach, where for n exporting countries in a given importing market, only (n-1) shares are forecast with econometrically estimated equations. The n-th share is then derived as 1 minus the sum of the (n-1) shares. The method is not chosen for the present trade model, mainly because of the prospect that whenever the sum of (n-1) forecast shares exceeds 1, the n-th share becomes negative, which violates the non-negativity condition stated above.

The present study adopts an alternative approach. It estimates all of the n share equations separately and then adjusts the shares to meet the adding-up condition. In this way, the forecast shares in each market will satisfy both the adding-up condition and the non-negativity condition. In scaling the forecast shares to meet the adding-up condition in each import market, those with the best fits should be adjusted proportionally less than those with poor fits. There is a set of good weights at hand: the standard errors of the estimated equations. Thus, the adding-up condition in each import market is imposed by distributing the residual in proportion to the standard error of each estimated share equation.

5. Parameter Estimates and Equation Fits

The present trade model consists of some 28,920 (= 120 x (16 x 16 - 15)) estimated trade-share equations, one for each off-diagonal element of the trade-shares matrix, plus the diagonal element representing the intraregional trade for the rest of OECD. It may be recalled that, in estimating the share equations, a search procedure is used to explore the parameter space and retain only estimates with correct signs. After eliminating zero shares and those with less than 5 observations in the sample period (1974-91), a total of 19,125 trade share equations were actually estimated.

The direct consequence of our search estimation technique is that the functional forms for the estimated share equations are not uniform. Some equations will retain all three independent variables as specified in Equation (1), while others will have only a subset of the three explanatory variables. A breakdown of eight different functional forms for the share equations is shown on Table 5.

Table 5
Trade Share Equations: A Breakdown of Functional Forms

Function Type	EQ Count	EQ Weight	Trade Weight
I: P, K, T	6,143	21.2	37.1

II: P, K	2,716	9.4	15.4
III: P, T	4,960	17.2	29.3
IV: K, T	1,643	5.7	6.5
V: P	1,556	5.4	4.4
VI: K	786	2.7	1.8
VII: T	1,317	4.5	4.9
VIII: No EQ	9,795	33.9	0.6
Total:	28,920	100	100

For instance, there are 6,143 Type I share equations with relative price, relative capital stock, and time trend as the explanatory variables ("EQ Count"), accounting for 21.2% of the total share equations ("EQ Weight"). The underlying trade flows represented by Type I share equations, however, amount to 37.1% of total world trade in the base year 1990 ("Trade Weight"). It may be noted that Types I and III are two of the largest equation categories in terms of the proportions of total share equations as well as total world trade. It may also be noted that although Type VIII share equations (i.e. those share equations that are not econometrically estimated because there are less than 5 observations of the trade shares in the sample period) represent 33.9% of total share equations, the trade flows associated with these shares merely equal to 0.6% of total world trade in the base year 1990. Overall, 53.2% of the share equations have at least a relative price term, while 39% of the share equations have at least a relative capital stock term. And 17.5% of the share equations (accounting for 21.6% of the total world trade) do not have a Nyhus trend variable.

The Parameter Estimates

The parameter estimates include those on price (the β_1's), those on capital stock (the β_2's), and those on time (the β_3's). As shown in Table 5, there are 19,125 β_0's, 15,375 β_1's, 11,288 β_2's, and 14,063 β_3's. Table 6 shows the trade share elasticities with regard to relative prices for "Motor vehicle parts (108)". The columns represent importers and the rows exporters. Thus, the value -0.57 in the Canadian column is the relative price elasticity for the Mexican auto parts exports to Canada. It says if the relative Mexican price of auto parts, expressed as a ratio of the Mexican price to the world price seen from Canada, falls by 1%, other things being equal, the Mexican share in the Canadian auto parts imports will rise by 0.57%. The meaning of various "dots" in this matrix (as well as other parameter matrices shown in this Section) is as follows:

A single dot (".") says that the estimated parameter was removed from the trade share equation due to a perverse sign;

A double-dot ("..") denotes an absence of bilateral trade flows in the entire historical period (1974-91);

A triple-dot ("...") indicates that the relevant trade share was not estimated because the number of valid observations is less than 5;

A quadruple-dot ("....") refers to a limited number of cases where the trade share equations were not estimated because the exporter in question was the only supplier in a given import market throughout the historical period (1974-91).

Table 7 shows the capital parameter matrix for "Motor vehicle parts" (108). Here, the value 0.68 in the Canadian column says if the relative capital stock of the US auto parts industry, expressed as a ratio of the US capital stock to the average world capital stock seen from Canada, rises by 1%, other things being equal, the US share in the Canadian auto parts imports will increase by 0.68%.

Due to space limitations, we will not display the parameter matrices for the other 119 sectors, which would occupy some 238 additional pages. Instead, we present Tables 8 and 9, which summarize the size distribution of the estimated structural parameters.

An examination of Tables 8 and 9 will reveal that in nearly every sector, for those shares equations with a price term, the absolute values of the price parameters in the majority of these equations are below 5, which are within the value ranges of earlier studies. For instance, in Sector 1 ("Cereals"), the number of estimated equations (or "NEQ") is 112, out of a total of 241 share equations. The value 99 in parenthesis indicates the total trade flows represented by the 112 share equations equal to 99% of the total trade flows in this sector. Next, we see 79 under the title "PEQ", which indicates that of the 112 estimated share equations, 79 have a price term. We can also see that there are 21 share equations whose price parameters are less than or equal to 1 (in absolute value), 40 share equations whose price parameters are less than or equal to 2 (in absolute value), 51 share equations whose price parameters are less than or equal to 3 (in absolute value), and 61 share equations whose price parameters are less than or equal to 5 (in absolute value). The number of share equations whose price parameters exceed 5 (in absolute value) is 18, and they account for about 12% of total trade flows in Sector 1.

TABLE 6
PRICE PARAMETERS FOR Auto Parts (108)

EXPORTER	IMPORTER															
	CA	US	MX	AU	BE	FR	GE	IT	SP	UK	JA	CN	SK	TW	RO	RW
Canada		.	-9.86	...	-4.61	...	-1.62	..	...	-0.66	-4.63	...	...	...	-0.35	-2.02
USA	.		-5.10	-1.15	-1.63	-0.69	.	-0.70	-0.20	-1.25	-1.55	.	-2.51	-0.68	-0.89	-0.30
Mexico	-0.57	-2.35		...	..	...	-0.60	..	...	..	...	...	...	..	..	...
Austria	...	...	..		-0.42	-1.10	-2.41	.	-2.69	-2.40	-2.51	.	...	...	-1.51	-1.89
Belgium	..	-1.42	...	-1.86		.	-1.41	-3.76	-1.47	-0.71	.	...	.	...	-0.69	-0.80
France	-0.04	-1.34	.	.	.		-0.01	-0.64	.	.	.	.	-0.70	-0.92	-0.10	-0.67
Germany	.	-0.27	.	-1.09	-2.76	-0.49		-0.47	-6.89	-1.55	-1.31	.	-1.57	-1.24	-0.98	-0.49
Italy	.	-1.09	-1.28	-3.00	.	-0.69	-0.88		.	-1.06	-0.03	.	-0.97	.	-0.93	-1.09
Spain	...	-1.20	-0.68	.	.	-2.45	-0.75	-5.79		.	...	..	.	.	.	-1.11
UK	-2.46	-1.16	.	-2.24	-0.85	-1.55	-1.08	-1.33	-1.06		-1.79	-0.60	-2.57	-3.52	-1.81	-1.24
Japan	-0.11	-1.40	-3.62	-0.25	.	-0.27	.	.	.	-0.31		.	-1.35	-0.78	-0.73	-0.75
China	..	...	...	..	..	..	..	...	..	..	...		...	..	..	-4.38
Korea	...	-6.50	..	..	..	..	..	..	..	..	-1.81	...		-3.34	...	-0.91
Taiwan	.	-11.24	.	...	..	...	..	...	..	...	-2.47	..	...		-0.09	-0.06
ROECD	-0.31	-2.46	-17.53	-0.86	-4.68	-2.08	-1.79	-2.90	-0.28	-1.30	.	-15.75	-10.75	-5.00	-1.58	.
ROW	-0.71	.	...	-2.20	-12.62	-0.20	-3.83	.	-3.62	-1.86	-16.04	-3.79	-5.14	.	-0.69	

TABLE 7
CAPITAL PARAMETERS FOR Auto Parts (108)

EXPORTER	IMPORTER															
	CA	US	MX	AU	BE	FR	GE	IT	SP	UK	JA	CN	SK	TW	RO	RW
Canada		.	.	...	.	...	.	..	...	.	.	...	...	...	.	.
USA	0.68		.	.	0.51	0.63	0.20	0.71	3.30	2.91	2.25	0.46	.	2.30	1.54	1.63
Mexico	1.64	0.13		...	..	...	0.37	..	...	..	...	...	...	..	..	...
Austria	...	...	..		.	.	0.10	0.40	2.24	.	6.70	22.20	...	...	0.04	0.14
Belgium	..	2.33	...	0.33		1.06	0.32	.	.	0.86	4.03	...	4.61	...	0.13	.
France	.	1.41	.	0.05	.		0.70	.	0.74	0.70	.	.	.	6.79	0.49	0.98
Germany	1.61	1.91	.	0.38	.	0.24		0.57	1.94	0.07	1.76	.	0.13	.	0.52	0.94
Italy	1.05	0.57	.	.	0.43	0.48	0.93		4.01	.	2.14	0.95	5.06	.	1.55	0.28
Spain	...	1.31	0.39	0.99	6.00	.	2.22	.		.	...	..	.	47.64	.	0.62
UK	0.10	0.48	4.71	1.23	1.41	1.82	0.12	0.77	.		.	.	3.03	3.08	0.36	0.65
Japan	2.01	2.56	.	.	1.72	2.57	.	.	0.30	.		1.24	0.57	1.08	.	0.75
China	..	...	...	..	..	..	..	...	..	..	...		...	..	..	.
Korea	...	0.36	..	..	..	..	..	..	..	..	.	...		.	...	0.69
Taiwan	2.50	2.03	18.54	...	..	...	..	...	..	...	.	..	...		4.81	0.93
ROECD	.	0.63	3.65	0.55	5.64	1.44	.	1.46	1.95	1.21	0.52	.	2.29	.	1.36	1.58
ROW	6.87	3.14	...	7.88	0.29	.	0.00	.	4.91	0.27	2.23	.	.	1.68	.	

Table 8: Value Range of the Estimated Price Parameters

SECTOR	TITLE	NEQ	PEQ	Pe<=1	Pe<=2	Pe<=3	Pe<=5	Pe>5
1	Unmilled Cereals	112 (99)	79 (80)	21 (15)	40 (54)	51 (62)	61 (68)	18 (12)
2	Fresh fruits & vegetables	150 (100)	134 (95)	46 (45)	83 (68)	109 (89)	123 (94)	11 (1)
3	Other crops	162 (100)	132 (80)	31 (9)	73 (20)	91 (40)	109 (54)	23 (26)
4	Livestock	143 (100)	114 (83)	35 (28)	66 (61)	80 (72)	95 (80)	19 (2)
5	Silk	55 (99)	48 (98)	15 (27)	30 (51)	35 (58)	40 (92)	8 (6)
6	Cotton	107 (94)	75 (58)	19 (16)	37 (19)	48 (32)	63 (52)	12 (6)
7	Wool	135 (100)	111 (92)	28 (18)	61 (47)	79 (62)	94 (73)	17 (20)
8	Other natural fibers	91 (99)	75 (84)	16 (24)	30 (41)	40 (55)	53 (64)	22 (19)
9	Wood	117 (100)	97 (86)	26 (25)	63 (52)	76 (62)	87 (81)	10 (5)
10	Fishery	145 (100)	119 (82)	34 (34)	68 (52)	86 (67)	95 (72)	24 (9)
11	Iron ores	49 (100)	32 (56)	3 (3)	4 (4)	5 (4)	6 (7)	26 (49)
12	Coal	79 (97)	71 (88)	6 (2)	16 (15)	34 (41)	43 (48)	28 (40)
13	Nonferrous metal ores	126 (99)	96 (80)	22 (28)	41 (38)	66 (51)	82 (63)	14 (16)
14	Crude petroleum	50 (99)	42 (97)	21 (82)	26 (86)	33 (90)	38 (91)	4 (6)
15	Natural gas	41 (96)	31 (85)	10 (20)	14 (25)	17 (26)	22 (55)	9 (30)
16	Non-metallic ores	188 (100)	165 (83)	52 (24)	103 (48)	124 (56)	148 (70)	17 (13)
17	Electrical energy	21 (63)	13 (31)	1 (1)	2 (2)	2 (2)	3 (7)	10 (23)
18	Meat	150 (100)	121 (92)	38 (44)	67 (57)	87 (69)	99 (80)	22 (11)
19	Dairy products	150 (100)	117 (87)	29 (10)	68 (49)	82 (65)	99 (84)	18 (3)
20	Preserved fruits & vegetables	173 (100)	139 (79)	39 (25)	73 (42)	94 (59)	124 (72)	15 (7)
21	Preserved seafood	171 (100)	136 (79)	39 (39)	72 (48)	94 (60)	112 (70)	24 (9)
22	Veg & animal oils and fats	147 (99)	115 (78)	33 (18)	66 (44)	85 (53)	103 (66)	12 (12)
23	Grain mill products	122 (100)	93 (88)	27 (41)	46 (62)	60 (70)	75 (81)	18 (7)
24	Bakery products	153 (100)	123 (91)	30 (26)	76 (76)	93 (81)	107 (88)	16 (2)
25	Sugar	88 (93)	63 (71)	19 (28)	31 (37)	40 (43)	50 (47)	13 (24)
26	Cocoa, chocolate, etc	165 (100)	128 (79)	27 (21)	65 (56)	91 (62)	106 (70)	22 (9)
27	Food products, n.e.c.	191 (100)	134 (68)	38 (22)	70 (37)	87 (43)	104 (52)	30 (16)
28	Prepared animal feeds	150 (100)	117 (80)	27 (21)	57 (51)	75 (60)	96 (72)	21 (8)
29	Alcoholic beverages	164 (100)	135 (93)	47 (40)	89 (82)	102 (86)	119 (90)	16 (3)
30	Non-alcoholic beverages	123 (99)	94 (72)	21 (27)	34 (40)	46 (50)	59 (54)	35 (18)
31	Tobacco products	125 (100)	91 (66)	20 (9)	42 (23)	52 (38)	66 (41)	25 (25)
32	Yarns and threads	206 (100)	172 (90)	48 (31)	100 (69)	127 (76)	145 (83)	27 (7)
33	Cotton fabrics	196 (100)	159 (89)	51 (36)	101 (61)	118 (65)	135 (69)	24 (20)
34	Other textile products	213 (100)	178 (84)	63 (38)	133 (74)	154 (81)	165 (82)	13 (2)
35	Floor coverings	162 (100)	133 (78)	38 (26)	77 (60)	96 (65)	115 (73)	18 (5)
36	Wearing apparels	190 (100)	163 (89)	66 (52)	119 (72)	137 (77)	154 (89)	9 (0)
37	Leather and hides	190 (100)	162 (94)	47 (21)	89 (45)	115 (60)	143 (83)	19 (11)
38	Leather products	193 (100)	157 (88)	75 (44)	106 (69)	126 (80)	145 (84)	12 (4)
39	Footwear	176 (100)	130 (80)	40 (39)	73 (60)	96 (66)	111 (77)	19 (3)
40	Plywood and veneer	126 (100)	97 (88)	12 (8)	25 (17)	47 (33)	62 (43)	35 (45)
41	Other wood products	195 (100)	149 (81)	53 (36)	93 (59)	111 (70)	133 (80)	16 (2)
42	Furnitures and fixtures	190 (100)	144 (79)	23 (30)	74 (49)	102 (62)	122 (71)	22 (8)
43	Pulp and waste paper	116 (100)	95 (78)	20 (17)	46 (31)	61 (44)	74 (58)	21 (20)
44	Newsprint	72 (89)	50 (28)	13 (12)	18 (15)	25 (17)	32 (21)	18 (7)
45	Paper products	190 (100)	159 (94)	34 (33)	91 (75)	115 (87)	140 (93)	19 (2)
46	Printing and publishing	204 (100)	186 (92)	67 (41)	134 (79)	155 (85)	167 (88)	19 (4)
47	Basic chemicals	222 (100)	198 (92)	72 (41)	131 (67)	158 (80)	177 (86)	21 (6)
48	Fertilizers	169 (100)	141 (94)	54 (34)	78 (54)	97 (66)	116 (74)	25 (20)
49	Synthetic resin and fibers	207 (100)	184 (92)	56 (37)	101 (67)	130 (82)	154 (88)	30 (3)
50	Paints and varnishes	160 (100)	129 (90)	33 (40)	74 (73)	90 (84)	104 (87)	25 (3)
51	Drugs and medicines	201 (100)	178 (87)	66 (25)	126 (72)	148 (80)	163 (85)	15 (2)
52	Soaps & other toilet prep.	182 (100)	148 (92)	47 (46)	84 (75)	105 (85)	123 (89)	25 (2)
53	Chemical products, n.e.c.	205 (100)	176 (94)	57 (37)	114 (72)	139 (78)	159 (90)	17 (4)
54	Petroleum refinery	133 (99)	98 (76)	22 (12)	44 (23)	60 (59)	78 (66)	20 (9)
55	Fuel oils	93 (98)	64 (65)	23 (12)	32 (21)	38 (24)	49 (53)	15 (13)
56	Product of petroleum	164 (99)	131 (77)	28 (12)	55 (26)	71 (39)	94 (56)	37 (22)
57	Product of coal	77 (97)	58 (73)	12 (33)	27 (50)	36 (59)	45 (64)	13 (8)
58	Tyre and tube	184 (100)	147 (91)	42 (46)	89 (75)	113 (82)	131 (88)	16 (3)
59	Rubber products, n.e.c.	204 (100)	166 (85)	55 (31)	111 (62)	128 (70)	152 (79)	14 (6)
60	Plastic product, n.e.c.	210 (100)	174 (86)	69 (42)	121 (73)	144 (80)	167 (86)	7 (0)
61	Glass	202 (100)	169 (89)	55 (41)	104 (64)	131 (79)	154 (87)	15 (2)
62	Cement	106 (99)	85 (83)	18 (17)	38 (40)	53 (45)	62 (53)	23 (30)

Table 8: (continued)

SECTOR	TITLE	NEQ	PEQ	Pe<=1	Pe<=2	Pe<=3	Pe<=5	Pe>5
63	Ceramics	205 (100)	148 (64)	43 (29)	92 (47)	112 (58)	126 (61)	22 (3)
64	Non-metallic mineral products	196 (100)	159 (90)	38 (26)	85 (58)	111 (73)	136 (83)	23 (7)
65	Basic iron and steel	203 (100)	180 (96)	36 (37)	84 (65)	121 (82)	150 (88)	30 (8)
66	Copper	163 (99)	122 (73)	34 (24)	66 (43)	83 (58)	101 (64)	21 (9)
67	Aluminum	169 (100)	141 (84)	31 (16)	53 (33)	75 (41)	99 (56)	42 (27)
68	Nickel	128 (98)	96 (72)	14 (11)	34 (25)	52 (30)	69 (48)	27 (24)
69	Lead and zinc	136 (99)	96 (84)	19 (25)	44 (55)	59 (74)	71 (79)	25 (5)
70	Other nonferrous metals	171 (100)	136 (86)	40 (21)	77 (49)	99 (56)	121 (82)	15 (3)
71	Metal furnitures & fixtures	191 (100)	146 (84)	17 (11)	60 (50)	85 (58)	110 (65)	36 (18)
72	Structural metal products	156 (100)	113 (76)	26 (29)	56 (59)	74 (66)	92 (70)	21 (5)
73	Metal containers	151 (100)	117 (80)	23 (35)	51 (53)	78 (69)	91 (73)	26 (7)
74	Wire products	189 (100)	154 (86)	35 (29)	65 (49)	86 (59)	110 (72)	44 (14)
75	Hardware	222 (100)	186 (90)	74 (50)	125 (78)	150 (83)	170 (88)	16 (2)
76	Boilers and turbines	147 (99)	104 (65)	35 (32)	60 (47)	68 (49)	84 (59)	20 (6)
77	Aircraft engines	110 (99)	82 (84)	19 (22)	40 (43)	50 (57)	63 (66)	19 (19)
78	Internal combustion engines	167 (100)	139 (93)	47 (49)	85 (77)	102 (81)	121 (86)	18 (6)
79	Other power machinery	152 (100)	110 (77)	31 (28)	54 (38)	71 (61)	83 (68)	27 (9)
80	Agricultural machinery	173 (100)	154 (96)	34 (23)	80 (65)	103 (81)	127 (91)	27 (6)
81	Construction,mining equipment	185 (100)	159 (94)	43 (39)	89 (63)	119 (77)	139 (85)	20 (9)
82	Wood & metalworking machinery	205 (100)	172 (80)	61 (49)	111 (68)	133 (74)	150 (78)	22 (2)
83	Sewing and knitting machines	191 (100)	148 (83)	54 (44)	91 (60)	114 (75)	128 (79)	20 (4)
84	Textile machinery	167 (100)	133 (88)	32 (32)	68 (65)	96 (75)	116 (82)	17 (5)
85	Paper mill machines	171 (100)	144 (95)	35 (25)	80 (59)	97 (73)	112 (78)	32 (17)
86	Printing machines	159 (100)	127 (92)	28 (45)	61 (65)	85 (76)	103 (86)	24 (6)
87	Food-processing machinery	170 (100)	135 (82)	45 (35)	73 (64)	89 (68)	109 (73)	26 (10)
88	Other special machinery	194 (100)	139 (73)	45 (31)	76 (42)	98 (50)	113 (59)	26 (14)
89	Service industry machinery	184 (99)	159 (90)	46 (38)	99 (72)	121 (80)	136 (88)	23 (2)
90	Pumps	190 (100)	163 (93)	57 (40)	109 (70)	123 (80)	140 (87)	23 (6)
91	Mechanical handling equipment	200 (100)	168 (91)	41 (27)	88 (65)	111 (75)	134 (79)	34 (12)
92	Other non-electrical machines	201 (100)	176 (94)	58 (51)	112 (79)	142 (89)	157 (93)	19 (1)
93	Radio, TV, phonograph	190 (100)	148 (87)	41 (35)	87 (60)	111 (72)	129 (80)	19 (7)
94	Other telecommunication equip	204 (100)	175 (95)	79 (35)	144 (89)	155 (90)	165 (91)	10 (4)
95	Household appliances	195 (99)	156 (78)	47 (34)	91 (56)	111 (66)	134 (75)	22 (3)
96	Computers and accessories	189 (100)	154 (82)	63 (43)	98 (70)	112 (73)	135 (78)	19 (4)
97	Other office machinery	188 (100)	145 (80)	59 (25)	88 (39)	109 (67)	131 (77)	14 (3)
98	Semiconductors & integrated	183 (100)	140 (83)	45 (38)	87 (70)	114 (76)	122 (77)	18 (5)
99	Electric motors	179 (99)	112 (69)	36 (28)	63 (43)	82 (62)	100 (67)	12 (2)
100	Batteries	180 (99)	151 (94)	52 (44)	98 (70)	115 (78)	133 (90)	18 (4)
101	Electric bulbs	197 (99)	163 (86)	60 (39)	109 (71)	129 (77)	143 (81)	20 (5)
102	Industrial appliances	210 (100)	167 (89)	65 (41)	112 (70)	135 (77)	157 (85)	10 (4)
103	Shipbuilding, ex. warships	145 (99)	105 (57)	26 (31)	49 (43)	68 (47)	78 (49)	27 (9)
104	Warships	7 (93)	5 (60)	0 (0)	1 (0)	1 (0)	2 (1)	3 (58)
105	Railroad equipment	136 (99)	92 (71)	21 (17)	37 (30)	55 (38)	68 (42)	24 (29)
106	Motor vehicles	155 (100)	124 (91)	28 (38)	62 (71)	78 (82)	96 (86)	28 (5)
107	Motorcycles and bicycles	167 (99)	134 (84)	29 (30)	59 (46)	84 (67)	105 (74)	29 (9)
108	Motor vehicle parts	175 (100)	132 (74)	51 (32)	90 (56)	107 (61)	119 (70)	13 (4)
109	Aircraft	107 (100)	81 (89)	25 (15)	44 (45)	58 (60)	69 (76)	12 (13)
110	Other transport equipment	86 (94)	63 (46)	11 (10)	26 (26)	35 (30)	46 (38)	17 (9)
111	Professional instruments	206 (100)	176 (89)	86 (58)	124 (74)	146 (81)	161 (88)	15 (1)
112	Photographic & optical goods	200 (100)	168 (89)	47 (24)	91 (67)	114 (72)	141 (79)	27 (10)
113	Watches and clocks	171 (100)	140 (83)	73 (41)	103 (57)	117 (61)	127 (70)	13 (13)
114	Jewellery & related articles	171 (100)	142 (90)	34 (23)	69 (48)	88 (55)	111 (71)	31 (18)
115	Musical instruments	192 (100)	166 (91)	42 (12)	95 (51)	124 (74)	146 (87)	20 (3)
116	Sporting goods	213 (100)	180 (74)	49 (22)	108 (47)	140 (57)	167 (68)	13 (6)
117	Ordnance	112 (96)	83 (77)	23 (30)	36 (34)	53 (57)	66 (60)	17 (17)
118	Works of art	160 (100)	132 (75)	46 (31)	92 (54)	111 (59)	119 (65)	13 (10)
119	Manufacture goods, n.e.c.	213 (100)	176 (80)	91 (41)	148 (69)	162 (77)	169 (78)	7 (2)
120	Scraps,used,unclassified	167 (100)	139 (87)	49 (34)	95 (62)	110 (70)	121 (73)	18 (14)

Overall:

NEQ	PEQ	Pe<=1	Pe<=2	Pe<=3	Pe<=5	Pe>5
19125 (99)	15375 (86)	4598 (36)	8795 (61)	11021 (71)	12973 (78)	2402 (8)

Table 9: Value Range of the Estimated Capital Parameters

SECTOR	TITLE	NEQ	KEQ	Ke<=1	Ke<=2	Ke<=3	Ke<=5	Ke>5
1	Unmilled cereals	112 (99)	64 (58)	8 (25)	21 (43)	24 (43)	32 (50)	32 (8)
2	Fresh fruits and vegetables	150 (100)	96 (58)	38 (25)	65 (47)	72 (55)	77 (56)	19 (2)
3	Other crops	162 (100)	107 (76)	42 (17)	55 (29)	74 (53)	88 (73)	19 (2)
4	Livestock	143 (100)	88 (73)	28 (28)	38 (56)	44 (60)	60 (70)	28 (4)
5	Silk	55 (99)	25 (37)	12 (37)	17 (37)	20 (37)	23 (37)	2 (0)
6	Cotton	107 (94)	70 (41)	25 (19)	32 (20)	38 (22)	51 (30)	19 (12)
7	Wool	135 (100)	78 (57)	24 (31)	33 (40)	45 (48)	60 (55)	18 (2)
8	Other natural fibers	91 (99)	47 (49)	13 (23)	22 (32)	27 (41)	36 (47)	11 (2)
9	Crude wood	117 (100)	63 (65)	26 (54)	40 (61)	45 (63)	52 (64)	11 (1)
10	Fishery	145 (100)	92 (81)	28 (50)	44 (65)	54 (71)	68 (77)	24 (4)
11	Iron ore	49 (100)	31 (77)	9 (55)	17 (62)	18 (62)	21 (68)	10 (9)
12	Coal	79 (97)	51 (81)	13 (18)	26 (47)	29 (49)	39 (62)	12 (19)
13	Nonferrous metal ores	126 (99)	53 (44)	26 (25)	34 (37)	38 (43)	45 (44)	8 (0)
14	Crude petroleum	50 (99)	26 (80)	12 (53)	18 (74)	20 (76)	21 (77)	5 (3)
15	Natural gas	41 (96)	19 (35)	8 (34)	9 (34)	9 (34)	12 (35)	7 (0)
16	Non-metallic ore	188 (100)	105 (55)	42 (28)	59 (40)	71 (44)	87 (51)	18 (4)
17	Electrical energy	21 (63)	7 (21)	0 (0)	1 (4)	1 (4)	4 (12)	3 (9)
18	Meat	150 (100)	98 (72)	32 (20)	49 (46)	57 (57)	75 (67)	23 (4)
19	Dairy products	150 (100)	81 (70)	22 (40)	38 (52)	43 (54)	61 (66)	20 (4)
20	Preserved fruits & vegetables	173 (100)	101 (75)	44 (32)	57 (42)	66 (65)	79 (69)	22 (6)
21	Preserved seafood	171 (100)	111 (59)	37 (15)	59 (26)	71 (30)	88 (46)	23 (13)
22	Veg & animal oils & fats	147 (99)	78 (51)	25 (20)	34 (32)	42 (39)	49 (41)	29 (10)
23	Grain mill products	122 (100)	69 (74)	10 (24)	17 (30)	22 (34)	31 (41)	38 (33)
24	Bakery products	153 (100)	93 (70)	30 (27)	44 (42)	56 (56)	67 (67)	26 (3)
25	Sugar	88 (93)	45 (52)	11 (19)	19 (29)	25 (33)	29 (42)	16 (9)
26	Cocoa, chocolate, etc	165 (100)	102 (75)	32 (24)	54 (49)	61 (55)	73 (69)	29 (5)
27	Food products, n.e.c.	191 (100)	109 (53)	24 (13)	48 (24)	60 (29)	78 (41)	31 (13)
28	Prepared animal feeds	150 (100)	77 (47)	10 (3)	23 (14)	36 (33)	49 (39)	28 (7)
29	Alcoholic beverages	164 (100)	113 (79)	41 (37)	58 (55)	71 (66)	84 (74)	29 (5)
30	Non-alcoholic beverages	123 (99)	62 (53)	18 (16)	26 (23)	31 (29)	39 (32)	23 (20)
31	Tobacco products	125 (100)	64 (77)	11 (3)	21 (18)	29 (42)	37 (59)	27 (18)
32	Yarns and threads	206 (100)	138 (62)	71 (45)	91 (52)	110 (57)	121 (60)	17 (3)
33	Cotton fabrics	196 (100)	105 (44)	56 (31)	66 (39)	74 (41)	87 (43)	18 (1)
34	Other textile products	213 (100)	131 (55)	76 (41)	94 (48)	104 (52)	118 (54)	13 (1)
35	Floor coverings	162 (100)	77 (45)	31 (22)	47 (38)	51 (43)	54 (43)	23 (2)
36	Wearing apparels	190 (100)	113 (48)	63 (33)	79 (42)	89 (46)	101 (47)	12 (0)
37	Leather and hides	190 (100)	126 (68)	42 (23)	66 (35)	78 (44)	98 (58)	28 (10)
38	Leather products	193 (100)	116 (67)	58 (47)	84 (59)	94 (64)	98 (65)	18 (1)
39	Footwear	176 (100)	101 (64)	54 (53)	67 (57)	74 (59)	84 (62)	17 (1)
40	Plywood and veneer	126 (100)	57 (35)	19 (9)	30 (23)	35 (28)	46 (30)	11 (6)
41	Other wood products	195 (100)	121 (53)	54 (30)	79 (43)	93 (49)	108 (50)	13 (2)
42	Furnitures and fixtures	190 (100)	119 (71)	52 (38)	75 (60)	85 (61)	96 (69)	23 (2)
43	Pulp and waste paper	116 (100)	63 (48)	20 (27)	29 (33)	34 (38)	50 (46)	13 (2)
44	Newsprint	72 (89)	35 (69)	8 (57)	12 (62)	14 (62)	18 (63)	17 (6)
45	Paper products	190 (100)	119 (60)	36 (29)	64 (48)	76 (52)	95 (58)	24 (2)
46	Printing and publishing	204 (100)	116 (61)	61 (43)	83 (54)	101 (58)	109 (59)	7 (2)
47	Basic chemicals	222 (100)	145 (62)	76 (39)	110 (56)	128 (59)	138 (62)	7 (0)
48	Fertilizers	169 (100)	99 (58)	38 (31)	62 (44)	75 (53)	87 (57)	12 (1)
49	Synthetic resin and fibers	207 (100)	129 (63)	53 (43)	79 (55)	91 (57)	110 (61)	19 (2)
50	Paints and varnishes	160 (100)	106 (56)	30 (33)	51 (48)	65 (50)	81 (54)	25 (2)
51	Drugs and medicines	201 (100)	136 (65)	71 (38)	102 (56)	113 (62)	126 (64)	10 (1)
52	Soaps and other toilet prep.	182 (100)	115 (71)	46 (41)	73 (65)	80 (67)	90 (69)	25 (2)
53	Chemical products, n.e.c.	205 (100)	123 (58)	61 (34)	83 (43)	97 (47)	110 (53)	13 (6)
54	Petroleum refinery	133 (99)	69 (45)	24 (12)	34 (17)	45 (31)	52 (35)	17 (9)
55	Fuel oils	93 (98)	48 (41)	12 (16)	18 (29)	25 (33)	34 (37)	14 (4)
56	Product of petroleum	164 (99)	91 (62)	22 (17)	38 (31)	50 (34)	65 (44)	26 (18)
57	Product of coal	77 (97)	50 (61)	13 (18)	18 (34)	24 (35)	34 (55)	16 (6)
58	Tyre and tube	184 (100)	120 (66)	42 (28)	69 (49)	79 (53)	94 (56)	26 (10)
59	Rubber products, n.e.c.	204 (100)	117 (62)	42 (28)	72 (52)	85 (57)	102 (60)	15 (2)
60	Plastic products, n.e.c.	210 (100)	126 (65)	78 (51)	99 (61)	112 (63)	116 (64)	10 (1)
61	Glass	202 (100)	132 (69)	61 (34)	96 (60)	111 (63)	119 (68)	13 (0)
62	Cement	106 (99)	59 (44)	17 (28)	26 (30)	31 (31)	40 (37)	19 (7)

Table 9: (continued)

SECTOR	TITLE	NEQ	KEQ	Ke<=1	Ke<=2	Ke<=3	Ke<=5	Ke>5
63	Ceramics	205 (100)	126 (49)	40 (24)	55 (30)	73 (36)	99 (43)	27 (6)
64	Non-metallic mineral products	196 (100)	116 (63)	44 (24)	66 (47)	89 (56)	105 (62)	11 (1)
65	Basic iron and steel	203 (100)	123 (73)	64 (52)	83 (63)	95 (67)	106 (70)	17 (4)
66	Copper	163 (99)	96 (66)	36 (30)	53 (55)	65 (59)	77 (63)	19 (3)
67	Aluminum	169 (100)	104 (64)	30 (23)	47 (37)	56 (40)	76 (47)	28 (17)
68	Nickel	128 (98)	77 (70)	19 (18)	33 (32)	44 (50)	62 (67)	15 (3)
69	Lead and zinc	136 (99)	82 (66)	24 (34)	39 (48)	53 (58)	62 (62)	20 (4)
70	Other nonferrous metals	171 (100)	96 (65)	41 (28)	55 (51)	68 (57)	78 (62)	18 (3)
71	Metal furnitures & fixtures	191 (100)	112 (61)	48 (29)	68 (43)	80 (48)	92 (54)	20 (6)
72	Structural metal products	156 (100)	76 (38)	32 (25)	46 (33)	54 (36)	60 (37)	16 (1)
73	Metal containers	151 (100)	94 (66)	34 (46)	51 (52)	57 (55)	75 (64)	19 (2)
74	Wire products	189 (100)	107 (57)	44 (34)	65 (46)	76 (51)	89 (55)	18 (2)
75	Hardware	222 (100)	131 (64)	83 (51)	106 (59)	112 (60)	121 (63)	10 (1)
76	Boilers and turbines	147 (99)	86 (52)	27 (20)	37 (27)	51 (39)	57 (41)	29 (11)
77	Aircraft engines	110 (99)	74 (67)	18 (36)	31 (42)	40 (45)	52 (49)	22 (17)
78	Internal combustion engines	167 (100)	113 (68)	41 (27)	72 (53)	84 (56)	98 (65)	15 (3)
79	Other power machinery	152 (100)	75 (56)	18 (6)	28 (23)	38 (31)	52 (40)	23 (16)
80	Agricultural machinery	173 (100)	98 (69)	50 (42)	65 (51)	75 (61)	83 (67)	15 (2)
81	Construction,mining equipment	185 (100)	125 (70)	52 (29)	72 (50)	83 (59)	101 (67)	24 (3)
82	Wood & metalworking machinery	205 (100)	118 (47)	57 (26)	86 (40)	97 (42)	108 (45)	10 (2)
83	Sewing and knitting machines	191 (100)	106 (43)	41 (15)	65 (28)	76 (34)	91 (39)	15 (5)
84	Textile machinery	167 (100)	96 (52)	39 (31)	62 (42)	67 (47)	77 (48)	19 (4)
85	Paper mill machines	171 (100)	111 (69)	33 (19)	60 (43)	71 (57)	85 (64)	26 (4)
86	Printing machines	159 (100)	110 (68)	40 (35)	64 (55)	79 (60)	87 (61)	23 (7)
87	Food-processing machinery	170 (100)	99 (59)	38 (34)	61 (44)	74 (56)	84 (57)	15 (2)
88	Other special machinery	194 (100)	124 (61)	36 (16)	51 (27)	72 (39)	88 (43)	36 (18)
89	Service industry machinery	184 (99)	111 (68)	55 (46)	73 (56)	81 (61)	98 (66)	13 (2)
90	Pumps	190 (100)	118 (75)	54 (40)	76 (66)	89 (69)	99 (72)	19 (3)
91	Mechanical handling equipment	200 (100)	126 (76)	57 (40)	77 (58)	92 (66)	106 (72)	20 (3)
92	Other non-electrical machines	201 (100)	123 (63)	58 (41)	85 (51)	105 (58)	108 (60)	15 (4)
93	Radio, TV, phonograph	190 (100)	97 (40)	50 (25)	67 (32)	83 (38)	93 (40)	4 (0)
94	Other telecommunication equip	204 (100)	120 (52)	59 (27)	80 (35)	103 (44)	109 (49)	11 (3)
95	Household appliances	195 (99)	106 (59)	52 (39)	74 (51)	84 (52)	93 (58)	13 (1)
96	Computers and accessories	189 (100)	119 (58)	51 (30)	76 (38)	90 (41)	103 (48)	16 (11)
97	Other office machinery	188 (100)	93 (41)	37 (18)	59 (30)	74 (35)	86 (38)	7 (2)
98	Semiconductors & integrated	183 (100)	107 (53)	46 (23)	69 (45)	80 (47)	91 (52)	16 (2)
99	Electric motors	179 (99)	99 (54)	30 (22)	44 (37)	55 (40)	73 (47)	26 (7)
100	Batteries	180 (99)	100 (60)	39 (29)	70 (47)	76 (52)	85 (57)	15 (3)
101	Electric bulbs	197 (99)	112 (61)	55 (41)	77 (51)	82 (52)	99 (61)	13 (1)
102	Industrial appliances	210 (100)	154 (80)	83 (52)	113 (69)	125 (73)	136 (75)	18 (5)
103	Shipbuilding, ex. warships	145 (99)	91 (61)	23 (13)	35 (49)	47 (54)	61 (56)	30 (5)
104	Warships	7 (93)	2 (59)	0 (0)	0 (0)	0 (0)	1 (58)	1 (1)
105	Railroad equipment	136 (99)	82 (68)	19 (12)	33 (27)	48 (44)	57 (63)	25 (5)
106	Motor vehicles	155 (100)	83 (50)	30 (23)	50 (43)	60 (46)	72 (48)	11 (2)
107	Motorcycles and bicycles	167 (99)	71 (27)	18 (11)	26 (15)	34 (17)	46 (22)	25 (5)
108	Motor vehicles parts	175 (100)	116 (73)	56 (49)	81 (61)	95 (71)	106 (72)	10 (2)
109	Aircraft	107 (100)	63 (77)	21 (24)	39 (58)	44 (65)	53 (76)	10 (1)
110	Other transport equipment	86 (94)	42 (61)	3 (4)	8 (7)	12 (7)	21 (43)	21 (19)
111	Professional instruments	206 (100)	113 (48)	62 (34)	84 (44)	94 (46)	102 (48)	11 (0)
112	Photographic & optical goods	200 (100)	119 (63)	58 (35)	83 (53)	95 (58)	111 (62)	8 (1)
113	Watches and clocks	171 (100)	92 (33)	43 (13)	55 (22)	66 (26)	73 (31)	19 (2)
114	Jewellery & related articles	171 (100)	90 (48)	25 (20)	35 (27)	48 (33)	59 (45)	31 (3)
115	Musical instruments	192 (100)	116 (48)	60 (28)	76 (33)	93 (44)	100 (47)	16 (2)
116	Sporting goods	213 (100)	127 (67)	64 (39)	88 (56)	101 (63)	112 (65)	15 (2)
117	Ordnance	112 (96)	70 (86)	9 (15)	22 (53)	30 (54)	44 (70)	26 (16)
118	Works of art	160 (100)	90 (56)	43 (44)	59 (48)	67 (51)	77 (52)	13 (4)
119	Manufactured goods, n.e.c.	213 (100)	136 (68)	74 (44)	94 (52)	99 (55)	118 (64)	18 (3)
120	Scraps,used, unclassified	167 (100)	98 (46)	46 (26)	66 (35)	77 (37)	89 (45)	9 (1)

Overall:

NEQ	KEQ	Ke<=1	Ke<=2	Ke<=3	Ke<=5	Ke>5
19125 (99)	11288 (61)	4497 (33)	6569 (47)	7780 (52)	9142 (57)	2146 (4)

The Fit of Equation

To see how well the equations fit the historical data, Figures 1-18 plot the predicted shares against the actual historical values for some of the most significant bilateral trade flows in the 1974-91 period. The selected sectors include Dairy products (19), Wearing apparels (36), Basic chemicals (47), Synthetic fiber (49), Iron and steel (65), Telecommunications equipment (94), Computers and accessories (96), Industrial appliances (102), Motor vehicles (106), and Auto parts (108). The underlying bilateral trade flows behind each of the graphs are among some of the largest bilateral trade flows in the base year 1990. For example, the trade flow behind Figure 30 -- Canada's import of Motor vehicles parts (108) from USA -- is valued at $8.6 billion in 1990, and is the 11th largest single bilateral trade flow of a total of 30,720 trade flows ranked. The trade flow behind Figure 29 -- Britain's import of Motor vehicles (106) from Germany -- is valued at more than $6 billion in 1990, and is the 22nd largest single bilateral trade flow in the world. The trade flow behind Figure 28 -- USA's import of Motor vehicles (106) from Germany -- is valued at $6 billion in 1990, and is the 25th largest. And the trade flow behind Figure 24 -- USA's import of Telecommunications equipment (94) -- is valued at $5.5 billion in 1990, and is the 32nd largest single trade flow.

These figures provide robust evidence on the fit of the trade share equations across a variety of sectors, in various import markets, for a number of exporters. To have a more comprehensive look at the fit of the trade share equations across all sectors, Table 10 is presented. Here, the "NEQ" column indicates the number of estimated share equations in a given sector. For instance, in Sector 19 ("Dairy products"), the number of estimated share equations is 150. The number in parenthesis is the base year 1990 share (in percentage) of total trade flows in Sector 19 as represented by the estimated share equations. In this case, the total trade flows represented by the estimated share equations account for all of the trade flows in this sector. The next column, PEQ, refers to the number of estimated share equations with a price term. In this case, Sector 19 has 117 share equations with a price term, accounting for 87% of total trade flows in this sector. Of the 117 share equations, 46 have a price parameter whose t-value is greater than or equal 2 (in absolute value). This is shown under the column "Pt2". In addition, of the 150 estimated share equations, 81 have a capital term, shown under the column "KEQ", and 24 have a capital parameter whose t-value is greater than or equal to 2 (in absolute value), shown under the column "Kt2". Regarding the time variable, the column, TEQ, shows that in Sector 19, 113 of the estimated share equations have a Nyhus trend. Further, the next column, Tt2, shows that 43 of them have a time parameter whose t-value is greater than or equal to 2 (in absolute value). Finally, the last two columns show the number of share equations whose independent variables can "explain" at least 50% of the variations in the trade shares over the sample period ("R50") and the number of share equations whose independent variables can "explain" less than 50% of the variations in the trade shares.

A final point needs to be made about the fit of the equation. Through the regression

Figure 13

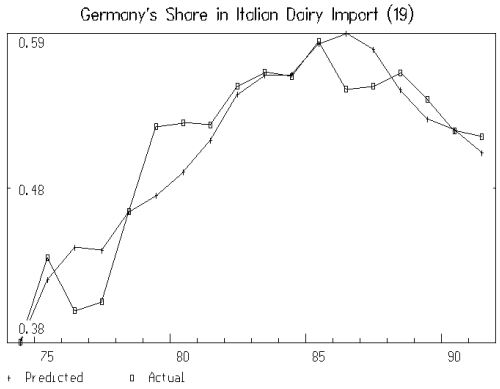

Figure 14

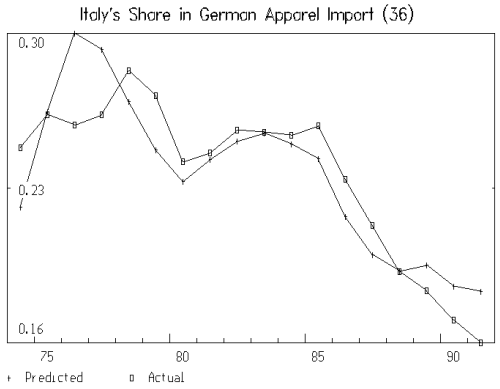

Figure 16

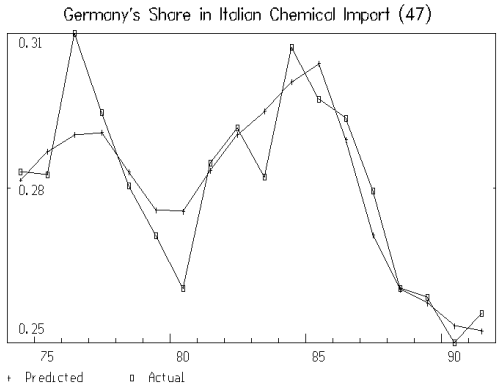

Figure 15

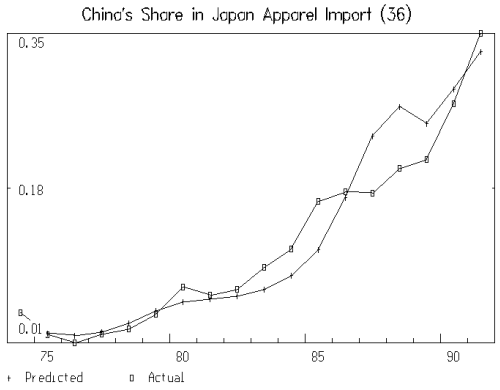

Figure 17

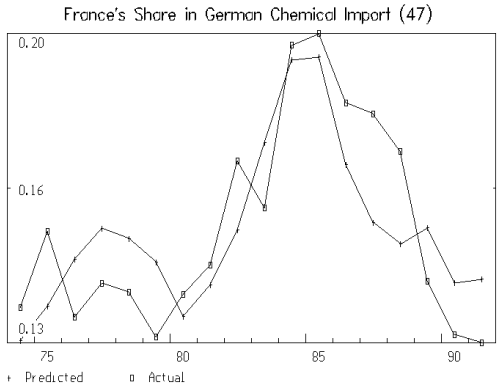

Figure 18

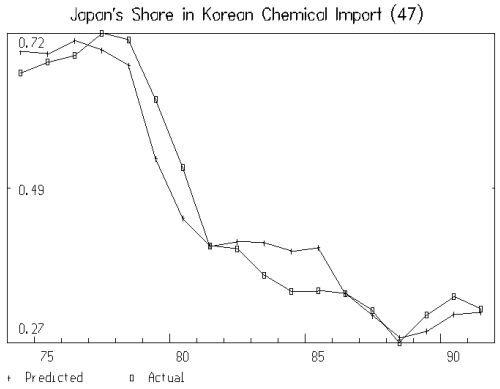

Figure 19

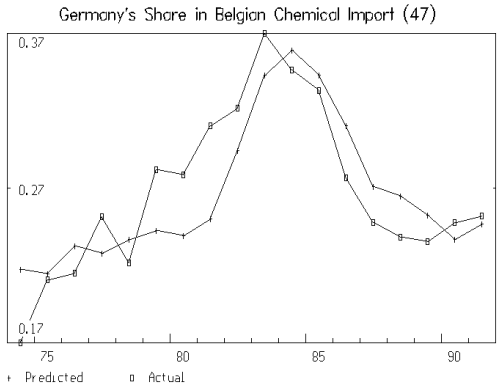

Figure 20

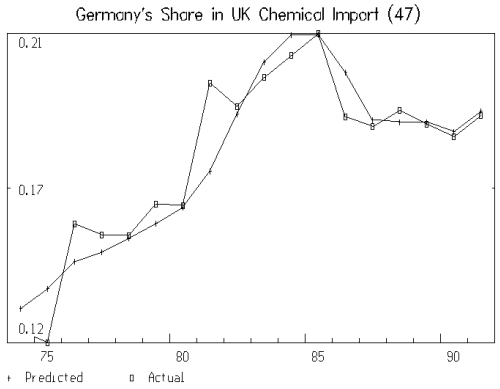

Figure 21

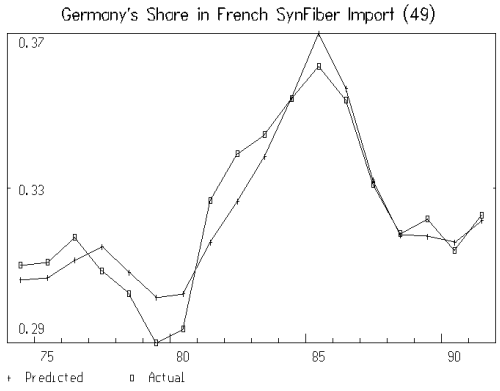

Figure 22

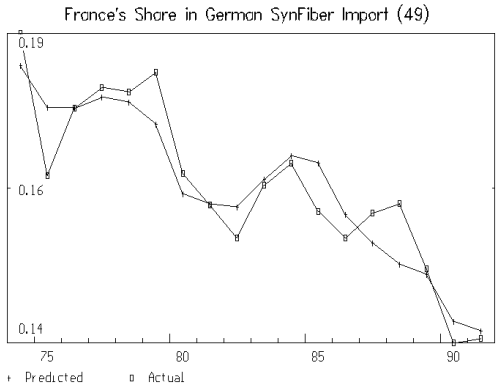

Figure 23

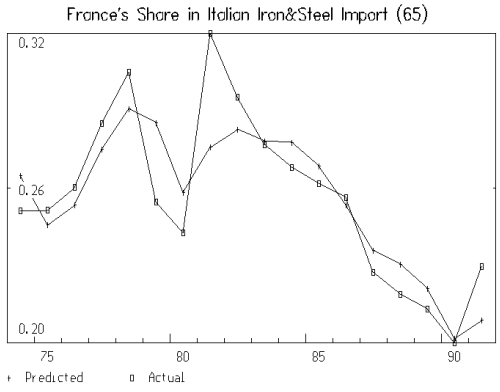

Figure 24

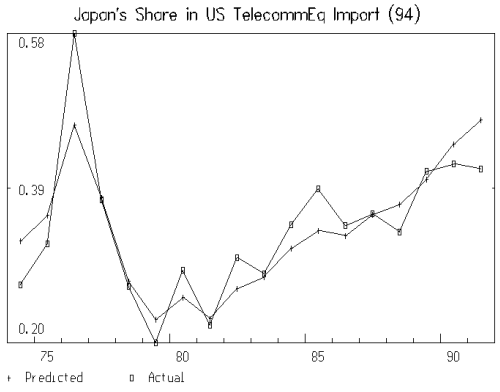

Figure 25

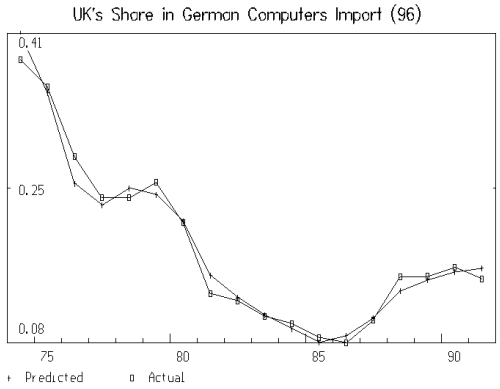

Figure 26

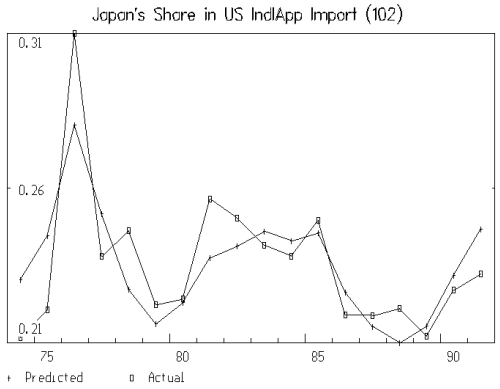

Figure 27

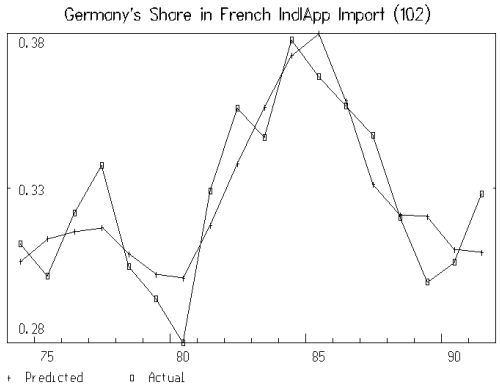

Figure 28

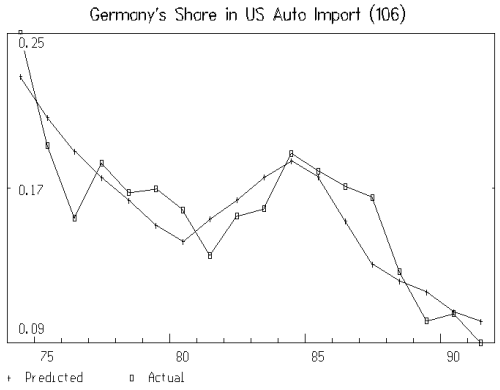

Figure 29

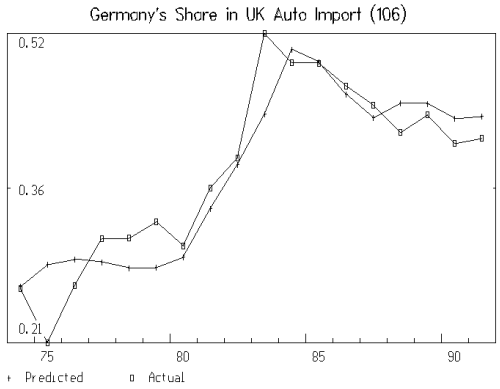

Figure 30

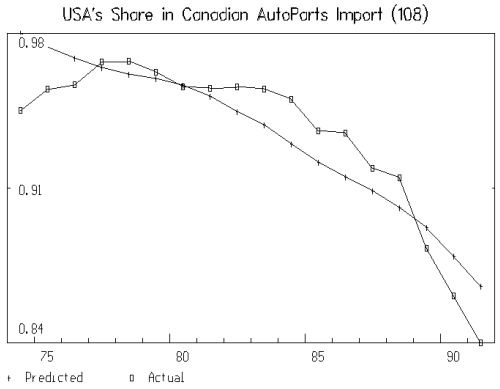

TABLE 10: Summary Statistics on the Fit of the Share Equations

SECTOR	TITLE	NEQ	PEQ	Pt2	KEQ	Kt2	TEQ	Tt2	R50
1	Unmilled cereals	112 (99)	79 (80)	11 (9)	64 (58)	28 (26)	77 (43)	30 (22)	31 (17)
2	Fresh fruits & vegs	150 (100)	134 (95)	57 (45)	96 (58)	33 (25)	116 (89)	51 (43)	67 (46)
3	Other crops	162 (100)	132 (80)	47 (23)	107 (76)	36 (51)	102 (75)	36 (28)	67 (52)
4	Livestock	143 (100)	114 (83)	38 (30)	88 (73)	36 (31)	108 (78)	48 (29)	51 (38)
5	Silk	55 (99)	48 (98)	14 (25)	25 (37)	5 (14)	42 (55)	6 (22)	13 (25)
6	Cotton	107 (94)	75 (58)	23 (19)	70 (41)	21 (9)	80 (79)	29 (56)	36 (39)
7	Wool	135 (100)	111 (92)	46 (37)	78 (57)	24 (28)	102 (81)	39 (41)	51 (45)
8	Other natural fibers	91 (99)	75 (84)	26 (29)	47 (49)	13 (13)	70 (79)	28 (36)	37 (56)
9	Crude wood	117 (100)	97 (86)	40 (50)	63 (65)	19 (13)	86 (78)	43 (52)	50 (54)
10	Fishery	145 (100)	119 (82)	48 (32)	92 (81)	28 (14)	116 (85)	58 (55)	70 (73)
11	Iron ores	49 (100)	32 (56)	17 (42)	31 (77)	4 (7)	36 (64)	14 (28)	18 (33)
12	Coal	79 (97)	71 (88)	30 (50)	51 (81)	22 (39)	52 (58)	25 (36)	34 (43)
13	Nonferrous metal ores	126 (99)	96 (80)	34 (29)	53 (44)	15 (10)	96 (83)	33 (30)	26 (15)
14	Crude petroleum	50 (99)	42 (97)	16 (39)	26 (80)	17 (46)	41 (77)	24 (58)	27 (59)
15	Natural gas	41 (96)	31 (85)	13 (15)	19 (35)	5 (1)	26 (61)	16 (41)	18 (41)
16	Non-metallic ore	188 (100)	165 (83)	77 (52)	105 (55)	31 (15)	136 (74)	71 (50)	106 (54)
17	Electrical energy	21 (63)	13 (31)	4 (6)	7 (21)	1 (5)	14 (57)	3 (3)	6 (15)
18	Meat	150 (100)	121 (92)	48 (41)	98 (72)	36 (43)	110 (80)	60 (49)	69 (67)
19	Dairy products	150 (100)	117 (87)	46 (40)	81 (70)	24 (22)	113 (68)	43 (23)	53 (32)
20	Preserved fruits & veg	173 (100)	139 (79)	70 (34)	101 (75)	38 (25)	137 (88)	74 (65)	83 (60)
21	Preserved seafood	171 (100)	136 (79)	60 (34)	111 (59)	36 (19)	116 (85)	54 (54)	77 (57)
22	Veg & animal oils,fats	147 (99)	115 (78)	39 (35)	78 (51)	25 (17)	111 (69)	59 (38)	63 (43)
23	Grain mill products	122 (100)	93 (88)	28 (40)	69 (74)	25 (33)	85 (66)	44 (31)	48 (55)
24	Bakery products	153 (100)	123 (91)	56 (40)	93 (70)	36 (39)	117 (83)	61 (59)	83 (73)
25	Sugar	88 (93)	63 (71)	11 (15)	45 (52)	14 (21)	68 (79)	19 (27)	27 (38)
26	Cocoa, chocolate, etc.	165 (100)	128 (79)	59 (40)	102 (75)	39 (30)	131 (80)	64 (45)	82 (59)
27	Food products, n.e.c.	191 (100)	134 (68)	52 (24)	109 (53)	32 (11)	145 (82)	83 (61)	90 (63)
28	Prepared animal feeds	150 (100)	117 (80)	43 (31)	77 (47)	22 (16)	114 (73)	40 (32)	37 (24)
29	Alcoholic beverages	164 (100)	135 (93)	83 (69)	113 (79)	40 (37)	119 (86)	49 (43)	95 (70)
30	Non-alcoholic beverage	123 (99)	94 (72)	29 (25)	62 (53)	15 (25)	90 (74)	35 (29)	36 (32)
31	Tobacco products	125 (100)	91 (66)	49 (47)	64 (77)	17 (9)	88 (71)	38 (16)	53 (66)
32	Yarns and threads	206 (100)	172 (90)	78 (42)	138 (62)	50 (22)	158 (79)	88 (57)	103 (65)
33	Cotton fabrics	196 (100)	159 (89)	63 (20)	105 (44)	29 (15)	149 (60)	69 (35)	86 (42)
34	Other textile products	213 (100)	178 (84)	88 (38)	131 (55)	56 (26)	159 (76)	87 (46)	122 (63)
35	Floor coverings	162 (100)	133 (78)	63 (46)	77 (45)	32 (26)	119 (87)	60 (56)	83 (63)
36	Wearing apparels	190 (100)	163 (89)	77 (44)	113 (48)	50 (20)	138 (81)	66 (51)	104 (71)
37	Leather and hides	190 (100)	162 (94)	76 (54)	126 (68)	55 (35)	132 (80)	65 (43)	108 (64)
38	Leather products	193 (100)	157 (88)	56 (38)	116 (67)	55 (43)	139 (74)	53 (38)	102 (61)
39	Footwear	176 (100)	130 (80)	57 (32)	101 (64)	37 (30)	137 (79)	81 (56)	102 (72)
40	Plywood and veneer	126 (100)	97 (88)	47 (34)	57 (35)	21 (14)	93 (72)	45 (57)	45 (54)
41	Other wood products	195 (100)	149 (81)	48 (17)	121 (53)	42 (20)	148 (84)	72 (47)	85 (45)
42	Furnitures and fixture	190 (100)	144 (79)	66 (33)	119 (71)	43 (35)	139 (79)	57 (38)	81 (54)
43	Pulp and waste paper	116 (100)	95 (78)	46 (48)	63 (48)	15 (8)	96 (90)	54 (63)	52 (66)
44	Newsprint	72 (89)	50 (28)	12 (6)	35 (69)	8 (2)	53 (74)	24 (17)	25 (14)
45	Paper products	190 (100)	159 (94)	95 (55)	119 (60)	37 (18)	130 (88)	67 (39)	103 (53)
46	Printing & publishing	204 (100)	186 (92)	111 (64)	116 (61)	36 (24)	155 (83)	69 (48)	110 (71)
47	Basic chemicals	222 (100)	198 (92)	108 (58)	145 (62)	55 (20)	164 (84)	71 (37)	115 (51)
48	Fertilizers	169 (100)	141 (94)	60 (45)	99 (58)	29 (21)	116 (49)	42 (20)	57 (31)
49	Synthetic resins,fiber	207 (100)	184 (92)	102 (67)	129 (63)	54 (22)	140 (80)	84 (56)	120 (72)
50	Paints and varnishes	160 (100)	129 (90)	58 (49)	106 (56)	39 (27)	113 (81)	57 (42)	85 (58)
51	Drugs and medicines	201 (100)	178 (87)	101 (55)	136 (65)	44 (27)	141 (78)	65 (30)	114 (62)
52	Soaps and other toilet	182 (100)	148 (92)	69 (59)	115 (71)	36 (27)	131 (74)	57 (26)	94 (53)
53	Chemical products, nec	205 (100)	176 (94)	93 (49)	123 (58)	43 (22)	139 (78)	66 (43)	116 (63)
54	Petroleum refinery	133 (99)	98 (76)	38 (27)	69 (45)	19 (15)	103 (88)	39 (26)	44 (39)
55	Fuel oils	93 (98)	64 (65)	19 (18)	48 (41)	11 (12)	68 (70)	25 (33)	32 (39)
56	Product of petroleum	164 (99)	131 (77)	51 (21)	91 (62)	26 (27)	119 (75)	46 (34)	72 (49)
57	Product of coal	77 (97)	58 (73)	16 (15)	50 (61)	9 (23)	51 (63)	23 (43)	24 (39)
58	Tyre and tube	184 (100)	147 (91)	68 (46)	120 (66)	46 (29)	129 (79)	62 (40)	80 (56)
59	Rubber products, n.e.c	204 (100)	166 (85)	71 (52)	117 (62)	28 (12)	159 (83)	72 (44)	87 (58)
60	Plastic products, nec	210 (100)	174 (86)	82 (43)	126 (65)	38 (15)	168 (83)	73 (40)	112 (64)
61	Glass	202 (100)	169 (89)	88 (49)	132 (69)	37 (32)	145 (84)	66 (40)	96 (51)
62	Cement	106 (99)	85 (83)	33 (35)	59 (44)	20 (10)	69 (67)	28 (22)	39 (32)

TABLE 10: (continued)

SECTOR	TITLE	NEQ	PEQ	Pt2	KEQ	Kt2	TEQ	Tt2	R50
63	Ceramics	205 (100)	148 (64)	58 (27)	126 (49)	47 (15)	159 (85)	63 (32)	66 (36)
64	Other nonmetallic prod	196 (100)	159 (90)	77 (38)	116 (63)	45 (33)	146 (84)	65 (43)	88 (55)
65	Basic iron and steel	203 (100)	180 (96)	88 (43)	123 (73)	35 (20)	137 (62)	61 (28)	97 (52)
66	Copper	163 (99)	122 (73)	41 (20)	96 (66)	28 (21)	115 (74)	59 (41)	68 (54)
67	Aluminum	169 (100)	141 (84)	60 (42)	104 (64)	38 (17)	116 (76)	41 (34)	63 (36)
68	Nickel	128 (98)	96 (72)	44 (31)	77 (70)	22 (17)	98 (73)	31 (22)	36 (30)
69	Lead and zinc	136 (99)	96 (84)	42 (32)	82 (66)	18 (16)	103 (82)	39 (32)	45 (50)
70	Other nonferrous metal	171 (100)	136 (86)	51 (24)	96 (65)	20 (6)	124 (80)	47 (31)	50 (30)
71	Metal furniture,fixture	191 (100)	146 (84)	65 (42)	112 (61)	37 (23)	141 (83)	66 (51)	90 (62)
72	Structural metal prod	156 (100)	113 (76)	36 (24)	76 (38)	16 (10)	118 (90)	46 (47)	41 (40)
73	Metal containers	151 (100)	117 (80)	35 (36)	94 (66)	20 (18)	111 (68)	47 (34)	41 (35)
74	Wire products	189 (100)	154 (86)	50 (33)	107 (57)	32 (23)	129 (77)	61 (43)	63 (51)
75	Hardware	222 (100)	186 (90)	100 (65)	131 (64)	48 (20)	172 (73)	92 (44)	116 (56)
76	Boilers and turbines	147 (99)	104 (65)	27 (21)	86 (52)	20 (13)	116 (84)	40 (27)	36 (27)
77	Aircraft engines	110 (99)	82 (84)	33 (41)	74 (67)	22 (20)	78 (67)	32 (36)	36 (45)
78	Internal combustion eng	167 (100)	139 (93)	64 (42)	113 (68)	29 (15)	128 (73)	59 (34)	85 (54)
79	Other power machinery	152 (100)	110 (77)	24 (10)	75 (56)	9 (5)	104 (80)	26 (18)	25 (12)
80	Agricultural machinery	173 (100)	154 (96)	72 (52)	98 (69)	23 (16)	136 (81)	59 (32)	84 (61)
81	Construction,mining eq	185 (100)	159 (94)	76 (65)	125 (70)	36 (27)	128 (68)	61 (41)	75 (54)
82	Metalworking machinery	205 (100)	172 (80)	73 (30)	118 (47)	35 (15)	152 (85)	66 (49)	92 (47)
83	Sewing machinery	191 (100)	148 (83)	62 (45)	106 (43)	37 (19)	138 (85)	61 (44)	82 (50)
84	Textile machinery	167 (100)	133 (88)	53 (31)	96 (52)	25 (15)	118 (78)	41 (33)	52 (33)
85	Paper mill machinery	171 (100)	144 (95)	34 (32)	111 (69)	13 (8)	127 (83)	39 (27)	42 (28)
86	Printing machinery	159 (100)	127 (92)	65 (45)	110 (68)	32 (20)	109 (71)	32 (23)	55 (45)
87	Food-processing machine	170 (100)	135 (82)	54 (30)	99 (59)	23 (17)	129 (83)	51 (47)	62 (52)
88	Other special machines	194 (100)	139 (73)	38 (13)	124 (61)	36 (27)	130 (65)	47 (38)	68 (40)
89	Service ind. machinery	184 (99)	159 (90)	55 (33)	111 (68)	28 (17)	136 (73)	50 (29)	69 (38)
90	Pumps	190 (100)	163 (93)	72 (52)	118 (75)	34 (20)	134 (75)	67 (38)	89 (51)
91	Mechanical handling eq	200 (100)	168 (91)	70 (52)	126 (76)	30 (17)	137 (75)	59 (31)	78 (55)
92	Other non-elec machine	201 (100)	176 (94)	81 (54)	123 (63)	44 (24)	145 (82)	62 (38)	94 (61)
93	Radio, TV, phonograph	190 (100)	148 (87)	60 (37)	97 (40)	22 (7)	130 (74)	50 (24)	93 (63)
94	Other telecom equipment	204 (100)	175 (95)	76 (51)	120 (52)	28 (19)	146 (72)	74 (40)	110 (68)
95	Household appliances	195 (99)	156 (78)	65 (40)	106 (59)	32 (13)	138 (81)	59 (45)	84 (52)
96	Computers & accessories	189 (100)	154 (82)	57 (27)	119 (58)	37 (21)	132 (78)	57 (54)	109 (63)
97	Other office machinery	188 (100)	145 (80)	45 (39)	93 (41)	25 (11)	124 (81)	46 (27)	78 (49)
98	Semiconductors	183 (100)	140 (83)	70 (41)	107 (53)	33 (14)	144 (80)	68 (45)	94 (66)
99	Electric motors	179 (99)	112 (69)	40 (39)	99 (54)	43 (26)	137 (82)	59 (43)	69 (44)
100	Batteries	180 (99)	151 (94)	70 (49)	100 (60)	35 (28)	141 (83)	72 (46)	96 (59)
101	Electric bulbs	197 (99)	163 (86)	61 (38)	112 (61)	40 (22)	150 (80)	78 (40)	109 (56)
102	Industrial appliances	210 (100)	167 (89)	80 (52)	154 (80)	46 (29)	157 (81)	81 (40)	114 (66)
103	Shipbuilding,ex.warship	145 (99)	105 (57)	30 (11)	91 (61)	16 (24)	112 (90)	29 (29)	22 (39)
104	Warships	7 (93)	5 (60)	2 (0)	2 (59)	1 (1)	4 (61)	3 (59)	3 (1)
105	Railroad equipment	136 (99)	92 (71)	28 (33)	82 (68)	16 (28)	101 (69)	29 (26)	29 (26)
106	Motor vehicles	155 (100)	124 (91)	70 (34)	83 (50)	34 (24)	120 (84)	70 (68)	88 (56)
107	Motorcycles & bicycles	167 (99)	134 (84)	59 (28)	71 (27)	25 (10)	132 (85)	75 (56)	79 (48)
108	Motor vehicle parts	175 (100)	132 (74)	64 (38)	116 (73)	42 (21)	129 (77)	76 (44)	94 (60)
109	Aircraft	107 (100)	81 (89)	30 (46)	63 (77)	14 (29)	83 (93)	40 (64)	33 (42)
110	Other transport equip	86 (94)	63 (46)	25 (18)	42 (61)	26 (53)	74 (85)	45 (61)	48 (67)
111	Professional instrument	206 (100)	176 (89)	84 (55)	113 (48)	43 (22)	152 (85)	69 (37)	106 (56)
112	Optical goods	200 (100)	168 (89)	86 (64)	119 (63)	36 (29)	143 (71)	74 (38)	96 (44)
113	Watches and clocks	171 (100)	140 (83)	65 (48)	92 (33)	35 (6)	126 (64)	61 (32)	98 (52)
114	Jewellery	171 (100)	142 (90)	56 (47)	90 (48)	34 (24)	141 (84)	59 (44)	58 (50)
115	Musical instruments	192 (100)	166 (91)	82 (68)	116 (48)	38 (21)	139 (75)	71 (60)	116 (83)
116	Sporting goods	213 (100)	180 (74)	92 (43)	127 (67)	48 (32)	155 (75)	89 (56)	120 (69)
117	Ordnance	112 (96)	83 (77)	23 (38)	70 (86)	15 (23)	82 (49)	28 (33)	21 (17)
118	Works of art	160 (100)	132 (75)	49 (40)	90 (56)	20 (18)	121 (68)	42 (38)	45 (25)
119	Manufactured goods,nec	213 (100)	176 (80)	87 (36)	136 (68)	52 (29)	160 (81)	71 (32)	118 (54)
120	Scraps,used,etc	167 (100)	139 (87)	63 (44)	98 (46)	27 (12)	132 (76)	62 (37)	63 (41)

Overall:

NEQ	PEQ	Pt2	KEQ	Kt2	TEQ	Tt2	R50
19125 (99)	15375 (86)	6573 (41)	11288 (61)	3582 (22)	14063 (78)	6317 (43)	8383 (54)

graphs and the summary statistic table on the preceding pages, we have attempted to demonstrate that there is ample empirical evidence on the robustness of the three explanatory variables in the trade share equations. Given the fact that in most cases the trade share experiences both ups and downs over the 18-year estimation period, the close fit of most of the share equations appears even more remarkable, because they suggest that the two independent variables that are economically meaningful (i.e. the relative prices and relative capital stock), rather than the trend variable, are the more significant explanatory variables in the trade share equations.

6. Historical Simulation: 1980-91

Historical simulation is one of the basic tests model-builders apply to any forecasting model to gauge its predictive accuracy. This test runs the model over the period for which it was estimated. Actual values of exogenous variables are used. Lagged values of endogenous variables may be either their actual values (for a static simulation) or the values calculated by the model (for a dynamic simulation). Here, we will be concerned only with the dynamic simulation.

We run the trade model for twelve sample years (1980-91). In solving the model, the competitive prices and relative capital stock for each country are computed from the export prices and capital investment supplied by the country models in the Inforum international system, and the solutions are obtained for trade-shares matrix. Then, for the given total import demand by industry of each country, the solutions are also obtained for bilateral trade flows and each country's exports.

Before we proceed to evaluate the trade model's performance in the historical simulation, we should note that good historical simulation results are not necessarily indicative of the strong explanatory power of the underlying model. It is certainly true that a model can be "rigged" to do well in dynamic historical simulation. All that is necessary is to put exogenous variables in each equation that provide the bulk of the explanation. For example, in a macroeconomic model of the U.S. economy, one could put into its equation for inflation in the GDP deflator the rate of inflation in the Consumer Price Index (CPI), and left the latter exogenous. Obviously such an equation would have fit well and would perform well in historical simulation. Its explanatory power and its value in forecasting, however, is nil. On the other hand, if a model does not have such rigging, the historical simulation can ba a meaningful as well as demanding test.

We submit that the dynamic historical simulation reported below belongs in the latter category, because the explanatory variables in the trade-share equations -- relative prices, relative capital investment and the Nyhus trend -- are not exogenous to the linked system; they are solved in the country models and then fed to the trade model. Thus, the better the historical simulation results, the stronger the explanatory power of the model.

To judge the predictive accuracy of the trade model, we have compared its historical

simulation with what trade flows would have been had trade shares remained constant.[6] As we will see in the next few pages, with its rather elaborate consideration of prices and capital investment, the present trade model has definitely outperformed the simpler scheme, namely, the assumption of constant shares.

The following presentation contains two parts. In the first, we will examine the predictive errors in the import shares. In the second, we will look at the errors in exports.

Errors in Import Shares

To compare errors in the predicted import shares under the two alternative historical simulations, we have calculated, for each historical simulation run, the length or "norm" of the difference of two vectors ***a*** and ***b***, where ***a*** is a vector of the predicted shares of all exporting countries in a given import market, and ***b*** a vector of the actual shares in the same market. Let ***c*** denote the difference between vectors ***a*** and ***b***, that is, ***c*** = ***a*** - ***b***, then, the "l-norm" of ***c*** is computed as follows:[7]

$$\|c\| = \sum_{i=1}^{n} |c_i| \qquad \textbf{(5)}$$

Note that the lower limit of the "l-norm" of vector ***c*** is zero, which is the case of a perfect fit, where the predicted shares of all exporting countries in a given import market match exactly the corresponding historical shares. To determine the upper limit of the "l-norm" of vector ***c***, recall that a general property of norms holds that,

$$\|a-b\| \leq \|a\| + \|b\| \qquad \textbf{(6)}$$

where the "l-norm" of ***a*** is equal to the sum of predicted trade shares of all exporting countries in a given import market, which, by the "adding-up" condition, is necessarily equal to 1. Likewise, the "l-norm" of ***b*** is the sum of the actual trade shares of all exporting countries in a given import market, which is also equal to 1. Hence, the upper limit of the "l-norm" of vector ***c*** -- the result of a worst possible fit between the predicted and actual shares -- must be 2 (= 1 + 1).

Table 11 shows sum of the "l-norm" of vector ***c*** over all 16 import markets for each trade model sector for each of the 12 years in the historical simulation period (1974-91). Note

[6]The constant shares used are those for the beginning year of the historical simulation period, 1980.

[7]The l in "l-norm" refers to French mathematician Henri Leon Lebesgue (1875-1941).

Table 11: Errors in the Import Shares by Sector by Year: Equation Share vs. Constant Share

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1	Unmilled cereals	4.15	4.58	5.46	4.62	4.41	5.39	5.00	5.08	5.13	5.81	5.23	4.74
		0.00	2.72	3.94	4.89	6.13	8.20	9.08	9.03	9.69	9.08	8.69	10.97
2	Fresh fruits & vegs	2.05	2.28	3.30	2.44	2.53	2.80	2.19	2.21	1.78	1.87	2.02	2.03
		0.00	2.15	2.95	3.57	4.53	4.67	4.58	5.38	5.54	5.80	6.69	7.06
3	Other crops	1.89	2.43	2.24	1.94	1.68	2.26	2.00	2.47	2.31	1.94	2.58	2.58
		0.00	2.48	2.93	2.52	2.23	3.13	3.05	5.55	5.76	6.07	7.09	7.45
4	Livestock	4.83	5.34	4.61	3.70	3.84	4.40	3.82	3.43	3.58	3.88	3.87	4.68
		0.00	3.98	5.18	4.81	5.38	6.44	6.83	7.38	7.98	7.95	8.37	8.86
5	Silk	5.28	5.00	5.40	5.52	5.59	4.81	4.37	3.20	2.90	3.62	3.96	2.97
		0.00	7.99	8.75	7.62	11.36	9.52	9.18	12.07	11.70	14.28	14.29	15.43
6	Cotton	3.11	3.47	3.75	3.14	2.89	3.14	4.21	3.00	3.29	2.52	2.51	2.54
		0.00	3.34	2.57	3.35	3.85	4.02	7.74	7.98	7.22	6.62	6.72	7.18
7	Wool	2.04	3.27	2.75	2.83	3.02	2.34	2.61	2.62	2.68	2.71	3.25	3.17
		0.00	1.96	2.35	3.29	4.06	3.76	3.52	5.00	5.19	5.71	5.54	6.20
8	Other natural fiber	2.97	3.05	3.04	4.57	4.77	4.59	4.84	4.45	4.29	4.55	5.26	4.85
		0.00	3.02	4.48	5.42	6.74	5.71	6.24	9.90	9.46	8.30	8.58	10.15
9	Crude wood	2.16	2.50	2.06	1.52	1.55	1.88	2.30	1.61	1.93	1.70	1.66	2.15
		0.00	1.32	1.70	2.21	2.71	3.21	3.21	3.98	4.39	5.13	5.18	5.74
10	Fishery	4.60	4.38	4.20	4.05	4.09	3.80	4.25	3.83	3.71	3.89	3.44	4.00
		0.00	4.72	5.95	6.29	6.66	6.72	6.77	7.66	7.88	8.35	8.51	8.80
11	Iron ore	2.07	2.84	2.54	2.94	2.28	2.38	1.71	2.20	1.78	1.42	1.30	1.20
		0.00	2.11	2.61	3.44	2.87	3.46	3.44	4.44	4.48	5.04	5.51	5.39
12	Coal	4.27	5.34	4.18	4.18	4.22	3.52	3.74	3.05	2.15	1.63	1.84	1.86
		0.00	5.41	4.51	6.71	8.13	7.64	7.22	8.38	7.96	7.73	8.03	8.49
13	Nonferrous metl ore	4.16	3.24	3.86	3.80	3.41	3.28	3.00	2.89	3.29	3.35	3.76	3.92
		0.00	3.53	4.14	5.04	5.31	6.03	6.35	7.56	7.59	7.66	7.92	8.17
14	Crude petroleum	2.37	2.82	3.55	3.71	3.06	2.61	2.31	2.12	1.59	1.28	1.47	1.84
		0.00	2.06	4.51	5.83	3.93	5.39	4.43	7.34	8.27	7.01	6.31	6.86
15	Natural gas	1.65	2.17	3.14	2.80	2.54	1.81	2.86	2.58	2.12	1.57	1.66	1.22
		0.00	3.25	4.10	4.86	5.25	6.87	6.72	8.54	6.25	6.75	7.47	6.94
16	Non-Metallic ore	2.48	3.96	3.89	4.11	3.27	3.37	3.91	3.52	2.87	3.23	3.01	3.46
		0.00	3.54	4.16	5.03	5.62	6.13	5.77	7.27	6.65	7.08	7.25	7.76
17	Electrical energy	1.62	1.54	2.10	1.83	1.74	1.58	2.02	1.70	1.66	1.55	1.64	1.64
		0.00	4.53	4.36	5.33	7.06	5.20	6.73	8.70	9.62	9.27	9.12	9.92
18	Meat	3.28	3.24	2.94	2.74	2.67	2.73	2.90	3.29	3.32	3.30	3.16	3.41
		0.00	2.88	3.70	4.00	4.63	4.46	4.58	5.92	5.89	6.57	6.97	7.33
19	Dairy products	3.34	3.57	3.17	3.19	2.93	2.83	3.52	3.42	3.39	3.61	3.72	4.33
		0.00	2.00	2.72	3.93	3.96	3.78	4.41	5.21	5.29	5.63	6.17	6.41
20	Preserved fruit,veg	3.36	4.74	3.65	3.33	3.40	3.59	3.70	4.42	3.22	3.63	3.60	3.73
		0.00	2.67	3.18	3.87	4.50	4.79	4.75	5.86	5.81	6.76	7.61	7.75

Table 11: (continued)

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
21	Preserved seafood	4.23	5.11	4.15	4.45	4.69	5.27	5.18	4.55	4.78	4.34	4.42	4.36
		0.00	2.67	3.62	4.47	5.12	5.28	5.52	6.72	7.99	7.81	7.68	7.95
22	Veg &animal oil,fat	3.40	3.30	3.36	3.52	2.97	2.71	3.17	3.74	3.23	3.64	4.21	4.81
		0.00	2.46	2.99	4.53	4.96	5.62	5.63	6.91	7.45	8.14	9.17	9.60
23	Grain mill products	5.18	6.22	6.63	6.24	6.38	5.33	4.19	5.22	5.12	4.77	4.56	4.30
		0.00	4.87	6.90	7.31	7.67	9.09	8.53	10.56	10.95	10.11	10.30	10.13
24	Bakery products	3.27	5.34	4.79	4.73	4.25	3.46	3.82	3.75	4.29	4.18	4.12	4.75
		0.00	3.81	5.04	6.09	7.18	7.10	7.23	7.47	8.31	9.16	9.50	9.98
25	Sugar	4.53	4.75	3.84	3.44	4.30	3.44	3.67	3.29	3.17	4.05	2.76	3.58
		0.00	5.19	5.25	5.50	6.25	6.50	6.32	8.33	8.69	8.22	8.32	9.15
26	Cocoa,chocolate,etc	4.39	4.03	4.33	5.69	5.34	5.61	4.85	5.62	5.23	5.35	5.56	5.45
		0.00	3.87	4.71	5.79	6.09	6.60	6.45	7.73	7.38	7.84	7.82	8.13
27	Food products,nec	5.03	5.97	6.30	5.74	6.14	5.30	5.17	4.36	4.45	4.55	4.36	5.17
		0.00	2.48	3.88	4.75	4.91	5.73	5.66	6.43	6.43	6.85	7.03	7.30
28	Prepared animalfeed	5.75	4.76	4.42	5.11	4.43	4.29	3.86	3.48	3.16	3.04	3.58	3.71
		0.00	4.12	5.49	6.54	6.33	6.97	6.86	7.71	7.97	8.08	8.02	8.56
29	Alcoholic beverages	3.25	4.97	4.27	4.02	3.42	3.55	4.05	4.43	3.40	3.35	3.33	3.10
		0.00	3.35	5.17	7.39	8.54	8.29	7.30	8.06	7.80	8.53	7.79	7.70
30	Nonalcoholic bevera	4.14	5.06	5.52	5.19	5.62	5.52	5.49	4.41	5.39	4.56	5.13	5.58
		0.00	6.34	6.55	8.30	9.41	10.65	11.33	13.16	12.55	11.20	10.88	11.13
31	Tobacco products	4.46	5.03	3.96	5.70	3.53	4.41	5.91	4.56	5.10	5.01	5.52	6.39
		0.00	2.77	4.12	6.14	6.29	6.85	5.28	7.97	7.53	7.32	7.50	7.42
32	Yarns and threads	3.82	3.45	3.42	2.90	3.09	2.24	3.00	3.19	2.59	2.73	2.91	3.20
		0.00	3.43	4.19	4.74	5.54	6.17	6.20	8.24	8.09	8.08	8.01	8.60
33	Cotton fabrics	3.30	3.17	3.75	2.90	3.02	3.23	3.34	2.73	2.76	2.70	2.79	3.21
		0.00	3.29	4.14	5.02	5.70	6.29	6.01	8.12	7.86	7.71	7.63	7.99
34	Other textile prod	2.27	2.54	3.38	2.23	2.14	2.28	2.61	2.52	2.40	2.41	2.40	2.47
		0.00	2.03	2.79	3.61	4.14	4.97	5.41	6.41	6.59	6.81	6.75	7.17
35	Floor coverings	3.27	3.74	3.62	4.00	3.40	3.33	4.04	2.83	2.95	3.23	3.50	3.01
		0.00	3.60	5.64	7.65	7.79	7.30	7.64	8.43	8.54	8.99	9.15	9.35
36	Wearing apparels	3.06	2.87	3.56	2.56	2.46	2.55	2.23	2.46	2.47	2.71	3.15	3.39
		0.00	2.52	3.53	4.42	4.98	5.22	5.02	6.61	6.93	7.44	8.02	8.80
37	Leather and hides	3.14	4.13	3.78	3.18	2.94	2.71	3.41	2.99	2.29	2.18	2.58	2.50
		0.00	2.73	3.23	3.97	4.84	5.23	5.20	6.08	6.73	7.35	8.08	8.46
38	Leather Products	3.79	3.94	3.90	3.91	4.14	4.09	3.71	3.74	3.73	3.20	4.15	4.65
		0.00	2.61	3.37	5.23	5.88	6.32	7.31	9.60	10.59	10.40	11.09	11.71
39	Footwear	4.08	4.28	4.68	4.61	4.47	4.15	4.16	3.66	4.03	3.63	4.40	4.89
		0.00	3.58	4.46	5.51	5.36	5.55	5.58	7.06	6.92	7.68	8.66	9.33
40	Plywood and veneer	5.15	5.80	4.95	5.28	4.33	4.27	4.90	3.70	4.44	4.05	4.18	5.07
		0.00	4.03	5.67	6.53	6.83	8.58	8.65	10.45	10.65	10.86	11.24	11.74

Table 11: (continued)

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
41	Other wood products	2.60	3.30	2.59	2.35	2.38	2.09	3.24	2.81	2.77	3.10	3.89	4.53
		0.00	3.02	3.26	3.49	4.31	4.53	4.68	6.24	6.12	6.63	6.85	7.18
42	Furniture & fixture	2.36	3.41	3.19	2.71	2.49	2.51	2.72	2.83	2.58	2.64	3.22	3.51
		0.00	2.81	3.82	3.93	4.33	4.99	4.98	6.37	5.91	5.87	6.01	6.33
43	Pulp & waste paper	2.29	2.44	2.52	2.22	2.03	1.93	2.08	2.81	2.93	2.79	2.87	3.17
		0.00	1.50	2.20	2.88	2.81	2.93	2.79	3.67	4.09	4.16	4.38	5.17
44	Newsprint	3.44	4.37	4.16	4.10	4.11	4.17	4.10	5.06	4.09	3.86	4.01	4.27
		0.00	3.58	3.15	4.95	5.83	5.13	7.04	8.04	10.00	9.37	9.78	10.52
45	Paper products	2.49	3.60	2.78	2.05	2.35	2.82	3.74	4.28	4.58	3.96	3.47	3.65
		0.00	1.99	2.53	3.48	4.42	4.89	4.51	5.20	5.70	5.91	5.24	5.20
46	Printing,publishing	1.78	2.54	2.75	2.07	2.06	2.16	2.48	2.45	2.49	2.29	2.48	2.91
		0.00	2.06	3.04	3.69	4.19	4.70	4.15	4.56	4.40	5.48	5.57	6.05
47	Basic chemicals	1.50	2.04	1.68	1.50	1.60	1.33	2.10	1.84	2.00	1.94	1.96	1.89
		0.00	2.22	2.84	3.45	4.10	4.28	3.79	4.57	4.80	4.97	4.97	5.05
48	Fertilizers	3.61	3.67	3.08	2.80	2.66	2.77	3.07	3.34	3.36	2.52	2.78	3.37
		0.00	3.25	4.29	4.53	5.22	5.24	5.95	6.46	7.10	7.33	7.03	7.36
49	Synthetic fibers	2.00	2.57	2.27	1.97	1.75	1.64	1.76	2.21	2.36	2.00	1.86	1.73
		0.00	1.66	2.31	3.15	3.65	4.10	3.64	4.27	4.45	4.64	4.53	4.63
50	Paints,varnishes	1.86	2.52	2.28	1.83	2.00	2.18	2.27	3.03	3.46	3.57	3.15	3.23
		0.00	2.05	2.61	3.51	4.22	4.54	4.58	5.22	5.50	5.93	5.62	5.80
51	Drugs and medicines	1.77	2.57	2.63	2.22	1.92	2.05	2.21	2.46	2.02	2.31	2.10	2.31
		0.00	1.99	2.90	3.62	4.23	4.87	4.39	5.26	5.29	5.89	5.86	5.96
52	Soaps &other toilet	1.80	2.77	2.78	2.15	2.10	2.15	2.70	2.66	2.73	2.52	2.66	2.65
		0.00	2.00	2.99	4.21	5.08	5.26	4.85	5.40	5.11	5.53	5.00	5.25
53	Chemical prod.,nec	1.73	2.18	2.50	1.72	1.63	1.70	2.19	2.77	2.94	2.70	2.19	2.98
		0.00	1.74	3.34	4.01	4.53	5.45	4.91	5.49	5.38	6.24	6.15	6.37
54	Petroleum refinery	3.41	4.47	4.04	3.30	2.97	2.92	2.94	2.83	2.54	2.95	3.03	3.43
		0.00	3.79	4.85	5.70	6.01	6.05	6.15	7.02	6.72	7.05	6.54	6.69
55	Fuel oils	2.82	4.11	4.01	4.12	3.37	3.07	2.36	1.97	1.77	2.39	2.65	3.38
		0.00	4.46	5.92	7.84	8.37	8.94	9.34	9.78	10.48	10.49	9.79	10.17
56	Prod of petroleum	5.55	8.04	5.73	5.38	5.10	5.16	5.08	5.99	4.72	4.19	4.03	4.78
		0.00	5.55	4.73	6.91	7.36	7.62	7.61	9.04	9.94	9.93	10.43	9.71
57	Product of coal	4.84	4.94	5.24	5.85	5.30	4.51	4.42	3.42	3.31	3.39	2.76	3.67
		0.00	4.22	6.24	7.34	6.97	7.60	7.58	8.57	9.09	9.81	10.98	11.89
58	Tyre and tube	4.54	5.24	4.49	4.87	4.31	4.47	4.90	4.16	4.63	4.70	4.95	5.43
		0.00	2.94	4.39	5.74	6.04	6.38	6.10	7.01	7.33	7.42	7.51	7.57
59	Rubber products,nec	2.88	3.29	3.06	2.55	2.44	2.25	3.21	3.31	3.31	3.13	3.02	3.09
		0.00	2.45	3.39	4.38	4.22	4.49	4.09	5.20	5.34	5.94	6.10	6.38
60	Plastic product,nec	2.80	2.67	2.80	2.23	2.15	2.08	2.51	2.72	3.01	3.04	3.21	3.39
		0.00	2.01	2.60	3.42	3.66	3.93	4.12	5.35	5.59	5.81	6.08	6.71

Table 11: (continued)

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
61	Glass	1.92	2.53	2.89	2.26	1.59	1.70	2.40	2.46	2.04	2.29	2.27	2.51
		0.00	2.37	3.31	4.05	4.31	4.34	4.03	4.90	5.03	5.40	5.20	5.45
62	Cement	6.03	7.65	7.67	6.21	7.10	6.50	5.49	4.73	4.93	4.68	5.56	5.06
		0.00	3.35	6.35	8.00	8.37	9.76	10.93	12.83	15.08	14.57	14.61	13.85
63	Ceramics	3.94	4.35	4.73	3.55	3.09	3.00	3.83	4.50	4.04	4.57	4.32	4.77
		0.00	3.01	5.07	4.92	5.30	5.36	5.55	6.85	8.91	9.69	9.36	9.59
64	Nonmetallic prd,nec	2.08	2.85	2.21	1.91	1.80	2.16	2.73	2.80	2.80	2.66	3.06	3.11
		0.00	2.30	3.08	3.89	4.44	4.86	4.60	5.44	6.51	6.86	6.93	7.17
65	Basic iron & steel	2.31	3.05	2.99	3.07	2.75	2.48	2.91	2.68	2.63	2.21	2.51	3.15
		0.00	2.47	2.76	2.89	3.73	3.78	3.44	4.81	5.43	5.67	5.86	6.19
66	Copper	4.55	3.49	3.98	4.13	3.32	2.83	2.60	2.50	2.96	2.67	2.94	3.53
		0.00	3.76	4.49	4.67	6.20	5.85	5.83	7.69	8.41	8.75	8.73	8.59
67	Aluminum	5.03	3.85	3.33	3.12	3.21	2.81	2.33	2.92	3.51	2.93	2.82	2.87
		0.00	4.80	6.36	7.19	7.67	7.55	7.43	8.17	7.81	8.09	8.00	7.90
68	Nickel	5.15	5.94	5.79	5.46	4.90	4.70	5.24	6.02	4.33	3.95	3.79	3.47
		0.00	4.02	4.64	4.86	5.54	6.31	6.38	7.22	8.85	9.16	9.55	9.16
69	Lead and zinc	5.76	4.77	3.83	5.03	4.64	3.63	3.64	4.20	3.51	4.16	3.65	4.50
		0.00	5.71	5.64	7.52	7.93	7.53	7.14	9.38	8.43	9.00	8.98	9.04
70	Other nonferrous	4.07	4.23	3.77	4.46	3.09	3.26	3.56	4.01	3.18	3.50	4.01	4.79
		0.00	4.58	5.78	5.67	5.49	6.11	5.66	7.35	7.63	8.10	8.27	9.34
71	Metal furnitures	2.39	3.24	3.41	3.61	3.76	4.22	4.56	4.56	4.02	3.95	4.43	3.65
		0.00	2.63	3.04	4.15	4.65	5.20	5.76	7.04	7.26	7.36	7.39	7.60
72	Structural metal pd	3.48	4.75	4.74	5.65	4.58	3.14	3.96	4.53	3.68	4.44	4.09	4.75
		0.00	4.62	4.67	7.12	6.96	7.24	6.67	9.95	9.34	7.97	8.61	9.10
73	Metal containers	4.76	5.21	4.94	5.51	5.08	5.07	4.99	4.01	4.21	3.69	4.25	4.11
		0.00	5.53	6.75	7.48	7.37	8.35	8.04	8.19	8.29	8.39	8.03	8.15
74	Wire products	3.62	4.35	4.23	4.74	3.91	3.93	4.74	4.63	4.89	5.25	4.68	4.58
		0.00	4.03	6.04	5.53	6.36	7.31	6.76	8.38	7.85	8.52	8.64	9.24
75	Hardware	1.86	2.34	2.60	1.73	1.46	1.34	2.00	2.04	1.79	1.89	1.85	1.93
		0.00	1.49	2.53	3.20	3.41	3.71	3.52	4.30	4.40	4.66	4.35	4.66
76	Boilers and turbine	4.70	5.71	5.28	6.79	5.28	5.09	5.11	5.44	5.15	5.56	4.53	4.61
		0.00	4.05	4.91	6.60	6.88	7.41	6.13	7.98	7.37	7.76	7.19	7.88
77	Aircraft engines	3.49	4.45	4.46	5.08	4.92	4.17	4.03	4.37	3.90	3.53	3.69	4.20
		0.00	3.87	4.93	6.67	7.18	7.32	7.46	8.92	9.32	9.40	8.67	8.78
78	Internal combust eg	3.00	4.12	4.46	4.00	3.40	4.12	4.51	3.49	3.58	3.45	3.81	3.67
		0.00	3.07	4.42	6.03	6.74	6.97	6.88	7.93	8.39	8.51	8.78	8.62
79	Other power machine	7.07	7.89	5.21	4.98	5.71	5.16	6.67	5.95	8.01	5.17	6.21	5.71
		0.00	6.79	7.63	8.53	10.39	10.10	9.87	11.65	13.06	9.84	9.97	10.32
80	Agricultural machin	2.40	3.61	3.09	2.97	2.35	2.23	3.14	3.73	3.33	2.46	2.70	3.59
		0.00	2.88	3.88	5.08	4.79	5.93	5.38	6.56	6.55	6.59	6.27	6.59

Table 11: (continued)

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
81	Construction equip	2.36	3.40	2.96	3.09	2.74	2.37	3.66	2.75	2.69	3.22	2.90	2.96
		0.00	2.87	3.72	4.98	5.57	6.06	5.57	6.52	6.21	6.73	6.67	6.76
82	Metalworking machin	2.27	3.01	2.64	2.76	2.29	1.83	2.58	2.50	2.23	1.87	2.20	3.06
		0.00	2.69	3.22	3.53	4.04	3.75	3.67	4.65	4.75	5.39	5.31	5.26
83	Sewing machines	3.79	4.37	4.19	2.86	3.03	2.96	3.15	3.31	3.46	3.81	3.72	4.02
		0.00	3.54	3.02	3.94	4.31	4.39	4.62	5.98	6.29	6.74	6.87	7.00
84	Textile machinery	2.91	3.11	2.99	2.76	3.25	2.27	2.64	2.73	2.67	2.68	3.22	3.38
		0.00	2.64	3.88	3.91	5.07	4.70	4.23	5.10	5.21	5.38	6.19	6.05
85	Paper mill machines	4.99	4.52	5.41	4.21	3.55	3.74	4.13	4.31	3.91	4.31	3.43	4.46
		0.00	4.22	5.29	5.41	5.03	4.75	4.86	6.53	6.83	7.14	7.24	6.19
86	Printing machines	2.79	3.36	2.90	2.87	2.41	2.49	3.07	3.00	2.71	2.98	2.75	3.04
		0.00	3.84	4.27	5.34	5.56	6.19	6.00	6.53	6.49	6.65	6.42	6.30
87	Food-processing mach	3.04	3.45	2.29	2.78	2.09	2.61	2.57	2.52	2.56	2.24	2.88	2.50
		0.00	3.24	3.52	4.82	4.32	5.12	4.39	5.52	5.72	5.75	5.90	5.76
88	Other special mach	3.70	4.55	4.90	3.87	3.38	2.98	3.80	4.79	4.38	4.16	4.28	5.19
		0.00	2.12	3.95	3.68	4.15	4.32	4.85	5.83	6.11	6.70	6.32	6.45
89	Service ind. machin	1.73	2.42	2.12	1.95	1.73	1.62	2.15	2.38	2.34	2.36	2.56	3.29
		0.00	2.27	3.12	3.43	3.66	4.07	3.87	4.98	4.71	5.07	5.13	5.43
90	Pumps	1.70	2.38	2.32	2.27	1.93	1.81	2.78	2.19	2.16	2.69	2.49	3.06
		0.00	2.21	2.99	3.88	4.42	4.68	4.61	5.29	4.86	5.28	5.08	5.24
91	Mechanical hand. eq	2.57	3.15	3.35	2.81	3.19	2.99	3.00	2.74	3.05	2.88	2.85	3.13
		0.00	3.45	4.83	4.89	5.54	5.63	5.64	6.33	6.20	6.17	5.89	5.96
92	Other non-elec mach	1.93	2.38	2.38	2.00	2.03	2.45	2.57	2.67	2.12	2.26	2.16	2.14
		0.00	1.96	3.03	3.45	3.98	4.08	4.03	4.98	5.06	5.33	5.15	5.47
93	Radio,TV,phonograph	2.67	3.96	4.63	4.06	3.21	3.27	4.08	3.93	3.18	2.46	3.08	3.83
		0.00	2.31	3.72	4.40	4.25	4.17	3.91	5.53	7.66	8.47	9.20	9.98
94	Other telecom eq	4.02	4.85	4.45	3.90	4.10	2.83	3.05	3.94	3.34	3.63	4.03	4.70
		0.00	3.61	3.70	4.81	5.20	4.85	4.58	6.50	7.10	7.20	7.78	7.93
95	Household appliance	3.01	2.87	3.63	3.51	3.41	3.44	3.32	4.20	3.64	3.71	3.88	5.10
		0.00	2.12	3.00	3.63	4.37	4.49	4.37	6.00	7.07	7.43	7.31	7.47
96	Computers	3.43	4.95	4.84	4.44	4.15	4.21	4.22	4.05	3.66	3.35	3.54	4.10
		0.00	3.15	3.96	4.88	5.42	6.70	7.47	8.21	8.67	8.93	9.88	10.13
97	Other office machin	4.30	4.55	4.90	4.91	4.74	5.36	4.04	4.15	4.27	4.28	4.03	6.15
		0.00	3.29	4.41	5.34	6.19	7.22	6.63	8.59	8.86	8.49	8.38	8.69
98	Semiconductors	5.05	5.01	5.31	4.30	4.03	4.96	4.36	4.02	3.38	2.88	3.28	4.17
		0.00	3.91	3.52	4.39	4.85	5.51	6.23	7.09	7.65	7.87	8.12	8.30
99	Electric motors	4.72	4.64	4.63	4.21	3.59	3.63	4.07	5.27	4.83	4.78	5.14	4.90
		0.00	2.61	3.83	4.08	4.10	4.64	4.84	6.91	6.83	6.84	6.95	7.34
100	Batteries	4.54	4.98	6.22	5.00	4.71	5.01	4.34	4.94	4.28	4.38	3.83	4.38
		0.00	3.25	5.20	5.60	5.80	6.88	6.95	7.76	7.62	7.99	8.11	8.34

Table 11: (continued)

SECTOR	TITLE	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
101	Electric bulbs	2.31	2.90	3.35	3.41	2.73	2.80	2.65	2.54	3.19	2.63	3.06	3.49
		0.00	2.35	3.96	3.92	4.75	4.49	4.44	5.77	6.11	6.26	6.12	6.62
102	Industrial applianc	2.71	3.31	3.29	2.45	2.22	2.12	2.24	2.60	2.51	2.35	2.46	2.71
		0.00	1.69	2.75	3.12	3.25	3.43	3.26	4.01	4.26	4.73	4.81	5.32
103	Shipbuilding	6.99	8.12	7.02	7.94	6.43	7.09	8.30	6.85	6.38	7.08	6.77	8.10
		0.00	6.83	9.65	10.11	9.21	9.24	8.56	10.56	11.22	10.56	11.23	10.84
104	Warships	0.70	1.17	1.75	2.61	0.07	1.09	1.14	0.38	0.12	0.13	0.22	0.77
		0.00	2.94	3.30	5.73	9.43	5.09	2.93	5.82	14.93	16.40	15.85	14.62
105	Railroad equipment	7.00	8.23	7.66	6.70	5.96	5.50	5.10	7.53	6.95	4.98	5.51	8.06
		0.00	6.22	9.16	9.90	9.72	10.03	10.06	12.02	12.09	11.56	11.32	12.46
106	Motor vehicles	3.79	3.89	3.38	2.47	2.54	3.34	3.24	3.38	2.48	2.53	2.72	3.07
		0.00	2.99	4.72	5.16	5.14	4.92	4.65	5.98	6.59	6.67	6.53	6.80
107	Motorcycle, bicycle	5.72	6.05	7.00	6.36	5.74	4.74	4.55	5.55	5.28	5.36	5.64	6.06
		0.00	2.24	3.59	4.29	5.42	5.13	6.60	8.77	9.03	9.78	10.27	11.27
108	Motor vehicle parts	2.43	3.06	3.14	2.80	2.29	2.29	2.96	2.73	2.34	1.96	2.04	2.51
		0.00	2.48	3.35	5.30	5.67	5.53	5.35	6.77	7.23	6.81	6.89	7.15
109	Aircraft	5.93	5.78	6.04	5.47	6.31	5.69	6.81	4.89	4.94	4.67	3.07	4.31
		0.00	5.59	8.44	9.55	8.86	9.18	7.06	9.60	7.94	7.65	7.17	6.98
110	Other transport eq	6.17	8.02	8.02	8.26	8.32	9.09	8.34	5.92	5.70	4.94	4.83	5.44
		0.00	7.23	8.84	11.23	13.08	13.78	16.09	17.65	17.21	17.70	18.13	19.06
111	Precision instrumen	1.05	1.69	1.66	1.58	1.35	1.38	1.86	2.02	1.79	1.83	1.72	1.94
		0.00	1.59	2.33	2.89	3.14	3.50	2.91	3.69	3.82	3.98	4.03	4.19
112	Optical goods	2.47	2.56	2.38	2.01	2.35	2.04	3.22	2.65	2.69	2.45	1.93	2.95
		0.00	1.85	2.90	3.29	3.95	4.18	3.82	4.82	5.19	5.48	5.89	6.29
113	Watches and clocks	4.40	4.41	3.27	3.86	6.93	3.77	3.30	3.27	3.03	3.30	3.77	4.21
		0.00	3.69	4.92	4.94	4.10	4.21	4.19	5.66	5.98	6.73	7.90	8.09
114	Jewellery	5.87	6.32	5.77	5.22	5.39	3.80	4.75	4.74	5.21	5.51	5.48	5.91
		0.00	6.07	6.18	6.97	8.03	8.14	8.59	9.81	9.27	10.89	10.25	10.78
115	Musical instruments	4.33	5.13	4.14	3.75	3.14	3.63	3.54	3.77	3.35	3.51	3.69	5.55
		0.00	2.48	3.83	5.30	5.99	7.00	7.27	8.26	7.87	8.47	8.54	8.53
116	Sporting goods	3.82	4.31	4.17	3.07	2.98	3.41	3.38	3.93	3.70	3.01	2.91	3.56
		0.00	3.21	4.30	4.69	5.06	4.95	4.94	6.53	7.08	7.56	7.77	8.16
117	Ordnance	7.91	7.77	7.03	7.45	6.93	5.23	4.50	5.48	4.28	6.38	5.67	6.13
		0.00	9.63	12.77	13.18	13.74	14.94	13.54	11.90	11.67	13.28	11.63	13.26
118	Works of art	5.44	4.93	4.89	5.23	5.13	4.97	4.50	4.58	4.71	5.03	3.93	3.74
		0.00	7.13	6.30	6.62	8.56	8.55	8.45	9.12	10.64	10.44	10.80	11.03
119	Manufact. goods,nec	3.93	3.91	4.10	3.41	3.33	3.77	3.67	3.77	3.59	3.68	3.88	4.06
		0.00	2.71	3.44	4.30	4.86	5.21	5.85	7.41	7.66	8.05	8.34	8.97
120	Scraps and used	3.66	4.09	3.46	3.28	3.10	3.45	3.63	3.55	3.70	4.72	4.42	4.99
		0.00	3.72	4.72	5.55	5.59	5.57	5.78	7.48	8.08	9.68	8.89	9.85

TABLE 12: Errors in the Import Shares by Market by Year: Equation Share vs. Constant Share

YEAR	CAN	USA	MEX	AUS	BEL	FRA	GER	ITA	SPA	UK	JAP	CHN	KOR	TW	ROECD	ROW	SUM
1980	20.17	29.27	34.90	22.21	22.45	20.45	21.03	24.18	39.75	26.57	28.77	0.00	47.80	46.91	17.11	25.47	427.03
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1981	23.39	35.18	38.81	28.66	26.97	25.15	25.65	31.76	43.99	30.21	33.84	0.00	47.42	41.55	24.18	32.09	488.86
	18.92	22.13	31.16	22.06	23.23	18.46	16.15	26.52	40.02	29.71	23.15	0.00	44.84	46.17	19.27	26.19	407.98
1982	22.96	34.76	43.84	24.10	24.14	23.68	24.36	27.09	39.56	27.13	32.30	0.00	50.67	46.08	22.28	30.22	473.17
	26.04	28.84	46.76	26.73	29.84	27.21	24.10	31.90	47.31	37.19	30.69	0.00	53.74	49.77	27.38	35.33	522.84
1983	23.63	36.58	42.88	20.76	23.00	20.65	21.17	25.61	36.40	24.12	32.56	0.00	50.38	44.47	20.16	28.15	450.53
	32.61	37.09	65.66	29.11	34.40	31.84	29.18	37.71	52.72	41.27	38.99	0.00	58.48	58.29	34.64	42.17	624.15
1984	21.73	34.11	39.70	21.43	22.04	19.47	19.78	24.56	36.71	21.20	30.82	0.00	43.44	44.19	18.25	25.01	422.45
	38.87	42.41	61.34	33.16	40.60	38.16	32.32	41.46	59.65	45.09	43.76	0.00	62.45	59.67	39.69	46.72	685.36
1985	18.17	35.66	35.34	21.65	20.21	19.93	19.64	23.15	34.54	21.75	31.40	0.00	41.85	43.42	16.89	24.74	408.34
	41.70	47.50	57.83	35.67	41.21	40.04	36.41	44.82	60.97	46.70	46.91	0.00	63.95	64.57	42.01	49.35	719.66
1986	19.13	34.48	37.12	23.46	23.72	23.32	22.15	24.33	35.17	24.68	34.17	0.00	42.49	43.87	19.45	26.26	433.80
	42.01	46.21	57.28	35.19	39.69	38.22	36.31	43.86	62.53	47.00	48.17	0.00	68.32	64.80	39.08	47.45	716.12
1987	16.47	30.52	35.66	23.03	21.94	19.00	20.18	22.61	33.42	22.76	32.16	31.59	39.31	38.67	18.13	23.84	429.29
	40.47	48.54	57.43	37.12	39.63	40.37	37.38	44.91	67.27	49.04	51.80	116.00	73.08	70.22	38.49	58.15	869.89
1988	16.91	29.65	31.87	21.64	21.27	19.05	18.73	23.16	30.11	21.01	30.29	29.60	36.66	40.58	17.34	22.99	410.85
	46.49	50.04	56.20	41.39	43.79	43.65	40.06	48.31	66.47	45.71	54.40	118.00	78.90	72.75	38.73	59.71	904.61
1989	15.38	28.02	28.53	22.88	21.42	18.10	17.99	24.72	29.82	21.61	29.33	30.21	37.27	39.17	17.36	22.91	404.72
	47.74	55.69	55.16	45.09	46.44	44.57	42.89	51.68	67.22	47.84	56.32	117.00	77.94	72.06	41.76	62.88	932.29
1990	16.04	27.88	27.06	24.43	21.67	20.30	19.27	24.26	31.07	22.73	29.32	27.98	38.36	39.62	18.05	23.90	411.95
	47.28	56.09	54.04	45.08	46.30	45.40	45.14	52.10	68.87	48.25	57.48	118.00	80.46	70.11	41.98	66.15	942.73
1991	20.53	31.24	27.37	27.57	24.93	23.70	24.07	28.80	34.45	23.39	30.94	26.48	38.50	44.04	21.23	27.74	454.98
	48.36	58.49	54.46	47.93	48.61	46.92	47.76	54.82	71.67	48.45	59.81	118.00	86.74	73.33	44.80	70.44	980.58

that the lower limit of this sum total is zero, while its upper limit is 32 (= 16 x 2). Note also that within each sector, the first line indicates the sum of the "l-norm" of vector ***c*** for the equation-share based trade model, and the second line shows the sum of the "l-norm" of vector ***c*** for the simulation results based on the constant share approach. As the constant shares used are those for the year 1980, the first number on the second line for each sector is always zero, because the predicted share is the actual share in 1980 in the alternative historical simulation.

Even a casual examination of Table 11 will reveal the substantial improvements in the predictive accuracy obtained by the current equation share based trade model over the simpler approach based on the constant share. Note also that while the trade model's predictive errors in import shares tend to be fairly stable over time in every trade sector, the errors resulted from the constant-share approach appear to be an increasing function of time across all trade sectors.

Table 12 presents the sum of the "l-norm" of vector ***c*** over all 120 trade sectors for each import market for each of the 12 years in the historical simulation period. Note that the lower limit of this sum total is zero, while the upper limit of this sum is 240 (= 120 x 2). Note also that within each year, the first line indicates the sum of the "l-norm" of vector ***c*** over all sectors for the equation-share based trade model, and the second line shows the sum of the "l-norm" of vector ***c*** for the simulation results based on the constant share approach. As the constant shares used are those for the year 1980, the second line for the year 1980 for each import market is always zero, because the predicted share is the actual share in 1980 in the alternative historical simulation.

Note that the last column of Table 12 lists the sum total by row. Each row sum corresponds to the sum of the "l-norm" of vector ***c*** over all sectors and all import markets in each year. Again, we observe that as time progresses, the improvement in the predictive accuracy in import share obtained by the equation-based trade model over the simpler approach based on the constant share grows more and more pronounced. By 1991, the error resulted from the constant-share approach is more than twice as large as that produced by the equation-share based trade model. And if we add up these errors over the 12 years in the historical simulation period, then for the constant-share approach, the sum is equal to 8,305.41, which is nearly twice as large as the corresponding error sum for the equation-based trade model (4,788.86). The moral of the foregone analysis should be clear by now: when dealing with trade flows, constant shares are not a good assumption.

Errors in Exports

Ultimately, the trade model is developed to forecast exports for each country in the linked international system. Therefore, the predictive accuracy of the trade model from the exporter side should also be examined. The statistic used here is normalized root mean square error (NRMSE), defined as follows:
where,

$$NRMSE\% = 100 * \frac{\sqrt{\frac{1}{N}\sum_{t=1}^{N}(X_p - X_a)_t^2}}{X_m} \qquad \textbf{(7)}$$

X_p = Predicted exports of a given product by a given exporter;
X_a = Actual exports of a given product by a given exporter;
X_m = Arithmetic mean of X_a;
N = The number of years in the simulation period, which is 12.

Table 13 shows the ratio of the equation NRMSE to constant 1980 share NRMSE (in logs) for all sectors by exporting countries. It should be noted that a negative number in the Table indicates an improvement by the trade model over the constant-shares approach: -0.1 is equivalent to a 10% improvement in NRMSE, -0.5 to a 40% improvement in NRMSE, and -1.2 to a 70% improvement in NRMSE. An inspection of Table 13 reveals marked improvements in "root mean square error" by the equation-share trade model over the simpler constant share approach. For exporter USA, for instance, the trade model approach leads to over 70% improvement in NRMSE of its export projections in Sector 2 (Fresh fruits and vegetables), 80% improvement in NRMSE of its export projections in Sector 9 (Crude wood), 85% improvement in NRMSE in Sector 36, 58% improvement in NRMSE in Sector 42 (Furnitures and fixtures), 70% improvement in NRMSE in Sector 51 (Drugs and medicines), and 70% improvement in NRMSE in Sector 80 (Agricultural machinery).

The last row of the Table shows the improvement in NRMSE of total exports for each exporting country. Thus, the trade model approach results in 40% improvement in NRMSE for Canada, 50% improvement for USA, 23% improvement for Mexico, 20% improvement for Austria, 23% improvement for Belgium, 50% improvement for France, 57% improvement for Germany, 55% improvement for Italy, 70% improvement for UK, no improvement for Spain, 30% improvement for Japan, 63% improvement for China, 46% improvement for Korea, and 50% improvement for Taiwan. It may be noted in passing that had we used the constant 1980 import shares instead of the equation shares to predict exports, by 1991 (the last year of the historical simulation period), the absolute error on the total world trade would be $961 billion, or 29% of the total world exports in 1991. The corresponding figures for the trade model are $414 billion and 10%.

TABLE 13: Ratio of Equation to Constant Share NRMSE (in logs)

		CAN	USA	MEX	AUS	BEL	FRA	GER	ITA	SPA	UK	JAP	CHN	KOR	TW	ROECD	ROW	WT. AVE
1	Unmilled cereals	0.11	-0.76	0.16	-0.27	0.86	-1.59	-0.52	-0.21	-0.17	0.09	-0.57	-1.00	0.00	0.17	-0.04	-0.40	-0.71
2	Fresh fruits and vegs	0.41	-1.25	0.04	0.87	-1.19	-0.69	-0.89	-1.74	-0.98	-1.10	-0.21	-0.18	0.15	-1.02	-1.53	-0.77	-1.00
3	Other crops	0.26	-0.87	0.14	-0.26	0.58	-0.81	-0.67	0.68	-0.73	0.20	1.05	-0.46	-0.21	-0.15	-1.08	-0.51	-0.68
4	Livestock	0.14	0.05	0.15	-0.38	-0.79	-0.71	-0.86	0.36	0.05	-0.93	1.03	-0.14	-0.13	-0.91	-0.12	0.45	-0.30
5	Silk	0.00	2.72	0.22	0.00	-0.24	-0.51	-0.28	-1.58	-0.22	-0.12	0.50	-0.24	0.31	0.18	-0.05	-0.20	-0.24
6	Cotton	-0.73	-0.14	-0.44	-0.45	-0.49	0.61	-0.32	0.89	-0.40	0.69	1.14	-0.46	0.35	-1.30	-0.57	0.30	-0.06
7	Wool	1.69	0.12	1.05	0.22	-0.51	0.58	0.15	-0.69	0.32	-0.82	1.25	-0.47	0.38	0.03	-0.09	0.48	-0.04
8	Other natural fibers	-0.31	0.41	1.07	0.49	-0.81	0.29	0.09	1.40	0.37	-0.72	1.16	-0.30	1.78	-0.20	-0.10	-1.19	-0.85
9	Crude wood	0.24	-1.68	0.04	-0.02	-1.31	-1.56	-0.67	-0.26	-0.73	-0.66	-0.11	-0.38	0.47	0.43	0.43	-1.62	-1.10
10	Fishery	-0.39	-0.07	-1.32	-0.01	-0.37	-0.11	0.12	0.61	0.08	-0.53	-1.33	-0.36	-1.25	0.04	-0.37	-0.63	-0.52
11	Iron ore	-0.22	-1.08	0.03	-0.76	-0.51	-0.90	0.13	0.18	0.32	0.74	0.12	-0.09	0.13	0.02	-0.33	-1.12	-0.76
12	Coal	-0.32	-0.32	0.04	-0.19	-0.54	-0.12	-0.58	-0.08	-0.14	-1.56	-1.11	-0.42	0.39	0.32	-0.65	-0.44	-0.48
13	Non-ferrous metal ore	-0.30	0.01	-0.12	-0.53	-0.00	-0.51	0.34	-0.24	-0.20	-1.19	0.40	-0.44	-0.33	-0.00	-0.54	-0.21	-0.27
14	Crude petroleum	-0.67	-1.15	-0.43	0.99	0.01	0.13	-0.01	-0.63	-0.15	-0.25	-0.29	-0.65	0.00	0.00	-0.38	-0.56	-0.54
15	Natural gas	-0.31	-0.85	-0.02	-0.55	0.35	-0.29	0.32	0.60	0.52	-0.11	2.29	0.95	-0.93	0.70	0.18	0.12	0.13
16	Non-metallic ore	-0.04	-0.60	-0.47	-1.03	-0.79	-0.65	-1.13	-0.44	-0.62	-0.63	-0.14	-1.47	-0.31	0.89	-0.20	0.01	-0.24
17	Electrical energy	0.00	0.00	0.00	-0.20	0.57	-1.10	0.23	-0.12	-1.09	0.51	0.00	-0.36	0.00	0.00	0.24	-0.23	-0.26
18	Meat	0.75	-0.94	0.37	0.88	-1.10	-0.81	-1.12	-0.34	-0.28	-1.52	0.98	-1.15	0.22	-1.22	-0.11	-1.21	-0.34
19	Dairy and eggs	0.30	-0.13	0.54	0.19	0.13	0.38	-0.40	-0.45	0.99	-1.65	0.10	-1.11	-0.44	0.60	-0.48	0.25	-0.40
20	Preserved fruits & vegs	0.14	-1.11	-0.72	-0.10	-0.81	0.03	-0.74	-1.39	-0.27	-1.54	-1.85	-0.53	-0.29	-1.69	0.37	-0.23	-0.36
21	Preserved seafood	-0.91	0.82	-0.67	-0.53	-0.38	-0.97	-0.03	-0.46	0.66	-0.62	-1.16	-0.19	-0.10	0.52	1.54	-0.43	0.20
22	Veg & animal oils,fats	0.71	-1.22	-0.17	0.76	-1.30	0.81	-0.64	-0.78	0.07	-0.22	0.16	-1.93	-0.35	0.75	-1.14	-0.11	-0.63
23	Grain mill products	-0.64	0.38	0.89	2.68	-0.33	-0.50	0.48	-0.45	-0.03	-0.62	0.58	-0.78	-0.34	1.77	0.33	0.59	0.11
24	Bakery products	-2.29	-0.32	0.62	0.79	0.37	-0.11	-1.80	-1.40	-0.76	-1.56	-0.52	-1.01	-1.10	0.58	0.08	0.49	-0.88
25	Sugar	0.35	-0.06	0.16	-0.08	0.02	0.16	0.35	0.02	-0.49	0.39	0.17	-1.36	-0.73	-0.15	0.49	0.19	0.22
26	Cocoa, chocolate, etc	-0.00	-0.52	0.81	-0.27	-0.97	-1.19	-1.31	-0.12	-0.10	-1.65	-0.03	-1.83	-0.50	-0.36	-0.47	-1.28	-1.02
27	Food products n.e.c.	-0.22	-0.87	0.21	0.64	-0.63	0.20	-0.91	-0.20	0.84	-1.44	0.59	-1.33	0.50	-1.04	-1.42	-0.97	-0.95
28	Prepared animal feeds	0.02	-1.03	0.03	-0.31	-0.85	-1.22	-0.95	-0.14	0.76	-0.59	0.08	-0.82	0.17	-0.08	-0.08	-0.12	-0.51
29	Alcoholic beverages	-0.53	-0.95	-0.19	0.70	-0.54	-1.40	-0.93	-0.21	-0.67	-1.37	0.58	-1.03	-0.12	-0.09	-1.46	-0.67	-1.30
30	Non-alcoholic beverages	-0.24	0.40	0.39	-1.15	0.24	-0.07	0.61	0.01	-0.06	-1.04	-0.65	-0.12	0.05	0.41	-0.03	0.04	-0.00
31	Tobacco products	0.00	-1.40	-1.02	0.42	-0.16	-0.28	-0.31	0.25	-0.06	-1.54	-0.89	-0.30	0.68	0.37	-0.25	0.08	-1.08
32	Yarns and threads	-0.94	-0.90	-0.16	-0.03	-0.11	-1.16	-1.16	-0.99	-0.75	-1.42	-0.76	-1.46	-0.20	-0.25	-0.49	-0.72	-0.87
33	Cotton fabrics	-0.98	-0.13	-0.28	0.69	0.45	-0.51	0.24	0.28	-1.13	-1.27	0.27	-0.30	0.53	-0.55	0.74	-0.13	-0.10
34	Other textile products	-0.20	-1.39	-0.40	-0.05	-0.65	-0.72	-1.61	-0.45	0.43	-1.52	-1.18	-1.84	-1.50	-1.35	-0.42	-0.01	-1.13
35	Floor coverings	-0.13	0.44	-0.04	1.19	-1.12	-0.02	-0.80	-0.37	-0.60	-0.66	-0.75	-1.25	1.63	0.96	-0.05	-1.06	-0.85
36	Wearing apparels	0.76	-1.91	0.19	0.58	0.27	-0.79	0.02	-0.66	0.48	-1.99	-1.26	-0.98	-0.23	-0.64	-0.41	-0.50	-0.75
37	Leather and hides	-0.28	-0.47	0.06	-1.05	-0.01	-0.46	-0.77	-1.03	-0.06	-1.32	-1.42	-0.89	0.16	-0.92	-0.62	-0.13	-0.65
38	Leather products	0.51	-1.48	0.38	0.69	-0.37	-0.46	-1.03	-1.23	-0.20	-1.74	-1.28	-1.52	-0.22	-0.27	-0.56	-0.91	-1.13
39	Footwear	-1.27	0.47	-0.24	-0.72	-0.73	-1.36	-0.28	-1.42	0.50	-1.55	-0.34	-0.83	-0.64	0.10	-0.30	-0.71	-0.85
40	Plywood and veneer	-0.39	0.39	0.26	-0.11	0.04	-0.49	-0.33	0.76	0.98	-1.77	0.72	-0.42	-1.17	-0.80	-0.10	-0.56	-0.54

TABLE 13:(continued)

	CAN	USA	MEX	AUS	BEL	FRA	GER	ITA	SPA	UK	JAP	CHN	KOR	TW	ROECD	ROW	WT. AVE
41 Other wood products	-0.45	-0.47	-1.05	-0.40	-0.72	-0.25	-0.14	-0.65	-0.71	-1.75	-0.53	-0.10	-0.37	-0.43	0.08	-0.12	-0.22
42 Furnitures & fixtures	-1.30	-0.86	-1.78	-0.15	-0.80	-0.96	-0.18	-1.27	0.03	-1.41	0.46	-0.11	-0.00	0.50	0.09	-1.03	-0.63
43 Pulp and waste paper	-0.57	-0.95	0.10	0.48	0.20	-0.26	-0.11	0.22	-0.31	-0.26	-1.00	-0.92	0.66	0.07	0.35	0.67	-0.29
44 Newsprint	0.21	0.67	-0.00	-0.24	0.05	-0.22	-0.70	0.22	1.30	-0.65	-0.52	-0.11	-0.01	-0.06	0.04	0.48	0.12
45 Paper products	-0.93	-0.66	0.12	-0.84	0.24	-0.84	-0.90	-1.51	-0.35	-1.27	0.08	-1.54	-0.62	-0.15	0.18	-0.55	-0.56
46 Printing and publishing	0.01	-0.50	0.58	-0.07	-1.34	-1.18	-0.83	-0.04	0.03	-1.38	0.09	-0.44	1.84	-0.40	0.17	-0.03	-0.87
47 Basic chemicals	-0.76	-0.43	-0.02	-0.30	-0.44	-0.94	-1.12	-0.58	-0.91	-1.25	0.32	-1.07	-0.76	0.13	-1.03	-0.03	-0.91
48 Fertilizers	-0.84	-0.52	-0.74	0.60	0.05	-0.54	-0.52	0.90	-0.24	-1.05	0.39	-1.09	0.01	-0.49	-1.56	-0.50	-0.66
49 Synthetic resins,fibers	-0.03	-0.57	-0.66	-0.41	-0.64	-0.18	-1.20	-1.30	-1.14	-1.57	0.41	-0.19	-1.11	-0.40	-0.87	-1.14	-0.93
50 Paints,varnishes	-0.71	-0.53	-0.62	-0.58	-1.04	-0.64	-1.90	-1.12	0.26	-1.52	0.11	-1.31	0.04	-0.59	-0.10	0.12	-1.14
51 Drugs and medicines	0.50	-1.12	0.01	-0.33	-0.53	-0.98	-1.03	-0.53	-0.48	-1.24	-0.67	-0.97	0.07	0.81	-1.14	-0.71	-1.09
52 Soaps and other toilet	0.17	-0.38	-0.97	0.75	0.37	-1.53	-0.71	-0.61	0.83	-1.55	0.23	-1.40	-0.10	-0.71	-0.26	-0.03	-1.18
53 Chemical products nec	-1.08	-1.00	-1.10	-0.04	-0.23	-0.56	-1.42	-0.67	0.22	-1.23	-0.66	-1.09	-0.92	-0.58	-0.95	-0.52	-0.99
54 Petroleum Refinery	-0.58	-0.84	-0.24	0.54	-0.14	0.45	-0.88	-1.04	-0.76	-1.27	-0.50	-0.23	-0.85	-0.89	-0.44	-0.34	-0.47
55 Fuel oils	0.06	-0.71	-0.47	-0.15	-0.33	-0.38	-0.14	-0.38	-0.96	-0.98	-0.05	-1.32	-0.00	-0.57	-0.14	-0.78	-0.64
56 Product of petroleum	-1.13	-0.12	-1.05	0.09	-1.28	-0.17	-0.33	0.30	-0.74	-0.86	1.20	-0.62	-0.68	-0.41	-0.99	-0.17	-0.41
57 Product of coal	-0.81	-0.07	-0.71	0.11	-0.15	-0.20	0.46	0.18	0.11	-1.14	0.12	-0.53	-0.48	-0.13	-1.09	-0.14	-0.16
58 Tyre and tube	-0.22	0.12	-0.02	1.05	-0.17	-0.45	-0.36	-0.69	0.31	-1.45	-0.17	-0.91	-0.13	1.66	-0.58	-0.21	-0.36
59 Rubber products n.e.c.	0.39	0.39	-0.57	0.15	-0.31	0.21	0.06	-1.02	-0.60	-1.86	-0.41	-0.26	0.51	-0.06	-0.13	-0.82	-0.51
60 Plastic products n.e.c.	-0.21	-0.58	0.37	0.64	-1.16	-0.60	-0.33	-1.49	0.34	-1.63	-0.44	-0.85	-0.44	0.41	0.58	0.38	-0.63
61 Glass	-1.12	-1.23	-1.20	-0.88	-0.57	-0.15	-0.67	0.88	-0.40	-1.71	-0.24	-0.56	-1.01	-1.18	0.26	-0.45	-0.59
62 Cement	-1.46	-1.09	-0.84	-2.30	0.03	0.34	-1.05	-0.06	0.25	-1.26	-0.59	-0.19	0.32	-0.33	-1.05	-0.39	-0.46
63 Ceramics	0.51	0.14	0.20	0.15	-0.90	-0.66	-0.88	-0.50	-1.26	-1.44	-1.25	-0.98	-0.02	1.16	0.63	-1.25	-0.68
64 Other non-metallic prod	-0.59	-0.64	-0.12	0.48	-0.59	-1.17	-0.76	0.03	-0.63	-1.27	-0.56	-0.68	-0.42	-0.48	-0.88	-0.33	-0.52
65 Basic iron and steel	-0.87	-0.95	-0.78	-0.29	0.35	0.15	-0.09	-0.68	0.26	-0.18	-0.81	-0.67	-0.07	-1.13	-1.15	-0.97	-0.64
66 Copper	-0.35	0.21	-0.67	0.37	-0.27	-1.48	-1.19	-1.44	0.84	-1.43	-1.42	-0.63	-0.50	-0.79	-1.78	0.23	-0.61
67 Aluminum	0.41	-1.09	-0.01	-0.79	-0.58	-0.01	-1.31	-0.96	0.30	-1.34	0.60	-0.61	-0.26	-0.32	-0.27	0.16	-0.43
68 Nickel	0.59	-1.31	0.11	2.29	-0.07	1.40	0.02	1.14	0.62	-0.52	0.76	-0.33	0.47	-0.24	0.29	-0.27	0.17
69 Lead and zinc	0.10	-1.02	-0.52	-0.74	-0.91	-1.00	-0.71	-0.96	-0.81	-1.55	-0.65	-0.55	-0.31	-0.01	-0.73	0.12	-0.57
70 Other non-ferrous metal	0.37	0.04	0.14	-0.80	0.31	-0.48	-0.60	0.66	0.65	-0.35	0.10	-1.75	0.40	-0.80	0.20	0.64	0.31
71 Metal furniture,fixture	-0.26	-0.37	-0.27	0.60	0.43	-0.72	-1.16	-0.73	0.04	-1.06	-0.21	-1.05	-0.51	-0.94	-0.90	-0.57	-0.77
72 Structural metal prod	-0.16	-1.09	0.29	-0.65	-1.10	-0.60	-0.53	0.09	-0.25	-1.06	-0.79	-0.34	-0.60	-0.00	-1.44	-0.44	-0.88
73 Metal container	0.29	-1.01	-0.39	-0.27	-0.99	-0.10	-1.10	-0.30	-0.13	-1.19	-0.06	-0.30	-0.62	-0.34	-0.26	0.03	-0.72
74 Wire products	-0.44	-0.36	-0.29	-0.99	-0.27	-0.99	-0.41	-0.36	0.57	-1.05	-1.14	-1.16	-0.34	-0.60	-0.64	-1.08	-0.60
75 Hardware	-0.60	-0.75	-0.29	-0.09	-0.38	-0.89	-1.18	-1.47	0.96	-1.43	-0.47	-0.78	0.06	-0.26	0.14	-0.55	-0.79
76 Boilers and turbines	0.12	-0.09	-0.54	0.78	-0.20	-0.55	-0.04	-0.22	-0.16	-1.38	-0.90	-0.44	-0.56	-0.63	-0.99	-0.76	-0.58
77 Aircraft engines	0.55	-1.43	1.45	-0.98	-0.15	-0.10	0.62	0.45	-0.48	-1.90	0.25	-0.89	0.45	0.29	0.52	0.16	-0.88
78 Internal combust engines	-0.28	-1.56	-1.14	-1.15	0.18	0.01	-0.43	-1.28	-0.26	-1.99	-1.39	-0.41	-0.12	0.39	-0.61	0.99	-1.16
79 Other power machinery	-1.84	-0.07	-0.30	0.33	0.07	-0.07	-0.62	-0.08	-0.25	-0.96	-0.91	-1.24	-0.14	-0.14	-0.33	-0.02	-0.39
80 Agricultural machinery	0.77	-1.18	-0.10	-0.51	0.51	-1.07	-1.02	-0.21	-0.15	-1.04	0.33	-0.66	-0.83	-0.40	-0.58	0.18	-0.64

TABLE 13:(continued)

		CAN	USA	MEX	AUS	BEL	FRA	GER	ITA	SPA	UK	JAP	CHN	KOR	TW	ROECD	ROW	WT. AVE
81	Construction,mining eq	0.04	-0.78	0.37	-0.58	-0.55	-0.72	-0.56	-0.89	0.21	-1.24	-0.47	-0.17	-0.89	0.09	-0.98	-1.00	-0.74
82	Metalworking machinery	0.24	-1.26	0.61	-0.30	-0.25	-0.68	-0.87	-0.87	0.80	-1.62	-0.26	-0.58	-0.47	-0.53	0.50	0.44	-0.57
83	Sewing,knitting machine	0.50	-0.49	0.17	-0.29	0.33	0.67	-0.70	-0.72	0.18	-1.65	-0.42	-0.64	0.18	0.15	-0.54	-0.39	-0.52
84	Textile machinery	-0.15	-1.57	-0.24	0.97	0.16	0.04	-0.83	-1.22	-0.51	-1.80	-0.69	-1.57	-1.03	-0.68	0.65	-1.03	-0.68
85	Paper mill machines	0.23	-1.34	-0.05	-0.15	0.81	-0.13	-0.40	-0.67	0.21	-1.71	-0.63	-0.39	-1.06	-0.60	-0.32	-0.61	-0.49
86	Printing machines	0.44	-1.60	-0.06	-0.11	-0.29	0.02	-1.11	-0.38	0.20	-1.32	-0.06	-0.24	0.04	-0.32	-0.09	0.75	-0.94
87	Food-processing machine	0.30	-1.32	0.70	-0.65	0.02	-0.20	0.26	-1.46	0.03	-1.45	-0.22	-1.30	-0.17	-0.09	-1.22	-0.70	-0.93
88	Other special machines	-0.68	-0.46	-0.61	-0.30	0.72	0.56	0.50	-1.49	0.37	-1.72	-0.84	-0.01	-0.37	-0.74	1.49	-1.09	-0.19
89	Service ind. machinery	-0.45	-0.92	-0.36	-0.55	0.34	-0.47	-0.12	-1.40	0.15	-1.47	-0.40	-0.53	-0.99	-0.30	0.03	-0.73	-0.65
90	Pumps	1.15	-0.44	-0.80	-0.01	-0.38	-0.28	-1.30	-0.39	-0.37	-1.59	-0.75	-0.57	-1.27	0.39	-0.30	1.22	-0.87
91	Mechanical handling eq	0.51	-0.60	-0.88	-0.14	0.04	-0.17	-1.05	-0.47	-0.06	-1.48	-0.34	-0.19	-1.51	0.33	-0.44	0.18	-0.73
92	Other non-elec machines	-1.65	-0.12	0.85	-0.34	-0.57	-0.80	-0.89	-0.81	-0.58	-1.73	0.09	-0.69	-0.45	-0.83	-0.63	-1.03	-0.71
93	Radio, TV, phonograph	-0.31	-1.38	-0.19	0.43	0.10	-1.02	-0.26	0.05	0.68	-0.42	-0.58	-1.44	-0.98	-1.14	0.32	-0.39	-0.61
94	Telecommunication eq,nec	0.72	0.08	-1.74	0.63	-1.35	-0.91	-0.94	-0.68	0.29	-1.04	-1.66	-1.28	-0.73	0.06	-0.84	-0.80	-1.17
95	Household appliances	-0.43	-1.98	-0.02	0.56	0.89	-0.24	-0.19	-0.81	0.50	-1.23	-0.10	-0.55	0.02	-0.20	-0.47	0.38	-0.39
96	Computers & accessories	-2.22	-0.96	-1.41	0.83	-0.73	-1.91	-0.27	-1.33	0.14	-1.83	-1.56	-0.89	-1.08	-1.32	-1.84	-0.99	-1.27
97	Other office machinery	-0.92	-0.50	0.64	0.24	0.24	0.43	0.19	-0.87	-0.92	-0.07	0.12	-1.00	-0.38	-0.97	-1.52	-0.19	-0.15
98	Semiconductors	0.29	-0.57	0.63	-0.13	-0.84	-0.40	-0.78	-0.08	0.79	-1.08	-0.78	-0.65	-0.94	-0.25	-0.09	-0.03	-0.60
99	Electric motors	-0.16	-1.12	0.73	0.90	0.32	-0.57	-0.90	-0.70	0.59	-1.06	0.21	-0.62	-0.87	0.07	1.15	-0.74	-0.38
100	Batteries	-1.27	-0.64	-0.15	-0.54	-0.48	-0.96	-0.94	-0.30	0.50	-1.86	-1.28	-1.49	-0.87	0.03	0.03	0.58	-0.94
101	Electric bulbs	-0.41	-0.61	-0.34	0.94	-0.04	-0.71	-0.85	-0.71	-0.14	-1.65	0.07	-0.91	-0.30	0.16	-0.11	0.62	-0.40
102	Industrial appliances	-0.03	-1.29	-0.48	0.33	-0.14	-0.62	-0.85	-0.40	1.19	-1.55	-0.38	-0.64	-0.51	-1.49	0.05	-1.51	-0.71
103	Shipbuilding	-0.96	-0.15	-0.49	0.30	1.33	0.11	0.30	0.59	0.22	-1.34	-0.02	-0.15	-0.40	-0.12	-0.05	-0.38	-0.17
104	Warships	-1.13	0.01	-0.54	0.05	-0.00	-0.07	-0.71	0.01	-0.00	-1.29	-0.23	-0.06	-0.85	-0.00	-1.91	-1.10	-1.23
105	Railroad equipment	-0.16	0.07	0.82	-0.10	-0.30	-0.18	-0.32	0.05	-0.56	-0.58	0.36	-0.49	0.79	-0.69	0.34	-0.53	-0.16
106	Motor vehicles	-0.52	-0.00	0.86	1.67	-0.01	-0.24	-0.96	-0.56	0.43	-0.52	0.22	-0.69	-0.36	-0.76	0.85	0.04	-0.16
107	Motorcycle and bicycles	-0.08	0.17	1.56	-1.15	-1.07	-0.23	-0.21	-0.60	0.43	-0.69	-0.56	-0.78	-0.21	-0.72	-0.25	-0.08	-0.58
108	Motor vehicle parts	-0.31	-1.72	-0.40	-0.52	0.16	-0.72	-0.51	0.11	-1.19	-1.68	-0.13	-1.05	-0.50	-1.41	0.51	-0.06	-0.58
109	Aircraft	0.21	0.15	0.12	-0.20	0.45	-0.39	-0.49	-0.25	0.16	-0.61	0.49	-1.01	0.14	0.56	0.55	0.12	-0.17
110	Other transport equip	-2.06	-1.64	-0.14	-0.18	-0.10	-0.97	0.13	-1.33	-0.02	-2.15	1.36	-0.51	-0.17	-0.42	0.68	0.55	-0.53
111	Professional instruments	0.15	-0.29	-0.35	-0.04	0.30	-0.54	-1.05	-1.61	0.36	-1.51	-0.14	-0.51	0.75	-0.25	0.54	-0.61	-0.61
112	Optical goods	0.94	0.42	-0.15	0.56	0.48	-0.55	-0.61	-0.41	1.13	-1.71	0.27	-0.27	0.00	-0.52	0.16	-0.45	-0.01
113	Watches and clocks	-1.33	-0.31	-0.41	0.48	-0.02	-0.25	-0.54	-0.68	2.13	-1.44	0.50	-1.47	-0.71	-0.30	-0.88	-0.50	-0.60
114	Jewellery	0.81	-0.36	0.35	0.15	-1.06	-0.01	-0.37	-0.59	-0.05	-0.93	-1.10	-0.66	-1.83	-0.03	0.14	-0.27	-0.40
115	Musical instruments	-0.13	-0.84	-1.19	-0.35	0.78	-0.19	-0.32	-1.70	0.84	-1.35	-0.22	-0.60	-0.87	0.33	-1.38	-0.78	-0.35
116	Sporting goods	0.66	-0.77	-0.02	-0.90	0.51	-0.82	-0.75	-0.54	0.16	-1.48	-0.05	-0.62	0.25	-0.31	-0.90	-0.20	-0.37
117	Ordnance	-1.08	-0.53	-0.11	-0.13	-0.10	-0.55	-0.54	-0.53	0.74	-0.12	-0.46	-0.32	-0.12	0.48	-0.72	-0.79	-0.48
118	Works of art	0.22	-0.05	-0.10	1.11	0.03	-0.70	-0.70	-0.68	0.01	-0.13	-0.22	-0.20	0.89	-1.83	-1.40	-0.93	-0.68
119	Manufactured goods, nec	0.75	-0.89	0.54	0.18	-0.67	-0.23	-0.91	-1.17	0.39	-1.47	-0.12	-1.18	-0.06	0.85	0.10	-0.97	-0.65
120	Scraps,used,unclassified	-1.26	-0.86	0.02	-0.67	-0.33	-0.48	-0.52	0.21	-0.52	-1.74	-0.68	-0.14	-0.81	-0.94	-0.11	0.30	-0.65
	Ave. of Sectors	-0.52	-0.67	-0.26	-0.21	-0.26	-0.60	-0.83	-0.78	0.03	-1.12	-0.35	-0.97	-0.61	-0.73	-0.34	-0.52	-0.63

7. Concluding Remarks

The multisectoral bilateral world trade model developed and tested in the current study represents a major advance in the modeling of the international trade linkages. Because the trade model is estimated at a level of disaggregation by commodities and countries that is not customarily employed in the literature, it is finally possible to link complete, multisectoral national models with consistent, bilateral trade flows and to examine sector- and country-specific issues in an international general equilibrium framework. Of course, the economies are actually linked by trade which is conducted at a much deeper level of product detail; but the step from no or few sectors to the maximum detail supportable by sectoral statistics and input-output tables is a significant increase in realism.

While the empirical results in the current study bring forward the fundamental role of relative prices in explaining the temporal variations in international trade shares, the study also finds that capital investment -- a proxy for quality change of product not reflected in the price index -- is also a significant determinant of changes in the trade shares. In many cases, changes in bilateral trade shares also show a significant trend not explainable by either relative prices or capital investment. Testing the model in a historical simulation shows that the equation shares definitely outperform the "naive" assumption of constant shares.

On a practical note, the current study has devoted a considerable effort to the organization of a detailed bilateral world trade database. We have processed over 200 bilateral trade data tapes from the OECD and UN, and made a number of adjustments to alleviate the inconsistencies in the raw data. The result is a detailed, consistent, usable time-series bilateral trade database that contains 18 years of bilateral flows in 120 products for 28 source countries and 60 partner countries and country groupings that make up the entire world. To be sure, the researcher who needs detailed bilateral trade data could, like this author, always go back and read the same OECD and UN trade data tapes, try to remove the inconsistencies in the raw data, and reduce as many as 3,000 commodity categories and 200 partner countries to a more manageable level. However, the trade database built in the current study clearly offers a better alternative, because it has already taken much of drudgery out of the routine data work. The extensive collection of bilateral trade flows can be easily accessed through a personal computer and carried in floppy diskettes. Using an accompanying data-handling software, VAM, one can, for instance, bring up in a spreadsheet the 16 x 16 trade (flows) matrices for each of the 120 products in each year or a given source country's exports to or imports from its partner countries over the 1974-91 period, or graph the time series, or perform other data transformations. Evidently, its usefulness goes beyond the present study.

In summary, the bilateral trade model developed in the paper can be expected to greatly enhance the consistency of the trade forecasts and significantly expand the modeling capabilities of the Inforum international forecasting system.

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