CANADA, THE UNITED STATES, AND NAFTA: THE EFFECTS ON TRADE PATTERNS

by
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Abstract

On January 1st, 1994 the North American Free Trade Agreement (NAFTA) which involved the Government of Canada, the Government of the United Mexican States and the Government of the United States of America, entered into force. The objectives of this Agreement, among others, were: to eliminate barriers to trade in goods and services, to promote conditions of fair competition in the free trade area, substantially increase investment opportunities, and enhance the competitiveness of their firms in global markets. What have been the effects, if any, of this Agreement on trade patterns between Canada and the United States?

This paper uses a methodology employed by the Centre d'études prospectives et d'informations internationales (CEPII) to study of the changes in trade patterns between Canada and the United States using data published by Statistics Canada, International Trade Division. These data, World Trade Country Metadata, include import and export data from 1988-1999, which are used to calculate three trade types—one-way trade, two-way trade in horizontally differentiated (similar) products, and two-way trade in vertically differentiated (quality) products—and track their evolution over the study period.

Dedication

til ære for min bestefar og bestemor

Acknowledgements

I would like to take this opportunity to thank my committee: Professor Richard G. Harris, Professor Nicolas Schmitt and Professor Stephen Easton for their help, encouragement and expertise that has proven invaluable for this project.

I would also like to thank Katrina for her unwavering support and patience during the completion of this work.

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1 Introduction

On January 1st, 1994 the North American Free Trade Agreement (NAFTA) entered into force. The objectives of this Agreement between the Government of Canada, the Government of the United Mexican States and the Government of the United States of America were to:

- eliminate barriers to trade in, and facilitate the cross border movement of, goods and services between the territories of the Parties
- promote conditions of fair competition in the free trade area
- increase substantially investment opportunities in their territories
- provide adequate and effective protection and enforcement of intellectual property rights in each Party's territory
- create effective procedures for the implementation and application of this Agreement, and for its joint administration and the resolution of disputes
- establish a framework for further trilateral, regional and multilateral cooperation to expand and enhance the benefits of this Agreement

What have been the effects of this Agreement on trade patterns between Canada and the United States, and in particular, on the importance and types of intra-industry trade? In this paper, I hope to reproduce aspects of the study undertaken by the Centre d'études prospectives et d'informations internationales (CEPII) on the effects of the completion of the Single European Market, but with respect to the implementation of NAFTA.

1.1 The European Study

In 1997, the Centre d'études prospectives et d'informations internationales (CEPII) published *Trade Patterns Inside the Single Market* which investigated the effect of the completion of the Single European Market. The authors of this study addressed three main questions: 1) how did intra-EC trade patterns evolve over the period of

study, 1980-1994 and, in particular, has the completion of the Single European Market increased trade flows among member states through inter-industry trade or intra-industry trade? 2) in the case of intra-industry trade, has the effect been upon horizontally differentiated goods or vertically differentiated goods? 3) which price/quality segments of the market are the member states positioned?

The authors found a large increase in intra-industry trade during the period of study, but this increase was not in the form of horizontally differentiated products as may have been expected with a reduction of tariff and non-tariff barriers, but rather in vertically differentiated products. At the beginning of the 1980s, one-way trade accounted for approximately 45% of intra-EC trade, but from the mid-1980s onward this share declined. Two-way trade in horizontally differentiated goods remained relatively stable at less than 20% of trade for the period of study, while vertically differentiated goods increased from approximately 35% of trade in 1980 to more than 42% of trade in 1994.

For all member countries, intra-industry trade in vertically differentiated goods is the most important—with respect to value share—trade type in intra-European trade. This importance of intra-industry trade in qualities, and not in varieties, suggested a qualitative division of labour within the Community—adjustments are taking place within industries along the quality spectrum, rather than between industries. Generally, "Northern" European countries have been specialized in up-market goods, while "Southern" Europe has specialized in middle- and down-market goods.

2 Two Models of Intra-Industry Trade

2.1 Neo-Heckscher-Ohlin Model

The standard Heckscher-Ohlin model of trade is unable to explain intra-industry trade; countries trade the good that uses their relatively abundant factor and each country trades one good. Falvey (1981) uses the capital-labour ratio in production to distinguish quality levels in goods to give his model of intra-industry trade a "Heckscher-Ohlin flavour".

The model has the familiar Heckscher-Ohlin framework: perfect competition, two countries, two factors of production, two industries, and labour is the mobile factor of production. The two main differences from the traditional Heckscher-Ohlin framework are that capital is industry specific and at least one sector produces a differentiated good (Greenaway and Milner, 1986).

The industry, which produces the quality-differentiated good, is assumed to be able to produce a continuum of products given by the index:

$$\alpha(\alpha^L < \alpha < \alpha^H) \tag{1}$$

$$L \equiv \text{Low Quality}$$
$$H \equiv \text{High Quality}$$

The cost of producing a given quality is given by:

$$C(\alpha) = w + \alpha r \tag{2}$$

$$w \equiv \text{wage rate}$$
$$r \equiv \text{rental rate}$$

Falvey assumes $w^* < w$ *and* $r^* > r$ in order for trade to occur—$^*\equiv$ foreign country. This assumption implies that there will be a range of qualities the home country can produce at a lower unit price than the foreign country, and another range of qualities for which the foreign country can do the same. Since $C(\alpha)$ and $C^*(\alpha)$ are continuous in α, for any given $r^* > r$, there exists some 'marginal quality' α_1 such

that $C(\alpha_1) = C^*(\alpha_1)$, and thus (Falvey, 1981):

$$\alpha_1 = \frac{w - w^*}{r^* - r} \tag{3}$$

For all other qualities: $C(\alpha) - C^*(\alpha) = (\alpha_1 - \alpha)\frac{(w-w^*)}{\alpha_1}$, and since $\frac{(w-w^*)}{\alpha_1}$ will always be positive:

$$[C(\alpha) - C^*(\alpha)] < 0 \; for \; \alpha > \alpha_1; \;\; [C(\alpha) - C^*(\alpha)] > 0 \; for \; \alpha < \alpha_1 \tag{4}$$

This implies that the home country has a comparative advantage in goods with greater quality than α_1, and the foreign country has a comparative advantage in goods with lesser quality than α_1. Therefore, as long as there is a demand for high and low quality goods, vertically differentiated intra-industry trade will occur (Greenaway and Milner, 1986).

2.2 Monopolistic Competition—The Neo-Chamberlinian Model

As opposed to the classical models of international trade, the monopolistic competition models are independent of relative factor endowments. In fact, gains from trade are maximized when the countries are identical. Product differentiation in these models is not along a quality basis, as with the Neo-Heckscher-Ohlin model, but along differences in actual of perceived characteristics of the good (Greenaway and Milner, 1986).

The neo-Chamberlinian approach assumes a preference for diversity—consumers wish to consume different varieties of goods.

Assumptions of the Model:

1. labour is the only factor of production and is fixed in supply
2. there are a large number of firms, each one producing a single variety
3. freedom of entry and exit
4. all varieties enter the consumers' utility function symmetrically

All consumers have the same utility function:

$$U = \sum_{\imath=1}^{n} v^{\alpha}(c_\imath); \quad 0 < \alpha < 1; \quad v' > 0; \quad v'' < 0 \tag{5}$$

$$\imath \equiv \text{number of varieties}$$

This assumption has diminishing returns to increases in the consumption of a given variety, and with more varieties consumed, holding total consumption constant, total welfare increases.

All goods are assumed to be produced using the same linear production function:

$$l_\imath = \alpha + \beta x; \quad \alpha, \beta > 0 \tag{6}$$

$$l_\imath \equiv \text{labour used to produce good } \imath$$
$$x_\imath \equiv \text{output of good } \imath$$
$$\alpha \equiv \text{fixed cost}$$

Given this production function, there are decreasing average costs and constant marginal costs. The production of good $\imath$, must equal the sum of individual consumptions of that good in autarky:

$$x_\imath = Lc_\imath \tag{7}$$

$$L \equiv \text{Total Labour Force}$$
$$c_\imath \equiv \text{an individual's consumption of good } \imath$$

and assuming full employment:

$$L = \sum_{\imath=1}^{n} l_\imath = \sum_{\imath=1}^{n} [\alpha + \beta x_\imath] \tag{8}$$

Given the symmetry of the model, all goods will be produced in the same quantities at the same price:

$$p = p_\imath; \; l = l_\imath; \; x = x_\imath \tag{9}$$

and the utility function (Krugman, 1979):

$$U = nv^{\alpha}(c) \tag{10}$$

As a result of this utility function, and assuming production costs are equal for each variety and a firm will sell the same volume of output regardless of the variety produced, no one firm will produce the same variety. Since each firm uses the same amount of labour in the production of its good, the number of firms, and hence, varieties, are determined in the model:

$$n = \frac{L}{l} = \frac{L}{\alpha + \beta x} \tag{11}$$

Once trade opens up in this model, assuming no transport costs or other barriers to trade, each firm will still only produce one variety of the differentiated good. If we assume that the two countries engaging in trade are identical in every way, there must be welfare gains in each country since there are no losses in production and the number and output of firms is unchanged—each consumer only consumes one-half of the original quantity, but there are twice as many consumers; consumers' welfare has increased due to an increase in varieties consumed and a decrease in the quantity consumed of each variety (Sodersten and Reed, 1994). It should be noted that if the countries are dissimilar is size, but identical in all other aspects, the smaller country will gain proportionately more than the larger country through a greater net trade in varieties since the quantity of varieties produced in an autarkic economy is proportional to its population.

The neo-Chamberlinian model has its limitations as well: the utility function's symmetric inclusion of all varieties appears to contradict the real world; product variety is determined solely by factor supply and production conditions, there is no role for demand; the process of variety selection, and the process of any adjustments are assumed away; and unless the are differences in the countries, the direction of trade cannot be determined (Greenaway and Milner, 1986). Both the Neo-Hecksher-Ohlin and Monopolistic Competition models have assumptions regarding the unit prices of goods traded. The Neo-Hecksher-Ohlin model assumes that each country produces certain goods at a lower unit cost than their trading partner and "guarantees" vertically differentiated trade between the two countries. In contrast, the Monopolistic Competition model with horizontally differentiated goods implies that the unit price of the variety exported is similar to the unit price of the variety imported. In other words, associated with intra-industry trade in vertically differentiated goods is the fact that the unit price of the export good is different from the unit price of the import good.

3 Measurement of Intra-Industry Trade

Before one can measure the degree and extent of intra-industry trade, an industry must be defined. As in many areas of economics, there is no dominant definition accepted by all, however, Sodersten and Reed (1994) lay out two of the main criteria used to define an industry for the purposes of empirical work:

1. The production process: if two differentiated products are produced using a similar production process—it is relatively easy to substitute one good for the other in the same production process—they are considered output of the same industry. Cars, trucks, buses and tractors would be products of the same industry by this criterion. An extension of this criterion is that the differentiated products should use identical technology intensity. By this definition, typewriters and word processors would not be products of the same industry, despite their similar use by consumers (Sodersten and Reed, 1994).

2. Consumer usage: if two differentiated products are essentially used for the same purpose—glass, plastic, and cardboard containers—they are outputs of the same industry. The first criterion focused on the substitutability within the production process, while this distinction focuses on the substitutability in final use. At times, these two criteria may complement each other, but they may also be in direct conflict; the choice of which criteria to use has often been determined by the data used in the study (Sodersten and Reed, 1994).

Once the researcher has defined the industry, the next obstacle is to determine the correct level of aggregation. As will be seen with indices used to measure intra-industry trade, if the industry is defined by the country as a whole, and trade is balanced, intra-industry trade will appear to be the only form of trade in which the country participates. At the other extreme, data permitting, if an industry is defined at the commodity level, there may be no intra-industry trade if the commodity classification is of a significantly high level of disaggregation.

Some researchers have suggested that intra-industry trade is merely a "statistical phenomenon" (Lipsey, 1976). This claim is supported by citing various levels of disaggregation within the SITC groups: canoes and 200,000 tonne tankers are in the same three digit classification, table model radios and airport flight control equipment are

in another. Is trading canoes for tankers really intra-industry trade? Lipsey's skepticism was expressed in a book review of Grubel and Lloyd's *Intra-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products* published in 1975. This problem of aggregation has far from disappeared twenty-five years later. The Harmonised System, which is a commodity based system, was adopted by Statistics Canada in 1988 to report on imports and exports. This system starts at the two-digit level and successively moves to the eight-digit level for exports and the ten-digit level for imports, which have 99, 7488, and 37 130 classifications, respectively. Any study that deals with an economy as a whole is bound to generate aggregation problems.

3.1 The Grubel-Lloyd Index

The Grubel-Lloyd Index measures the degree of trade in similar products within one or several industries (Sodersten and Reed, 1994). For a single industry, it is equal to:

$$GL = \frac{(X_\imath + M_\imath) - \mid X_\imath - M_\imath \mid}{(X_\imath + M_\imath)} = 1 - \frac{\mid X_\imath - M_\imath \mid}{(X_\imath + M_\imath)} \tag{12}$$

$$\imath \equiv \text{commodity within industry } \jmath$$

The Grubel-Lloyd Index above is expressed the country level as an unweighted average for all commodity categories. This restriction with the index can be removed with a weighted average, there still remains the category/sub-group aggregation problem with the ratio of net trade to gross trade (Greenaway and Milner, 1986).

This problem arises since the net trade-gross trade ratio "is a weighted average of the indices for the next most disaggregated groups" (Sodersten and Reed, 1994).Suppose there are two commodities/sub-groups within an industry:

$$\frac{\mid X_\imath - M_\imath \mid}{(X_\imath + M_\imath)} = \frac{\mid (X_{1\imath} - M_{1\imath}) + (X_{2\imath} - M_{2\imath}) \mid}{(X_{1\imath} + X_{2\imath} + M_{1\imath} + M_{2\imath})} \tag{13}$$

If the country in question is a net exporter in both sub-groups, the weighting effect of the ratio is maintained, but if the country is a net exporter of one good and a net importer of the other good, the weighting effect is lost and the Grubel-Lloyd Index will take on a different value (Sodersten and Reed, 1994).

The index can be corrected by replacing the original net trade-gross trade ratio with the following:

$$\frac{\sum_{i=1}^{n} \mid X_{ij} - M_{ij} \mid}{(X_j + M_j)} \tag{14}$$

$$i \equiv \text{sub-group } i \text{ within industry } j$$

This adjustment removes the categorical aggregation problem that results from countries being a net exporter in one sub-group of an industry and a net importer in another sub-group. If a country is a net exporter/importer in both goods, GL = GL′, but if a country is a net exporter in one good and a net importer in another, GL ≠ GL′ (Greenaway and Milner, 1986):

$$GL'_j = 1 - \frac{\sum_{i=1}^{n} \mid X_{ij} - M_{ij} \mid}{(X_j + M_j)} \tag{15}$$

3.2 Trade Overlap

Trade within a commodity classification can be considered to be two-way trade when the value of the minority value flow of trade represented at least $\gamma\%$ of the majority value flow of trade, which is the following condition:

$$\frac{Min(X_{p,t}, M_{p,t})}{Max(X_{p,t}, M_{p,t})} > \gamma\% \tag{16}$$

$$p \equiv \text{product}$$
$$t \equiv \text{year}$$

Below this level, the minority value flow is not considered significant since it does not represent a structural feature of trade. In this study, as with the CEPII, $\gamma = 10\%$.

This criterion can then be used to calculate an index of two-way trade. For those products which have this 10%, or greater, overlap:

$$Share\ of\ Two-Way\ Trade = \frac{\sum_i (X_i + M_i)}{(X_j + M_j)} \tag{17}$$

$$i \equiv \text{two-way traded goods, } \gamma \text{ \% overlap}$$
$$j \equiv \text{all traded goods}$$

When the Grubel-Lloyd Index and the two-way trade index used by the CEPII are compared, they are quite similar. Fontagné, and Freudenberg (1997), using regression analysis, found the fit between the two indices to be impressive: ($R^2 = 0.97$). The CEPII two-way trade index is typically an overestimate of two-way trade as compared to the Grubel-Lloyd Index since the Grubel-Lloyd Index measures the degree of trade overlap, while the CEPII index considers all trade over the γ % threshold to be two-way trade (Fontagné, and Freudenberg, 1997). As will been seen below, the Grubel Lloyd Index does indeed fall below the CEPII two-way trade index in this North American study.

3.3 Product Similarity

Thus far, the measurements of intra-industry trade encompass this trade classification as a whole. Within a given commodity classification that experiences two-way trade, products may differ in their quality which indicates vertically differentiated trade. Differences in the unit values (UV) of these commodities can be assumed to represent these quality differences; traded products can be considered similar in quality—horizontally differentiated—if the export and import values differed by less than α %, and therefore, satisfied the following condition:

$$1 - \alpha \leq \frac{UV^X}{UV^M} \leq 1 + \alpha \tag{18}$$

If this condition does not hold, the product trade is considered to be vertically differentiated.

There are two arbitrary thresholds used for the distinction between vertically and horizontally differentiated trade in the literature: 15 and 25%. The 15% threshold is generally used when price differences are supposed to only reflect differences in quality—the assumption of perfect information, such that a consumer will not purchase a similar, or lower, quality good at a higher price. However, in cases with imperfect information, such as price difference resulting from brand names only, the 15% threshold may be too narrow. For these cases, the 25% threshold may be more appropriate. Alternatively, both thresholds could be used in order to evaluate the robustness of results (Greenaway, Hine, and Milner, 1995).

3.4 Three Trade Types

The preceding criteria for trade overlap and product similarity lead to three different categories of trade:

1. two-way trade in similar, horizontally differentiated, products (significant overlap and low unit value differences)
2. two-way trade in vertically differentiated products (significant overlap and high unit value differences)
3. one-way trade (no significant overlap).

With quality ranges of goods defined as up-market, middle-market, and down-market goods:

- up-market: unit value $> 15\%$ of the average
- down-market: unit value $< 15\%$ of the average
- middle-market: unit value within 15% of the average.

The purpose of the up-, middle-, and down-market distinctions is to investigate which price/quality segments of the market countries or industries lie, or move towards.

3.5 Calculated Indices

In order to measure the extent of intra-industry trade, the Grubel-Lloyd Index corrected for the categorical aggregation problem and the CEPII trade overlap index, outlined above, will be used. In order to measure the share of two-way trade in horizontally differentiated products, the ratio of the value of two-way trade—for which $\frac{UV^X}{UV^M}$ falls within the horizontally differentiated products range ($0.85 \leq \frac{UV^X}{UV^M} \leq 1.15$)—to the total value of trade in that industry is calculated:

$$TWHD = \frac{\sum_{p_i \in J} \sum_{HD} (X_{p,t} + M_{p,t})}{\sum_{p_i \in J} \sum_{Z} (X_{p,t} + M_{p,t})} \tag{19}$$

$$Z \equiv \text{all trade types}$$
$$TWHD \equiv \text{two-way horizontally differentiated trade share}$$
$$p_\imath \in \jmath \equiv \text{product } \imath \text{ in industry } \jmath$$
$$t \equiv \text{year}$$

A similar formula is used in the calculation of the share of two-way trade in vertically differentiated products; that is, when $\frac{UV^X}{UV^M}$ is either below 0.85 or above 1.15.

4 Canada and the United States, 1988-1999

The data to be used in this paper, *World Trade Country Metadata*, was published by Statistics Canada, International Trade Division. These data include import and export data from 1988-1999, classified by the Harmonized Commodity Description and Coding System (Harmonized System) at the 8-digit level for exports and the 10-digit level for imports. These data are monthly observations that contain the state and province of origin/destination for both imports and exports.

The first task was to aggregate these data to yearly observations at the country level for each commodity classification. Once this was performed, I investigate the evolution of the three different trade types from 1988-1999. Whether or not a change in trade patterns was found at the national level, the next step was to classify industries within each country along the lines used in the CEPII study—see Appendix I—and repeat the investigation for the evolution of the three different trade types.

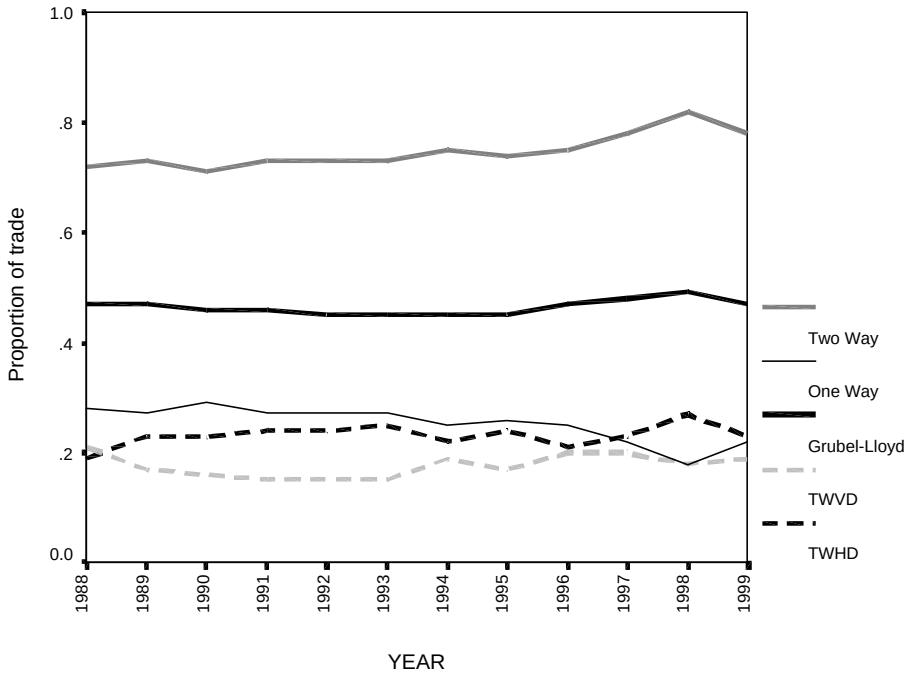
Unfortunately, quantities are not available for all goods in the data set—quantities are available for approximately $\frac{2}{3}$ of all commodities. Therefore, the vertical and horizontal trade types could only be calculated for a sub-sample of the goods. Due to this complication, the CEPII two-way trade index was calculated for all goods, and restricted to the goods for which quantities were available. In most industries, the restricted trade index is close to the unrestricted trade index in magnitude as well as patterns over time—I will assume the sample is representative of all goods for all calculations below.

4.1 Overall Picture of the Patterns of Trade

Figure 1 illustrates the trade patterns, calculated at the 15% threshold, from 1988-1999 at the most aggregated level, all products taken together. The trade types calculated are the traditional Grubel-Lloyd Index (G-L), CEPII two-way trade index (TW), two-way trade in horizontally differentiated products (TWHD), and two-way trade in vertically differentiated products (TWVD).

There is little movement, with a low value, in the Grubel-Lloyd Index over the study period, compared to the alternate measure of two-way trade. This low phenomenon is

Figure 1: Evolution of Trade Types, 1988-1999



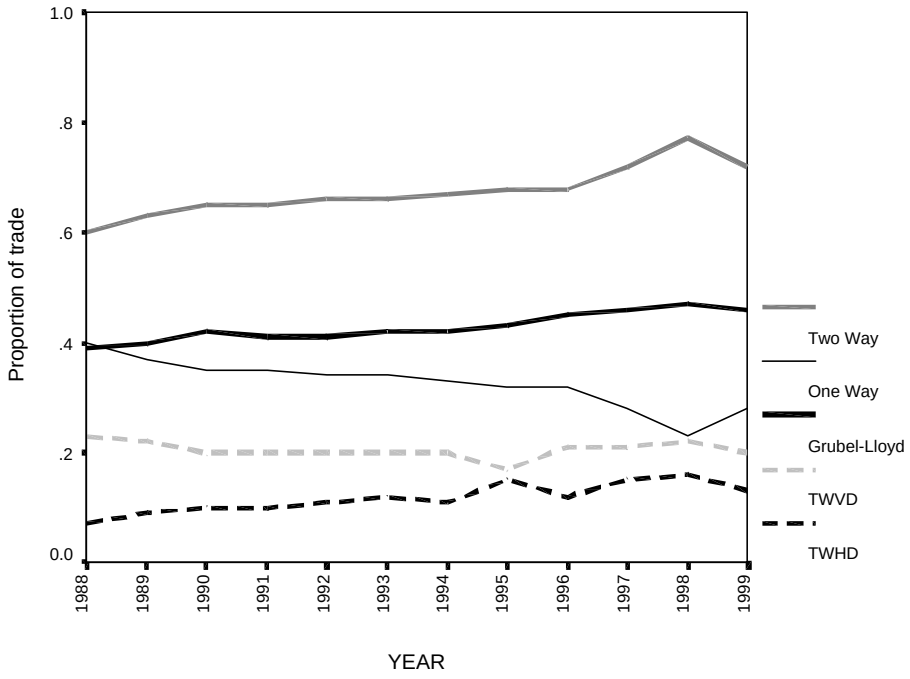
Source: Statistics Canada, calculations by the author.

probably due to the high level of disaggregation—approximately 7500 products with their trade type calculated individually. The TW trade index has more movement over the study period. Though there is little change during the first five years (pre-NAFTA), the index does move up 3 percentage points from 1994-1999.

Curiously, as Figure 2 indicates, when the motor vehicle industry is removed—24 to 28% of overall trade during the study period—the results change.

Due to the high level of intra-industry trade in the motor vehicles industry—discussed below—two-way trade has shifted down significantly, ($\approx$ 10% over all years). The Grubel-Lloyd Index only had a significant shift downward in the beginning of the period, giving the index a smooth upward trend over the entire period. There is little movement in the proportion of TWVD, with most of the movement in two-way trade types is now in TWHD. As will be shown below, the motor vehicle industry has most of its trade in TWHD, which has most probably suppressed the movement of TWHD at the fully aggregated level due to its large share in total trade.

Figure 2: Evolution of Trade Types, Without Motor Vehicles Industry, 1988-1999



Source: Statistics Canada, calculations by the author.

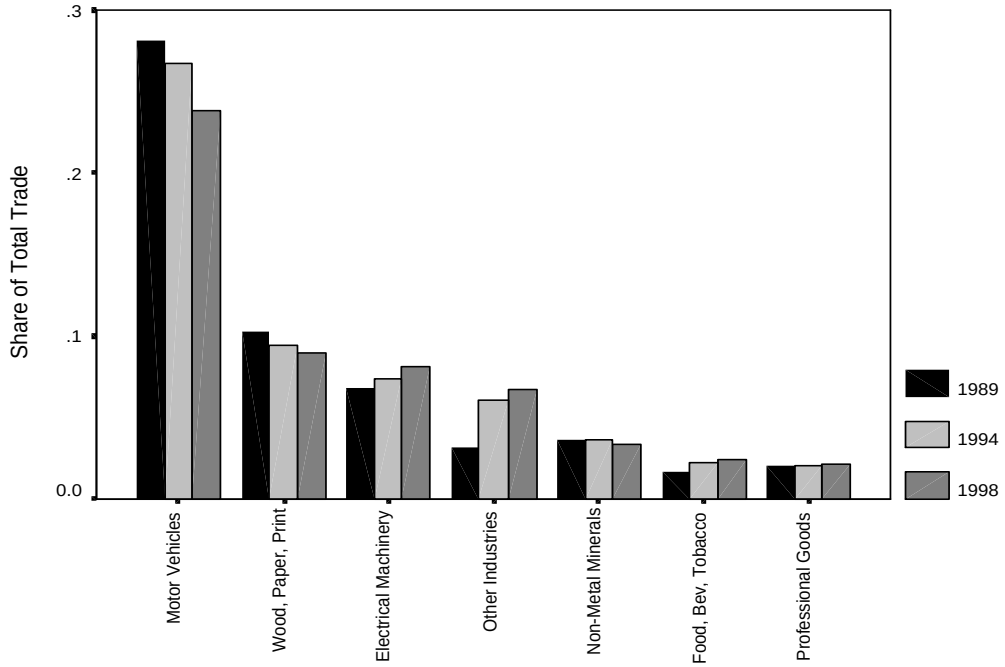
4.2 Share of Industries in Total Trade

Figure 3 shows that the motor vehicles industry has remained the most important trade share over the study period (24 – 28%), followed by non-electrical machinery (13 – 14%), and wood, paper, printing (9 – 10%).

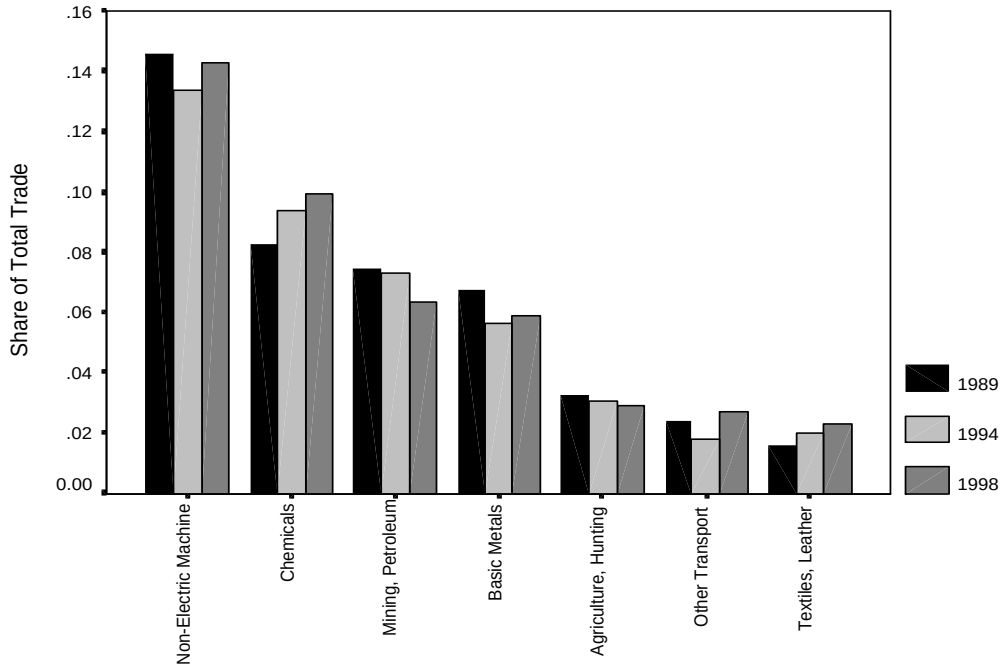
Though there has not been substantial change in the trade share for most of the industries, which did occur within the European Union in certain industries, there have been some significant relative changes within the industries' proportions themselves.

Table 1 highlights the industries that have had larger than average changes in their share of total trade. These industries tend to have the larger movements of the share in all trade, but it is the changes within their own proportions that the most striking.

Figure 3: Share of Industries in Total Trade, 1989 - 1998



Source: Statistics Canada, calculations by the author.



Source: Statistics Canada, calculations by the author.

Table 1: Changes in the Composition of Trade Shares, 1989 - 1998

Industry	Change in Trade Share	Relative Percentage Change
Agriculture, Hunting, Forestry	≈ 0	-11
Food, Beverages, Tobacco	0.7	**46**
Mining, Quarrying, Petroleum	-1.0	**-14.7**
Chemicals	1.75	**20.6**
Wood, Paper, Printing	-1.0	-12.5
Textiles, Leather	0.75	**49.3**
Non-Metallic Mineral Products	≈ 0	-6.3
Basic & Fabricated Metals Products	-0.8	-12.5
Non-Electrical Machinery	-0.3	-2.2
Electrical Machinery	1.3	**18.7**
Motor Vehicles	-4.3	**-15.25**
Other Transport Equipment	0.3	11
Professional Goods	≈ 0	1
Other Industries	3.6	**116**

Source: Statistics Canada, calculations by the author.

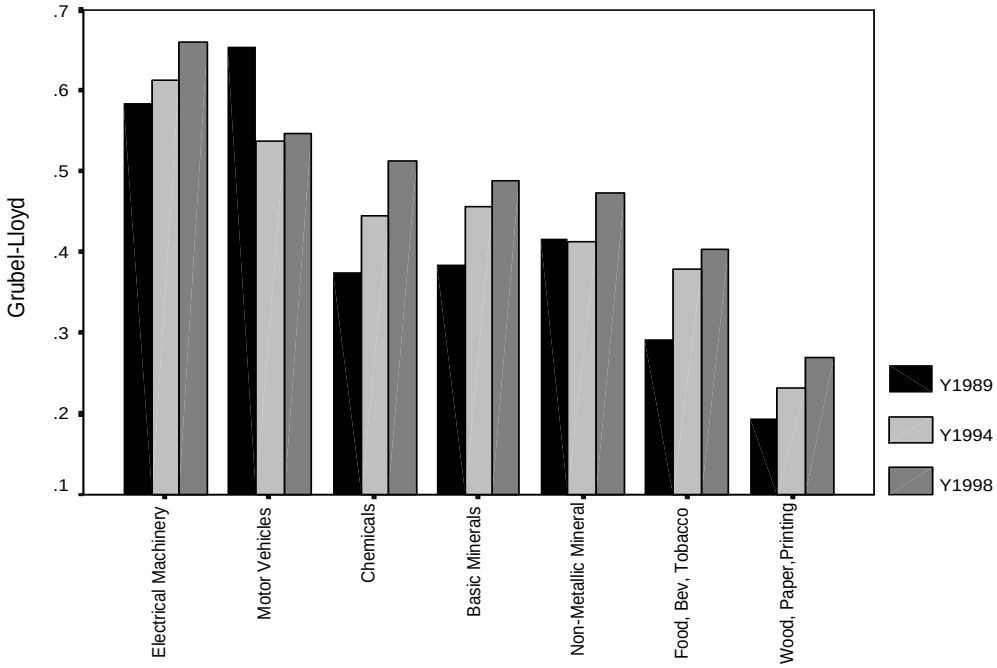
4.3 Evolution of the Grubel-Lloyd Index by Industry

Given that the level of two-way trade increased over the study period, the values for the Grubel-Lloyd index are not surprising. Table 2 and Figure 4 show that most industries have had an increase in their level of intra-industry trade, measured by this index, which corresponds to the general increase of intra-industry trade at the aggregated level. A noteworthy result is the decrease in the Grubel-Lloyd index for the motor vehicles industry—this result holds for all sub-groups of this industry as well. This decrease does not come as a surprise since the Grubel-Lloyd index was essentially constant at the fully aggregated level, but had an upward trend once the motor vehicle industry was removed.

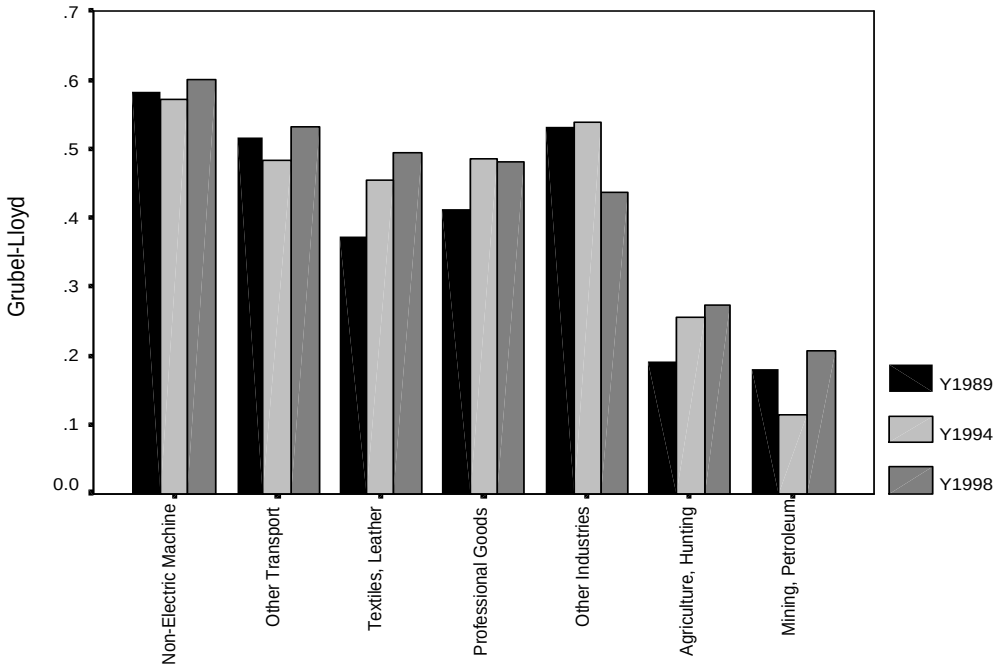
4.4 Evolution of Trade Types by Industry

Now that the movements in trade types at the most aggregated level, and shares at the industry level have been examined, it is time to distinguish the three different trade types within industries. Table 3 shows that the changes in trade types for industries have dominantly been in the form of increased two-way trade in horizontally differentiated products, with a corresponding fall in one-way trade. However, at the aggregate level, which includes the motor vehicle industry, the overall share of one-way trade has fallen and two-way trade in horizontally differentiated products re-

Figure 4: Evolution of the Grubel-Lloyd, 1989 - 1998



Source: Statistics Canada, calculations by the author.



Source: Statistics Canada, calculations by the author.

Table 2: Changes in the Grubel-Lloyd Index, 1989 - 1998

Industry	Percentage Change
Agriculture, Hunting, Forestry	8.4
Food, Beverages, Tobacco	11.1
Mining, Quarrying, Petroleum	2.75
Chemicals	13.9
Wood, Paper, Printing	7.4
Textiles, Leather	12.3
Non-Metallic Mineral Products	5.8
Basic & Fabricated Metals Products	10.2
Non-Electrical Machinery	2.0
Electrical Machinery	7.5
Motor Vehicles	-10.0
Other Transport Equipment	1.8
Professional Goods	6.8
Other Industries	-9.5

Source: Statistics Canada, calculations by the author.

mained constant, with a slight upward trend in vertically differentiated goods. When the motor vehicles industry is removed, the changes in trade patterns are a better reflection of the general trend within each of the industries: increased two-way trade in horizontally differentiated products with a corresponding fall in one-way trade, and an overall small change in two-way trade in vertically differentiated products.

4.5 High-, Middle-, and Down-Market Specialisation at the Country Level

Following the study performed by the CEPII to better understand the "quality division of labour", two-way trade in vertically differentiated products was split into up-market and down-market products with horizontally differentiated products representing middle-market products. At the aggregated level, all $\approx$ 7500 products, a 15% threshold was used for differences in unit values to differentiate between the three different quality levels-the 15% and 25% thresholds were calculated and both had similar trends in all industries, so the 15% threshold has been used in all calculations below.

Figure 5 shows Canada's share for the three different types of two-way trade. There has been little change in Canada's exports of middle-market products from 1989 to the end of the study period, aside from a small decrease of these products around the

Table 3: Percentage Share in Trade Types by Industry

Industry	Share in 1999, %			Change from 1988, %		
	One-Way	TWVD	TWHD Trade	One-Way	TWVD	TWHD Trade
Agriculture, Hunting, Forestry	0.53	0.34	0.09	-0.19	0.17	0.02
Food, Beverages, Tobacco	0.34	0.34	0.32	-0.19	0.00	0.19
Mining, Quarrying, Petroleum	0.84	0.07	0.08	0.10	-0.01	-0.09
Chemicals	0.21	0.32	0.24	-0.16	-0.02	0.12
Wood, Paper, Printing	0.59	0.16	0.07	-0.12	0.04	0.03
Textiles, Leather	0.16	0.41	0.35	-0.18	-0.02	0.20
Non-Metallic Mineral Products	0.31	0.12	0.27	-0.06	-0.01	0.03
Basic & Fabricated Metals Products	0.20	0.27	0.19	-0.22	0.00	0.08
Non-Electrical Machinery	0.06	0.18	0.18	-0.05	-0.14	0.17
Electrical Machinery	0.11	0.28	0.01	-0.09	0.00	-0.01
Motor Vehicles	0.02	0.16	0.53	0.01	-0.02	0.06
Other Transport Equipment	0.40	0.12	0.01	0.18	-0.14	0.01
Professional Goods	0.15	0.04	0.01	-0.08	0.00	0.01
Other Industries	0.08	0.02	0.00	-0.01	-0.04	0.00
All Industries, 15% threshold	0.22	0.19	0.23	-0.06	-0.02	0.04
All Industries, less Motor Vehicles	0.28	0.20	0.13	-0.12	-0.03	0.06

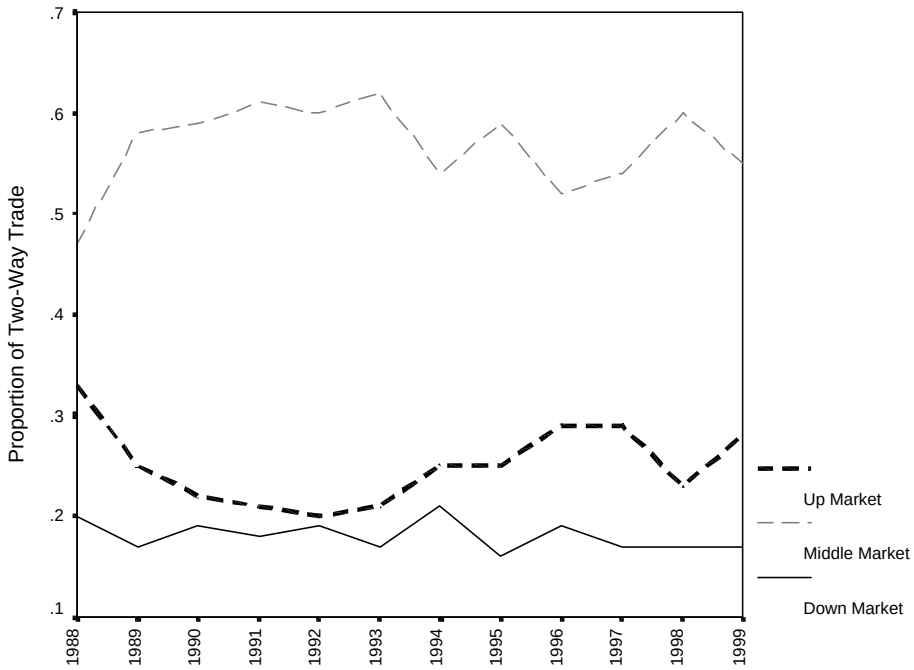
Source: Statistics Canada, calculations by the author.
TWHD: Two-Way Trade in Horizontally Differentiated Products.
TWVD: Two-Way Trade in Vertically Differentiated Products.

implication of NAFTA—the relative importance of the three types of two-way trade has not changed over the study period. Corresponding to this fall in middle-market products, post-NAFTA, there has been an increase in Canada's export of up-market products, while the export of down-market products has remained relatively constant.

4.6 High-, Middle-, and Down-Market Specialisation at the Industry Level

Table 4 shows the trends in the proportions of trade in the quality dimension. Actual changes in the different proportions were not reported here due to the volatility of some of the indices. Most of the industries have had a decrease in the proportion of down-market goods and a corresponding increase in medium-market goods, with varied changes in the up-market products. Comparing to Table 1, all industries that had higher than average relative changes in their trade shares have had increases in their middle market share.

Figure 5: Evolution of Trade by Price/Quality Range for Canada, 1988 - 1999



Source: Statistics Canada, calculations by the author.

Table 4: Changes in the Composition of Trade Shares, 1988 - 1999

Industry	Down-Market	Middle-Market	Up-Market
Agriculture, Hunting, Forestry	↓	↓	↑
Food, Beverages, Tobacco	↓	↑	↓
Mining, Quarrying, Petroleum	↓	↑	↓
Chemicals	↓	↑	↓
Wood, Paper, Printing	↓	↑	↑
Textiles, Leather	↓	↑	↑
Non-Metallic Mineral Products	↓	↑	↓
Basic & Fabricated Metals Products	—	↓	↑
Non-Electrical Machinery	—	↑	↓
Electrical Machinery	↑	↑	↓
Motor Vehicles	—	—	↑
Other Transport Equipment	—	↑	↓
Professional Goods	↑	↑	↓
Other Industries	↓	↑	↑

Source: Statistics Canada, calculations by the author. (The dash represents little change)

Table 5: Calculated Tariff Rates

Industry	Percentage Change
Agriculture, Hunting, Forestry	3.93
Food, Beverages, Tobacco	**14.73**
Mining, Quarrying, Petroleum	0.21
Chemicals	5.16
Wood, Paper, Printing	5.87
Textiles, Leather	**13.6**
Non-Metallic Mineral Products	5.76
Basic & Fabricated Metals Products	6.1
Non-Electrical Machinery	5.2
Electrical Machinery	**8.28**
Motor Vehicles	1.8
Other Transport Equipment	**6.87**
Professional Goods	4.3
Other Industries	6.1
Simple Average	**6.28**

Source: Department of Finance, Canada.

4.7 Tariff Reduction and Trade Patterns

Using tariff data published by the Canadian Department of Finance, Fiscal Policy and Economic Analysis Branch, pre-Free Trade Agreement (FTA) tariffs were calculated for the fourteen industries studied:

Table 5 shows that food, beverages, tobacco; textiles, leather; and other transport had higher than average pre-FTA tariff rates, and comparing with Table 3, had significant gains in horizontally differentiated trade over the period of study—ranges between 8 and 17%. None of the industries shown went from a net importer to a net exporter, but all industries except chemicals, electrical machinery, professional goods, and non-electrical machinery experienced increases in their trade balances which most probably contribute to their increased share in total trade over the study period. Chemicals, electrical machinery, professional goods, and non-electrical machinery all had decreases in their shares of up-market goods.

The following industries, which had lower than average pre-NAFTA tariff rates (4-6%), had increases in their proportion of up-market goods: agriculture, hunting, forestry; wood, paper, printing; basic & fabricated metals products; and other industries. Along with these increases in up-market goods, were corresponding drops in down-market goods indicating that the fall in tariff rates with the implementation of NAFTA forced these industries to specialise at the high end of the quality spectrum.

With the exception of "other industries," these industries all experienced decreases in their proportion of total trade over the study period.

Comparing to Table 4, all above average pre-FTA tariff rate industries have had increases in two-way trade in horizontally differentiated goods at the expense of vertically differentiated low quality goods. Also, comparing to Table 1, all industries but other transport equipment have had higher than average changes in their relative trade shares.

4.8 Unit Values

In order to investigate the evolution of unit values over the study period, only commodities that were traded over all years were considered—2335 commodities. Within an industry, many commodities have different units of measure. This would make any average unit value in a given industry meaningless. To overcome this complication and make use of the data on unit values, I calculated the percentage change in unit values for all commodities and years and then calculated the weighted average of these changes for each industry; a weighted average of the unit value ratio used to differentiate between up-, middle-, and down-market goods was also calculated for all of the industries.

The unit value of Canadian exports rose in all industries except: food, beverages, tobacco; mining, quarrying, petroleum; textiles, leather; and electrical machinery. Aside from mining, quarrying, petroleum, these industries had higher than average pre-FTA tariff rates. The unit value of imports rose in all industries except mining, quarrying, petroleum, which has the smallest of all pre-FTA tariff levels.

The ratio of export unit value percentage changes to import unit value percentage changes was also calculated. If this ratio is trending upward, the unit value of exports is increasing at a faster rate than the unit value of imports which would indicate that Canada is exporting goods that are increasing in quality faster than U.S. goods. Of course this does not give any indication of the level of quality, only how quickly exports are increasing in quality, relative to imports. Nevertheless, this ratio is increasing for all industries except: food, beverages, tobacco; textiles, leather; and electrical machinery which all have higher than average pre-FTA tariff rates.

Table 6: Weighted Unit Value Ratio Changes

Industry	Weighted Unit Value Ratio, 1998	Relative Change From 1989
Agriculture, Hunting, Forestry	91.55	**111.98**
Food, Beverages, Tobacco	1.05	12.86
Mining, Quarrying, Petroleum	1.90	73.06
Chemicals	1.44	1.45
Wood, Paper, Printing	6.50	**513.08**
Textiles, Leather	17.89	-74.08
Non-Metallic Mineral Products	4.21	**159.12**
Basic & Fabricated Metals Products	5.98	**220.32**
Non-Electrical Machinery	1.77	-29.23
Electrical Machinery	2.84	80.60
Motor Vehicles	1.97	29.28
Other Transport Equipment	4.07	16.45
Professional Goods	1.78	**176.73**
Other Industries	6.67	-13.65

Source: Statistics Canada, calculations by the author.

Table 6 shows that agriculture, hunting, forestry; wood, paper, printing; non-metallic mineral products; basic & fabricated metals products; and professional goods had larger than average relative changes within their weighted unit value ratios indicating that these industries have had significant changes in the quality of goods traded. Wood, paper, printing and basic & fabricated metals products have also had significant movements in their composition of up-, medium-, and down-market proportions of two-way trade. Other industries, such as mining, quarrying, petroleum; textiles, leather; and non-electrical machinery, which have had less than average changes in their weighted unit value ratios, have had significant movements in their composition of up-, middle-, and down-market proportions of two-way trade as well.

Curiously, the industries with the largest movements in their weighted unit value ratios had lower than average pre-FTA tariff rates and relative change in trade shares, which indicates that tariff changes during the study period only played a partial role in quality specialisation and trade share changes.

4.9 Tests for Correlation

Table 7 shows the correlation and Spearman's rank coefficients for various changes in trade types and unit values with the pre-FTA tariff rates in all industries calculated. All of these coefficients were tested against the null hypothesis of zero correlation, and

Table 7: Correlations for Changes in Trade Types With Pre-FTA Tariff Rates

	Correlation Coefficients	T-Statistics[1]	Spearman's Rank Coefficients[2]
Down-Market Change	-0.19412	-0.685491	-0.19121
Percentage Change	-0.11088	-0.3864827	-0.028571
Middle-Market Change	0.0792	0.2752214	-0.002197
Percentage Change	0.033603	0.11647	0.14725
Up-Market Change	0.045536	0.1579051	0.14725
Percentage Change	-0.22902	-0.8150101	0.18242
Weighted Unit Value Ratio Change	-0.49823	**-1.990577**	-0.27473
Percentage Change	-0.23304	-0.8301301	-0.27473
Vertically Differentiated Change	-0.01164	-0.0403	-0.076923
Percentage Change	-0.17423	-0.6129251	-0.17363
Two-Way Trade Change	-0.09379	-0.3263296	-0.037363
Percentage Change	-0.3063	-1.114629	-0.094505

Source: Statistics Canada, calculations by the author.

[1] Critical Value for 10 % significance level: 1.356.

[2] Critical Value for 10 % significance level: 0.457.

only the weighted unit value ratio could be rejected as being significantly different from zero at the 10% significance level—negative correlation. This result comes as a surprise given that the industries which had the largest changes in the weighted unit value ratios had lower than average pre-FTA tariff levels.

5 Conclusion

Trade patterns between Canada and the United States were measured using information on values and quantities for, approximately, 7500 commodities over 1989 to 1998. This analysis has found that there has been a general increase in intra-industry trade, with intra-industry trade remaining the most important trade type for these two countries over the study period.

Though trade in horizontally differentiated goods was the most important type of trade before the completion of NAFTA, trade in vertically differentiated goods is now the most important type of trade between Canada and the United States. This increase in vertically differentiated trade is dominantly the influence of the motor vehicles industry as all other industries—aside from basic and fabricated metals products—have had increases in horizontally differentiated trade.

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A Appendix I: Definitions of Industries, by 2-Digit Harmonised System

Agriculture, Hunting, Forestry

01 live animals

02 meat and edible meat offal

03 fish and crustaceans, mollusks and other aquatic invertebrates

04 dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included

05 products of animal origin not elsewhere specified or included

06 live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage

07 edible vegetables and certain roots and tubers

08 edible fruit and nuts; peel of citrus fruits or melons

09 coffee, tea, mate and spices

10 cereals

11 products of the milling industry; malt; starches; insulin; wheat gluten

12 oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medical plants; straw and fodder

13 lacs; gums, resins and other vegetable saps and extracts

14 vegetable plaiting materials; vegetable products not elsewhere specified or included

Food, Beverages, Tobacco

15 animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes

16 preparations of meat, fish or crustaceans, mollusks or other aquatic invertebrates

17 sugars and sugar confectionery

18 cocoa and cocoa preparations

19 preparations of cereals, flour, starch or milk; pastry cooks' products

20 preparations of vegetables, fruit, nuts or other parts of plants

21 miscellaneous edible preparations

22 beverages, spirits and vinegar

23 residues and waste from the food industries; prepared animal fodder

24 tobacco and manufactured tobacco substitutes

Mining, Quarrying, Petroleum

25 salt; sulfur; earth and stone; plastering material, lime and cement

26 ores, slag and ash

27 mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes

Chemicals

28 inorganic chemicals: organic or inorganic compounds of precious metals, of rare-earth metals

29 organic chemicals

30 pharmaceutical products

31 fertilizers

32 tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter

33 essential oils and resinoids; perfumery, cosmetic or toilet preparations

34 soaps, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes

35 albuminous substances; modified starches; glues; enzymes

36 explosives; pyrotechnic products; matches; pyrophoric alloys; combustible materials

37 photographic or cinematographic products

38 miscellaneous chemical products

39 plastics and plastic products

40 rubber and articles thereof

Wood, Paper, Printing

44 wood and articles of wood; wood charcoal

45 cork and articles of cork

46 wickerwork and basketwork

47 pulp of wood or of other fibrous cellulose material; waste and scrap of paper or paperboard

48 paper and paperboard; articles of paper pulp, paper or paperboard

49 books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans

Textiles, Leather

41 hides and skins (other than fur-skins) and leather

42 articles of leather; saddlery and harness; travel goods, handbags and similar containers

43 fur skins and artificial fur; articles thereof

50 silk

51 wool, fine and coarse animal hair; yarn and fabrics of horsehair

52 cotton

53 other vegetable textile fibers; paper yarn and woven fabrics of paper yarn

54 man-made filaments

55 man-made staple fibers

56 wadding, felt and non-wovens; special yarns; twine, cordage, rope and cable and articles thereof

57 carpets and other textile floor coverings

58 special woven fabrics; tufted textile products; lace; tapestries; trimmings; embroidery

59 impregnated, coated, covered or laminated textile fabrics; articles for technical use, of textile materials

60 knitted or crocheted fabrics

61 articles of apparel and clothing accessories, knitted or crocheted

62 articles of apparel and clothing accessories, not knitted or crocheted

63 other made up textile articles; sets; worn clothing and worn textile articles; rags

64 footwear, gaiters and the like; parts of such articles

65 headgear and parts thereof

66 umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof

67 prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair

Non-Metallic Mineral Products

68 articles of stone, plaster, cement, asbestos, mica or similar materials

69 ceramic products

70 glass and glassware

71 natural or cultured pearls, precious or semi-precious stones, precious metals

Basic Metals & Fabricated Metals Products

72 iron and steel

73 articles of iron or steel

74 copper and articles thereof

75 nickel and articles thereof

76 aluminum and articles thereof

78 lead and articles thereof

79 zinc and articles thereof

80 tin and articles thereof

81 other base metals; cements; articles thereof

82 tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal

83 miscellaneous articles of base metal

Non-Electrical Machinery

84 nuclear reactors, boilers, machinery and mechanical appliances; parts thereof

Electrical Machinery

85 electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image

Motor Vehicles

87 vehicles other than railway or tramway rolling-stock, and parts and accessories thereof

Other Transport Equipment

86 railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures

88 aircraft, spacecraft, and parts thereof

89 ships, boats and floating structures

Professional Goods

90 optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments

91 clocks and watches and parts thereof

92 musical instruments; parts and accessories for such articles

Other Industries

93 arms and ammunition; parts and accessories thereof

94 furniture; medical and surgical furniture; bedding, mattresses, mattress supports, cushions

95 toys, games and sports requisites; parts and accessories thereof

96 miscellaneous manufactured articles

97 works of art, collectors' pieces and antiques

98 components of complete industrial plants of chapter 63: power production

99 other products

B Appendix II: Tables and Graphs: Proportion of Trade Types

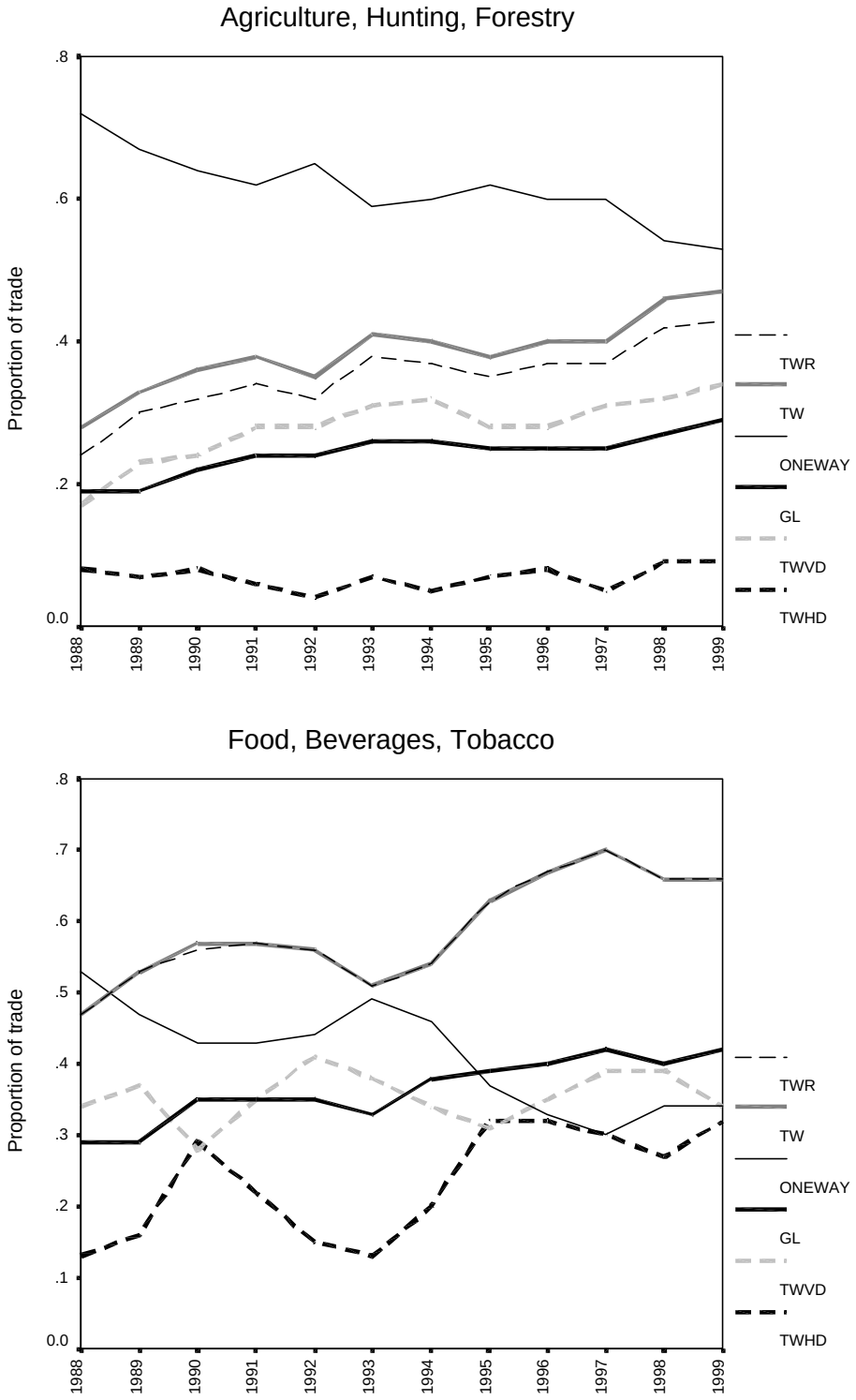
Table 8: Proportion of Trade Types, by Industry

Industry	Trade Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Agriculture, Hunting, Forestry	TWR	0.24	0.30	0.32	0.34	0.32	0.38	0.37	0.35	0.37	0.37	0.42	0.43
	TW	0.28	0.33	0.36	0.38	0.35	0.41	0.40	0.38	0.40	0.40	0.46	0.47
	One Way	0.72	0.67	0.64	0.62	0.65	0.59	0.60	0.62	0.60	0.60	0.54	0.53
	GL	0.19	0.19	0.22	0.24	0.24	0.26	0.26	0.25	0.25	0.25	0.27	0.29
	TWVD	0.17	0.23	0.24	0.28	0.28	0.31	0.32	0.28	0.28	0.31	0.32	0.34
	TWHD	0.08	0.07	0.08	0.06	0.04	0.07	0.05	0.07	0.08	0.05	0.09	0.09
Food, Tobacco Beverages, Tobacco	TWR	0.47	0.53	0.56	0.57	0.56	0.51	0.54	0.63	0.67	0.70	0.66	0.66
	TW	0.47	0.53	0.57	0.57	0.56	0.51	0.54	0.63	0.67	0.70	0.66	0.66
	One Way	0.53	0.47	0.43	0.43	0.44	0.49	0.46	0.37	0.33	0.30	0.34	0.34
	GL	0.29	0.29	0.35	0.35	0.35	0.33	0.38	0.39	0.40	0.42	0.40	0.42
	TWVD	0.34	0.37	0.28	0.35	0.41	0.38	0.34	0.31	0.35	0.39	0.39	0.34
	TWHD	0.13	0.16	0.29	0.22	0.15	0.13	0.20	0.32	0.32	0.30	0.27	0.32
Mining, Quarrying, Petroleum	TWR	0.25	0.30	0.21	0.19	0.16	0.21	0.19	0.19	0.17	0.26	0.58	0.16
	TW	0.25	0.30	0.21	0.19	0.16	0.21	0.19	0.19	0.17	0.26	0.58	0.16
	One Way	0.75	0.70	0.79	0.81	0.84	0.79	0.81	0.81	0.83	0.74	0.42	0.84
	GL	0.12	0.18	0.21	0.12	0.10	0.11	0.11	0.11	0.12	0.15	0.21	0.12
	TWVD	0.08	0.14	0.09	0.06	0.09	0.07	0.09	0.08	0.05	0.06	0.13	0.07
	TWHD	0.17	0.15	0.13	0.12	0.07	0.13	0.09	0.11	0.12	0.20	0.45	0.08
Chemicals	TWR	0.46	0.44	0.45	0.48	0.49	0.49	0.51	0.55	0.58	0.58	0.56	0.55
	TW	0.63	0.63	0.63	0.66	0.69	0.68	0.73	0.74	0.78	0.79	0.79	0.79
	One Way	0.37	0.37	0.37	0.34	0.31	0.32	0.27	0.26	0.22	0.21	0.21	0.21
	GL	0.37	0.37	0.39	0.40	0.40	0.42	0.44	0.46	0.49	0.51	0.51	0.52
	TWVD	0.34	0.29	0.29	0.32	0.32	0.38	0.34	0.27	0.36	0.31	0.34	0.32
	TWHD	0.12	0.15	0.16	0.16	0.17	0.11	0.17	0.28	0.22	0.27	0.22	0.24
Wood, Paper, Printing	TWR	0.16	0.17	0.21	0.21	0.22	0.22	0.22	0.23	0.22	0.23	0.24	0.23
	TW	0.29	0.30	0.35	0.37	0.38	0.38	0.38	0.39	0.39	0.42	0.44	0.41
	One Way	0.71	0.70	0.65	0.63	0.62	0.62	0.62	0.61	0.61	0.58	0.56	0.59
	GL	0.19	0.20	0.20	0.21	0.22	0.22	0.23	0.24	0.24	0.26	0.27	0.26
	TWVD	0.12	0.11	0.12	0.14	0.15	0.14	0.13	0.08	0.12	0.12	0.15	0.16
	TWHD	0.04	0.05	0.09	0.07	0.07	0.08	0.09	0.15	0.10	0.10	0.09	0.07
Textiles, Leather	TWR	0.58	0.57	0.61	0.63	0.65	0.70	0.66	0.72	0.69	0.70	0.72	0.75
	TW	0.66	0.68	0.71	0.70	0.72	0.76	0.72	0.78	0.76	0.78	0.80	0.84
	One Way	0.34	0.32	0.29	0.30	0.28	0.24	0.28	0.22	0.24	0.22	0.20	0.16
	GL	0.39	0.37	0.41	0.42	0.44	0.45	0.45	0.48	0.50	0.51	0.49	0.49
	TWVD	0.43	0.44	0.40	0.41	0.40	0.42	0.40	0.48	0.49	0.43	0.43	0.41
	TWHD	0.15	0.13	0.21	0.22	0.25	0.27	0.27	0.24	0.20	0.26	0.30	0.35
Non-Metallic Mineral Products	TWR	0.37	0.40	0.49	0.37	0.51	0.49	0.26	0.21	0.20	0.49	0.43	0.40
	TW	0.62	0.69	0.82	0.68	0.84	0.77	0.60	0.56	0.53	0.81	0.71	0.69
	One Way	0.38	0.31	0.18	0.32	0.16	0.23	0.40	0.44	0.47	0.19	0.29	0.31
	GL	0.39	0.40	0.56	0.40	0.45	0.44	0.40	0.39	0.37	0.44	0.48	0.39
	TWVD	0.14	0.10	0.27	0.35	0.31	0.26	0.20	0.18	0.09	0.09	0.11	0.12
	TWHD	0.24	0.30	0.23	0.03	0.20	0.23	0.06	0.03	0.11	0.41	0.31	0.27

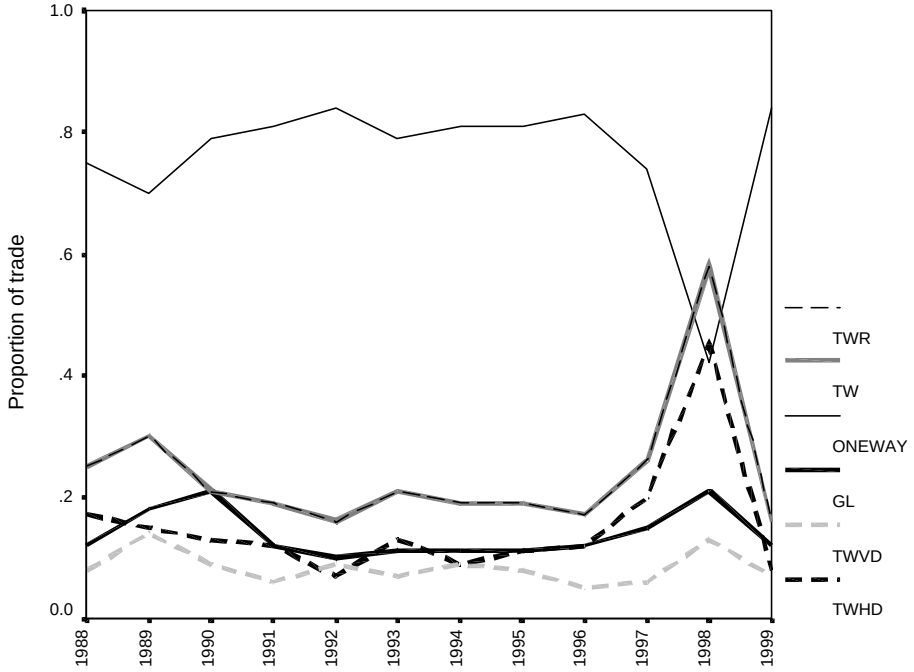
Table 9: Proportion of Trade Types, by Industry, continued

Industry	Trade Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Basic & Fabricated Metals Products	TWR	0.37	0.44	0.45	0.39	0.45	0.43	0.47	0.47	0.48	0.49	0.46	0.46
	TW	0.58	0.68	0.69	0.63	0.69	0.70	0.72	0.72	0.74	0.78	0.78	0.80
	One Way	0.42	0.32	0.31	0.37	0.31	0.30	0.28	0.28	0.26	0.22	0.22	0.20
	GL	0.39	0.40	0.42	0.42	0.42	0.44	0.45	0.45	0.46	0.48	0.48	0.50
	TWVD	0.27	0.23	0.19	0.23	0.22	0.20	0.23	0.28	0.31	0.31	0.29	0.27
	TWHD	0.11	0.21	0.27	0.16	0.22	0.24	0.24	0.19	0.16	0.18	0.17	0.19
Non-Electrical Machinery	TWR	0.33	0.32	0.32	0.31	0.31	0.32	0.28	0.28	0.31	0.30	0.34	0.36
	TW	0.89	0.87	0.87	0.88	0.87	0.88	0.89	0.88	0.90	0.89	0.92	0.94
	One Way	0.11	0.13	0.13	0.12	0.13	0.12	0.11	0.12	0.10	0.11	0.08	0.06
	GL	0.60	0.58	0.58	0.58	0.59	0.58	0.57	0.57	0.61	0.59	0.60	0.61
	TWVD	0.32	0.31	0.29	0.19	0.15	0.11	0.13	0.16	0.18	0.16	0.19	0.18
	TWHD	0.01	0.01	0.03	0.11	0.15	0.21	0.15	0.12	0.13	0.14	0.15	0.18
Electrical Machinery	TWR	0.31	0.32	0.28	0.31	0.34	0.30	0.31	0.34	0.33	0.35	0.33	0.29
	TW	0.80	0.83	0.87	0.89	0.89	0.84	0.85	0.85	0.88	0.91	0.90	0.89
	One Way	0.20	0.17	0.13	0.11	0.11	0.16	0.15	0.15	0.12	0.09	0.10	0.11
	GL	0.54	0.58	0.67	0.63	0.61	0.60	0.61	0.65	0.67	0.64	0.66	0.62
	TWVD	0.28	0.30	0.26	0.28	0.30	0.28	0.28	0.13	0.29	0.33	0.31	0.28
	TWHD	0.03	0.02	0.02	0.03	0.04	0.02	0.03	0.21	0.04	0.02	0.02	0.01
Motor Vehicles	TWR	0.65	0.65	0.65	0.66	0.63	0.63	0.68	0.67	0.68	0.68	0.68	0.69
	TW	0.99	0.98	0.89	0.96	0.93	0.93	0.94	0.94	0.94	0.96	0.97	0.98
	One Way	0.01	0.02	0.11	0.04	0.07	0.07	0.06	0.06	0.06	0.04	0.03	0.02
	GL	0.67	0.66	0.59	0.59	0.55	0.54	0.54	0.52	0.54	0.56	0.55	0.51
	TWVD	0.18	0.04	0.04	0.02	0.02	0.03	0.16	0.15	0.16	0.17	0.05	0.16
	TWHD	0.47	0.61	0.61	0.64	0.62	0.61	0.51	0.52	0.51	0.51	0.63	0.53
Other Transport Equipment	TWR	0.26	0.21	0.22	0.41	0.27	0.42	0.37	0.37	0.33	0.39	0.37	0.13
	TW	0.78	0.74	0.81	0.92	0.73	0.88	0.83	0.76	0.73	0.82	0.83	0.60
	One Way	0.22	0.26	0.19	0.08	0.27	0.12	0.17	0.24	0.27	0.18	0.17	0.40
	GL	0.65	0.52	0.57	0.50	0.45	0.52	0.48	0.51	0.48	0.57	0.53	0.53
	TWVD	0.26	0.21	0.22	0.23	0.27	0.42	0.37	0.34	0.23	0.30	0.30	0.12
	TWHD	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.03	0.10	0.09	0.07	0.01
Professional Goods	TWR	0.04	0.03	0.04	0.06	0.05	0.04	0.03	0.06	0.04	0.06	0.04	0.05
	TW	0.77	0.75	0.73	0.80	0.81	0.81	0.85	0.88	0.87	0.90	0.84	0.85
	One Way	0.23	0.25	0.27	0.20	0.19	0.19	0.15	0.12	0.13	0.10	0.16	0.15
	GL	0.43	0.41	0.40	0.44	0.48	0.46	0.49	0.50	0.51	0.48	0.48	0.46
	TWVD	0.04	0.03	0.03	0.05	0.03	0.03	0.03	0.05	0.03	0.04	0.03	0.04
	TWHD	0.00	0.00	0.01	0.01	0.02	0.02	0.00	0.01	0.01	0.01	0.01	0.01
Other Industries	TWR	0.06	0.05	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02
	TW	0.92	0.94	0.98	0.97	0.97	0.96	0.97	0.97	0.95	0.97	0.96	0.92
	One Way	0.08	0.06	0.02	0.03	0.03	0.04	0.03	0.03	0.05	0.03	0.04	0.08
	GL	0.55	0.53	0.52	0.58	0.59	0.58	0.54	0.53	0.57	0.53	0.44	0.45
	TWVD	0.06	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	TWHD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

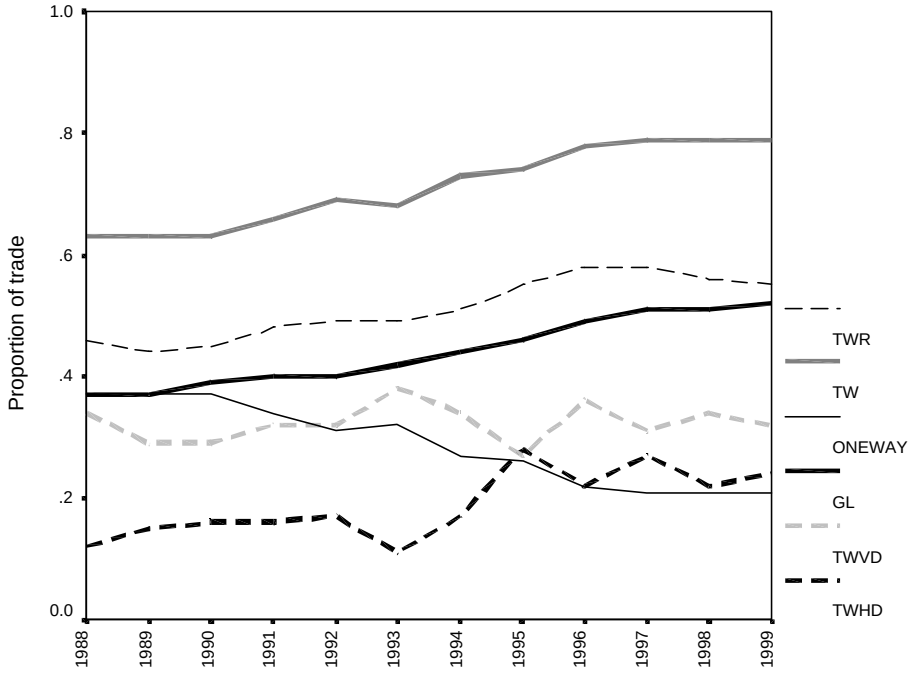
Figure 6: Proportion of Trade Types, by Industry

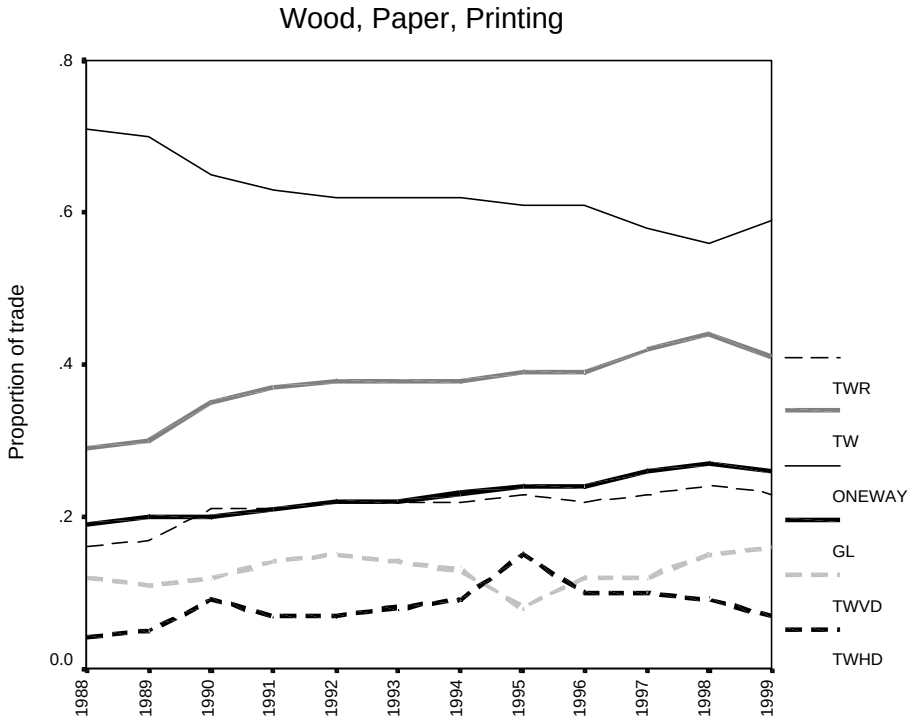


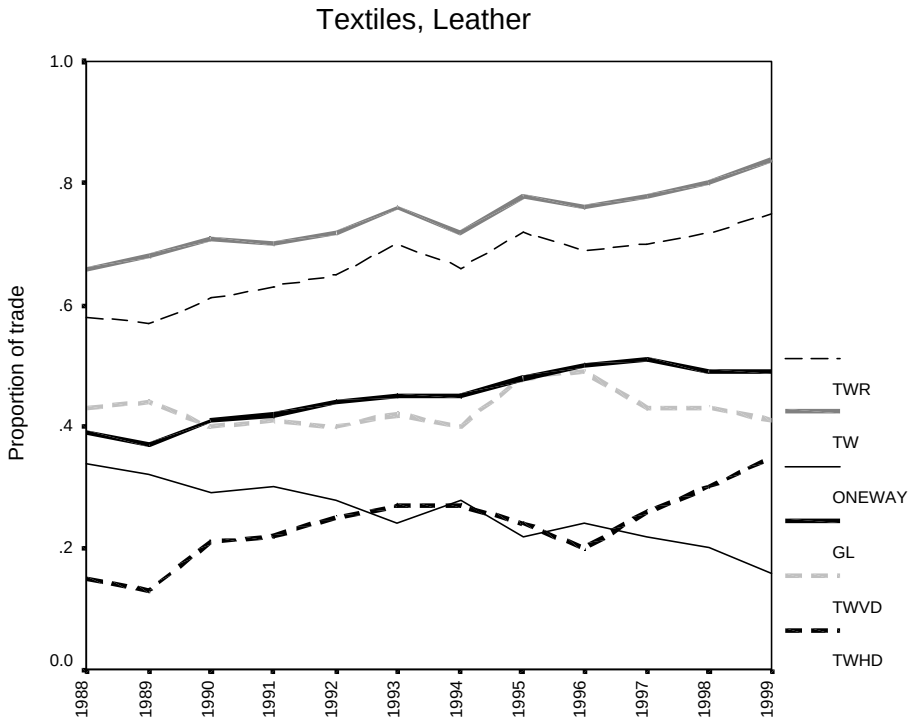
Mining, Quarrying, Petroleum



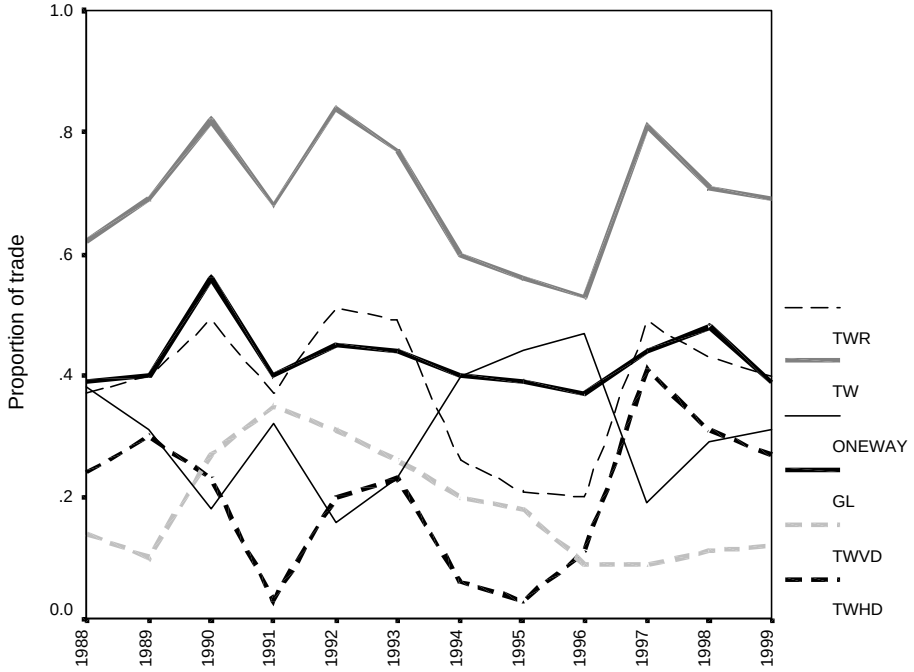
Chemicals



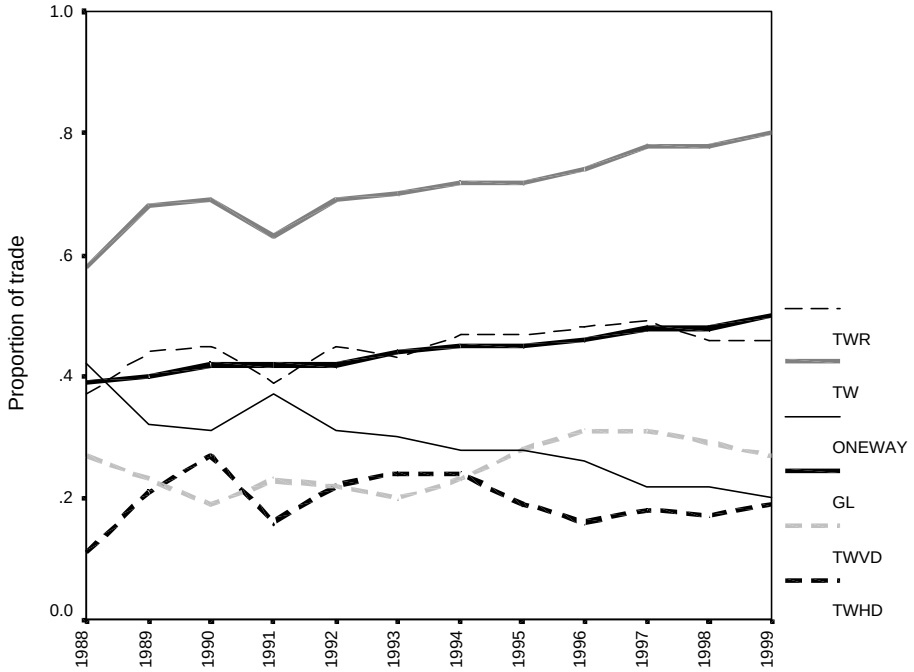

Wood, Paper, Printing
Proportion of trade
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD

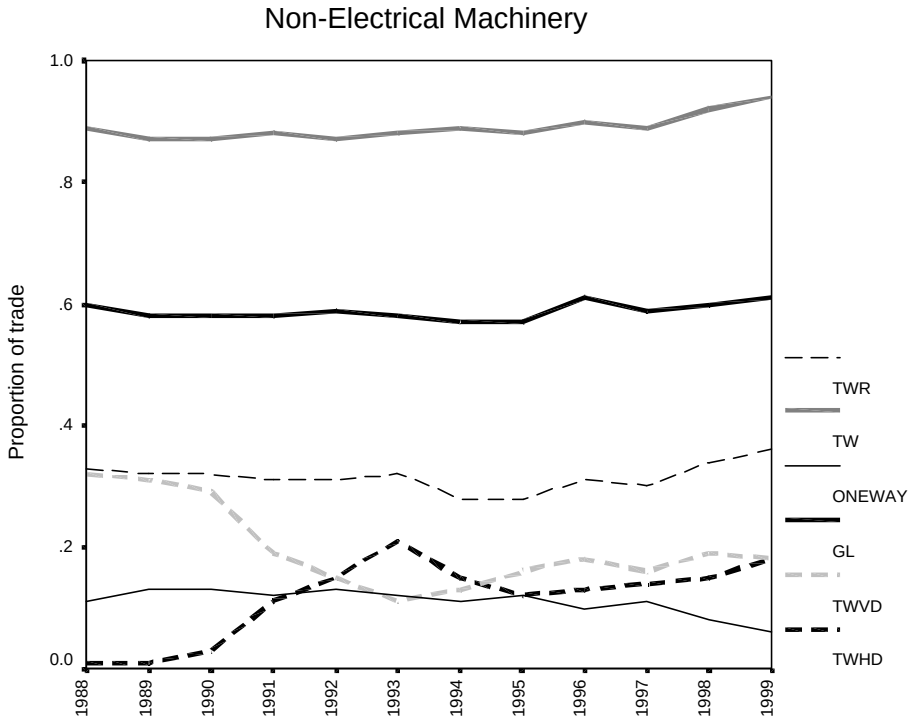

Textiles, Leather
Proportion of trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD

Non-Metallic Mineral Products



Basic Metals & Fabricated Metals




Non-Electrical Machinery
Proportion of trade
1.0
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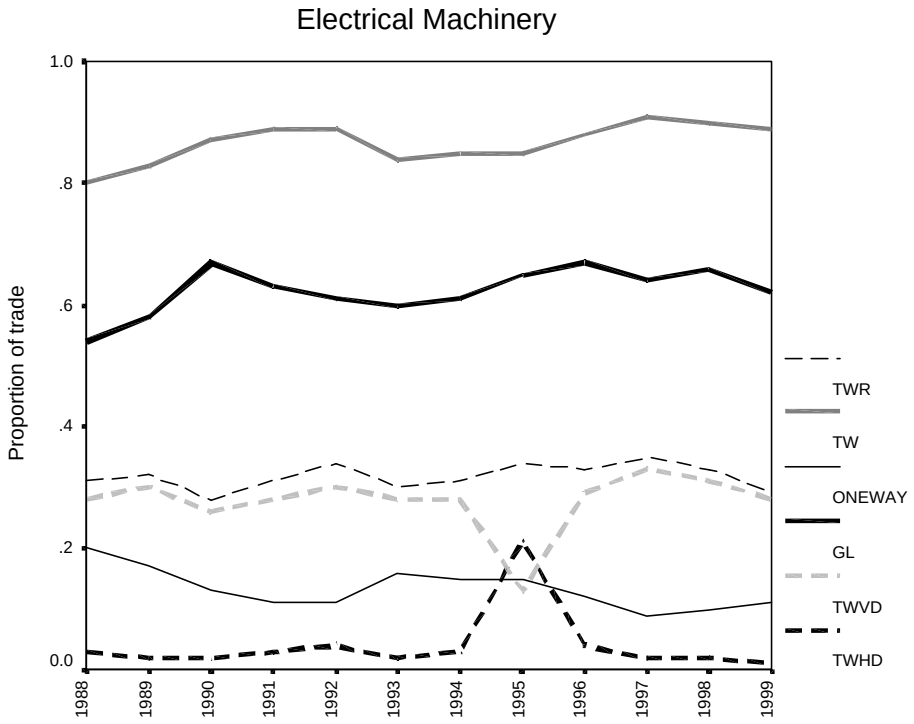
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD


Electrical Machinery
Proportion of trade
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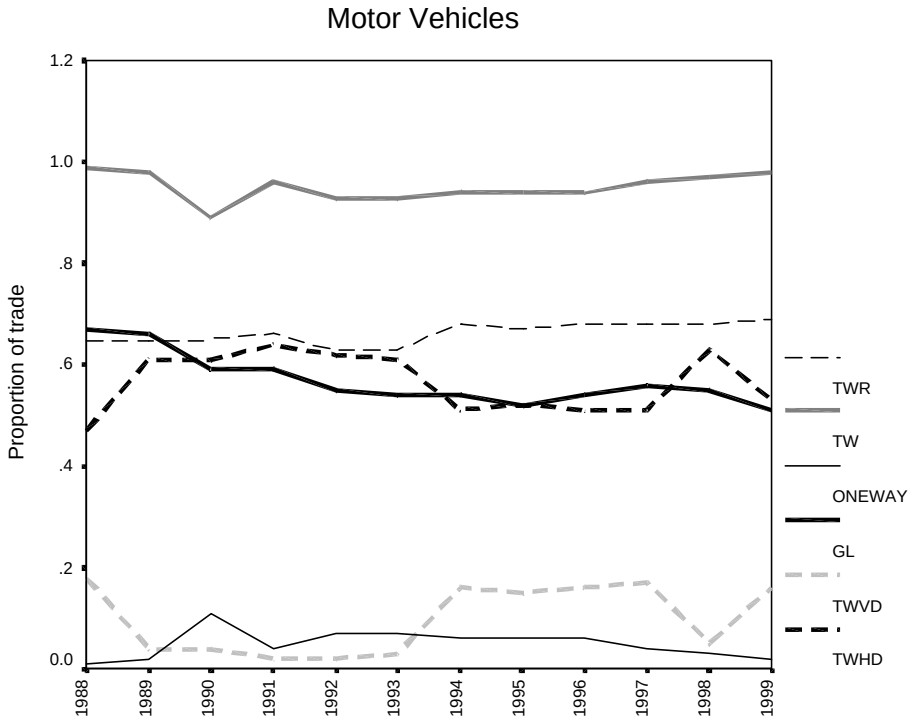
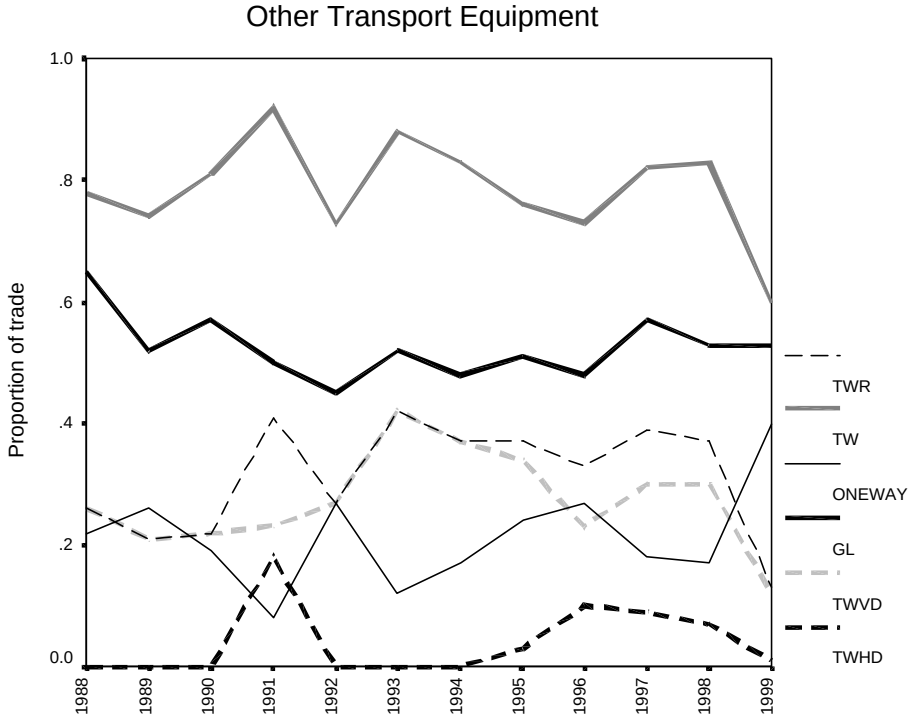
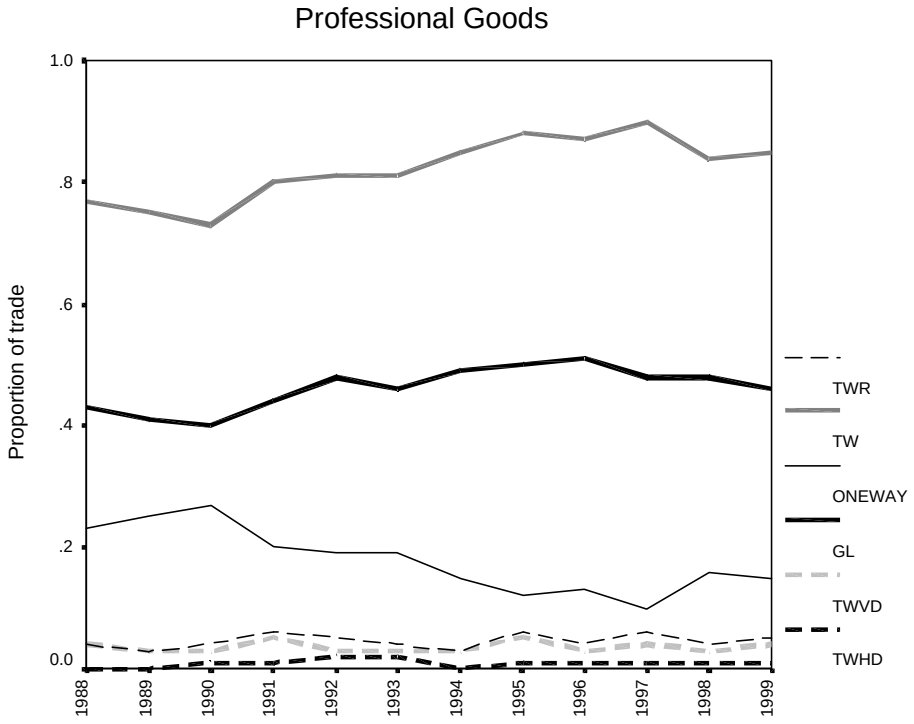
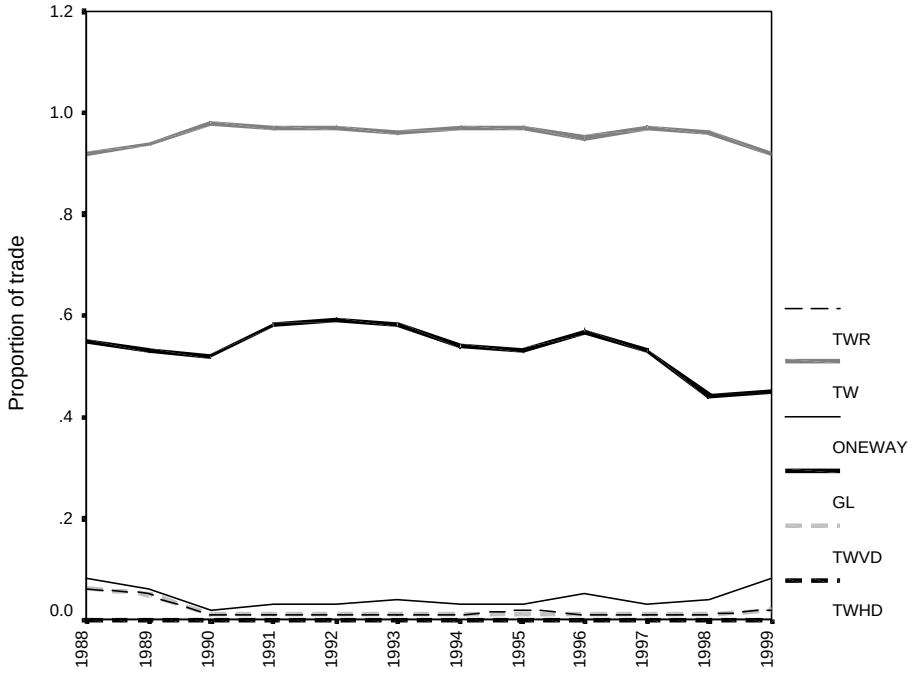
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD


Motor Vehicles
Proportion of trade
1.2
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD


Other Transport Equipment
Proportion of trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD


Professional Goods
Proportion of trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD

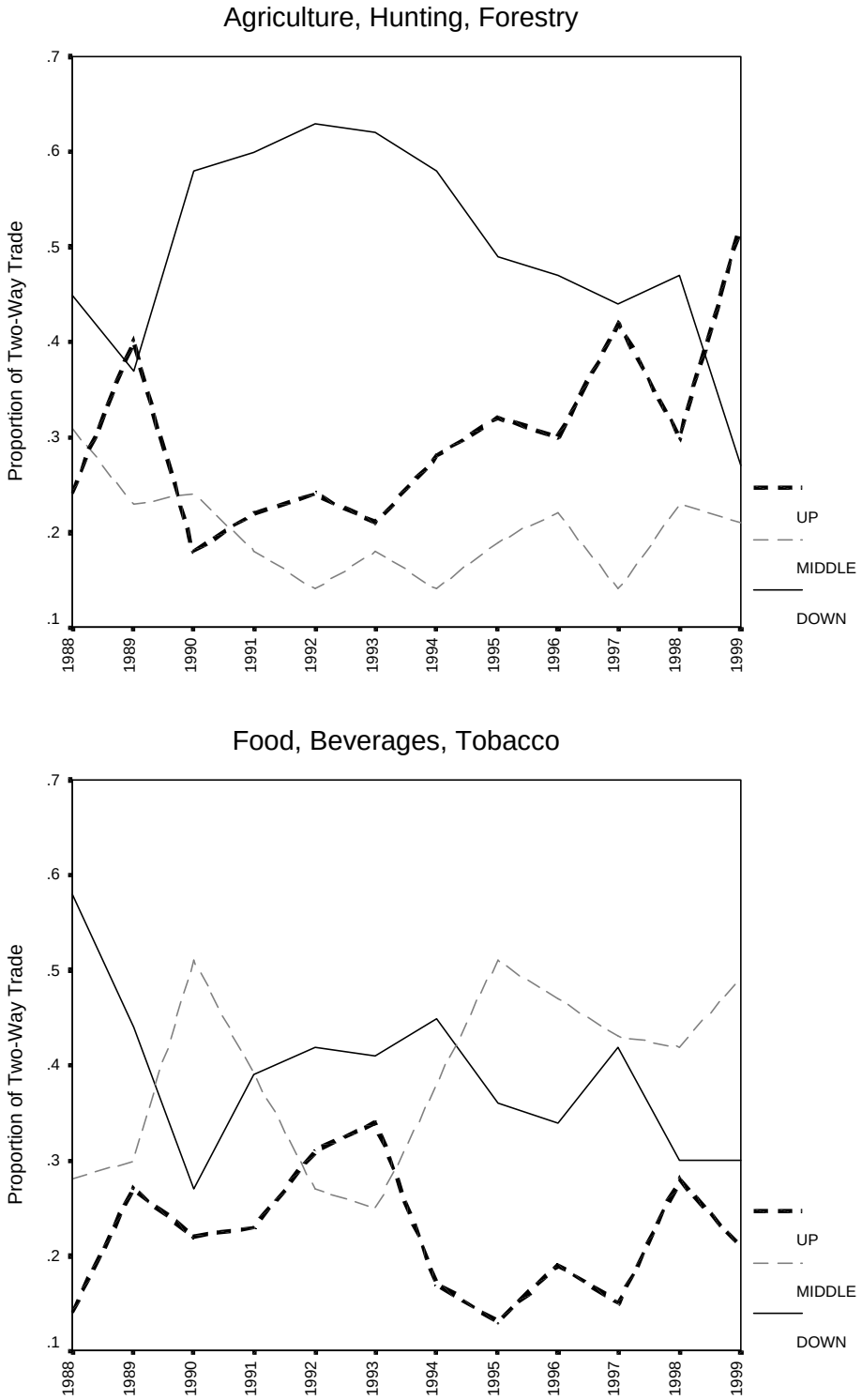

Other Industries
Proportion of trade
1.2
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
TWR
TW
ONEWAY
GL
TWVD
TWHD

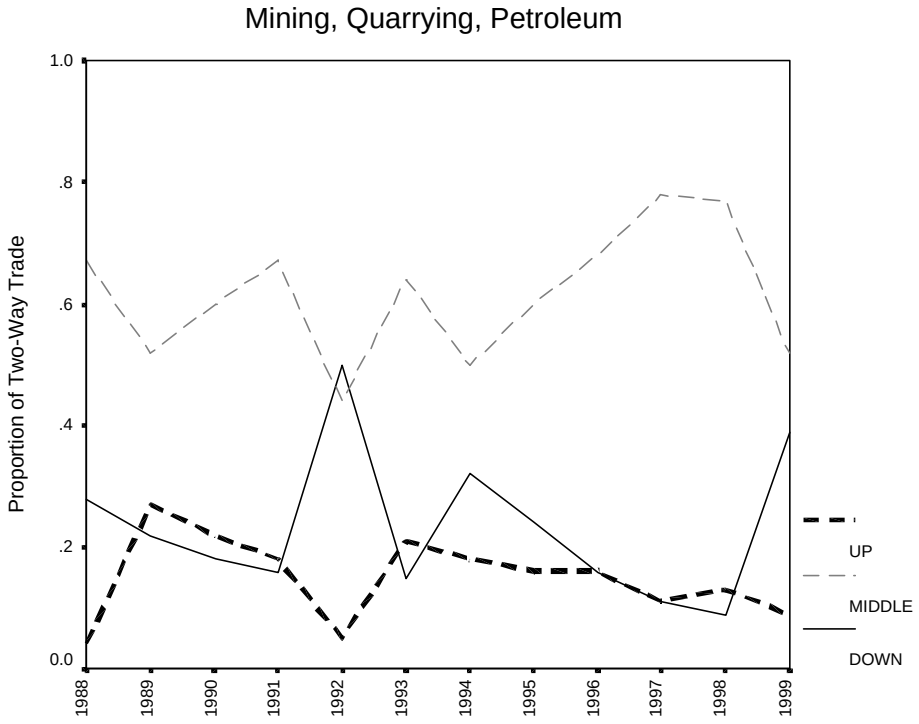
C Appendix III: Tables and Graphs: Up, Middle, and Down-Markets

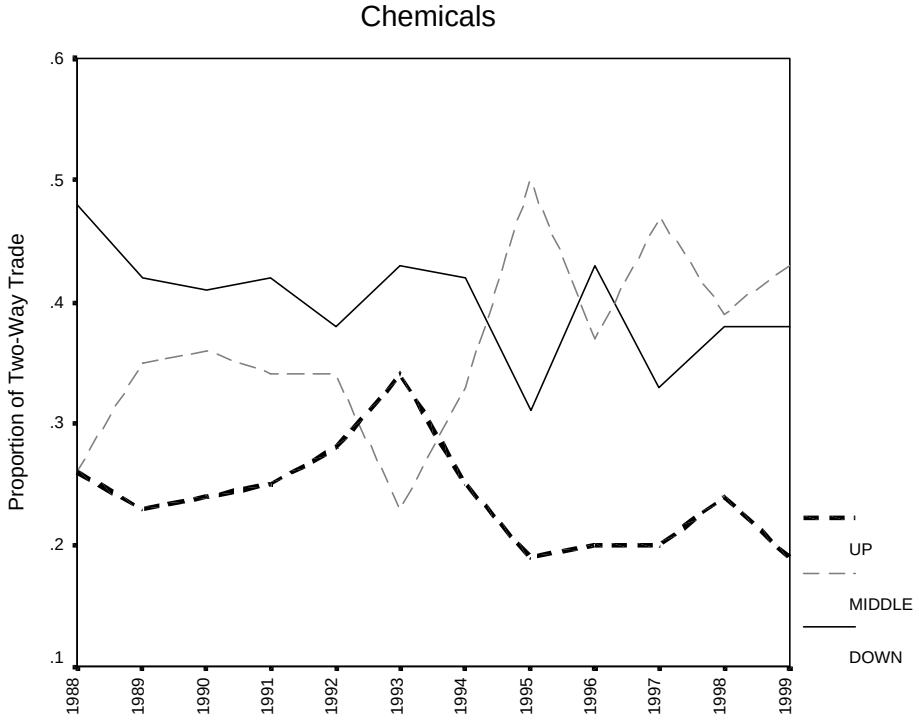
Table 10: Up-, Middle-, and Down-Markets by Industry

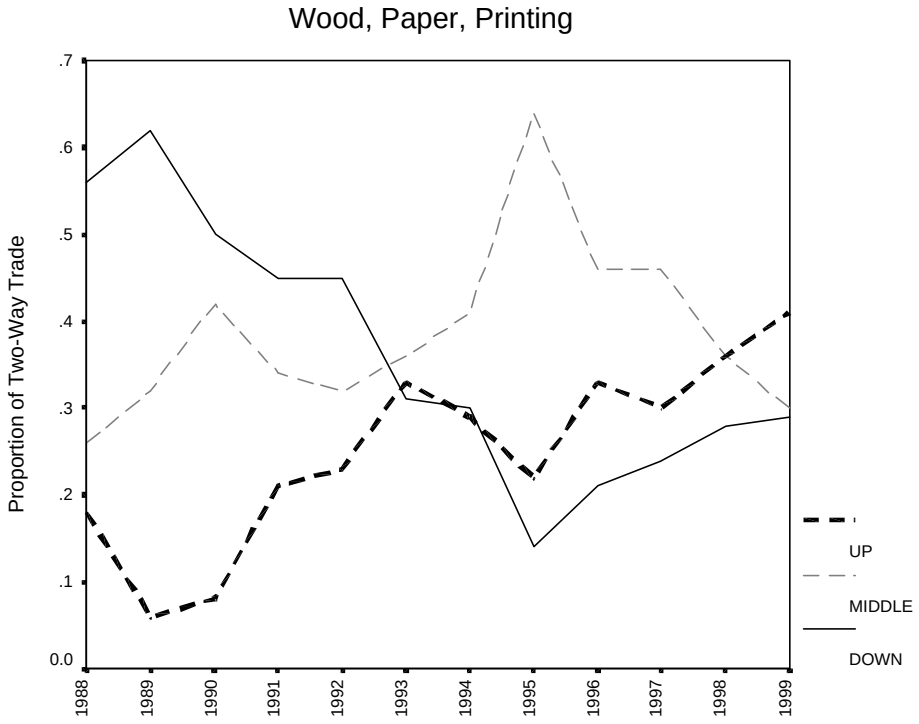
Industry	Trade Type	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Agriculture,	Up	0.24	0.40	0.18	0.22	0.24	0.21	0.28	0.32	0.30	0.42	0.30	0.52
Hunting,	Middle	0.31	0.23	0.24	0.18	0.14	0.18	0.14	0.19	0.22	0.14	0.23	0.21
Forestry	Down	0.45	0.37	0.58	0.60	0.63	0.62	0.58	0.49	0.47	0.44	0.47	0.27
Food,	Up	0.14	0.27	0.22	0.23	0.31	0.34	0.17	0.13	0.19	0.15	0.28	0.21
Beverages,	Middle	0.28	0.30	0.51	0.39	0.27	0.25	0.38	0.51	0.47	0.43	0.42	0.49
Tobacco	Down	0.58	0.44	0.27	0.39	0.42	0.41	0.45	0.36	0.34	0.42	0.30	0.30
Mining,	Up	0.04	0.27	0.22	0.18	0.05	0.21	0.18	0.16	0.16	0.11	0.13	0.09
Quarrying,	Middle	0.67	0.52	0.60	0.67	0.44	0.64	0.50	0.60	0.68	0.78	0.77	0.52
Petroleum	Down	0.28	0.22	0.18	0.16	0.50	0.15	0.32	0.24	0.16	0.11	0.09	0.39
Chemicals	Up	0.26	0.23	0.24	0.25	0.28	0.34	0.25	0.19	0.20	0.20	0.24	0.19
	Middle	0.26	0.35	0.36	0.34	0.34	0.23	0.33	0.50	0.37	0.47	0.39	0.43
	Down	0.48	0.42	0.41	0.42	0.38	0.43	0.42	0.31	0.43	0.33	0.38	0.38
Wood,	Up	0.18	0.06	0.08	0.21	0.23	0.33	0.29	0.22	0.33	0.30	0.36	0.41
Paper,	Middle	0.26	0.32	0.42	0.34	0.32	0.36	0.41	0.64	0.46	0.46	0.36	0.30
Printing	Down	0.56	0.62	0.50	0.45	0.45	0.31	0.30	0.14	0.21	0.24	0.28	0.29
Textiles,	Up	0.15	0.40	0.29	0.31	0.30	0.31	0.39	0.40	0.48	0.39	0.34	0.31
Leather	Middle	0.26	0.23	0.35	0.35	0.39	0.39	0.40	0.34	0.29	0.38	0.41	0.46
	Down	0.59	0.37	0.36	0.34	0.31	0.29	0.21	0.26	0.22	0.23	0.25	0.23
Non-Metallic	Up	0.21	0.11	0.46	0.86	0.58	0.48	0.67	0.78	0.37	0.17	0.26	0.30
Mineral	Middle	0.64	0.75	0.46	0.07	0.39	0.47	0.24	0.15	0.56	0.82	0.73	0.69
Products	Down	0.15	0.14	0.08	0.07	0.03	0.05	0.09	0.07	0.07	0.00	0.00	0.01
Basic &	Up	0.32	0.26	0.17	0.23	0.16	0.15	0.21	0.37	0.39	0.40	0.36	0.34
Fabricated	Middle	0.29	0.48	0.59	0.41	0.50	0.55	0.51	0.41	0.34	0.36	0.37	0.41
Metals Products	Down	0.39	0.27	0.24	0.35	0.35	0.31	0.28	0.22	0.27	0.24	0.27	0.25
Non-Electrical	Up	0.69	0.72	0.57	0.35	0.21	0.19	0.16	0.19	0.25	0.27	0.31	0.26
Machinery	Middle	0.04	0.04	0.09	0.37	0.50	0.65	0.52	0.43	0.41	0.46	0.45	0.51
	Down	0.26	0.23	0.34	0.27	0.29	0.17	0.32	0.37	0.34	0.27	0.24	0.23
Electrical	Up	0.75	0.83	0.74	0.74	0.76	0.76	0.23	0.24	0.74	0.70	0.76	0.69
Machinery	Middle	0.08	0.07	0.07	0.10	0.12	0.08	0.11	0.63	0.13	0.06	0.05	0.04
	Down	0.17	0.10	0.19	0.16	0.12	0.16	0.66	0.13	0.13	0.23	0.19	0.28
Motor	Up	0.25	0.04	0.05	0.02	0.02	0.03	0.23	0.22	0.22	0.24	0.04	0.21
Vehicles	Middle	0.72	0.94	0.93	0.97	0.97	0.96	0.76	0.77	0.76	0.75	0.93	0.77
	Down	0.03	0.02	0.02	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.03	0.02
Other	Up	0.92	0.99	0.96	0.56	0.99	0.99	0.99	0.90	0.68	0.76	0.80	0.90
Transport	Middle	0.00	0.00	0.00	0.44	0.00	0.00	0.00	0.08	0.30	0.23	0.19	0.07
Equipment	Down	0.08	0.01	0.04	0.00	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.04
Professional	Up	0.42	0.63	0.33	0.22	0.22	0.30	0.25	0.34	0.25	0.18	0.31	0.32
Goods	Middle	0.05	0.02	0.34	0.23	0.44	0.37	0.00	0.09	0.37	0.26	0.27	0.21
	Down	0.53	0.35	0.33	0.56	0.33	0.33	0.75	0.57	0.39	0.56	0.42	0.47
Other	Up	0.71	0.74	0.76	0.76	0.79	0.81	0.77	0.75	0.77	0.77	0.80	0.87
Industries	Middle	0.00	0.00	0.00	0.00	0.03	0.00	0.09	0.16	0.15	0.00	0.04	0.00
	Down	0.29	0.26	0.24	0.24	0.18	0.19	0.14	0.08	0.07	0.23	0.16	0.13

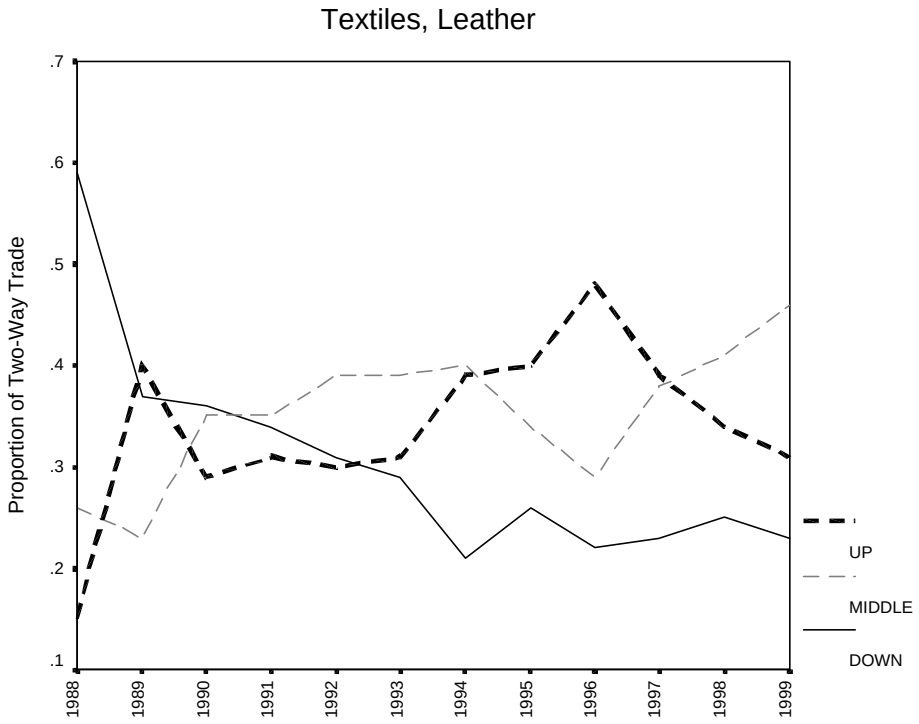
Figure 7: Up-, Middle-, and Down-Markets by Industry

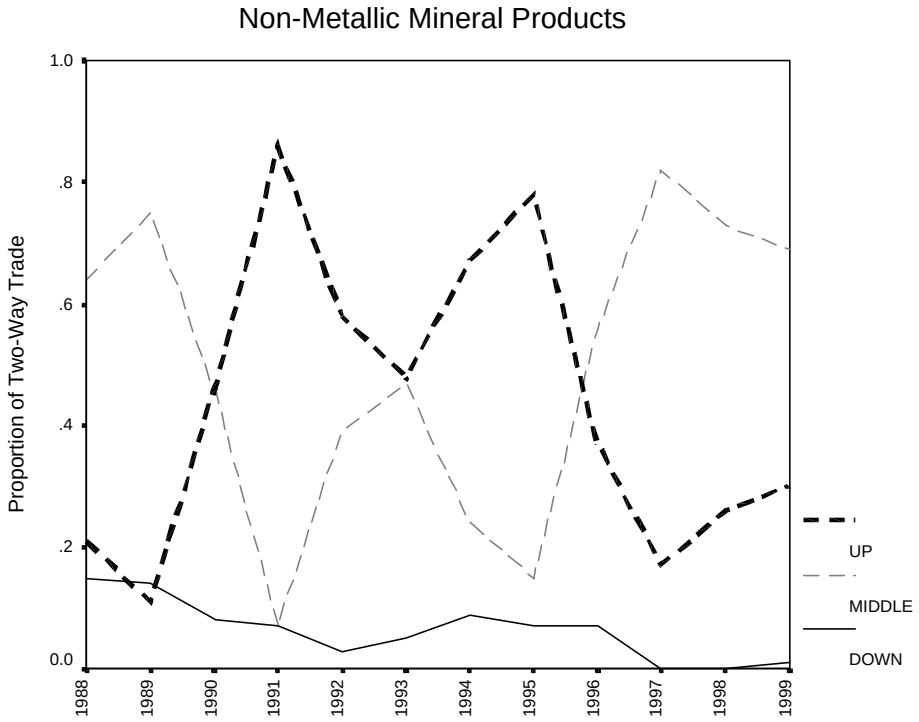


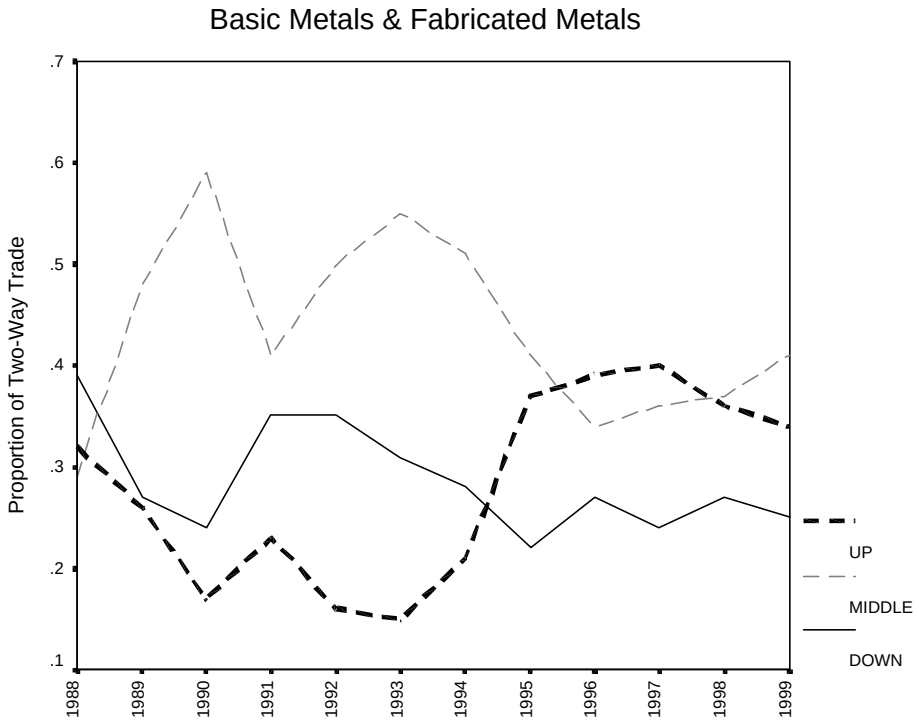

Mining, Quarrying, Petroleum
Proportion of Two-Way Trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

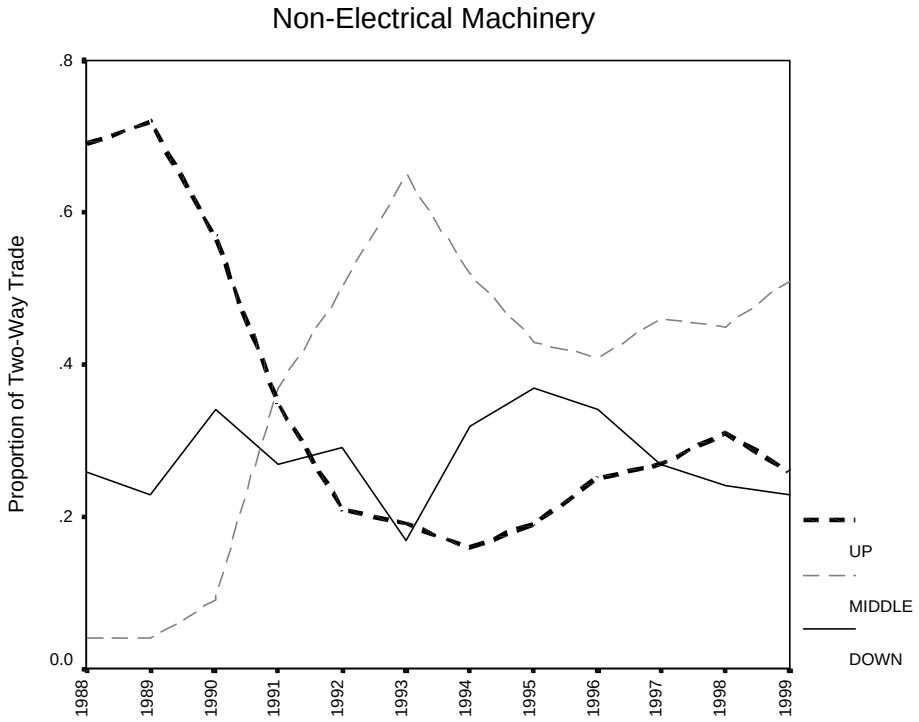

Chemicals
Proportion of Two-Way Trade
.6
.5
.4
.3
.2
.1
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

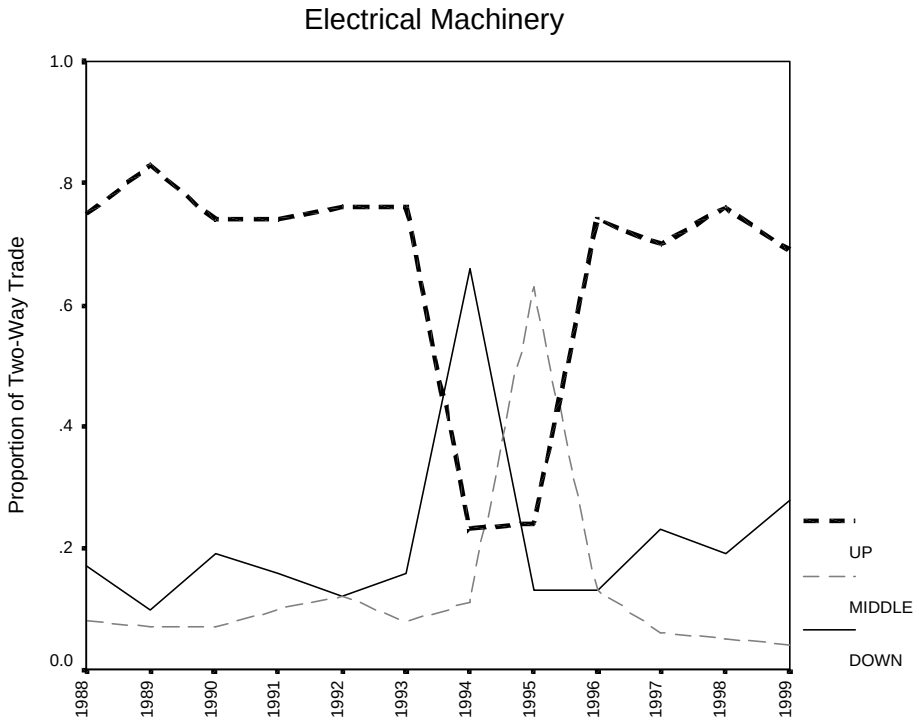

Wood, Paper, Printing
Proportion of Two-Way Trade
.7
.6
.5
.4
.3
.2
.1
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

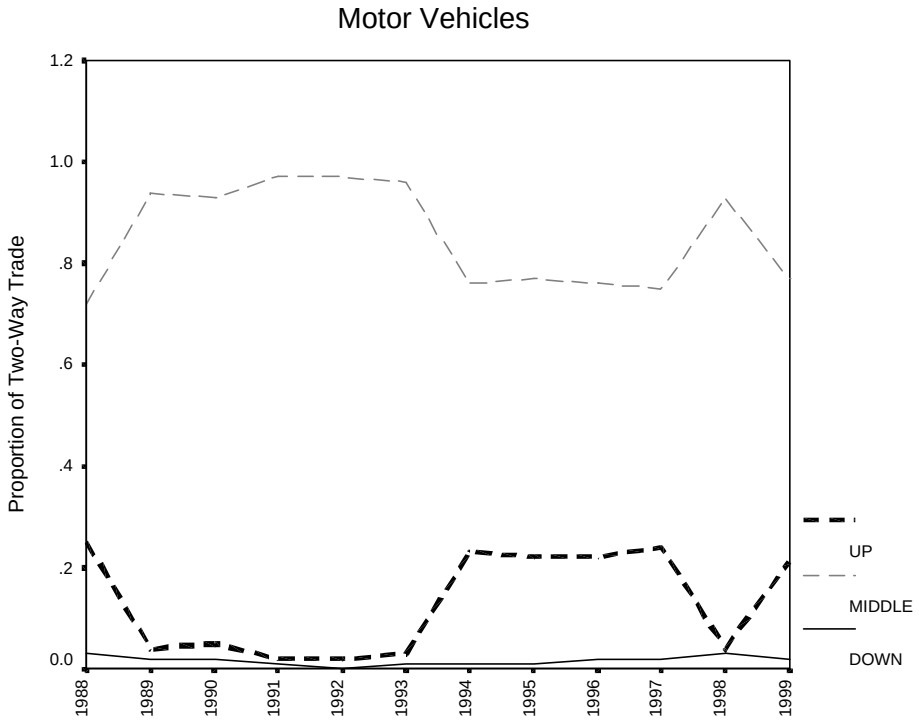

Textiles, Leather
Proportion of Two-Way Trade
.7
.6
.5
.4
.3
.2
.1
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

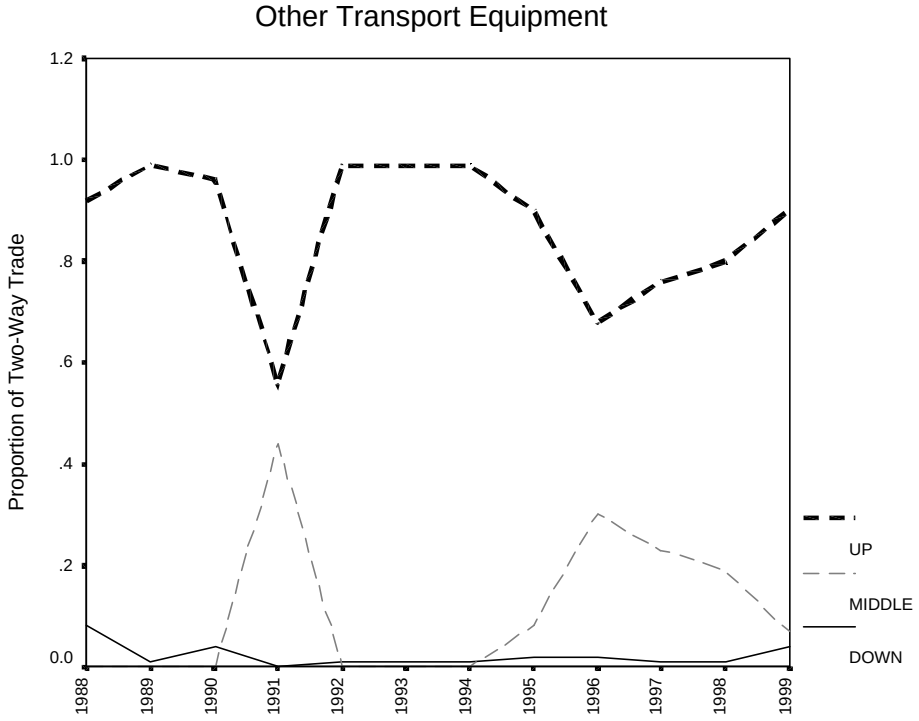

Non-Metallic Mineral Products
Proportion of Two-Way Trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN


Basic Metals & Fabricated Metals
Proportion of Two-Way Trade
.7
.6
.5
.4
.3
.2
.1
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

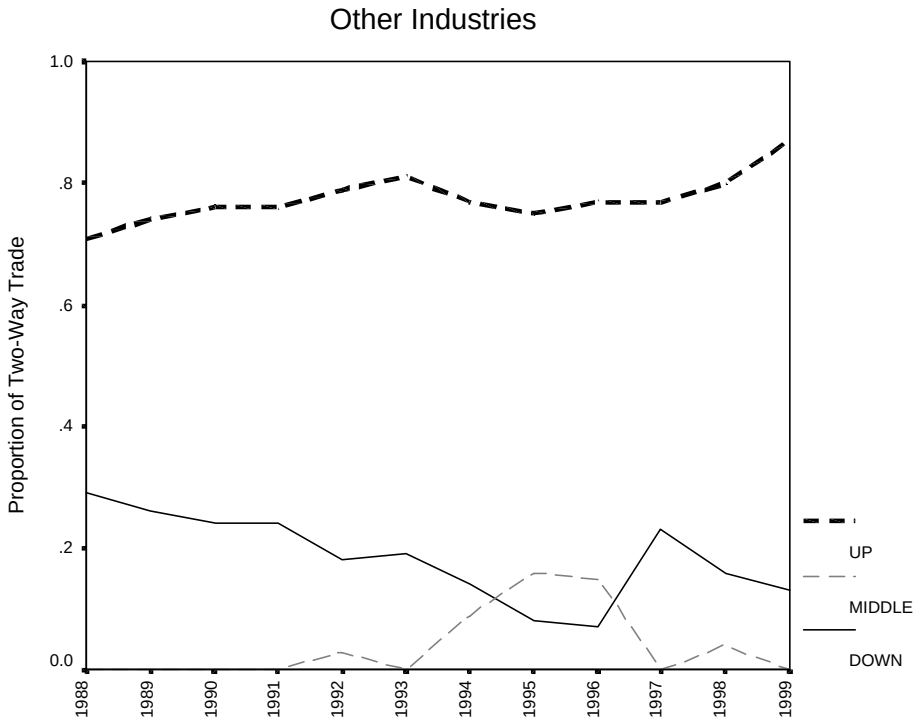

Non-Electrical Machinery
Proportion of Two-Way Trade
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN


Electrical Machinery
Proportion of Two-Way Trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN


Motor Vehicles
Proportion of Two-Way Trade
1.2
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN


Other Transport Equipment
Proportion of Two-Way Trade
1.2
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN


Professional Goods
Proportion of Two-Way Trade
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

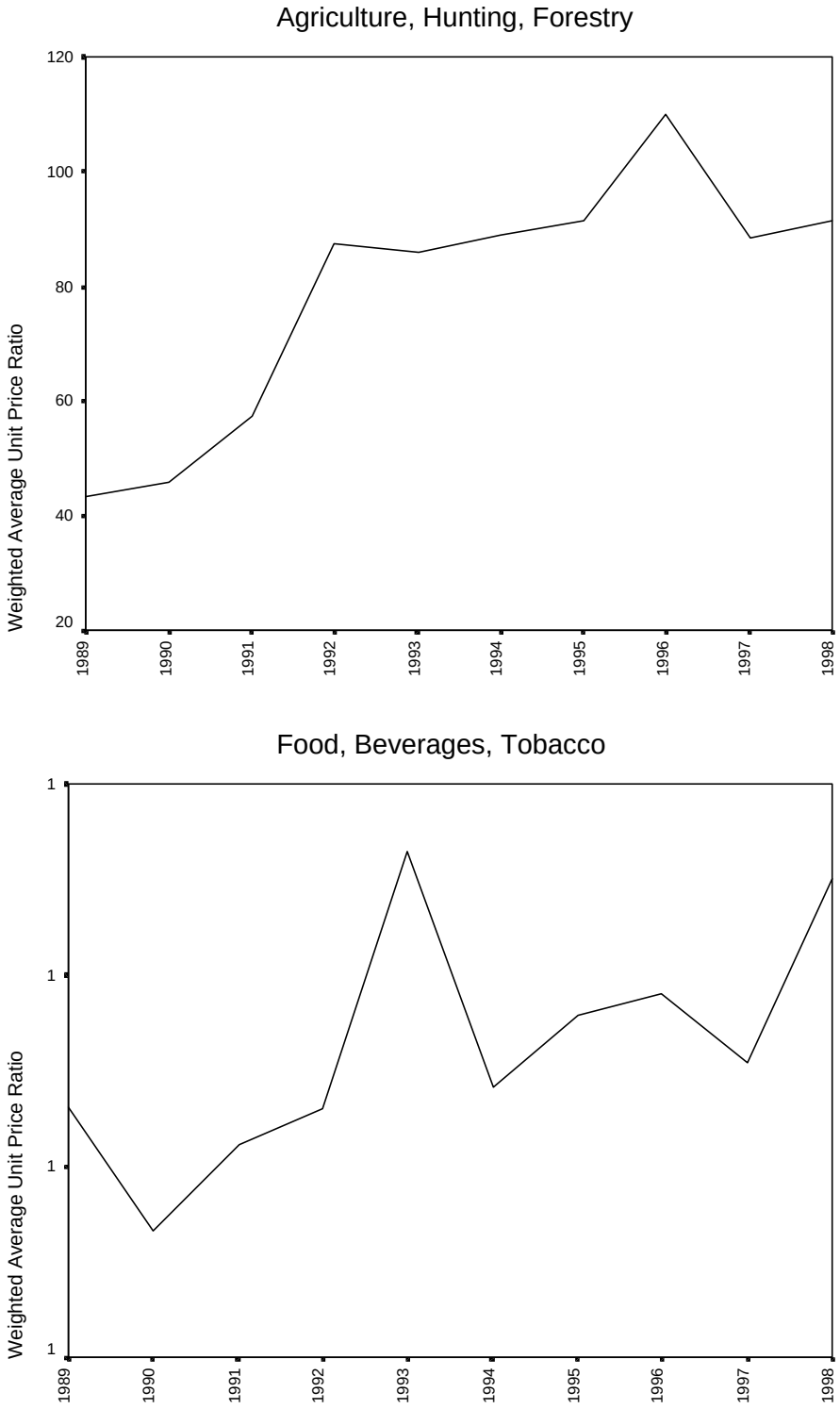

Other Industries
Proportion of Two-Way Trade
1.0
.8
.6
.4
.2
0.0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
UP
MIDDLE
DOWN

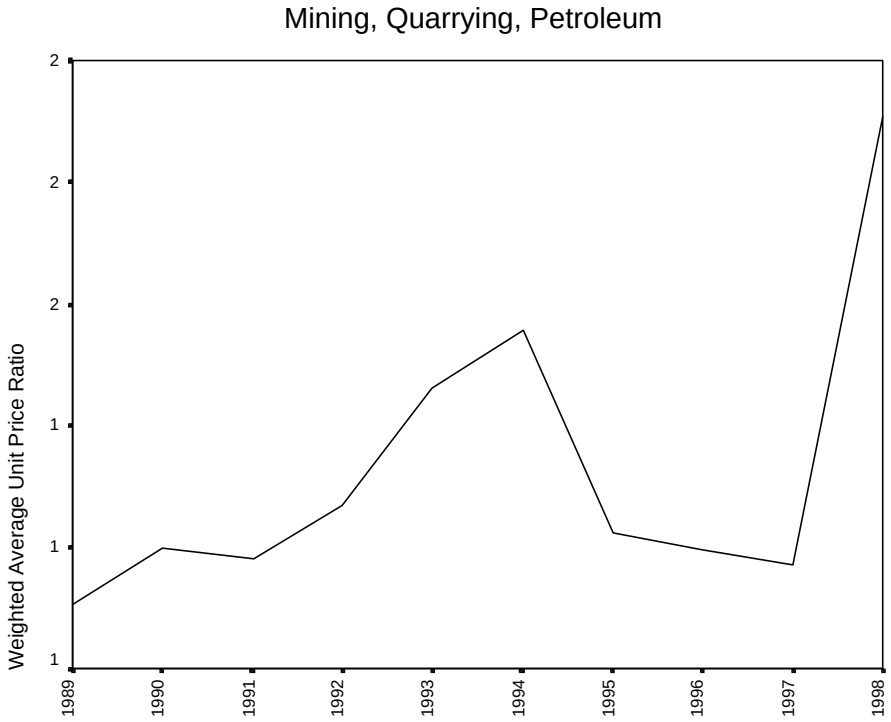
D Appendix IV: Tables and Graphs: Unit Values

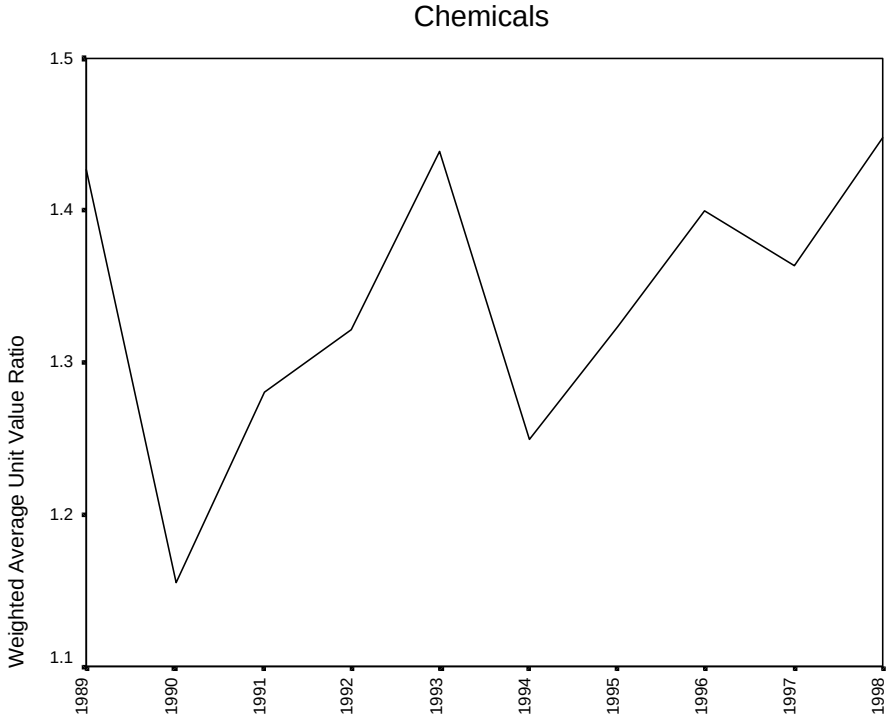
Table 11: Unit Values by Industry

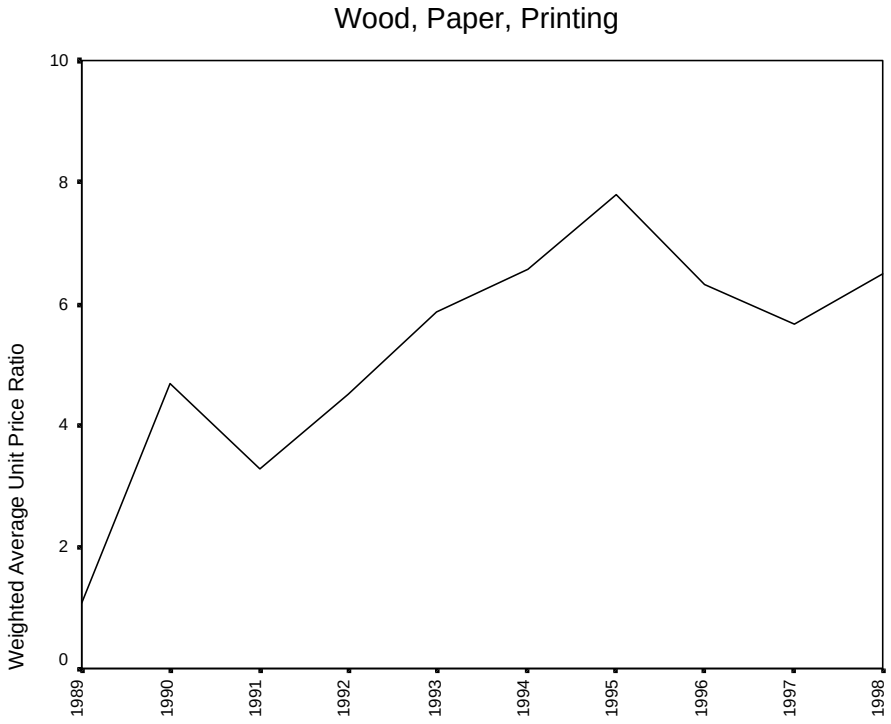
Industry		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Agriculture, Hunting, Forestry	Weighted Average Unit Price Ratio	43.19	45.79	57.41	87.42	86.15	88.88	91.41	110.15	88.40	91.56
Food, Tobacco Beverages, Tobacco	Weighted Average Unit Price Ratio	0.93	0.87	0.91	0.93	1.06	0.94	0.98	0.99	0.95	1.05
Mining, Quarrying, Petroleum	Weighted Average Unit Price Ratio	1.10	1.20	1.18	1.27	1.46	1.56	1.22	1.20	1.17	1.91
Chemicals	Weighted Average Unit Price Ratio	1.43	1.16	1.28	1.32	1.44	1.25	1.32	1.40	1.36	1.45
Wood, Paper, Printing	Weighted Average Unit Price Ratio	1.06	4.70	3.30	4.53	5.88	6.57	7.80	6.31	5.67	6.51
Textiles, Leather	Weighted Average Unit Price Ratio	69.06	80.84	31.99	32.79	26.15	27.66	23.30	25.27	23.85	17.90
Non-Metallic Mineral Products	Weighted Average Unit Price Ratio	1.63	14.58	22.24	13.27	7.72	11.69	7.89	5.10	2.27	4.22
Basic & Fabricated Metals Products	Weighted Average Unit Price Ratio	1.87	5.04	10.50	34.52	13.40	9.22	8.87	23.03	4.34	5.99
Non-Electrical Machinery	Weighted Average Unit Price Ratio	2.51	1.53	1.55	1.73	1.73	1.94	1.52	1.89	1.93	1.77
Electrical Machinery	Weighted Average Unit Price Ratio	1.58	1.39	1.94	1.46	1.61	1.75	1.56	1.72	2.02	2.85
Motor Vehicles	Weighted Average Unit Price Ratio	1.53	1.33	1.59	1.89	2.67	2.81	1.78	1.55	1.89	1.97
Other Transport Equipment	Weighted Average Unit Price Ratio	3.50	4.06	3.94	5.65	5.22	5.48	4.05	6.22	3.89	4.07
Professional Goods	Weighted Average Unit Price Ratio	0.64	3.52	2.05	3.25	1.73	1.42	1.94	1.55	1.44	1.78
Other Industries	Weighted Average Unit Price Ratio	7.74	4.33	4.22	4.10	4.96	11.76	11.69	5.94	6.03	6.68

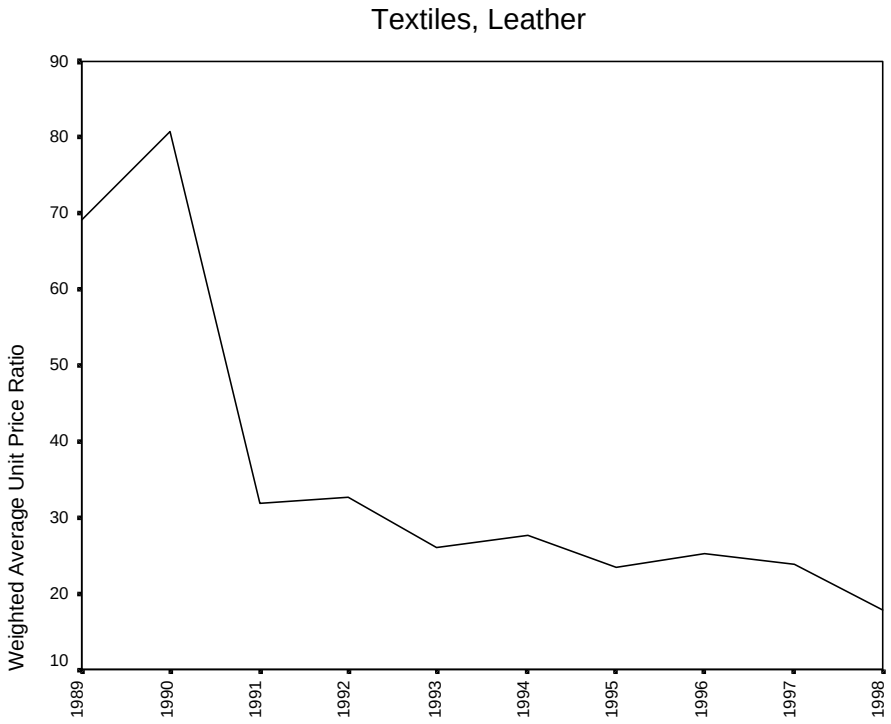
Figure 8: Unit Values by Industry

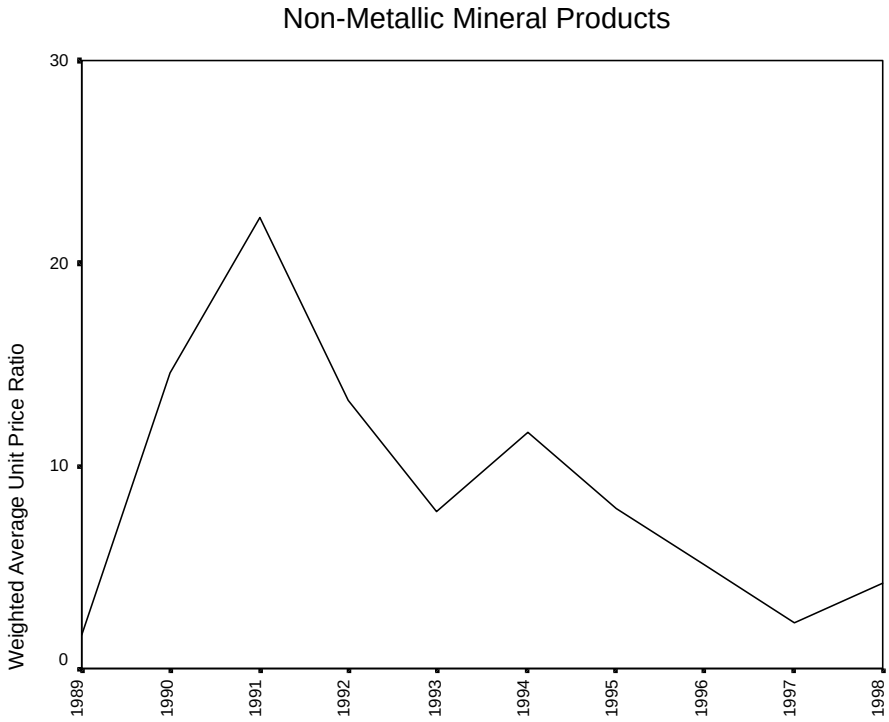


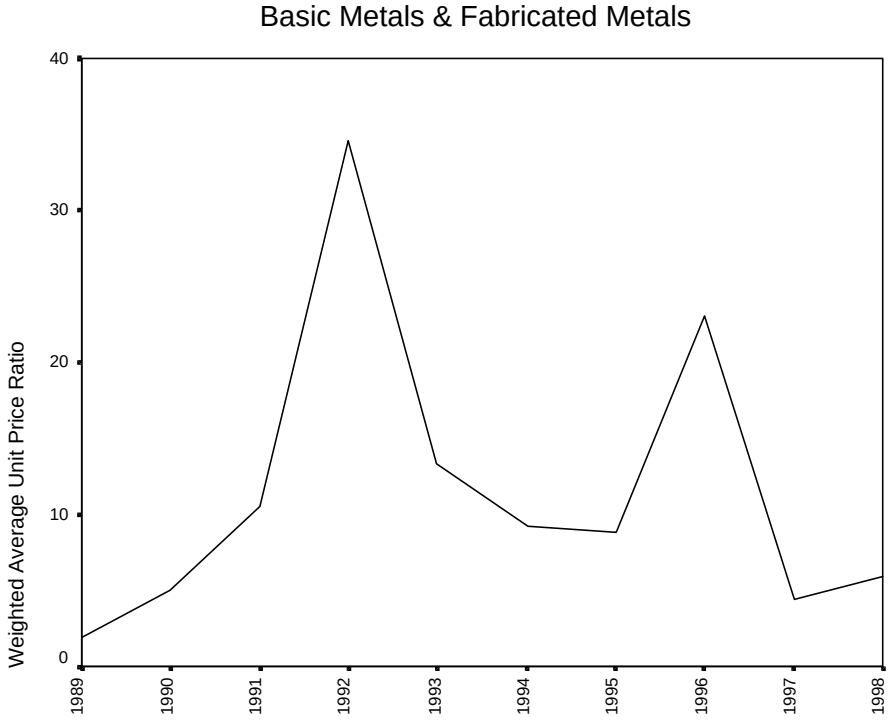

Mining, Quarrying, Petroleum
Weighted Average Unit Price Ratio
2
2
2
1
1
1
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

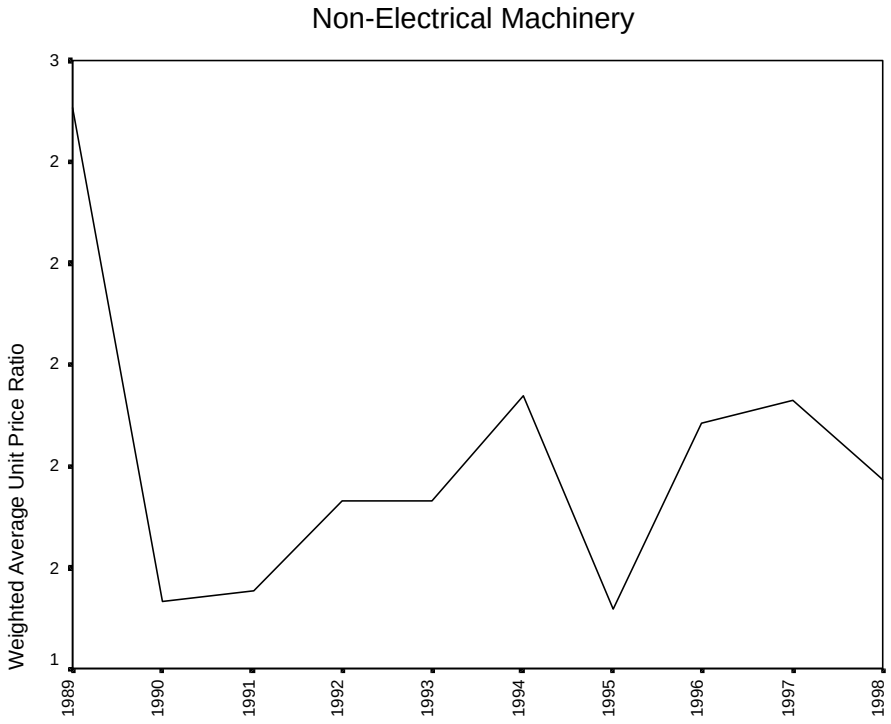

Chemicals
Weighted Average Unit Value Ratio
1.5
1.4
1.3
1.2
1.1
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

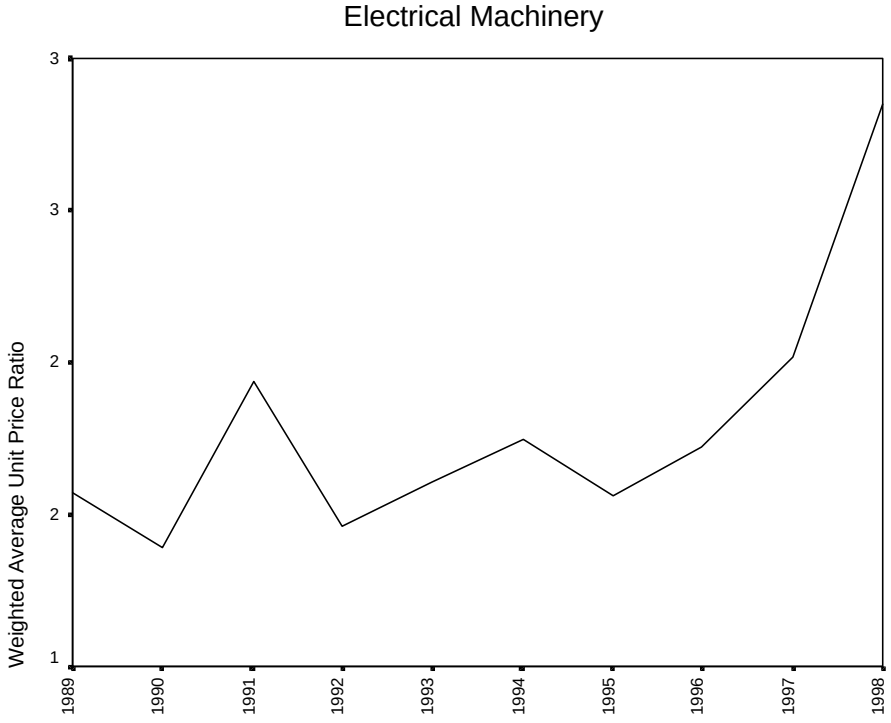

Wood, Paper, Printing
Weighted Average Unit Price Ratio
10
8
6
4
2
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

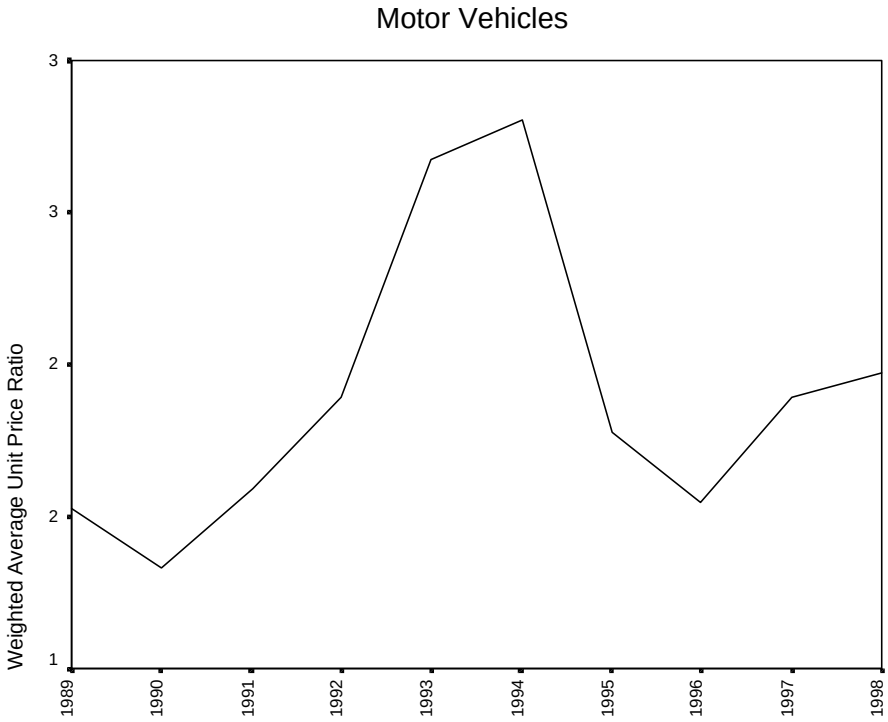

Textiles, Leather
Weighted Average Unit Price Ratio
90
80
70
60
50
40
30
20
10
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

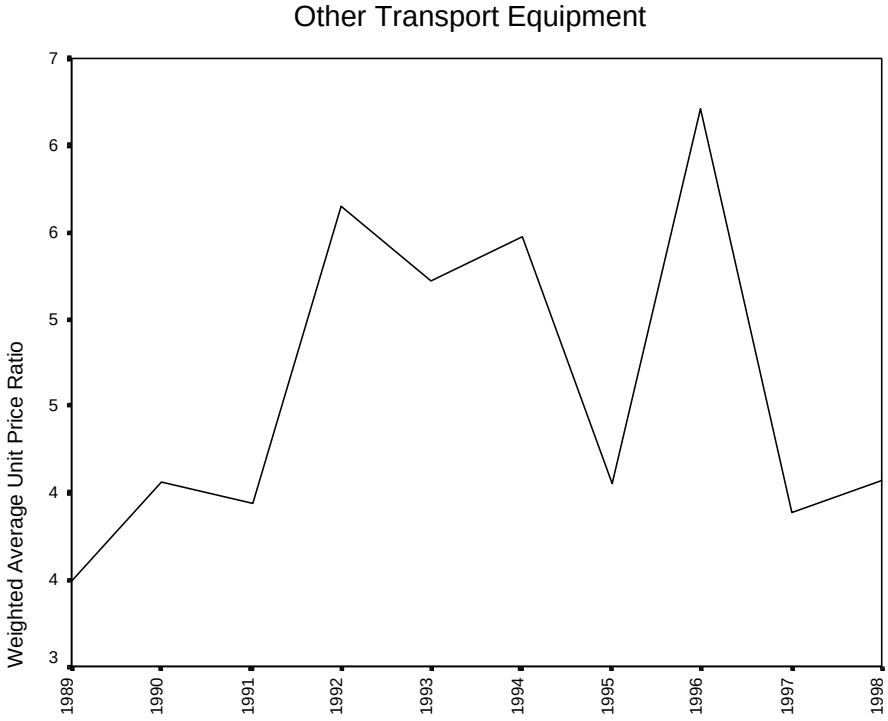

Non-Metallic Mineral Products
Weighted Average Unit Price Ratio
30
20
10
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

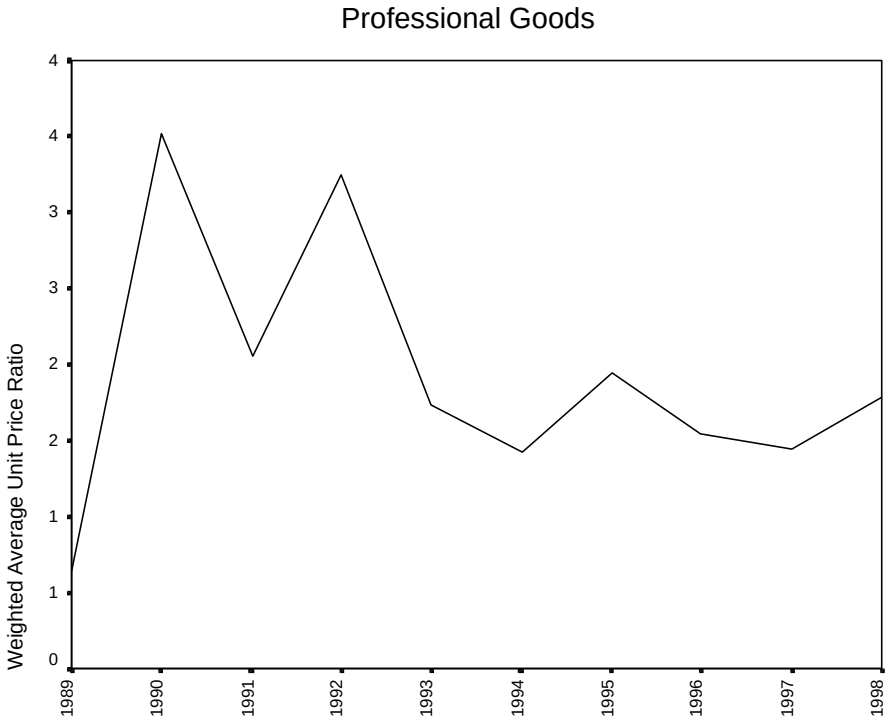

Basic Metals & Fabricated Metals
Weighted Average Unit Price Ratio
40
30
20
10
0
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

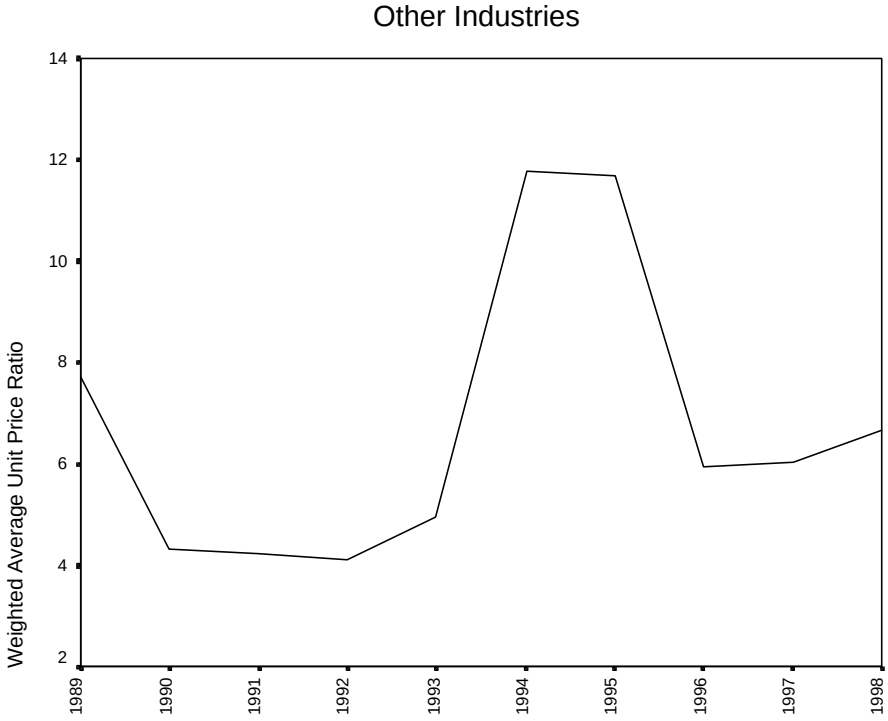

Non-Electrical Machinery
Weighted Average Unit Price Ratio
3
2
2
2
2
2
1
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


Electrical Machinery
Weighted Average Unit Price Ratio
3
3
2
2
1
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


Motor Vehicles
Weighted Average Unit Price Ratio
3
3
2
2
1
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


Other Transport Equipment
Weighted Average Unit Price Ratio
7
6
6
5
5
4
4
3
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


Professional Goods
Weighted Average Unit Price Ratio
0
1
1
2
2
3
3
4
4
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


Other Industries
Weighted Average Unit Price Ratio
2
4
6
8
10
12
14
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998