Onderzoeksrapport N° 8009

BELGIAN PRICE REGULATION : THE REVEALED PREFERENCES OF REGULATED FIRMS AND THE MINISTER OF ECONOMIC AFFAIRS*

by

R. De Bondt+, J. Brennan+ and B. Martens++

September 1980

* We wish to express our appreciation for the assistance received from Mr. R. Ruysschaert, Librarian of the Faculty of Economic and Applied Economic Sciences, KUL, during the data coding stages of this work. Without his freely given time and advice the task would have been greatly complicated. Also for enlightening discussions on statistics, held with Prof. Dr. R. Vandenborre, Prof. Dr. W. Gochet, Dr. B. Regidor, all of the Department of Applied Economic Sciences, KUL. They were instrumental in helping to cristalize our methodology. Any remaining coding errors or flaws in statistical logic can not of course be blamed upon their participation.

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Wettelijk Depot : D/1980/2376/19.

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SAMENVATTING DER BELANGRIJKSTE BEVINDINGEN

Dit rapport bevat de eerste bevindingen van een systematische empirische analyse van de Belgische prijsregeling van 1975 tot en met 1979. Voor de eerste maal werden een 5000-tal gegevens van procentuele prijs verhogingsaangiften en aanbevelingen van de Minister van Economische Zaken systematisch onderzocht. De belangrijkste bevindingen omvatten :

1. Een aangifte van een producent is typisch hoger dan deze van een groothandelaar/importeur.

2. De Ministeriële aanbeveling aan een producent is typisch groter dan deze aan een groothandelaar/importeur.

3. Voedsel en dranken hebben typisch de hoogste prijsverhogingsaangiften.

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4. De aanbevolen verhogingen zijn typisch hoger voor voedsel en dranken dan voor andere sektoren.

5. Vervoermiddelen (auto's, vrachtwagens, rijwielen, en motorrijwielen) hebben typisch de laagste prijsverhogingsaangiften.

6. De aanbevolen verhogingen zijn typisch lager voor vervoermiddelen dan voor andere sektoren.

x x x

7. In perioden wanneer het indexcijfer van de groothandelsprijzen stijgt is er meer overeenstemming tussen de ondernemingen aangaande de hoogte van hun aangifte.

8. De overeenstemming tussen ondernemingen aangaande de hoogte van hun aangifte in perioden van stijgende groothandelsprijzen is vooral typisch voor Belgische producenten en niet zozeer voor groothandelaars/importeurs.

9. Indien de diversiteit van prijsverhogingsaangiften groot is voor Belgische producenten dan is ze klein voor groothandelaars/importeurs en omgekeerd. Dit in alle jaren behalve 1977.

x x x

10. De diversiteit van de Ministeriële aanbevelingen is relatief groter voor groothandelaars/importeurs dan voor producenten in alle sektoren behalve voor rubber produkten.

11. Er is meer overeenstemming tussen sektoren aangaande de hoogte van prijsverhogingsaangifte dan er overeenstemming is in de overeenkomstige Ministeriële aanbevelingen.

× × ×

12. Wanneer de Minister van Economische Zaken een strengere politiek gaat voeren gebeurt dit niet uniform voor alle ondernemingen. De diversiteit van zijn aanbevelingen wordt groter zowel voor producenten als voor groothandelaars/importeurs.

13. De Minister van Economische Zaken wordt strenger naarmate de ondernemingen kleinere prijsverhogingen aangeven.

. . .

14. Het merendeel der volledig geweigerde verhogingen vallen steeds ten laste van de groothandelaars/importeurs.

15. De Minister is strenger voor de producenten dan voor de groothandelaars/importeurs in alle jaren behalve 1976.

16. De Minister is meer consistent in zijn strengheid ten overstaan van Belgische producenten dan ten overstaan van groothandelaars/importeurs.

. . .

17. De Minister van Economische Zaken is het strengst voor de sektoren papier produkten, chemische produkten en houten meubelen.

18. De Minister van Economische Zaken is het minst streng voor metaalproduktie, niet-metaalhoudende mineraalprodukten (cement, ceramiek, gals), en machinebouw.

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1. INTRODUCTION

1.1. Background

An important topic for both industrial and macroeconomic policy is the explanation and prediction of pricing decisions. Earlier research has paid little attention to the impact of government price regulation on the magnitude and timing of price changes. While this may be justified in countries with temporary, loose, or limited price regulation, it does not appear appropriate for Belgium which has an extensive and apparently durable system of price regulation.

Given the adaptive and anticipative abilities of managers, it clearly is inevitable that their behavior over the years has been shaped by the Belgian regulation. Pricing decisions therefore, very probably, not only reflect the effect of macroeconomic and structural elements, but are also affected by these institutional influences. At the same time, the responsible government officials behavior is not only determined by macroeconomic objectives, say a desire to limit the rate of inflation, but also by the economic, social, bureaucratic and political factors. This in turn may again influence firms, which may again influence the

government officials until perhaps some equilibrium is reached.

The working hypothesis of our work is that it is unlikely that one will be able to understand firm pricing decisions in Belgium without understanding how these are affected by the price regulation and without having insight into the behavior of the regulators. The Belgian regulation involves advice by the Price Commission (see De Bondt (1978)) and recommendations by the Minister of Economic Affairs which are prepared by his Administration of Prices. Since the focus in on the regulatory outcome and not on the regulatory process, the regulator is for convenience identified with the Minister of Economic Affairs.

The firm pricing decisions considered in our project involve both the timing and the magnitude of the price increase requests and the timing and magnitude of the actual price increases following the recommendation on the same dimensions by the Minister of Economic Affairs. Since it is not clear which theoretical model for both the behavior of the firm and the regulator could be general and tractable enough to yield manageable testable hypotheses, we choose instead to begin our research by investigating the behavior of both parties as revealed by their choices.

This paper is a first report of a wider effort to study the pricing behavior of the firms and the regulator with industrial economic and macroeconomic policy questions in mind. The results reported constitute facts established by statistical analysis of more than 5000 individual observations from

a five year sample period. They are, we hope, not premature, although their full explanation is not attempted since this is the subject of ongoing and future research. The objectives of this report can best be detailed after a discussion of the data set.

1.2. Description of the Data Set

1.2.1. The Primary Source of Information

The primary sources of information used in this study are monthly summaries of the decisions made by the Belgian Minister of Economic Affairs during the five year period begining in January 1975 and ending in December of 1979. These summaries used together in chronological order form a historical record of the Belgian price regulation system. Each summary is a listing of the requests that were made for price increases together with the corresponding recommendations given by the Minister and the actual firm's decisions. The listing contains an abbreviated reference to the requestor's complete legal name and the product type, together with the size and date of the price increases.

1.2.2. The Coding of the Data Set

In order to transform the primary source of information into a numerical data set compatable with the FORTRAN IV computer language, a coding system was designed. The information comprising each case in the primary listing

was given a numerical coding and punched upon a data card. Each card contains the requestor's BTW tax number as a means of identifying the requestor, a four-digit NACE activity code, a code reflecting the product type, the date and magnitude of the request, the date and magnitude of the recommendation and the data and magnitude of the result that was applied into the market.

The explicit identity and commercial activity of each requestor was determined by comparing and analyzing the information contained in the Handels-index BE-LUX 1979 by Dun and Bradstreet, Informatiewerk over het Bedrijfsleven in België en Luxembourg 1979-1980 by Kompass Belgium, Jaarregister der BTW-Plichtigen, the eight volume Belgian telephone book, the published yearly reports of firms when available and casual empiricism. On the basis of this information it was decided whether the requestor functioned as a selling domestic producer or as a wholesaler/importer in the product market for which the request was made and the correct NACE activity coding was determined.

1.2.3. The Final Data Set Used

In constructing the data set used in this report only those requests made by individual firms were included. For this project all collective and industry requests were illiminated from consideration. Further, all requests originating in the service sector (i.e., hotels, rest homes, vehicle rental, water distribution, camping, movies, etc.) were deleated. For the type of analysis reported here it was impossible to use cases in which the magnitude of the request or the recommendation was expressed absolutely in Belgian Franks

and thus only those expressed explicitly in percentage of increase could be used. As a result of these deletions, the number of useable observations in the final data set was reduced to 5020.

1.3. Objectives

The objectives of this study are to determine if there exists differences in the percentages requested for price increase by sellers and the percentages recommended by the Minister of Economic Affairs in response to these requests in variously defined portions of the complete data set. The function of this regulatory system is to restrain price increases and therefore more than simply an analysis of the changes in the absolute magnitudes of the percentages requested and recommended is desired. It is an additional objective to determine the relative degree of restraint placed upon sellers by the Minister of Economic affairs in these same portions of the data set.

First, differences arising from purely chronological reasons were considered. This was accomplished by a division of the data set according to the year in which the request was made. A discussion of this analysis is to be found in section 3 of this report. The emphasis next turns to the differences that might arise from reasons connected with the commercial activity of the requestor. A dichotomization of the data set was accomplished according to whether the requestor of the product in question was a domestic producer of it or simply a wholesaler/importer of it. This discussion comprises section 4.

Finally differences arrising from the peculiarity of the sector were considered by an apportionment of the data set into twelve product groups according to the product type of the request. A discussion of the findings of this analysis are found in section 5 of this report.

The major conclusions that were drawn can be found in section 6.

2. METHODS OF ANALYSIS

The methods of analysis used in this paper are justified and explained in this section.

2.1. The Justification for the Use of Nonparametric Methods

The random variables analyzed in this paper are the percentage price change requested by sellers which has a range of all positive real numbers and the percentage recommended by the Minister which ranges over nonnegative real numbers. The data set utilized consists of a sample of realizations of these random variables whose frequencies of occurance were determined by the choices that were made by these actors.

It cannot be assumed that the distributions of these random variables conform to any commonly used theoretical parametric statistical models. This result is arrived at by investigating the histograms of the complete data set of observed realizations of these random variables, see the scaled histograms in Figure I.

In order to compare each histogram with a continous density function the member of the family of lognormal distributions best fitting the data also appears (for the moment the zero percent realizations of the random variable percentage recommended are ignored as the lognormal distribution is undefined at zero). The verticle piles of the letter X represent the scaled cell frequency of realizations and the numbers shown on the horizontal axis are the

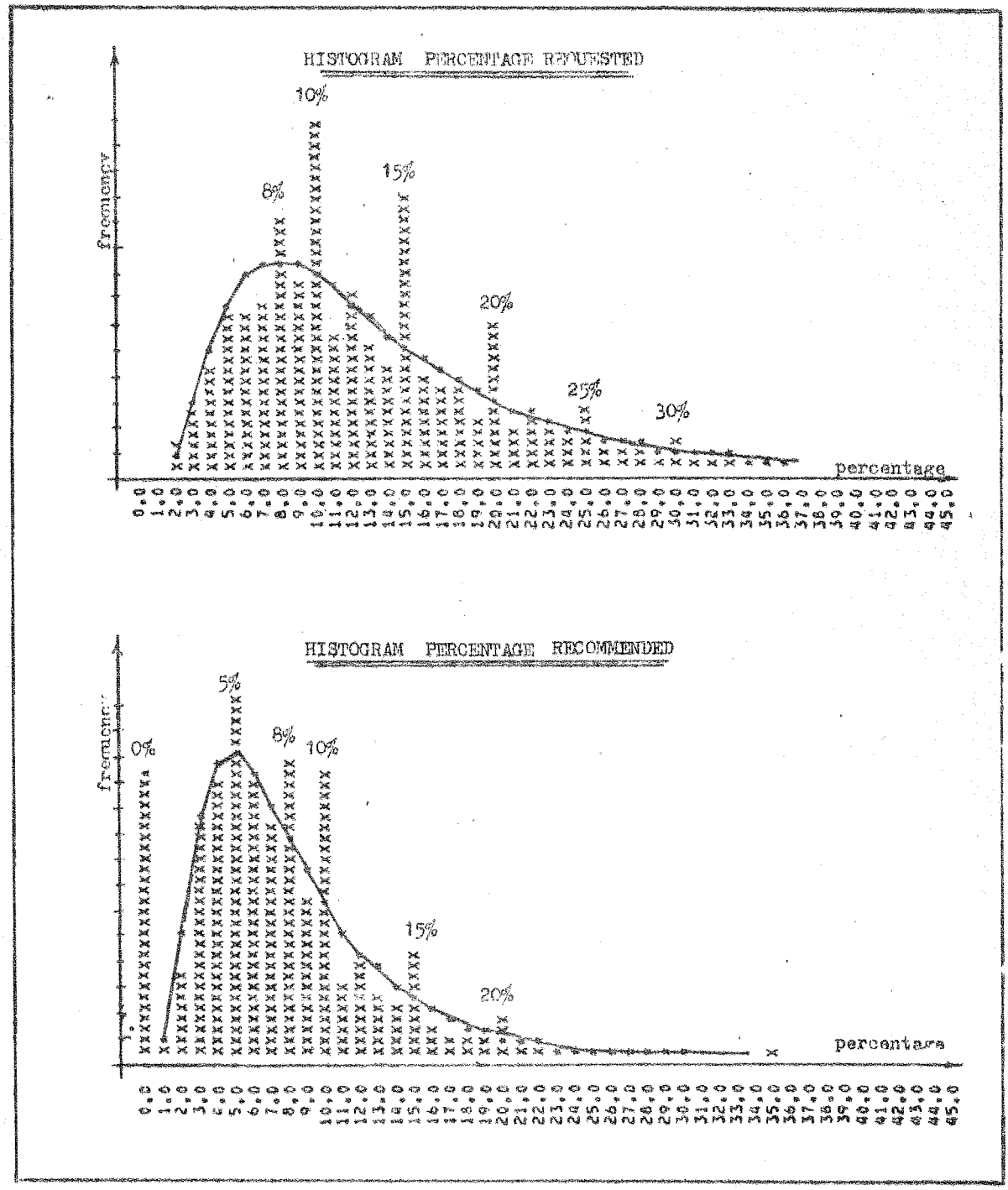


FIGURE 1. Complete Data Set Histograms .

mid points of cells 1 % wide. The important thing to note from these large sample histograms is that the population distributions are nonnegative, highly skewed to the right and that the probabilities are not smoothly distributed.

Considering only the realizations of the random variable percentage requested and looking at the frequency of observations falling into the cell centered at 10 %, it is noted that this cell alone contains 10.62 % of the total observations as compared to a lognormal prediction of 6.04 %, 75.84 % too overpopulated. Also note the relative underpopulation of its adjacent cells. The same is true of other particular cells and their neighbors. Table I displays the percentage of the total sample of realizations that are observed in only four of the forty-five cells shown, namely 10 %, 15 %, 20 % and 25 %. The table is subdivided further into whether the requests originated with selling domestic producers or with wholesaler/importers, by year and by major NACE 2-digit industry. The findings of this table are that all data subdivisions show the same marked degree of overpopulation in these popular cells.

This significant "lumpiness" in the frequency histogram is evidence that the assignment rule in the population is not smoothly distributing probabilities among events. For that reason it is difficult to assume an underlying theoretical parametric statistical model with a commonly used functional form that would be useful in hypothesis testing.

Table I. The Percentage Requests Falling Into the Four Most Popular Cells - 10 %, 15 %, 20 %, & 25 %.

	Complete samples						Domestic producers						Wholesaler/importers					
	% obs. in into popular cells	% predicted by lognormal distribution	% of over population	% obs. in into popular cells	% predicted by lognormal distribution	% of over population	% obs. in into popular cells	% predicted by lognormal distribution	% of over population	% obs. in into popular cells	% predicted by lognormal distribution	% of over population	% obs. in into popular cells	% predicted by lognormal distribution	% of over population	% obs. in into popular cells	% predicted by lognormal distribution	% of over population
Complete data set	25.06%	13.35%	88.80%	27.51%	13.62%	101.88%	23.54%	13.22%	77.98%	14.06%	8.72%	61.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
	Break-down by year																	
1975	25.24%	13.99%	80.58%	28.75%	14.08%	104.17%	22.73%	14.06%	61.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
1976	27.03%	13.86%	94.67%	29.66%	14.16%	109.33%	25.34%	13.79%	83.85%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
1977	24.94%	12.70%	96.33%	30.43%	13.15%	131.43%	21.29%	12.45%	70.51%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
1978	25.00%	12.14%	105.88%	24.71%	12.97%	90.51%	25.17%	12.02%	109.34%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
1979	23.65%	12.90%	83.47%	25.77%	13.05%	97.00%	22.37%	12.91%	73.33%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
	Break-down by 2 digit NACE industry																	
20	41.53%	15.19%	173.59%	45.90%	15.99%	187.17%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
25	27.95%	14.74%	99.86%	22.53%	13.84%	62.89%	32.63%	14.99%	117.53%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
31	25.51%	13.59%	89.78%	28.27%	13.74%	111.37%	22.95%	13.74%	66.28%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
32	22.74%	13.39%	69.76%	32.63%	15.56%	109.60%	20.73%	13.07%	58.49%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
34	22.15%	12.43%	78.32%	26.12%	12.27%	112.92%	20.63%	12.41%	66.19%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
35/36	13.82%	9.87%	53.64%	17.59%	7.62%	130.86%	11.81%	9.17%	28.79%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
37/39	28.22%	12.50%	109.76%	30.61%	12.98%	135.68%	28.45%	12.43%	96.76%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
41/42	19.55%	13.08%	49.88%	16.99%	12.52%	35.68%	21.09%	13.39%	57.36%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
43	27.72%	14.64%	97.45%	32.17%	15.09%	113.13%	24.70%	13.40%	84.37%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
46	30.98%	15.58%	99.46%	31.89%	15.94%	99.99%	26.92%	13.69%	96.69%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
47	32.16%	16.22%	119.99%	36.09%	18.00%	111.64%	31.33%	14.53%	115.59%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%
48	21.64%	15.70%	39.30%	26.09%	13.78%	89.27%	29.27%	16.88%	74.16%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%	31.43%	13.33%	135.72%

2.2. Measures of Location and Dispersion

The locations of the cumulative frequency distributions of samples will be characterized by certain quantiles : the median, $q_{0.50}$, the lower quartile, $q_{0.25}$ (that value of the random variable that has a cumulative frequency of 0.25), and the upper quartile, $q_{0.75}$ (that value of the random variable that has a cumulative frequency of 0.75). The measure of dispersion used is the interquartile range, defined as the upper quartile minus the lower. In order to make comparisons in the relative variability between two frequency distributions with differing medians, a dimensionless measure is defined called the percentage of variability. It is the interquartile range expressed as a percentage of the median, or $((q_{0.75} - q_{0.25})/q_{0.50}).100$.

2.3. Stochastic Dominance

In order to infer underlying preferences from the realizations of random variables observed, hypothesis testing procedures are required. The focus in this paper is limited to investigating whether or not the preferences as revealed by the magnitudes of the percentages requested and recommended can be regarded as being the same for different years or sectors or whether some years or sectors can be viewed as prefering larger values.

Viewing the observations as samples drawn from larger populations, we will test whether or not the values of the population from which one sample (say requests for all firms in 1975) was drawn, is stochastically larger than the values of the population form which the other sample (say requests for all firms in 1976) was drawn, i.e. to test the statement that one population has higher values than the other.

As the illustrative histograms in Figure II demonstrate this cannot be determined simply by inspection. There exists, however, a statistical test for this purpose provided by the non parametric statistics literature known as the Kolmogorov-Smirnov two-sample test (Siegel (1956)).

This test is concerned with the agreement between the two cumulative frequency distributions derived from these histograms. If the two samples whose frequencies give rise to these cumulative frequency distributions have in fact been drawn from populations with equal distributions, then these cumulative frequency distributions may be expected to be located fairly close to each other. In as much as the population distributions share the same location, these sample cumulative frequency distributions should show only random deviations from this location. Should the two sample cumulative frequency distributions be located "too far apart" at any point, then this would suggest that these samples have been drawn from populations whose distributions do not share the same location. In the terminology of the economics of uncertainty (Hanoch and Levy (1969), Whitmore (1970)) we are investigating whether or not a stochastic dominance exists between the population distributions by performing this test upon the sample cumulative frequency distributions.

The null hypothesis of the test states that the two samples have been drawn from populations with equal distributions. The alternative hypothesis is that the values of the population from which one of the samples was drawn are stochastically larger than the values of the population from which the other sample was drawn.

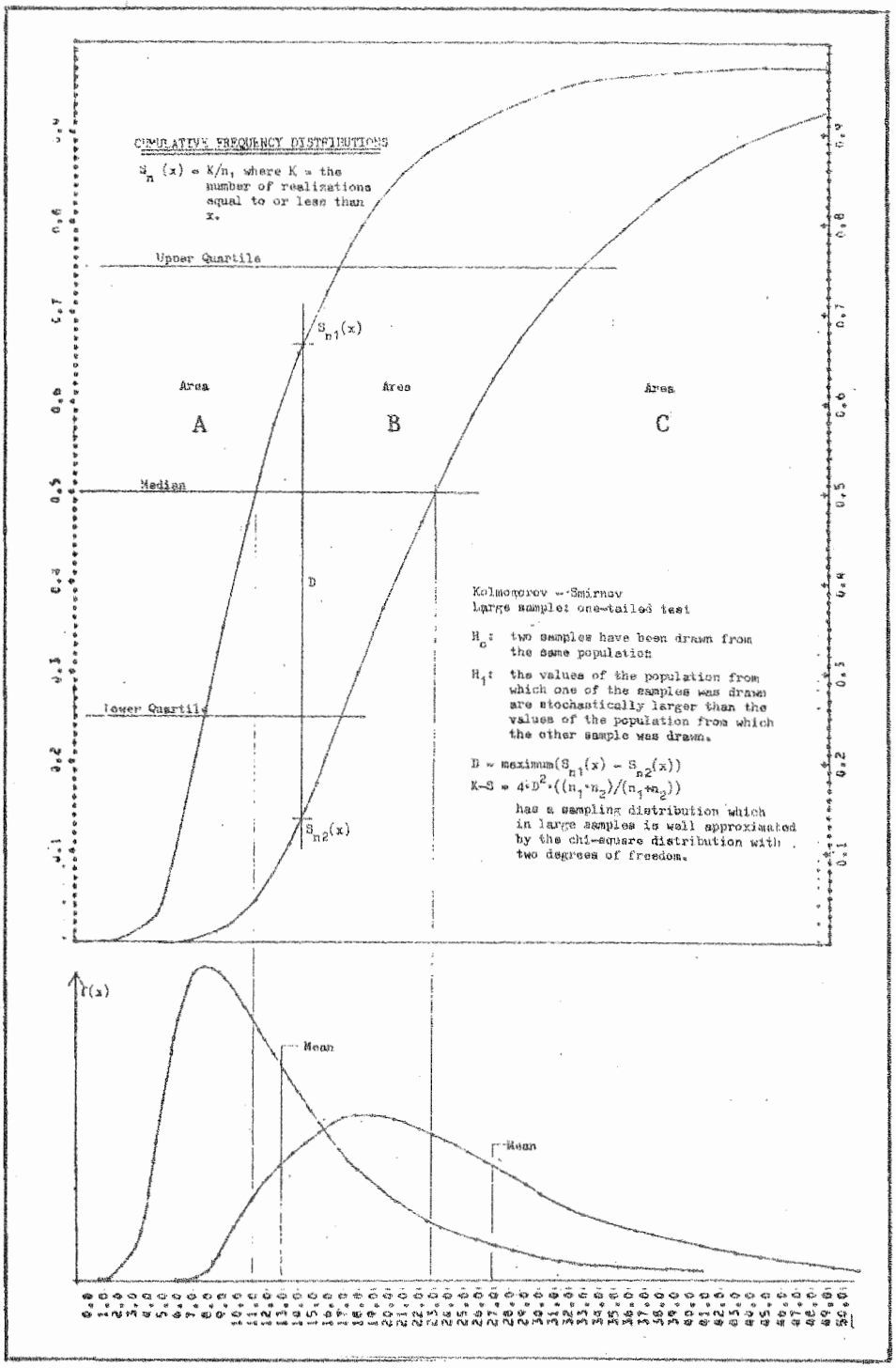


FIGURE II. Illustrative Histograms and Cumulative Frequency Distributions

2.4. "Hard Handed Index"

The "Hard Handed Index" is a quantitative measure of the degree of difference that exists between the cumulative frequency distributions of the percentages requested at the percentages recommended.

Consider the two random variables of interest, namely the percentage requested and the percentage recommended. In the notation of Figure II let the cumulative frequency distribution of a sample of the percentages requested be $S_{n2}(x)$ and the cumulative frequency distribution of a sample of the percentages recommended be $S_{n1}(x)$. It is the nature of price regulation that $S_{n1}(x)$ should always lie entirely to the left and above $S_{n2}(x)$. In order to quantitatively determine the amount with which $S_{n1}(x)$ lies to the left of $S_{n2}(x)$ a measure of the differences in location of the two cumulative frequency distributions is needed.

The simplest measure to calculate is the percentage difference in certain point measures of location, such as the upper quartile, the median or the lower quartile. Two deficiencies in this type of analysis are quickly apparent, however. The first is that it relies upon the choice of particular point measures of the location of the frequency distributions and the result obtained is sensitive to these particular chosen points. In order to increase its sensitivity more and more points are required, increasing the difficulty of its interpretation. The second criticism is that the lower quantile measures of location are influenced by the amount of observations of the percentage recommended that fall into the zero percent cell.

In order to rely on a measure of locational difference that is free from these deficiencies the following "hard handed index" (HHI) will be used. In Figure II area C is the area under the cumulative frequency distribution $S_{n2}(x)$. The area under $S_{n1}(x)$ is B+C, or B is the area in between. Area A is the remaining area of the rectangle whose area is A+B+C. The "hard handed index" is numerically calculated by the computer from these areas that are related to the locations of these cumulative frequency distributions as :

$$HHI = B/(A+B)$$

The HHI is a measure of the "severity" with which the minister responds to the requests made in the issuance of his recommendations. It has a range from zero to one. If the Minister should call a general price freeze in a certain time period, meaning that the recommendation would be zero percent for all the requests that were made, the cumulative frequency distribution for the percentages recommended would follow the vertical axis and the index would take the value one. This is the maximum level of "severity". Should the Minister fully approve all requests in another period, given a recommendation equal to the request in all cases, the two cumulative frequency distributions would lie on top of each other and the value of the index would be zero. This is the minimum level of "severity". Intermediate values of the index correspond to varying degrees of "severity".

3. COMPLETE DATA SET RESULTS

3.1. Analysis of the Percentage Requested

3.1.1. Measures of Location and Dispersion

The empirical distribution of the percentage requests made for price increases during the complete sample period (1975-1979) has a median of 11.27 % and an interquartile range of 9.65 %, yielding a percentage of variability of 85.63 %. Sorting these requests into five subsamples according to the year in which they were made and computing the same set of descriptive statistics the results of Table II are obtained.

Table II. The Percentage Requested for the Complete Data Set by Year.

year	median	interquartile range	percentage of variability
1975	12.29%	10.60%	86.25%
1976	13.12%	10.80%	82.32%
1977	9.98%	8.63%	86.47%
1978	9.36%	8.21%	87.71%
1979	9.87%	7.80%	79.03%

Figure III is a graph of the cumulative frequency distribution of the percentage requests made for each of the five years. On the lower right hand corner of this chart the yearly medians and the interquartile ranges are plotted to demonstrate the high degree of correlation that exists between the changes in their magnitudes from year to year. This correlation can also seen by looking at the percentage of variability, since with median, m, and interquartile range, r, the percentage of variability was defined as $k = \frac{r}{m}$. The interquartile range is a measure of the level of agreement among requestors in any given year of the amount selected for their requests.

During the years 1975, 1977 and 1978, the percentage of variability was between 86.25 % and 87.71 %, a narrow band 1.46 % wide. In 1976 and 1979 the dispersion of requests was proportionally less than these years. They are the same years where the median has shown an increase over the previons year's value.

To understand these findings we plotted the percentage change in the wholesale price index (see Table III and Fig. IV), against the coefficient of variability, yielding a negative correlation with correlation coefficient of -0.8481. So, when the wholesale price index goes up the percentage of variability goes down. The dispersion in the amounts requested show a proportionate decrease, since the coefficient of variability decreased. Therefore we obtain the finding that,

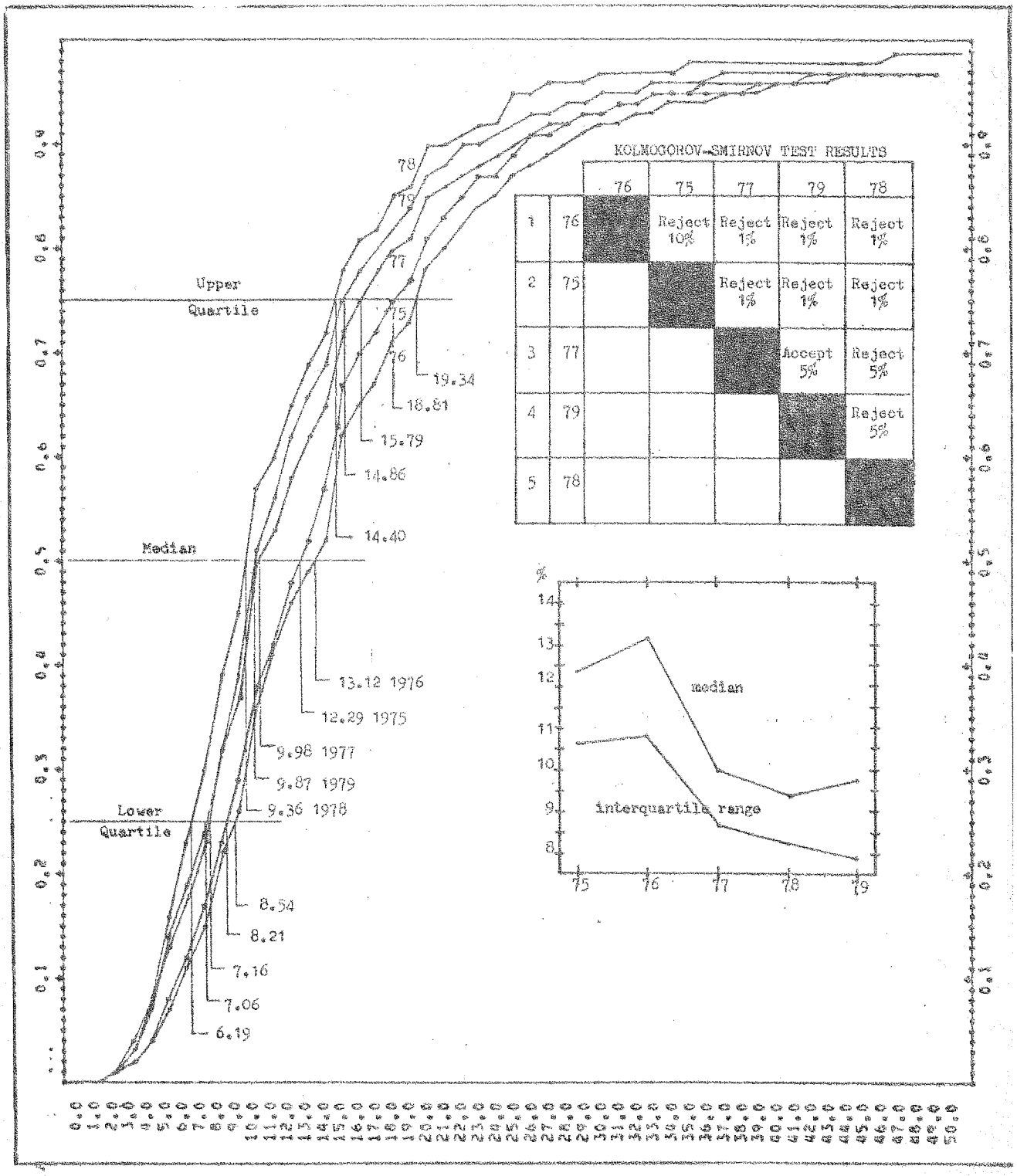


FIGURE III. Complete Data Set Cumulative Frequency Distribution of the Percentage Requested per Year.

Result 1 : *There existed proportionally more agreement among requestors (as in 1975 to 1979) regarding the magnitudes of their requests in periods of increases in the wholesale price index then in other years.*

Table III. Algemeen Indexcijfer van de Groothandelsprijzen 1953 = 100.

year	index	change
1974	169.4	
1975	171.5	+1.24%
1976	183.7	+7.11%
1977	188.1	+2.40%
1978	184.6	-1.86%
1979	196.2	+6.28%

3.1.2. Stochastic Dominance

Refering again to Figure III, the question remains to be answered if the differences in the location of the yearly cumulative frequency distribu-

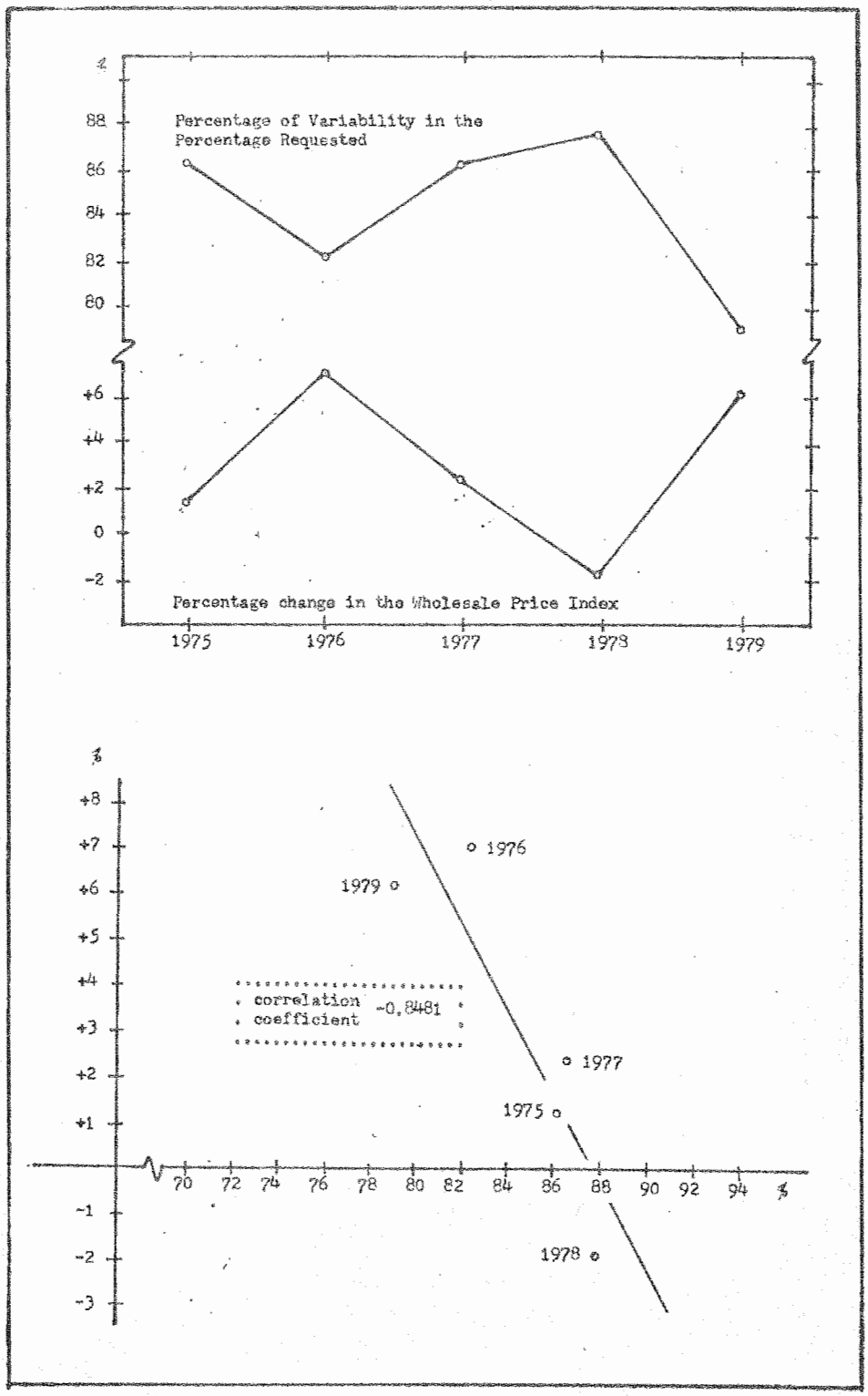


FIGURE IV. The Negative Relationship between the Percentage of Variability in the Percentage Requested and the Percentage Charge in the Wholesale Price Index.

tions is statistically significant. This is accomplished by performing all possible pairwise comparisons of the cumulative frequency distributions using the Kolmogorov-Smirnov two-sample one-tailed test, here after referred to as the K-S test.

In the upper right hand corner of Figure III is the matrix of test results. It is read from the left hand side into the matrix, for the left hand ranking is the stochastic dominance ranking. Consider the K-S test that compares the cumulative frequency distributions of 1976 to 1975. The second column of the top row yields the test result, reject the null hypothesis that they are samples drawn from populations with equal distributions of probability at a 10 % level of significance in favor of the alternative hypothesis that the population values of 1976 are stochastically larger than the population values of 1975. This result stated in a slightly different manner says that when comparing the magnitudes of two randomly selected requests, one from 1976 and one from 1975, the request from 1976 is the most likely (has the highest mathematical probability) of being the largest of the two. Looking at the K-S test matrix it is seen that all combinations of years are significantly different except the combination of years 1977 and 1979, where the hypothesis that the two samples have been drawn from populations with equal distributions can be accepted.

3.2. Analysis of the Percentage Recommended

3.2.1. Measures of Location and Dispersion

The empirical distribution of the percentages recommended for price increases by the Minister during the complete sample period (1975-1979) has a median of 6.25 % and an interquartile range of 6.01 %, yielding a percentage of variability of 96.11 %. This measure of variation is 10.5 % greater than that for the percentage requests indicating that the variability in recommendations is proportionately greater than that of the requests. Sorting these recommendations also by the year in which they were issued and computing the same set of descriptive statistics the results of Table IV were obtained.

Table IV. The Percentage Recommended Complete Data Set by year.

year	median	interquartile range	percentage of variability
1975	7.34%	6.55%	89.24%
1976	7.08%	6.24%	88.14%
1977	6.00%	5.87%	97.83%
1978	4.78%	4.93%	103.14%
1979	6.05%	5.37%	88.76%

The cumulative frequency distributions of the percentage recommended are plotted for each year in Figure V. A quick comparison of figure III with figure V shows that all of the cumulative frequency curves for the percentages recommended lie to the left and above those for the percentages requested as would be expected under any price regulation system. It is also noted that the cumulative frequency distributions for the percentage recommended begin on the verticle axis at the percentage of the yearly sample of recommendations that were given a recommended price increase of zero percent, in effect a price freeze.

In the lower right hand corner of figure V is also a plot of the yearly medians and the interquartile ranges. A degree of positive correlation exists here also, but it is not as strong as that observed for the percentages requested. This can be seen by inspecting the percentages of variability. The percentage of variability during the years 1975, 1976 and 1979 was between 88.14 % and 89.24 %, a band only 1.10 % wide. In the years 1977 and 1978, however, the variation in the percentages recommended grew proportionally greater than the other years. A possible explanation of this point is postponed.

3.2.2. Stochastic Dominance

The question of the statistical significance between the cumulative frequency distributions of the percentage recommended is more clearly answered than it was for the percentages requested. The samples of recommendations

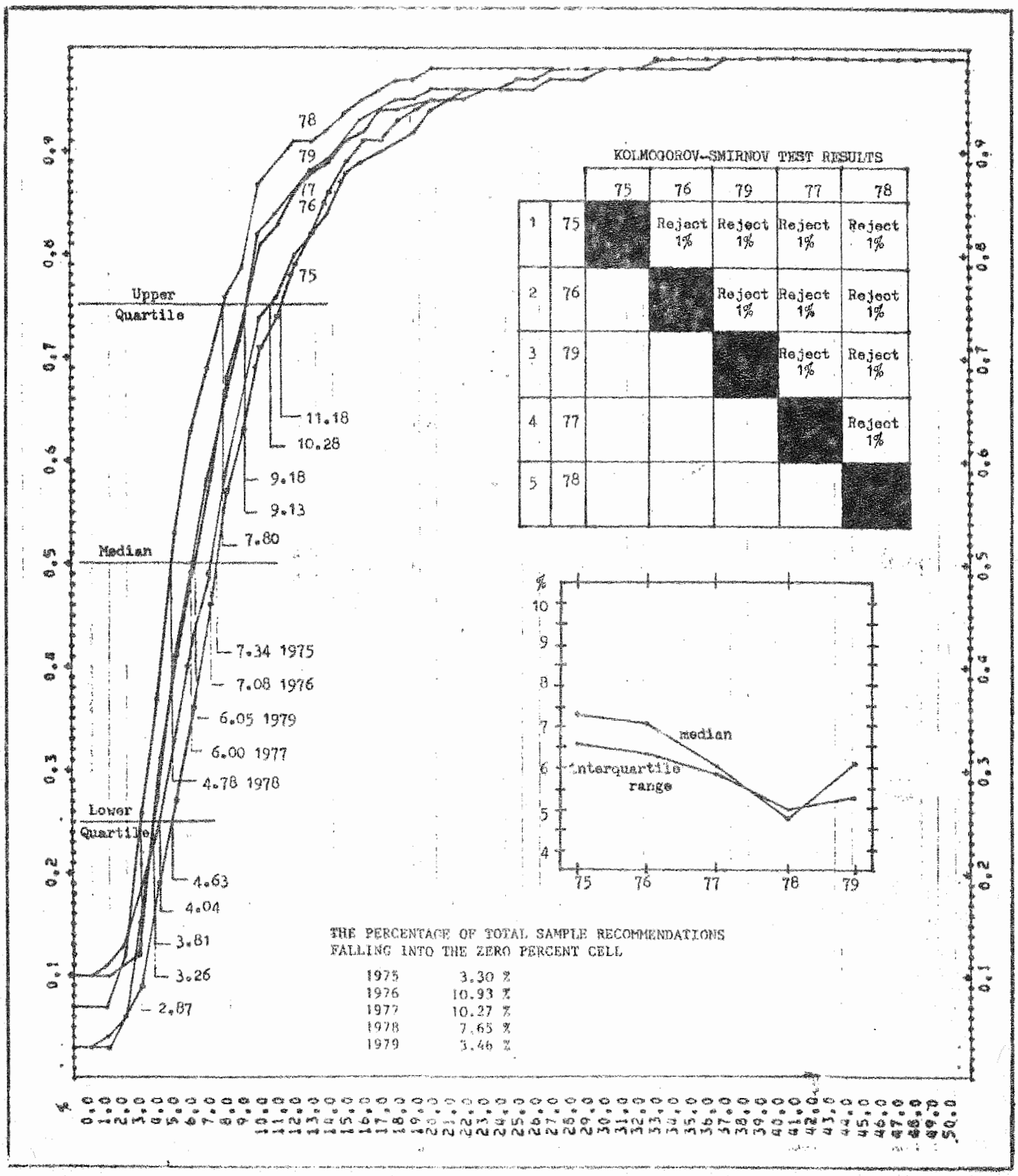


FIGURE V. Complete Data Set Cumulative Frequency Distributions of the Percentage Recommended per Year.

issued by the Minister in each of the five years can be said to be from populations with different distributions of probability at a 1 % level of significance. Again the K-S test matrix is displayed in the upper right hand corner of Figure V. Comparing the stochastic dominance ranking shown in Figure III with that of Figure V, it is observed that a different ranking is obtained. For example, even through the distribution of requests made in 1976 stochastically dominated those 1975, the reverse was true with respect to the recommendations issued by the Minister. These ranking reversals manifest themselves in differences between yearly values of the "hard handed index" also.

3.2.3. The "Hard Handed Index"

The "Hard Handed Index" was computed as a measure of the differences between the cumulative frequency distributions of the percentages requested and recommended in each of the five years. The result of these computations together with the percentage change in this index between periods is shown in Table V.

The percentage change in the HHI shows a steady increase in the restrictive nature of the recommendations issued from 1975 through 1978, when in 1979 the recommendations given by the Minister become more lenient in comparison. Viewing the percentage change in the HHI as an indicator of the consistency in administrative policy from period to period, it is observed that the greatest change occurred between 1975 and 1976 when there was a

Table V. Complete Sample "Hard Handed Index" By Year.

year	"hard handed index"	Change
1975	0.374	
1976	0.435	+16.31%
1977	0.440	+1.15%
1978	0.475	+7.95%
1979	0.404	-14.95%

tightening of policy. The next largest percentage change took place between 1978 and 1979 when policy was relaxed.

The two years with the highest absolute value of the HHI, 1977 and 1978, are also the years with the highest percentage of variability in the recommendations issued, see Figure VI. Computing the correlation coefficient between the two variables a high positive correlation is discovered, + 0.7868. We conclude,

Result 2 : *It appears that as hard hardedness increases there is a greater then proportionate increase in the dispersion of recommendations given. This would be observed if the increased restrictive policy was not administered uniformly to all requestors but harder on some than on others.*

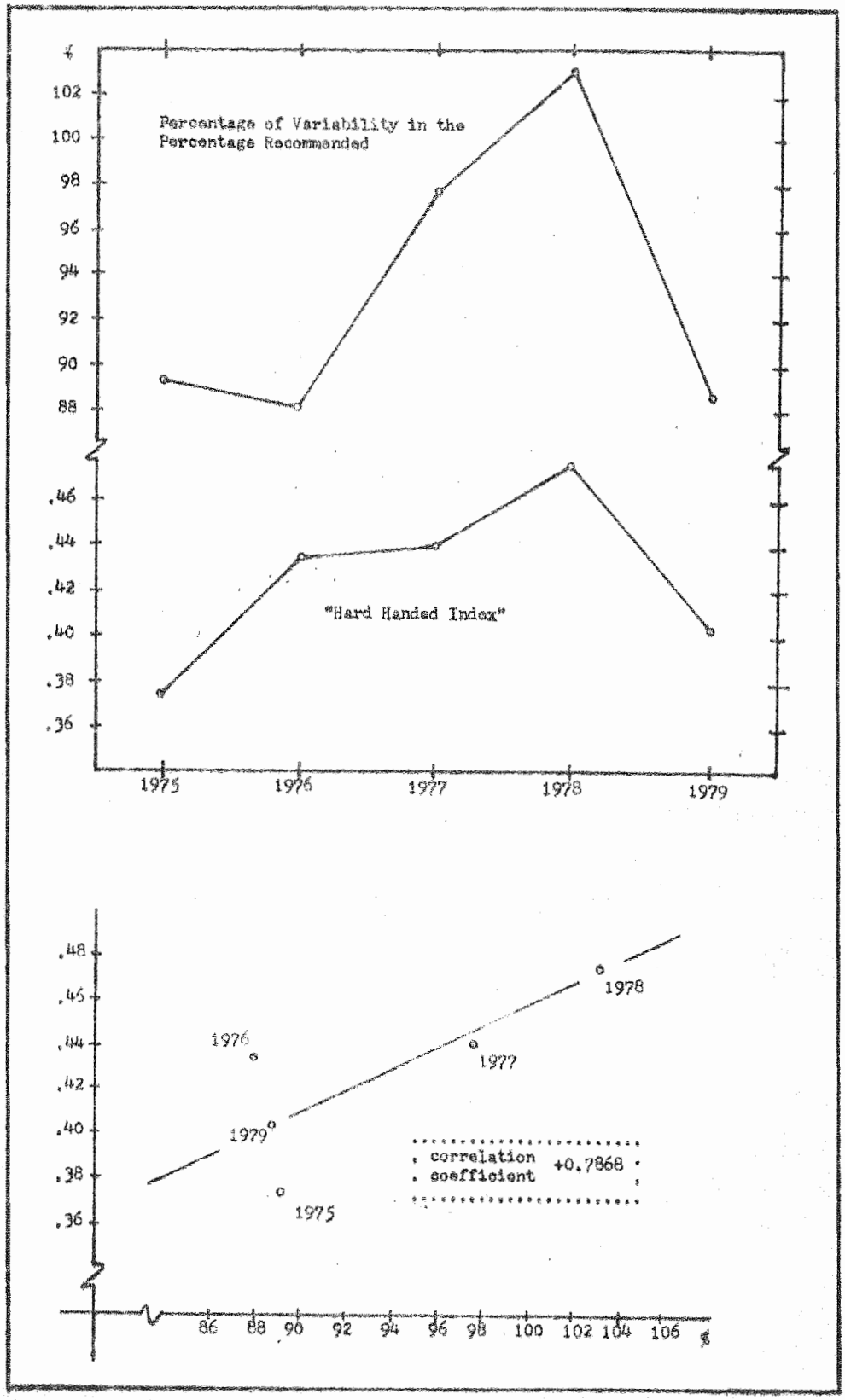


FIGURE VI. The Positive Relationship between the Percentage of Variability in the Percentage Recommended and the "Hard Handed Index".

It is observed that as the hard handedness of the Minister increased during 1976 through 1978, the cumulative frequency distributions of the percentages requested showed a statistically significant shift up and to the left. Thus, somewhat paradoxically,

Result 3 : *As the magnitudes of the requests decreased the Minister's policy became more severe.*

In fact, the highest absolute value of the HHI ocurred in 1978, the year that the population values of requests were stochastically smaller than any other year !

4. DOMESTIC PRODUCERS VERSUS WHOLESALER/IMPORTERS RESULTS

The complete data set is now divided according to whether the request originated with a domestic producer of the product in question or with a wholesaler/importer of it.

4.1. Analysis of the percentages Requested

4.1.1. Measures of Location and Dispersion

The empirical distribution of the percentage requests made for price increases by domestic producers during the complete sample period (1975-1979) has a median of 12.20 % and an interquartile range of 11.11 %, yielding a percentage of variability of 91.07 %. The distribution of requests made by wholesaler/importers during the same period has a lower median of 10.65 % and a proportionally smaller interquartile range of 8.71 %, yielding a smaller percentage of variability of 81.78 %. Sorting this dichotomy of the data according to year, the following statistics emerge, see Table VI.

Figure VII contains graphs of the cumulative frequency distributions of the percentages requested by domestic producers, data points shown by the capital letter P, and by wholesaler/importers, with data points shown by the letter I. Above and to the left of these curves are the cumulative frequency distributions of the percentages recommended by the Minister for both of these groups of requestors.

These curves were drawn using the complete data set. To the right of

Table VI. The Percentage Requested by Year Domestic Producers versus Wholesaler/Importers.

year	median	interquartile range	percentage of variability
Domestic producers			
1975	12.10%	10.42%	86.12%
1976	14.37%	10.80%	75.16%
1977	11.43%	9.89%	86.53%
1978	9.71%	8.23%	84.76%
1979	11.11%	9.11%	82.00%
Wholesaler/importers			
1975	12.39%	9.29%	74.98%
1976	11.93%	10.44%	87.51%
1977	9.61%	8.26%	85.95%
1978	9.04%	8.25%	91.26%
1979	9.60%	7.64%	79.58%

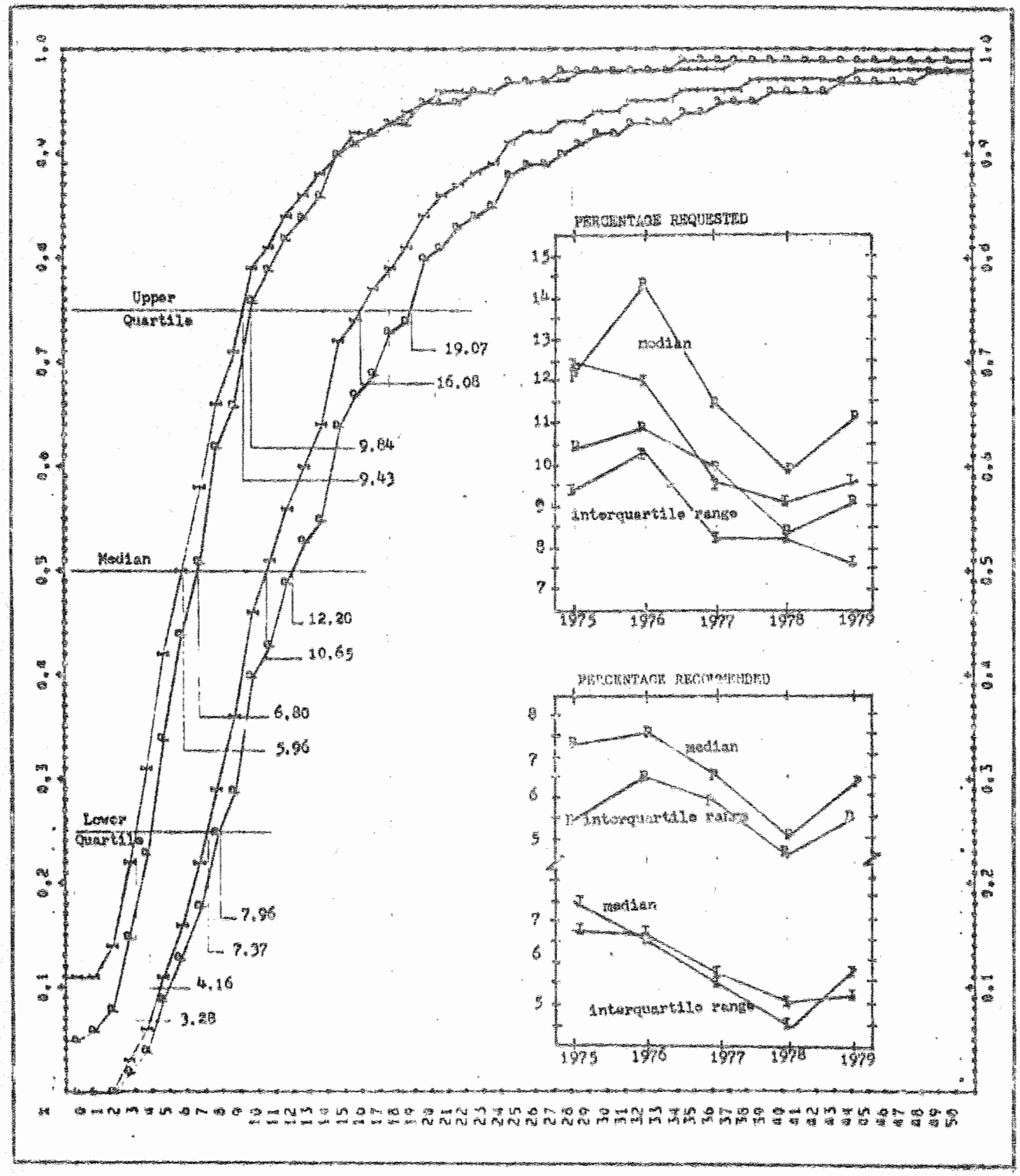


FIGURE VII. Complete Data Set Cumulative Frequency Distributions for the Percentage Requested and the Percentage Recommended - Domestic Producers versus Wholesaler/Importers.

these curves are plotted the yearly medians and interquartile ranges. The correlation between movements in the medians and interquartile ranges of the distributions of percentages requested is higher for domestic producers than with wholesaler/importers. Again the strength of correlation can be seen in the time series of the percentages of variability. This indicates that changes in the dispersion of requests (relating to the degree of agreement among requestors) as the location of the distribution changes is more linearly predictable for domestic producing requestors then for the wholesaler/importer ones. The factors underlying the degree of agreement among them appears to be more irregular and complex.

In the years 1976 and 1979 the medians and the interquartile ranges of the wholesaler/importer requestors moved in opposite directions.

Figure VII reveals that,

Result 4. There appears to be no relationship between the relative degree of agreement among producing requestors and wholesaler/importers in any particular year except in 1977. In all the other years, when agreement among producers appears to be proportionally higher the reverse is true among the wholesaler/importers and vica versa.

Computing the correlation coefficient between the percentage of variability and the percentage change in the wholesale price index for the wholesaler/importer requestors a value of -0.2141 is obtained and for domestic producers a value of -0.7455. They are both negative, however,

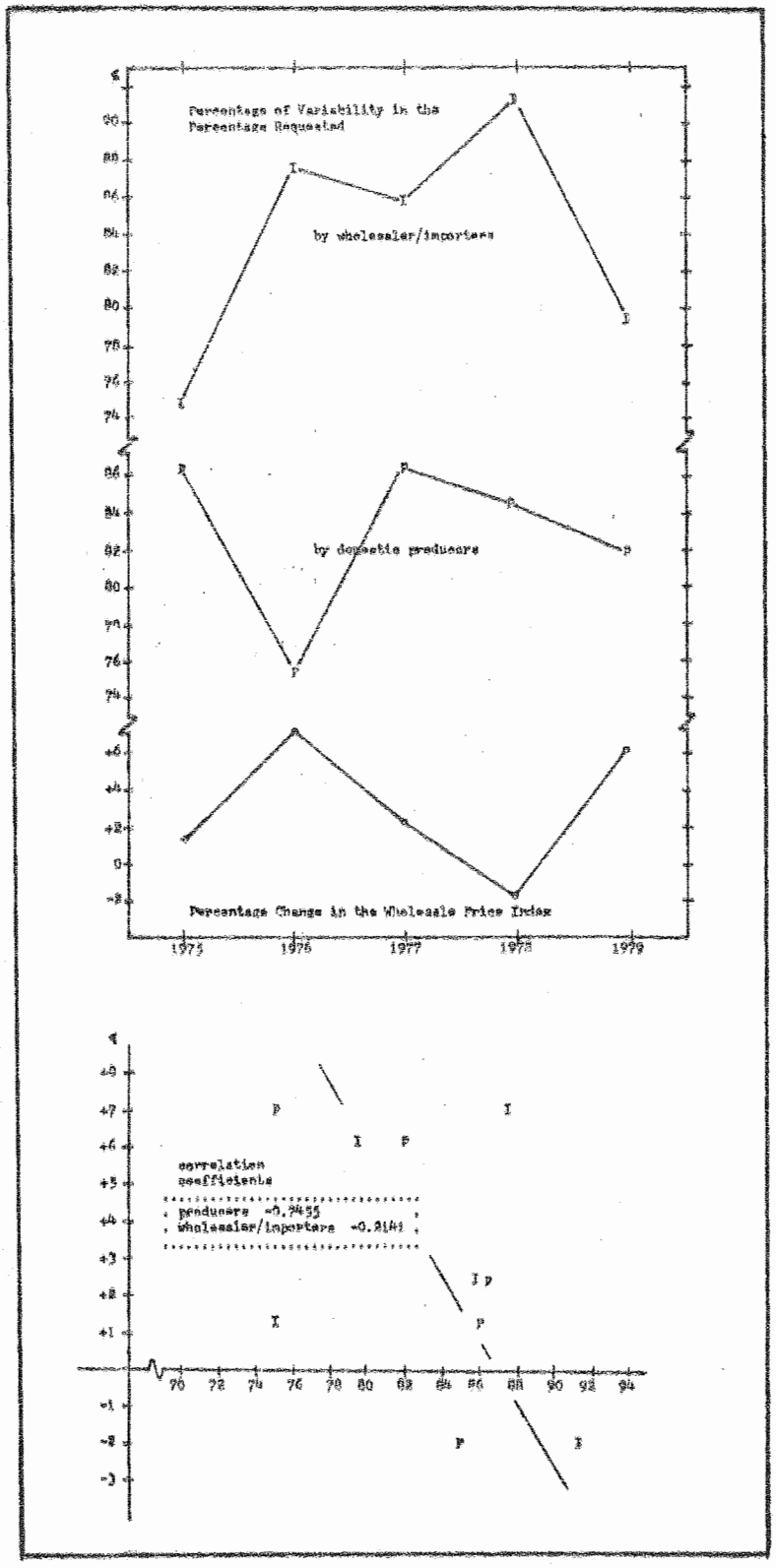


FIGURE VIII. The Negative Relationship between the Percentage of Variability in the Percentage Requested by Domestic Producers and Wholesaler/Importers and the Percentage Change in the Wholesale Price Index.

Result 5. *The strong relationship reported earlier between changes in the wholesale price index and the degree of agreement among requestors is being caused principally by the actions of domestic producers, with only a slight reinforcement made by wholesaler/importers.*

4.1.2. Stochastic Dominance

Stochastic Dominance in the context of this section concerns the statistical significance of the difference between be cumulative frequency distributions of the percentages requested by domestic producers and wholesaler/importers as seen in Figure VII. Performing a K-S test upon these complete sample cumulative frequency distributions, the null hypothesis is strongly rejected at a 0.1 % level of significance.

Performing the K-S test in each of the five years singly it is always possible to either accept or reject the null hypothesis against the alternative hypothesis that the requests originating from domestic producers are members of a population whose values are stochastically larger than those of wholesaler/importers. These K-S test results are presented in Table VII.

Table VII. KOLMOGOROV-SMIRNOV Test Results for the Percentage Requested by Domestic Producers verus Wholesaler/Importers.

1975	1976	1977	1978	1979
accept 5%	reject 5%	reject 5%	accept 5%	reject 5%

It is interesting to note that during this five year period it is never possible to reject the null hypothesis in favor of an alternative hypothesis that the yearly populations of the requests made by wholesaler/importers consisted of values stochastically larger than those of domestic producers. Either the distributions were equal, as they were in 1975 and 1978, or the distribution of requests from domestic producers stochastically dominated the other. Thus,

Result 6. During the period 1975 to 1979 a request made by a domestic producer was likely to be larger than one made by a wholesaler/importer.

4.2. Analysis of the Percentage Recommended

4.2.1. Measures of Location and Dispersion

The empirical distribution of the percentage recommended for domestic producers during the complete sample period has a median of 6.80 % and an interquartile range of 5.68 %, yielding a percentage of variability of 83.53 %. The distribution of recommendations given to wholesaler/importers during the same period has a lower median of 5.96 % and an absolutely greater interquartile

range of 6.15 %, yielding a larger percentage of variability of 103.19 %. The variability in the recommendations given to wholesaler/importers is proportionally greater than those given to domestic producers. This result occurs because both of the cumulative frequency distributions of the percentages recommended are located closer to each other in the higher quantiles, than in the lower ones, see Figure VII. The fact that the distribution of recommendations given to wholesaler/importers is pulled upward and to the left in the lower quantiles, increases the interquartile spread, and thus the result occurs that the recommendations given to wholesaler/importers have a proportionally greater dispersion than those given domestic producers. The lower quantile effect is influenced by the fact that,

Result 7 : *Wholesaler/importer requestors always received the largest share of zero percent approvals.*

The following table substantiates this result.

Table VIII. The Share of Zero Percent Recommendation Given by the Minister to Domestic Producers versus to Wholesaler/Importers.

	complete sample	1975	1976	1977	1978	1979
Domestic producers	5.76%	2.35%	6.64%	7.85%	7.14%	3.38%
Wholesaler/importer	11.20%	4.00%	13.71%	11.95%	7.94%	3.51%

Sorting these data by year the following yearly descriptive statistic were calculated, see Table IX

Table IX. The Percentage Recommended by Year, Domestic Producers versus Wholesaler/Importers

year	median	interquartile range	percentage of variability
	Domestic producers		
1975	7.24%	5.47%	75.55%
1976	7.59%	6.48%	85.38%
1977	6.64%	5.81%	87.50%
1978	5.03%	4.45%	88.47%
1979	6.42%	5.63%	87.69%
	Wholesaler/importers		
1975	7.46%	6.87%	92.09%
1976	6.51%	6.58%	101.08%
1977	5.64%	5.74%	101.77%
1978	4.62%	5.11%	110.61%
1979	5.70%	5.13%	90.00%

Again the correlation between the medians and the interquartile ranges for domestic producers is higher than for wholesaler/importers. This indicates that changes in the location of the distribution of recommendations given domestic producers are accompanied by changes in the spread that are more linearly predictable than those of wholesaler/importers. It is interesting to note

Result 8 : *In every year the variability of the recommendations given to wholesaler/importers is proportionally larger than those given domestic producers.*

This would indicate the issuance of a more similar set of recommendations to producers than to wholesaler/importers.

4.2.2. Stochastic Dominance

Testing the statistical significance of the difference in location between the complete sample cumulative frequency distributions of the percentages recommended for domestic producers and for wholesalers/importers, again the null hypothesis is strongly rejected at a 0.1 % level of significance. The distribution of recommendations given to domestic producers stochastically dominates that given wholesaler/importers.

Performing the K-S test in each of the five years singly it is always possible to either accept or reject the null hypothesis against the alternative that the recommendations given domestic producers are from a population whose values are stochastically larger than those of wholesaler/importers, see

table X.

Table X. KOLMOGOROV-SMIRNOV test results for the Percentage Recommended to Domestic Producers versus to Wholesaler/Importers.

1975	1976	1977	1978	1979
accept	reject	reject	reject	reject
5%	5%	5%	10%	10%

Thus,

Result 9: It is more likely that the recommendation made to a producer is greater than that for a wholesaler/importer.

This, however, may simply be a reflection of our finding that it is more likely that the percentage requested by a domestic producer is greater than that by a wholesaler, or that the percentage amounts granted are, to some extent, influenced by the percentage amounts requested.

4.2.3. The "Hard Headed Index"

The "hard headed index" was computed for both domestic producers and for wholesaler/importers over the complete sample period (1975-1979) and

almost equal numbers were obtained, 0.438 and 0.431 respectively.

The HHI shows that when the complete sample is considered, both groups received equal treatment and neither was treated with a higher degree of "severity" by the Minister of Economic Affairs than the other. The reason is that even though wholesaler/importer requestors received a greater share of zero percent recommendations during the period strongly invluencing the lower quantiles, the distribution of requests made by producers was reduced relatively more in the higher quantiles.

Computing the same index separately for each year, see Table XI, it is seen that,

Result 10. The recommendations given producers were more restrictive in all years except 1976 than those given the wholesaler/importers.

Table XI. "Hard Handed Index" by Year Domestic Producers versus Wholesaler/ Importers.

year	"hard handed index"	change
	Domestic producers	
1975	0.398	
1976	0.421	+5.78%
1977	0.447	+6.18%
1978	0.485	+8.50%
1979	0.433	-10.72%
	Wholesaler/importers	
1975	0.350	
1976	0.450	+28.57%
1977	0.433	-3.78%
1978	0.465	+7.39%
1979	0.375	-19.35%

Result 11. Viewing the percentage changes in the HHI as a measure of policy consistency, it is seen that the policy towards domestic producers is the more consistent one.

From 1975 through 1978 there was a smooth application of tightening policy towards producers while the same period had a more erratic policy directed towards the wholesaler/importers. In 1979 the policy towards both was a more lenient one.

The same high positive correlation between the percentage of variability and the "hard handed index" is found for both domestic producers and wholesaler/importers. The correlation coefficient is higher, however with wholesaler/importers, +0.9172, than with domestic producers, +0.7820, see Figure IX.

Thus,

Result 12. As the severity of the Minister of Economic Affairs increases, the dispersion of the recommendations (relative to the median) increases both for both domestic producers and wholesaler/importers.

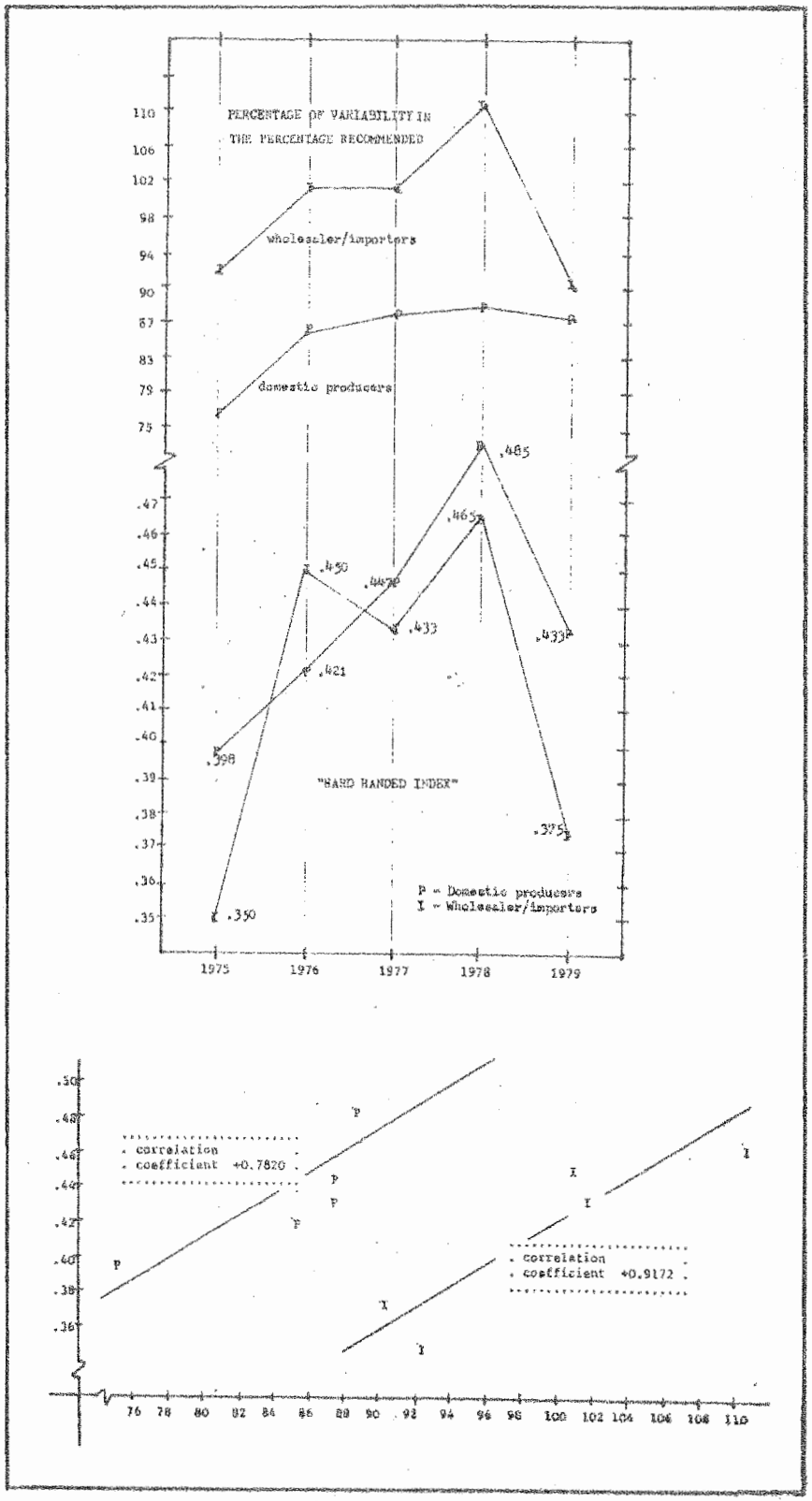


FIGURE IX. The Positive Relationship between the Percentage of Variability in the Percentage Recommended for Wholesaler/Importers and for Domestic Producers and the Hard Handed Index.

5. SECTORIAL DIFFERENCE RESULTS

Finally, the data set was subdivided into twelve major groups according to product type. Table XII lists the twelve groups along with their corresponding NACE activity codes. The products in the sample fall into three NACE producer divisions, which when broken down into twelve NACE classes yield the major product subdivisions.

Table XII. Sectorial Break Down of Data Set into Twelve Product Groups.

Product division	Product classes			
NACE Producer	NACE Producer	NACE Wholesale	No.	Product subdivision
2				Non-Energy producing minerals and derived products; Chemical industry
	24	613/615	1	Non-metallic mineral products
	25	612/618	2	Chemical products
3				Metal articles; Mechanical, Electrical and Instrument Engineering
	31	615/613	3	Metal articles
	32	614	4	Mechanical Engineering
	34	614/615	5	Electrical Engineering
	35/36	614	6	Motor vehicles/cycles
	37/49	614/619	7	Instrument Eng./other specialized prod.
4				Other non-metal manufactured products
	41/42	617	8	Food and Drink
	43	616	9	Textile products
	46	615	10	Wooden Furniture
	47	619	11	Paper products
	48	612/614	12	Rubber products

5.1. Analysis of the Percentages Requested

5.1.1. Measures of Location and Dispersion

The empirical distributions of the percentage requests made for price increases during the complete sample period (1975-1979) for each of the twelve product groups can be stochastically ranked according to the following criterion. Place at the top of the list that product group most likely to request a larger amount than all others. After removing it from consideration, select the second member of the ranking using the same criterion. In this manner a stochastic ranking of the product groups was made using the cumulative frequency distributions of the percentage requested, see Table XIII. It is essentially a ranking made on the locations of the cumulative frequency distributions, drawn to the same scale, by their distance from the ordinate of the graph. Notice that the ranking of product groups does not correspond exactly to the rankings by magnitude of any of the location measures shown. It is, however, a balance between these measures.

It is interesting to note that all product division three groups, manufactured metal products, fall into the bottom half of the rank listing with the non-metal products appearing above.

Table XIII. Stochastic Ranking of the Percentage Requested by product group.

rank	division	classes	$\int_0^1 S_n^{-1}(x)$	lower quartile	median	upper quartile	range	percentage of variability	Domestic Producers: median	Domestic Producers: range	Domestic Producers: percentage of variability	Wholesaler/importers: median	Wholesaler/importers: range	Wholesaler/importers: percentage of variability
1	4	Food and Drink	15.90	9.24%	14.62%	22.54%	13.30%	90.97%	15.59%	14.97%	96.02%	14.28%	12.34%	86.41%
2	2	Chemical products	14.73	9.33%	14.03%	19.29%	9.96%	70.99%	14.36%	12.49%	86.98%	13.42%	7.58%	56.48%
3	4	Paper products	14.02	9.09%	12.07%	17.89%	8.80%	72.91%	12.50%	7.33%	58.69%	12.00%	10.02%	83.50%
4	2	Non-metallic mineral	13.08	8.83%	11.89%	17.05%	8.22%	69.13%	13.00%	8.42%	64.77%	10.30%	7.76%	75.34%
5	4	Rubber products	12.59	8.50%	12.60%	14.91%	6.41%	50.87%	13.75%	8.75%	63.64%	12.13%	5.62%	46.33%
6	4	Wooden furniture	12.46	8.45%	11.29%	14.86%	6.41%	56.77%	11.47%	6.18%	53.88%	9.75%	7.00%	71.79%
7	3	Electrical Engineering	12.27	7.15%	10.31%	18.13%	10.98%	106.50%	9.36%	10.00%	103.84%	10.71%	11.26%	105.14%
8	4	Textile products	12.13	7.52%	10.62%	14.99%	7.47%	70.34%	11.53%	7.34%	63.66%	9.71%	7.57%	77.96%
9	3	Metal articles	12.31	7.29%	10.07%	15.28%	7.99%	79.34%	10.81%	9.91%	91.67%	9.88%	7.18%	72.67%
10	3	Mechanical Engineering	11.69	7.07%	9.65%	14.85%	7.78%	80.62%	11.90%	8.27%	69.50%	9.40%	7.85%	83.51%
11	3	Instrument Engineering	11.27	6.83%	9.54%	14.63%	7.80%	81.76%	11.20%	9.32%	83.21%	9.04%	7.50%	82.96%
12	3	Motor vehicles/cycles	7.64	4.89%	7.15%	9.51%	4.62%	64.62%	6.73%	3.95%	58.69%	7.35%	5.06%	68.84%

Result 13 . *It is likely that a request made for a non-metallic product will be larger than one made for a metal product.*

Looking at the percentage of variability it can be seen that there exists great differences between product groups. They range from a value of 50.87 % for rubber products to 106.50 % for electrical engineering products, indicating there are great differences in the dispersion of the requests originating from various sectors.

Comparing the percentage of variability between domestic producers and wholesaler/importers there appears to be no relationship in the degree of agreement between these groups of requestors. In some product groups it appears that the requests of producers have a proportionally smaller spread while in other product groups the requests of wholesaler/importers have the proportionally smaller spread. It can be seen that the spread of the requests made by domestic producers of wooden furniture and wholesaler/importers of rubber products are proportionally smaller than all other groups. Also of interest is the fact that the spread of requests from both domestic producers and wholesaler/importers of electrical engineering products are the highest of any group.

5.1.2. Stochastic Dominance

Stochastic dominance in the context of this subdivision of the data set concerns the statistical significance of the ranking proposed in Table XIII. The K-S test was performed upon all possible pairwise combinations of the groups in order to test the significance of the differences between members in that ranking. A matrix of these test results is displayed in the lower right hand corner of figure X. This matrix has the stochastic dominance ranking down the left side and is read from this side to the right into the matrix. The K-S test clearly shows that,

Result 14 . The requests made for products that fall into the food and drink sector have a higher likelihood associated with large population values than any other sector.

The cumulative frequency distribution of the complete sample of requests made by the food and drink group is plotted in figure X with the capital letter A. The product group whose cumulative frequency distribution is the furthest to the left is motor vehicles/cycles, plotted with the capital letter L. The K-S test shows that,

Result 15 . The request made for products that fall into the motor vehicle/cycle sector have a higher likelihood associated with small population values than any other sector.

All other product groups have cumulative frequency distributions that cross and cluster between these two outlying curves. The statistical significance of the differences between these can be found in the K-S matrix.

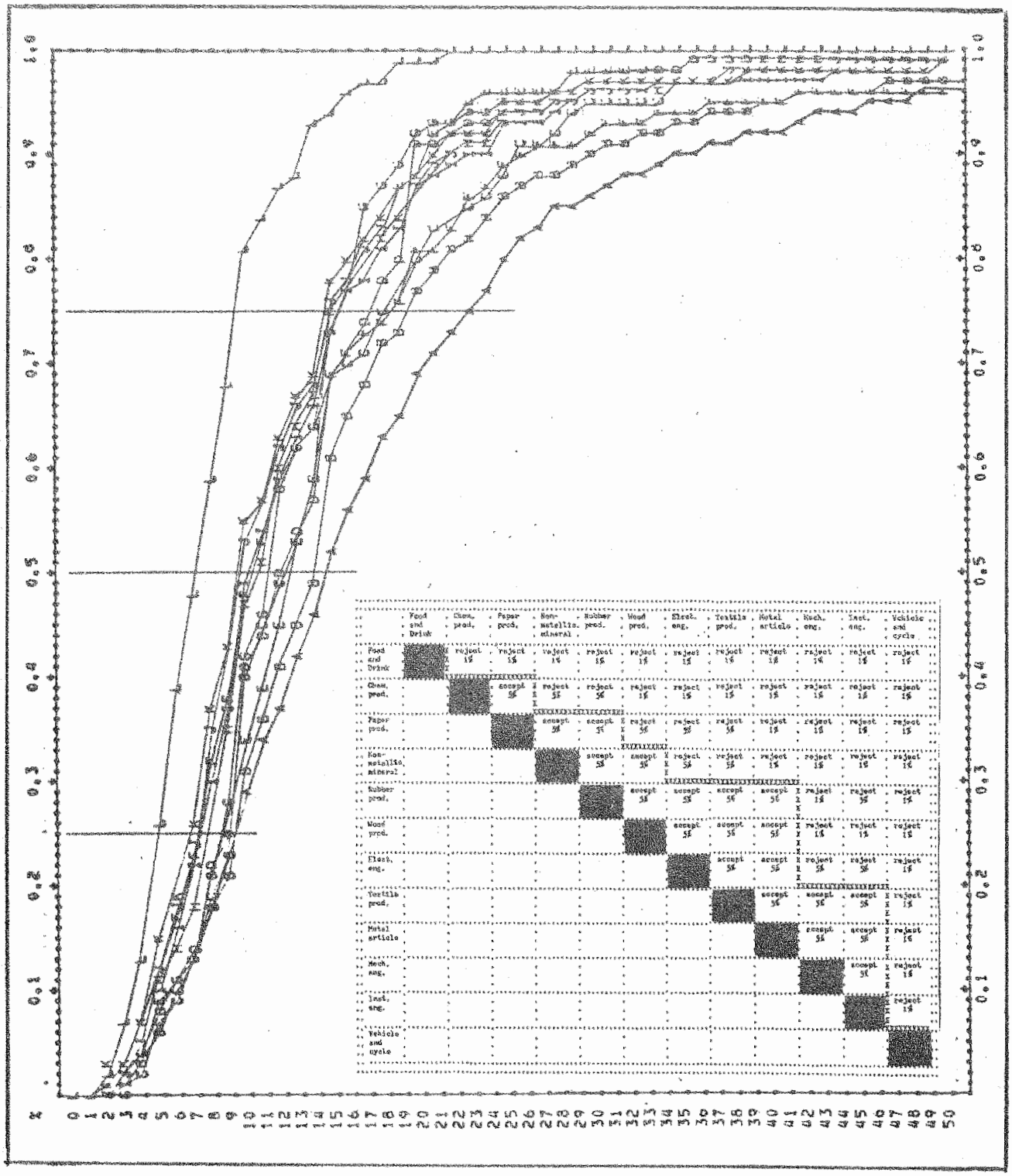


FIGURE X. The Percentage Requested by Sector.

5.2. Analysis of the Percentage Recommend

5.2.1. Measures of Location and Dispersion

The empirical distributions of the percentage recommendations made during the sample period for each of the twelve groups were also stochastically ranked according to the same criterion, see Table XIV. By comparing the ranking obtained in Table XIII with this ranking it is seen that the relative positions of many of the members of the list have shifted.

A comparison of the percentages of variability shows that the dispersion in the recommendations that were given is proportionally greater than those of the requests that were made. Concentrating on Table XIV and comparing the percentages of variability between the recommendations given domestic producers and those given wholesaler/importers,

Result 16 : The dispersion in the recommendations given the wholesaler/importers is proportionally greater than those given domestic producers in all product groups except Rubber products where it is nearly equal.

5.2.2. Stochastic Dominance

Stochastic dominance now concerns the statistical significance of the ranking of product groups according to the percentages recommended as proposed in Table XIV. A twelve by twelve matrix of the K-S test results is displayed in the lower right hard corner of Figure XI. This matrix is to be read in the same manner as before. The product group food and drink is again

Table XIV. Stochastic Ranking of the Percentage Recommended by product group.

									Domestic Producers			Wholesaler/importers		
rank	division	classes	$\int_0^1 s_n^{-1}(x)$	lower quartile	median	upper quartile	range	percentage of variability	median	range	percentage of variability	median	range	percentage of variability
1	4	Food and Drink	9.38	4.53%	7.85%	12.82%	8.29%	105.60%	8.61%	9.51%	110.45%	7.57%	7.70%	101.72%
2	2	Non-metallic mineral	7.99	4.64%	7.30%	9.80%	5.16%	70.68%	7.33%	4.81%	65.62%	7.21%	6.03%	83.63%
3	3	Metal articles	7.46	4.14%	6.68%	9.43%	5.29%	79.19%	7.16%	5.08%	70.95%	5.86%	5.57%	95.05%
4	4	Rubber products	6.88	4.81%	6.90%	9.44%	4.63%	67.10%	6.50%	4.46%	68.62%	7.50%	4.64%	61.87%
5	3	Mechanical Engineering	7.29	3.75%	6.30%	9.43%	5.68%	90.16%	7.05%	5.30%	75.18%	6.16%	5.74%	93.18%
6	3	Electrical Engineering	7.27	3.45%	5.95%	9.48%	6.03%	101.34%	6.04%	5.27%	87.25%	5.92%	6.34%	107.09%
7	4	Textile products	7.22	3.97%	6.33%	9.66%	5.69%	89.89%	7.23%	4.99%	69.02%	5.45%	9.50%	174.31%
8	2	Chemical products	7.22	3.29%	6.11%	9.70%	6.41%	104.91%	7.00%	6.81%	97.29%	5.65%	6.05%	107.08%
9	3	Instrument Engineering	6.52	2.86%	5.94%	9.37%	6.51%	109.60%	6.19%	6.31%	101.94%	5.82%	6.42%	110.31%
10	4	Wooden furniture	6.14	3.88%	5.59%	8.12%	4.24%	75.85%	5.63%	3.97%	70.52%	4.83%	5.00%	103.52%
11	4	Paper products	5.72	1.24%	4.78%	7.65%	6.41%	134.10%	5.70%	3.79%	66.49%	4.55%	7.55%	165.93%
12	3	Motor vehicles/cycles	4.09	2.45%	3.64%	4.94%	2.49%	68.41%	3.27%	2.27%	69.42%	3.86%	2.84%	73.58%

plotted with the letter A. The K-S test clearly shows that,

Result 17 : *The recommendations given to requests for products that fall into the food and drink sector have a higher likelihood associated with large population values than any other group.*

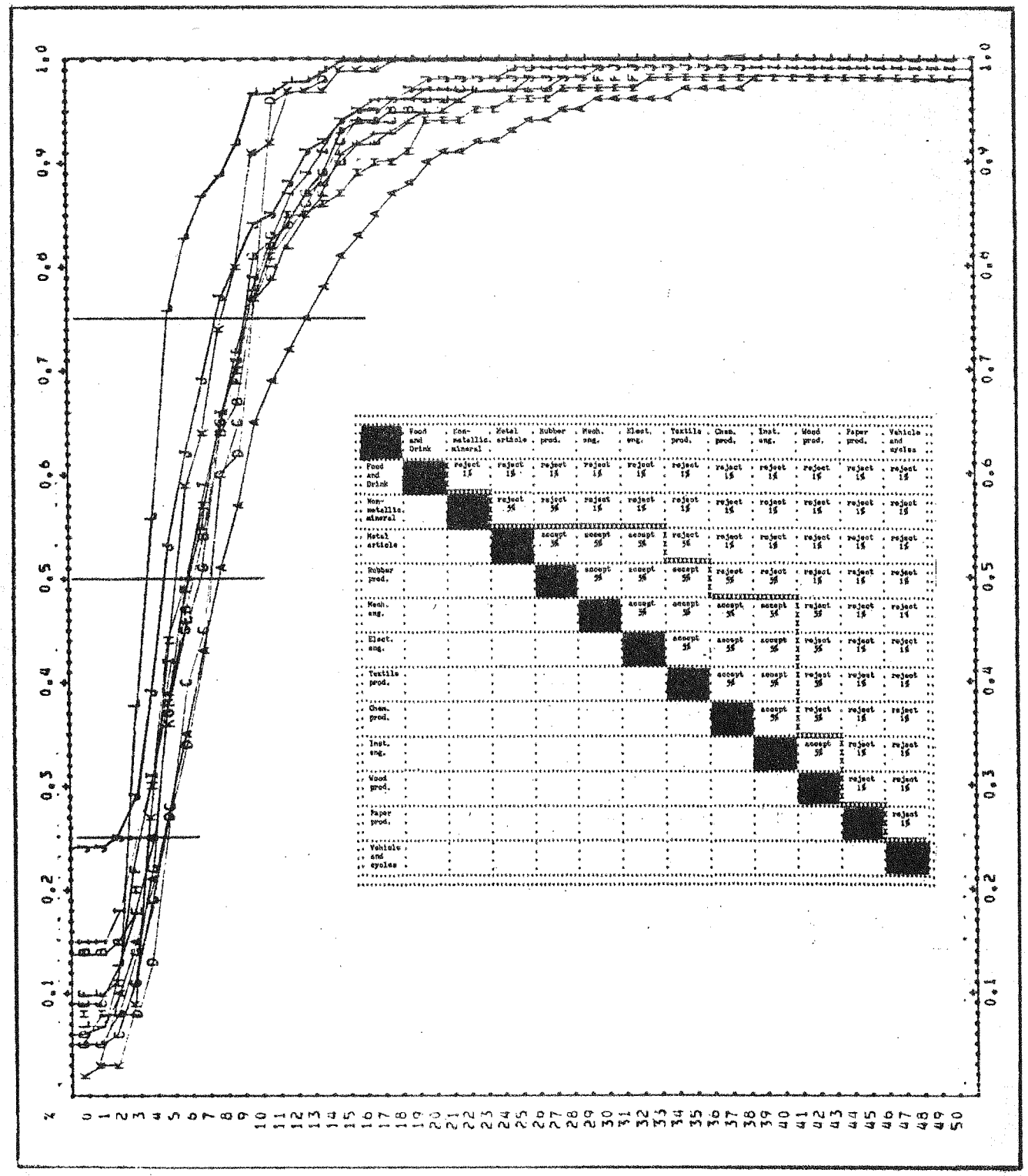
The cumulative frequency distribution of the recommendations given products from the group motor vehicles/cycles is again farthest left (plotted with the letter L). The K-S test reveals that,

Result 18 : *The recommendations given to requests for products that fall into the motor vehicle/cycle product group have a higher likelihood associated with small population values than any other sector.*

These results are not just the natural consequence of the fact that food and drink was the leading group in the ranking of requestors and motor vehicle/cycle the trailing. Therefore it is necessary to consider the "hard handed indexes" for these groups to understand the reason why these groups maintained their same relative position in both rankings when every other product group changed theirs.

The cumulative frequency distributions of the recommendations given to the other product groups are clustered between these two outlying curves in a manner similar to that of Figure X. There is a difference, however, worth noting.

Compare the K-S test matrix for the percentages recommended shown in Figure XI with that for the percentage requested in Figure X and it is seen



FIGUPE XI. The Percentage Recommended by sector.

that at a five percent level of significance the acceptance region for the recommendations is somewhat smaller. The percentage recommended K-S test matrix has seventeen acceptance boxes (pairwise combinations of product groups where the null hypothesis could be accepted that the recommendations were realizations of random variables with equal population distributions) while the percentage requested K-S test matrix has twenty such acceptance boxes. This indicates a perhaps surprising finding that,

Result 19 : *There exists more agreement between product groups concerning the magnitudes of their requests than their exists similarity between the corresponding magnitudes of the recommendations issued by the Minister of Economic Affairs.*

5.2.3. "The Hard Handed Index"

The "hard handed index" was computed for each of the twelve product groups for the complete sample period (1975-1979). These indexes are listed in Table XV according to the ranking obtained from the percentages requested in Table XIII.

The HHI when computed for the complete Data Set has a value of 0.435. This number was placed in the middle of Table XV in order to highlight the fact that most of the values of the HHI larger than 0.435 are found in the upper half of the list and those less than 0.435 are in the lower half. This is evidence that the magnitudes of the requests are not the deciding factor in the recommendations given. The generally declining magnitudes of these

Table XV. The "Hard Handed Index" by Sector, Ranked According to the Percentage Requested.

rank from Table XIII	product group	"hard handed index"
1	Food and Drink	0.410
2	Chemical products	0.510
3	Paper products	0.592
4	Non-metallic mineral	0.389
5	Rubber products	0.454
6	Wooden Furniture	0.507
	"Hard Handed Index" for the complete sample taken together	0.435
7	Electrical Engineering	0.407
8	Textile products	0.405
9	Metal articles	0.394
10	Mechanical Engineering	0.377
11	Instrument Engineering	0.421
12	Motor vehicles/cycles	0.464

HHI values is consistent with a policy of the Minister of Economic Affairs of issuing to all groups of requestors distributions of recommendations that are close to each other in location. A policy guided by "rule of thumb" percentages would be such a policy. There are, however, some exceptions that eliminate the possibility that there is but one "rule of thumb" applied to all sectors.

The product group food and drink received a value of the HHI of 0.410, less than the complete sample value indicating it received a more lienent treatment than did its neighbor product groups in the listing. This accounts for the fact that it comfortably maintained its position as leader in the Table XIV listing. The same is true of the product group motor vehicles/ cycles who received a value of the HHI higher than the complete sample value. A relatively more severe treatment than would appear warranted by a straight application of a "rule of thumb" policy by its position in the ranking.

One other product group is worth noting. The sector non-metallic mineral products is located in the number four position of the ranking by percentage requested,although it received the second to the lowest value of the HHI, 0.389. The recommendations given this product group were certaintly guided by considerations other than the magnitude of the requests alone.

Table XVI is again the "hard handed index" for each of the product groups, however, this time ranked according to their magnitudes. It is clear from this listing that the relative shifting of positions from the Table XIII to the Table XIV ranking is caused by the differential hard hardedness of the

Minister of Economic Affairs. If the restrictive nature of the recommendations issued by the Minister were evenly applied across product groups the column entitled change would contain only a column of zero values. The Minister does not apply a "rule of thumb" uniformly across all product groups.

Hard hardedness is related to the magnitudes of original requests. There exists, however, additional differentially applied restraint upon certain product groups for reasons that are unclear.

Table XVI shows that,

Result 20 : *The requests for price increases for products belonging to the groups Paper products, Chemical products and wooden furniture received relatively the severest treatment by the Minister of Economic Affairs as measured by the "hard handed index".*

At the other end of the scale it is true that,

Result 21 : *The requests for price increases for products belonging to the groups Metal articles, Non-metallic mineral products and mechanical Engineering received relatively the most lienent treatment by the Minister of Economic Affairs.*

Finally, there is a great spread in the level of the hard hardedness across groups. For example, from the top of the listing to the bottom there exists a 0.215 point difference. The level of the index for paper products is 57.03 % greater than that for mechanical engineering. Certainly the spread in the locations of the distributions of the percentages requested are a contributing factor.

Table XVI. The "Hard Handed Index" by Sector Ranked According to Magnitude.

rank	HHI	product group	rank from Table XIII (1)	rank from Table XIV (2)	change (1)-(2)
1	0.592	Paper products	3	11	-8
2	0.510	Chemical products	2	8	-6
3	0.507	Wooden Furniture	6	10	-4
4	0.464	Motor vehicle/cycles	12	12	0
5	0.454	Rubber products	5	4	+1
6	0.421	Instrument Engineering	11	9	+2
7	0.410	Food and Drink	1	1	0
8	0.407	Electrical Engineering	7	6	+1
9	0.405	Textile products	8	7	+1
10	0.394	Metal articles	9	3	+6
11	0.389	Non-Metallic mineral	4	2	+2
12	0.377	Mechanical Engineering	10	5	+5

The question of greatest economic interest, however, is not why there was a spread in the level of severity associated with the recommendations issued to various product groups, but rather why was it applied differentially across groups. Unfortunately, this as well as other such interesting matters must wait for a later date to be considered.

6. CONCLUSIONS

This paper is a first report of a statistical analysis of more than 5000 observations on Belgian price increase requests and recommendations for the period 1975-1979. The preferences of regulated firms and the regulator were viewed as being revealed by the frequency distributions of percentage price increases requested and recommended. The analysis attempted to determine significant differences in preferences by analyzing and determining differences in these corresponding frequency distributions.

The most important findings include :

During the period 1975 to 1979 a request made by a domestic producer was likely to be larger than one made by a wholesaler/importer.

It is more likely that the recommendation made to a producer is greater than that for a wholesaler/importer.

The requests made for products that fall into the food and drink sector have a higher likelihood associated with large population values than any other sector.

The recommendations given to requests for products that fall into the food and drink sector have a higher likelihood associated with large population values than any other group.

The request made for products that fall into the motor vehicle/cycle sector have a higher likelihood associated with small population values than any other sector.

The recommendations given to requests for products that fall into the motor vehicle/cycle product group have a higher likelihood associated with small population values than any other sector.

× × ×

There existed proportionally more agreement among requestors (as in 1975 to 1979) regarding the magnitudes of their requests in periods of increases in the wholesale proce index then in other years.

The degree of agreement among requestors is being caused principally by the actions of domestic producers, with only a slight reinforcement made by wholesaler/importers.

When agreement among producers appears to be proportionally high the reverse is true amoung the wholesaler/importers and vica versa, in all years except 1977.

× × ×

The dispersion in the recommendations given the wholesaler/importers is proportionally greater than those given domestic producers in all product groups except Rubber products where it is nearly equal.

There exists more agreement between product groups concerning the magnitudes of their requests than their exists similarity between the corresponding magnitudes of the recommendations issued by the Minister of Economic Affairs.

× × ×

As the severity of the Minister of Economic Affairs increases, the dispersion of the recommendations (relative to the median) increases both for both domestic producers and wholesaler/importers.

As the magnitudes of the request decreased the Minister's policy became more severe.

. . .

Wholesaler/importer requestors always received the largest share of zero percent approvals.

The Minister treated producers more severe than wholesaler/importers in all years except 1976.

Viewing the percentage changes in the HHI as a measure of policy consistency, it is seen that the policy towards domestic producers is the more consistent one.

. . .

The requests for price increases for products belonging to the groups Paper products, Chemical products and wooden furniture received relatively the severest treatment by the Minister of Economic Affairs.

The requests for price increases for products belonging to the groups Metal articles, Non-metallic mineral products and mechanical Engineering received relatively the most lienent treatment by the Minister of Economic Affairs.

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