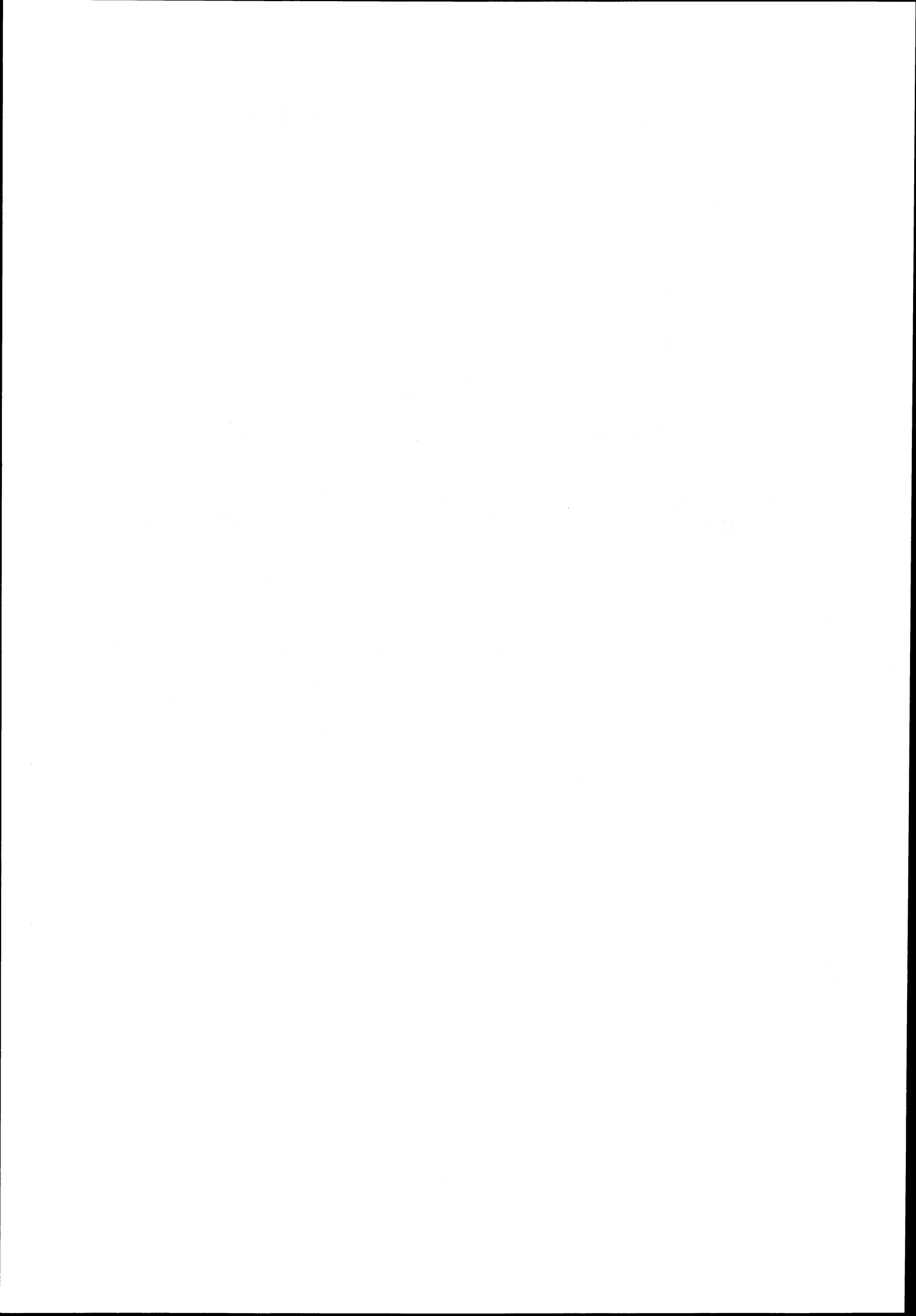# TARIFFS IN A WORLD TRADE MODEL
AN ANALYSIS OF CHANGING COMPETITIVENESS
DUE TO TARIFF REDUCTIONS IN THE 1960'S AND 1970'S

BY
P. FRENGER, E. S. JANSEN AND M. REYMERT

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PREFACE

In 1979 the Research Group of the Central Bureau of Statistics estimated a model for world trade in manufactured goods, with particular emphasis given to the Norwegian export of such goods. The data used covered the years 1960 - 1977. In this period substantial tariff adjustments took place in all major industrial countries, and considerable efforts were therefore made to give a satisfactory treatment to tariffs in the theoretical as well as the empirical part of the work. A documentation has been presented in RAPPORTER from the Central Bureau of Statistics 79/29 "Modell for norsk eksport av bearbeidde industrivarer".

In response to an inquiry from the Secretariat of EFTA, the present report is a translation of those parts of the original report, which dealt with the analysis of tariffs. Several changes were made in order to allow this report to be read independently of the Norwegian documentation. Moreover, new calculations on tariff indices were made to illustrate the significance of the Kennedy Round and of the creation of EFTA and EEC.

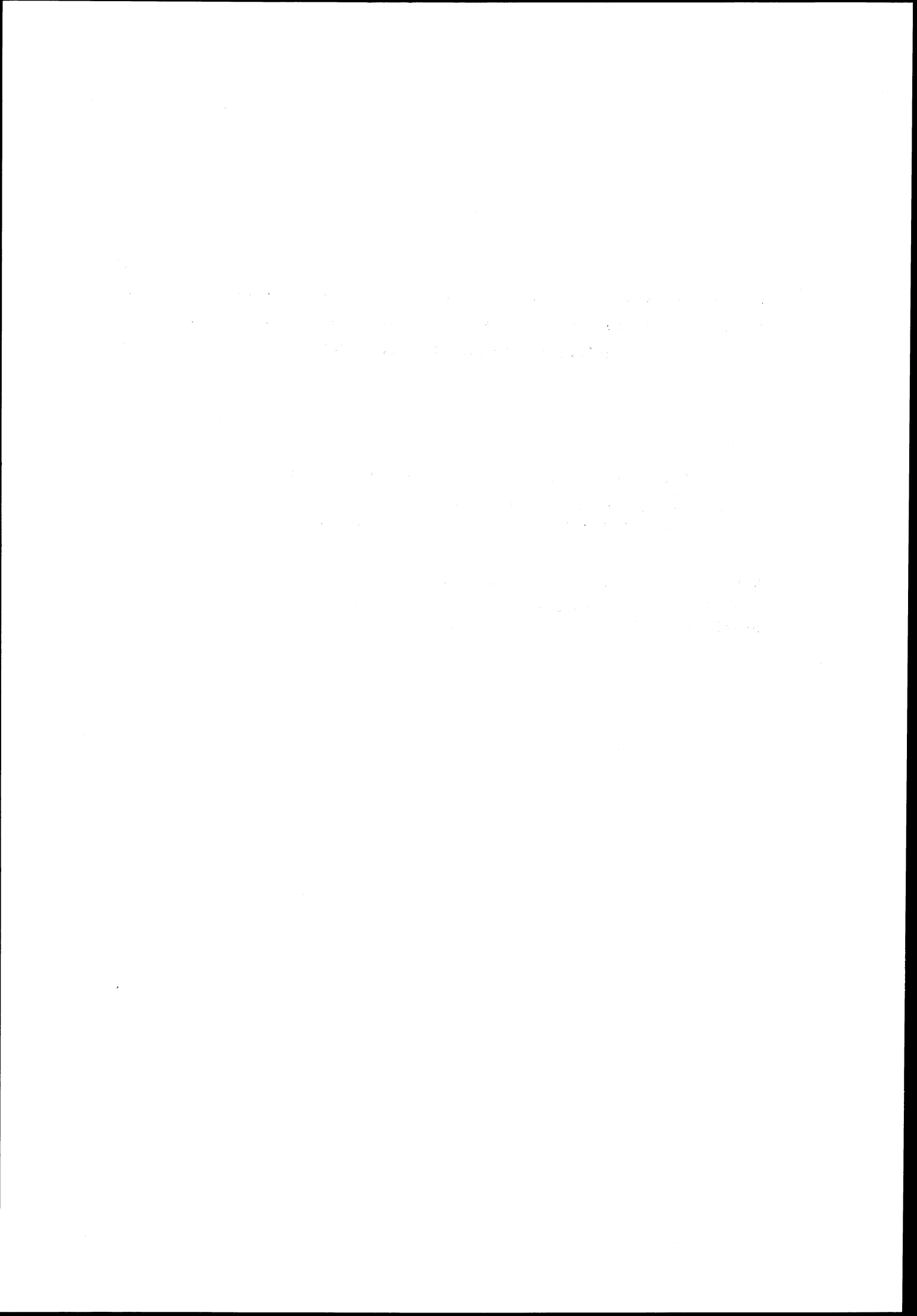Central Bureau of Statistics, Oslo, 30 June 1980

Petter Jakob Bjerve

CONTENTS

INTRODUCTION

During the last twenty years considerable changes have taken
place in tariff rates in most industrial countries. Tariff rates on
manufactured goods within both EFTA and the EEC were eliminated in the
course of the 1960's and the EEC countries established a common external
tariff. The Kennedy Round resulted in significant reductions in the tariff
rates applied by the United States, Canada and Japan. In the beginning of
the 1970's the EEC was enlarged to include three former EFTA members, and
the other EFTA countries - including Norway - concluded agreements con-
cerning reciprocal tariff reductions with the enlarged EEC.

The tariff adjustments led to considerable changes in the compe-
titive position of industries in the various countries. The competitive
position of import-competing industries in the industrial countries de-
teriorated because tariff rates were generally reduced. But the tariff
adjustments also resulted in changes in the competitive position of export-
competing industries because changes in tariff rates differed among coun-
tries.

In this paper we will attempt to quantify those changes in the
competitive position of different countries' manufacturing industries which
can be traced to tariff rate adjustments. We derive an index for the ave-
rage tariff rate on imports on a given market and an index of the relative
tariff between the tariff rates that a given country encounters and the
rates its competitors encounter on their mutual export markets. Both these
indices are based on the theoretical model which is developed in the early
part of this note. For these magnitudes - and for each of 15 countries -
annual values have been computed for the period 1960 - 1977 for manufac-
tured goods.[1] At the end of the section we use specially computed values
of some of these indices in a discussion of the consequences of establishing
EEC and related tariff developments.

Information of tariff rates according to an extremely detailed commo-
dity classification is available for most countries. Based on such infor-
mation it is possible to compute the indices which are derived in this paper.
This would, however, be an extremely time-consuming task. Instead, we have
started with a set of "most favoured nation" tariff incidences computed by
GATT for relatively aggregated commodity groups. With the aid of information

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1) Manufactured goods are defined as commodities contained in SITC (Rev 1)
5-8, ex 68 and 735. See United Nations (1961).

concerning the tariff adjustments that have taken place under the auspices of the EEC, EFTA and GATT and certain other information, we have computed time series for the magnitudes mentionded above.

2. A general equilibrium model for world trade

The theoretical framework for our analysis is a general equilibrium model for world trade, in which the export and import of the aggregate commodity is determined simultaneously.[1]

There are L countries in the model, each of which produces the aggregate commodity "manufactured products" and sells it on the world market in competition with each other. Each country k produces the exported commodity x_k^E using variable inputs and a given capital stock K_k. The industry may be characterized by free competition, and we assume that marginal cost pricing or some other price setting rule gives us the following, usually increasing, supply function:

$$x_k^E = x_k^E(\hat{v}_k, \hat{p}_k^E; K_k), \qquad k=1,\ldots,L$$

where $\hat{v}_k$ represent variable unit cost and $\hat{p}_k^E$ is the export price index, both measured in country k's own currency. Let us introduce a numeraire currency, and let θ_k be the exchange rate, i.e the price of the numeraire currency measured in country k's currency. Variable unit cost and the export price index of country k measured in the numeraire currency are given by:

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1) The model is akin to the world trade models developed by the OECD (Samuelsen, 1973) and the IMF (Deppler and Ripley, 1978).

$$v_k = \hat{v}_k/\theta_k \quad \text{and} \quad p_k = \hat{p}_k/\theta_k.$$

Substituting these expressions into the supply function gives:

$$x_k^E = x_k^E(\theta_k v_k, \theta_k p_k^E; K_k), \qquad k=1,\ldots,L. \qquad (2.1)$$

If the supply function were homogeneous of degree zero in $\hat{v}_k$ and $\hat{p}_k$, then the exchange rate would vanish as an argument in (2.1).

We will follow Armington's (1969) two level approach in determining the demand for imports, and assume that each country's export of manufactured goods represents a product which is different from the other countries export of manufactured goods. These "products" then compete on each import market ℓ on the basis of their relative prices. Let $p_{k\ell}^B$ and $x_{k\ell}$ be the price and the quantity of manufactured goods delivered from country k to country ℓ, and let B_ℓ be country ℓ's total import. The demand for product k on market ℓ can be written:

$$x_{k\ell} = m_{k\ell}^B(p_{1\ell}^B,\ldots,p_{k\ell}^B,\ldots p_{L\ell}^B) \cdot B_\ell, \qquad k,\ell=1,\ldots,L; k\neq\ell \quad (2.2)$$

where $m_{k\ell}^B$ represent the import share functions, i.e the demand for import of product k to market ℓ per unit of total import.[2] The prices $p_{k\ell}^B$

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2) The set of import share functions $m_{k\ell}^B$, $k=1,\ldots,L$; $k\neq\ell$ is assumed to have been derived from a cost function or a utility function on the basis of cost minimization or utility maximization. This optimization is carried out on the basis of prices measured in country ℓ's own currency. But the exchange rate vanish as an argument in (2.2) since these functions are homogeneous of degree zero in prices. We have therefore choosen to express (2.2) directly in terms of the numeraire currency.

are measured in a numeraire currency. We have assumed <u>a priori</u> that
the import elasticity of $x_{k\ell}$ with respect to B_ℓ is unity. Country ℓ's
own production of manufactured goods is excluded from the system (2.2).

At the "upper" level total import B_ℓ in country ℓ is determined
as a function of the price p_ℓ^A of manufactured goods produced in country
ℓ, the price index of imports p_ℓ^B [see (2.5) below], and country ℓ's gross
national product R_ℓ[3]:

$$B_\ell = B_\ell(R_\ell, \frac{p_\ell^A}{p_\ell^B}), \qquad\qquad \ell=1,\ldots,L \qquad (2.3)$$

The set of equations (2.1)-(2.3) describe the $L(L+1)$ behavioral equa-
tions of the model.[4] The model is completed by three sets of definitions.
The import prices are defined by:

$$p_{k\ell}^B = t_{k\ell} h_{k\ell} p_k^E, \qquad\qquad k,\ell=1,\ldots,L; \ \ell \neq k \qquad (2.4)$$

where $t_{k\ell}$ is one plus the percentage tariff imposed on import from country
k to country ℓ (se section 3), and $h_{k\ell}$ represents the difference between

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3) This two level approach, with the demand for domestically produced goods
   determined at the upper level as a function of the price ratio p_ℓ^A/p_ℓ^B and
   GNP, is rendered necessary by the lack of data on manufactured goods de-
   livered to the domestic market. It would be theoretically more satis-
   factory to include the relationship between import and domestically pro-
   duced manufactured goods at the lower level, i.e in (2.1), and to repre-
   sent the relationship between manufactured goods and other goods at
   the upper level.
4) There are L equations in (2.1) and in (2.3), and $L(L-1)$ equations in (2.2).

c.i.f. and f.o.b. prices. The import price is thus measured inclusive of tariffs, while the export price is f.o.b. We assume that there has been no systematic shift in the relationship between c.i.f. and f.o.b. prices, and we thus ignore possible changes in $h_{k\ell}$ [see Samuelsen (1973), p. 15, for a test of this hypothesis].

The import price index p_ℓ^B in country ℓ is defined as the minimum cost per unit of B_ℓ:

$$p_\ell^B = p_\ell^B(p_{1\ell}^B,\ldots,p_{k\ell}^B,\ldots,p_{L\ell}^B), \qquad \ell=1,\ldots,L \qquad (2.5)$$

and depends on the degree of substitutability which exists between the import from different countries.[5] The identities which specify that the supply of exports from each country must equal the demand for that country's exports, the latter being the sum of the demand on each market, gives:

$$x_k^E = \sum_{\ell\neq k} x_{k\ell}. \qquad\qquad k=1,\ldots,L \qquad (2.6)$$

Summarizing the model, we see that equations (2.1) to (2.6) gives us a system of $2L(L+1)$ equations in $2L(L+1)$ endogenous variables:

			Number of variables
p_k^E	–	price of exports (in numeraire currency)	L
$p_{k\ell}^B$	–	import prices (in numeraire currency)	$L(L-1)$
p_ℓ^B	–	import price index (in numeraire currency)	L
x_k^E	–	export volume, total	L
$x_{k\ell}$	–	export volume from country k to country ℓ	$L(L-1)$
B_ℓ	–	import, total	L

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5) The system of import share functions $m_{k\ell}^B$, $k=1,\ldots,L$, $k\neq\ell$, are the partial derivatives of the import price index with respect to the prices of imports, i.e $m_{k\ell}^B = \partial p_\ell^B / \partial p_{k\ell}^B$.

The exogeneous variables are:

Number of variables

v_k — variable unit cost L

p_ℓ^A — price of deliveres to domestic market (in numeraire currency) L

K_k — capital stock (or production capacity) L

R_ℓ — gross national product (or aggregate demand) L

$t_{k\ell}$ — tariffs .... L(L-1)

θ_k — exchange rate; price of numeraire currency measured in country k's currency L

In this model the tariff rates are among the exogeneous variables which determine the magnitude of export volumes and export prices and other endogenous variables. In order to be able to analyze further how changes in tariffs affect the endogenous variables of the model (and to get a model which can be estimated), we will choose explicit functional forms for the equations (2.1)-(2.3).[6] We will further make some simplifications, - some of which may seem rather drastic - which will result in a model which contains a set of rather familiar price equations[7] and a set of indices which measure the influence of tariff changes.

The choice of an explicit functional form will be determined by taking the logarithmic Taylor expansion of the equations, evaluated at the base year of the model. Let

$$y = f(x_1, \ldots, x_n)$$

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6) To get a model that could be estimated was of course the main purpose of choosing explicit functional forms in Frenger, Jansen and Reymert (1979).

7) They have for example the same form as the "export price block" in Samuelson (1973).

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be an arbitrary function. Take the logarithm of both sides, and compute

the first two terms of the Taylor expansion with respect to $\ln x_i$, $i=1,\ldots,n$

about $\bar{x} = (\bar{x}_1,\ldots\bar{x}_n)$. This gives:

$$\ln \frac{y}{\bar{y}} = \sum_{i=1}^{n} \left.\frac{\partial \ln y}{\partial \ln x_i}\right|_{\bar{x}} \ln \frac{x_i}{\bar{x}_i} . \qquad (2.7)$$

The coefficients in (2.7) can be interpreted as elasticities.[8]

We eliminate the endogenous variables $x_{k\ell}, p_{k\ell}^B$, and p_ℓ^B, $k,\ell=1,\ldots,L$

by setting (2.2), (2.4) and (2.5) into (2.1), (2.3) and (2.6). We then

differentiate the latter system of equations with respect to the remaining

$3L$ endogenous variables (p_k^E, x_k^E, and B_ℓ) and the exogenous variables. The

supply equations (2.1) become :

$$\ln x_k^E = \eta_k^E \ln p_k^E + \eta_k^V \ln v_k + (\eta_k^E + \eta_k^V) \ln \theta_k +$$

$$+ \eta_k^K \ln K_k + \text{const..} \qquad k=1,\ldots,L \qquad (2.8)$$

The coefficients η_k^E, η_k^V and η_k^K represent the supply elasticities with

respect to the export price, variable unit cost , and capital stock res-

pectively.[9]

The demand equations (2.6) for country k's exports present some-

what greater problems. By assuming that the elasticity of substitution

between any two countries' exports to market ℓ is the same and denoting

this parameter by σ_ℓ, it can be shown[10] that the logarithmic approxi-

mation to the demand equations are:

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8) We have in general not normalized the variables in relation to their base
    year values, which therefore become part of the constant term.
9) Note that $\eta_k^E = - \eta_k^V$ if the supply equation is homogeneous of degree zero
    in the export price and variable unit costs.
10) See appendix C in Frenger, Jansen and Reymert (1979).

$$\ln x_k^E = \sum_j [\sum_{\ell \neq k} w_{k\ell} \sigma_\ell (s_{j\ell} - \delta_{kj})] \ln p_j^E +$$

$$+ \sum_j \sum_{\ell \neq k} w_{k\ell} \sigma_\ell (s_{j\ell} - \delta_{kj}) \ln t_{j\ell} + \sum_{\ell \neq k} w_{k\ell} \ln B_\ell + \text{const.}$$

$$(2.9)$$

where

$$w_{k\ell} = \frac{\bar{x}_{k\ell}}{\bar{x}_k^E}, \qquad s_{j\ell} = \frac{\bar{p}_{j\ell}^B \bar{x}_{j\ell}}{\sum_{j \neq \ell} \bar{p}_{j\ell}^B \bar{x}_{j\ell}}.$$

are the base year export and import shares, and δ_{kj} is the Kronecker delta (equal 1 if $j=k$ and equal zero otherwise). Both the competitors' price index and the tariff index, which will be derived below, will take the approximation (2.9) as their point of departure.

The second level demand functions are represented by (2.3). Their logaritmic Taylor expansions are:

$$\ln B_\ell = \eta_\ell^R \ln R_\ell + \eta_\ell^B \ln(p_\ell^A / p_\ell^B) + \text{const.}, \qquad (2.10)$$

where η_ℓ^R is the volume (or income) elasticity of imports, and η_ℓ^B is the elasticity with respect to the price ratio p_ℓ^A / p_ℓ^B. The import price index p_ℓ^B is given by the approximation:

$$\ln p_\ell^B = \sum_{j \neq \ell} s_{j\ell} \ln p_j^E + \sum_{j \neq \ell} s_{j\ell} \ln t_{j\ell} + \text{const.} \qquad (2.11)$$

Let us designate the second sum in (2.11) by $\ln \tau_\ell$. The tariff parameter τ_ℓ is thus a geometric average of the tariffs faced by the exporters to market ℓ, and may be interpreted as the average tariff on market ℓ[11].

Combining (2.10) and (2.11) gives the second level demand function:

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11) These indices will be analyzed in much greater detail in section 3.

$$\ln B_\ell = \eta_\ell^R \ln R_\ell + \eta_\ell^B [\ln p_\ell^A - \sum_{j \neq \ell} s_{j\ell} (\ln p_j^E + \ln t_{j\ell})] + \text{const.} \quad (2.12)$$

The equations (2.8), (2.9) and (2.12) form a complete simultaneous model which is linear in the unknown elasticities η_k^E, η_k^v, η_k^K, η_ℓ^R and η_ℓ^B, $k, \ell = 1, \ldots, L$. The model is also linear in the unknown parameters σ_ℓ, $\ell = 1, \ldots, L$, but they enter the equations in a more complicated pattern imposing restrictions both within and across the individual equations.

Another, and perhaps the greatest, simplification we will perform is to assume that the elasticity of substitution for manufactured products σ_ℓ is the same on all markets, i.e. $\sigma_\ell = \sigma$, $\ell = 1, \ldots, L$. Let us define the following coefficients and variables:

$$d_{kj} = \sum_{\ell \neq k} w_{k\ell} (s_{j\ell} - \delta_{kj}) \quad (2.13)$$

$$\ln \lambda_k = - \frac{1}{d_{kk}} \sum_j \sum_{\ell \neq k} w_{k\ell} (s_{j\ell} - \delta_{kj}) \ln t_{j\ell} \quad (2.14)$$

For $k \neq j$, d_{kj} is an average of the import shares of country k's exports, weighted by market ℓ's share of country k's export.[12] Note also that $\sum_j d_{kj} = 0$, and that the diagonal elements d_{kk} are negative. The index λ_k is a double-weighted geometric average of the tariffs faced by country k and its competitors. They form a set of L exogenous variables, which in the model replaces the detailed tariffs $t_{k\ell}$. Rewriting the demand equation (2.9) using (3.1) and (3.2) gives:

$$\ln x_k^E = \sigma d_{kk} \left[\frac{1}{d_{kk}} \sum_j d_{kj} \ln p_j^E - \ln \lambda_k \right] +$$

$$+ \sum_\ell w_{k\ell} \ln B_\ell + \text{const.} \quad (2.15)$$

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12) The computed values of the weights d_{kj} are to be found in Appendix B.

In order to get the model which was estimated in Frenger, Jansen and Reymert (1979) some further simplifications are necessary. But these simplifications do not affect the treatment of tariffs. We will, however, present them in this note so that the reader can see how the tariff rate indices were incorporated in the estimated world price model, and the model for Norwegian exports.

Let us substitute (2.15) for x_k^E in the supply equations (2.8) and solve for the k'th export price. This gives a set of L equations which we will call the price model:

$$(\eta_k^E - \sigma\, d_{kk})\, \ln p_k^E = -\sigma\, d_{kk}\left[-\frac{1}{d_{kk}} \sum_{j\neq k} d_{kj}\, \ln p_j^E + \ln\lambda_k\right]$$

$$-\eta_k^v\, \ln v_k - (\eta_k^E + \eta_k^v)\, \ln\theta_k + \sum_\ell w_{k\ell}\, \ln B_\ell$$

$$-\eta_k^K\, \ln K_k + \text{const.} \qquad k=1,\ldots,L. \qquad (2.16)$$

This price model consists of a set of simultaneous equations in the endogenous variables $\ln p_k^E$, $k=1,\ldots,L$, and each equation is a reduced form of country k's supply and demand equations for export.

Equation (2.16) shows that export prices depend both on the production capacity and on the level of imports in each country. Lack of data on the capital stock for many countries forces us to assume that that K_k and B_ℓ have grown so smoothly that we can ignore their net effect, i.e that the real magnitudes have played no significant role in the price formation. This could have happened if the producers had correctly forecasted the growth of their market, and increased their production capacity accordingly. This assumption, which may be reasonable in the long run, has obvious shortcomings over the business cycle, but it does lead to a familiar set of relations which simultaneously explain the development of export prices

on the basis of variable costs alone. We will in the following also ignore the possible effects of changing exchange rates on the supply functions.

Let us define the index of competitors' prices inclusive of the tariff index:

$$\ln p_k^{CT} = -\frac{1}{d_{kk}} \sum_{j \neq k} d_{kj} \ln p_j^E + \ln \lambda_k. \tag{2.17}$$

This is a doubly weighted index of the export prices of country k's competitors, and of the tariff rates, the latter correcting for changes in competitive position which arise from unequal development in the tariffs. It should be stressed that this index of competitors' price depends crucially on the assumptions of the model, particularly the assumption of equal elasticity of substitution on all markets, and on the approximation method used.

Taking into consideration our assumptions about the capital stock, imports, and the exchange rate, allows us to write the simplified price model:

$$(\eta_k^E - \sigma d_{kk}) \ln p_k^E = -d_{kk} \sigma \ln p_k^{CT} - \eta_k^V \ln v_k + \text{const.} \quad k=1,\ldots,L. \tag{2.18}$$

This simplified price model forms a complete simultaneous equation model in the L endogenous variables $\ln p_k^E$, and explains their development on the basis of changes in variable costs and the tariff rates. The model was estimated in section 4 of Frenger, Jansen and Reymert (1979).

The primary purpose of that paper was to develop a model for Norwegian export. The price model (2.18) was used to obtain an estimate of the price index p_N^{CT} of Norway's competitors. If we set this expression into

(2.15) with $k = N$ we obtain the demand equation for Norwegian exports:

$$\ln x_N^E = -\sigma\, d_{NN} (\ln p_N^{CT} - \ln p_N^E) + \sum_{\ell} w_{N\ell} \ln B_\ell + \text{const.} \quad (2.19)$$

The supply equation (still ignoring the exchange rate) for Norwegian exports is given by (2.8) with $k=N$:

$$\ln x_N^E = \eta_k^E \ln p_k^E + \eta_k^v \ln v_k + \eta_k^K \ln K_k + \text{const.} \quad (2.20)$$

We proceeded to reestimate (2.19) and (2.20) simultaneously both because not all the structural parameters are identified by the reduced form price model (2.18) and because of the need to include the real variables K_N and B_ℓ, $\ell=1,\ldots,L$ in a model which explains the volume of Norwegian exports.

3. The use of tariffs in the world trade model

The tariff rates enter the export model in two places:

- They are used to compute the import prices (see e.g. (2.11)).

- They are included in the price index of competing exports (see (2.17)).

The import prices in the model are weighted averages of the export prices plus tariffs.[1] Equation (2-11) gives:

$$\ln p_\ell^B = \sum_{j \neq \ell} s_{j\ell} \ln p_j^E + \sum_{j \neq \ell} s_{j\ell} \ln t_{j\ell} + \text{const.} \quad (3.1)$$

---

1) The model is expressed in percentage changes from a base point value and we have assumed that the rate of transportation charges etc. remains unchanged. We may therefore ignore the difference between c.i.f. and f.o.b. prices.

We define

$$\ln\tau_\ell = \sum_{j\neq\ell} s_{j\ell} \ln t_{j\ell} \tag{3.2}$$

and

$$\tau_\ell^* = \tau_\ell - 1 \tag{3.3}$$

τ_ℓ is country ℓ's average tariff rate on imports of manufactured goods.

The price index of competing exports for a country is defined by equation (2.14) and (2.17):

$$\ln p_k^{CT} = -\frac{1}{d_{kk}} \sum_{j\neq k} d_{kj} \ln p_j^E + \ln\lambda_k \tag{3.4}$$

$$\ln\lambda_k = -\frac{1}{d_{kk}} \sum_j \sum_{\ell\neq k} w_{k\ell}(s_{j\ell}-\delta_{kj}) \ln t_{j\ell}$$

$$= -\frac{1}{d_{kk}} \sum_{\ell\neq k} \sum_{j\neq\ell} w_{k\ell} s_{j\ell} \ln\frac{t_{j\ell}}{t_{k\ell}} \tag{3.5}$$

We see that the L(L-1) tariff rates t_{ij} enters the model only as the 2L indices τ_ℓ^* (or τ_ℓ), $\ell=1,\ldots L$ and λ_k, $k=1,\ldots L$. In this section we will analyze the contents of these indices and we will present the computed values which were used in estimating the model in Frenger, Jansen and Reymert (1979). It will be shown that these indices are of interest also outside the world trade model and that the computed values of these indices give interesting information about the changes in competive positions due to tariff changes that have taken place in the 1960's and 1970's.

The index τ_ℓ^x measures country ℓ's average tariff rate on imports
of manufactured goods. Each country's tariff incidence, defined in this
way, is shown in table 3.1. for the period 1963 to 1977. If table A.5.
(in appendix A) is compared with table 3.1., we find that for Canada, the
United States and Japan the tariff incidence for 1973 is equal to the
"most favoured nation" tariff incidence prevailing on 1 January 1973.
This is so since these three countries neither reduced tariff rates during
1973 nor discriminated between different countries. On the other hand, the
computed average tariff incidence for all other countries for 1973 is lower
than the "most favoured nation" tariff incidence on 1 January 1973. This
is due to the fact that all the other countries were members of a customs
union or a free trade area in 1973 and thus had a lower tariff rate than
the "most favoured nation" rate (or possibly no tariffs at all) on imports
from the other countries within the same customs union or free trade area.

From table 3.1. it will also be seen that according to our methods
of calculation the European industrial countries had virtually no tariff
protection in the last year covered by our calculations. The United
Kingdom had the highest tariff incidence (3 per cent), while the computed
tariff incidence for all the other countries was lower than 1½ per cent.
Canada, the United States and Japan, on the other hand, had at that time a
relatively high tariff protection for manufactured goods (7.3, 8.1 and
9.7 per cent, respectively).

Given the way in which the rules for tariff reductions within the
EEC, EFTA and GATT were formulated, those countries which initially had
the greatest tariff protection would implement the largest tariff reduction
measured in percentage points. This applied to Italy and France in the
EEC and to Austria and the United Kingdom in EFTA. Austria reduced its
average tariff rate on manufactured goods by about 17 percentage points in
the period 1960 - 1977, while the reduction for the other three countries

was about 12 percentage points. The tariff reduction in the same period

for those countries outside EFTA and the EEC - Canada, the United States

and Japan - was 4 to 6 percentage points. Those countries which initially

had the lowest tariff rates also had relatively low reductions in tariffs -

the Benelux countries and West Germany in the EEC and the Nordic countries

and Switzerland in EFTA. In these countries the average tariff rates were

also reduced by 4 to 6 percentage points in the course of the 18 year

period we have examined.

Table 3.1. Average tariff rate on imports of manufactured goods[1). 1960-1977. In.per cent.

Year	Canada	U S A	Japan	Belgium Luxem- bourg	Nether- lands	West Germany	France	Italy	U K	Nor- way	Swe- den	Den- mark	Fin- land	Aus- tria	Switzer- land
1960	11.4	12.7	15.9	7.7	7.2	6.1	12.6	12.8	14.8	4.1	6.6	5.4	6.9	18.0	4.5
1961	11.4	12.7	15.9	7.0	6.6	6.0	10.8	11.9	14.3	3.7	6.2	5.0	6.4	17.3	4.4
1962	11.4	12.7	15.9	6.1	5.8	5.3	9.2	10.2	13.7	3.4	5.7	4.6	5.7	16.5	4.2
1963	11.4	12.7	15.9	5.5	5.3	5.1	8.1	8.9	13.3	3.1	5.4	4.3	5.2	16.1	4.1
1964	11.4	12.7	15.9	5.3	5.1	5.2	7.5	8.3	13.0	2.9	5.1	4.0	4.8	15.6	4.0
1965	11.4	12.7	15.9	4.7	4.6	4.7	6.4	7.1	12.6	2.6	4.8	3.7	4.4	15.1	4.0
1966	11.4	12.7	15.9	4.1	4.0	4.3	5.3	6.1	12.2	2.4	4.5	3.4	3.9	14.6	3.9
1967	11.4	12.7	15.9	4.0	4.0	4.5	4.9	5.6	11.4	1.9	3.9	2.9	3.5	13.6	3.7
1968	10.6	11.8	14.7	3.3	3.4	4.1	3.5	4.0	10.5	1.8	3.6	2.7	2.9	12.6	3.4
1969	9.8	10.9	13.4	2.6	2.7	3.5	2.5	2.9	9.6	1.6	3.3	2.5	2.7	11.5	3.1
1970	8.9	9.9	12.2	2.4	2.5	3.2	2.3	2.7	8.8	1.5	3.0	2.3	2.5	10.5	2.8
1971	8.1	9.0	10.9	2.2	2.2	2.9	2.1	2.4	7.9	1.3	2.6	2.1	2.3	9.4	2.6
1972	7.3	8.1	9.7	2.0	2.0	2.6	1.9	2.2	7.0	1.2	2.4	1.9	2.0	8.3	2.2
1973	7.3	8.1	9.7	1.8	1.9	2.4	1.7	2.0	6.5	1.0	2.1	1.7	1.9	7.1	2.0
1974	7.3	8.1	9.7	1.6	1.6	2.0	1.5	1.8	5.3	0.8	1.6	1.4	1.4	5.1	1.5
1975	7.3	8.1	9.7	1.4	1.4	1.7	1.3	1.6	4.4	0.6	1.3	1.1	1.1	3.6	1.1
1976	7.3	8.1	9.7	1.2	1.2	1.4	1.1	1.3	3.5	0.4	0.9	0.8	0.7	1.9	0.8
1977	7.3	8.1	9.7	1.1	1.1	1.3	1.0	1.2	3.1	0.3	0.7	0.7	0.5	1.1	0.6

1) Average tariff rate τ_ℓ^* is computed by $\ln \tau_\ell = \sum_{j \neq \ell} s_{j\ell} \, \text{Int}_{j\ell}$ where $\tau_\ell^* = \tau_\ell - 1$.

The interpretation of the competitiors' relative tariff indices λ_k is somewhat more difficult than that of the τ^*. In (2.14) λ_k is defined as a geometric double-weighted average of the different t_{ij}'s. In the λ-index for Norway, for example, the tariff on Swedish export to Denmark will be given a weight proportional to the product of Denmark's share of Norwegian exports and Sweden's share of Danish imports.[2] The index is normalized by the "diagonal" term $-d_{kk}$.

An examination of the homegenity properties of λ_k will help in the interpretation of these indices. As mentioned in the previous section λ_k are homogenous of degree zero in all the tariffs $(t_{ij}, i \neq j)$. This is a simple consequence of the fact that the weights $w_{k\ell}(s_{j\ell} - \delta_{jk})$ sum to zero over the indices j and ℓ. This is readily seen by rewriting the sum of the weights as $\sum_{\ell \neq k} w_{k\ell} \sum_{j \neq \ell} (s_{j\ell} - \delta_{kj})$, and noting that the sum $\sum_{j \neq \ell} (s_{j\ell} - \delta_{kj})$ is by definition equal to zero. Equation (2.14) can be rewritten :

$$\lambda_k = -\frac{1}{d_{kk}} \sum_{\ell \neq k} w_{k\ell} \sum_{j \neq \ell} s_{j\ell} \ln\left(\frac{t_{j\ell}}{t_{k\ell}}\right) \qquad (3.6)$$

The "diagonal" elements $d_{kk} = \sum_{\ell \neq k} w_{k\ell} (s_{k\ell} - 1)$ are the only negative magnitudes in the sum $\sum_{\ell \neq k} w_{k\ell}(s_{j\ell} - \delta_{jk})$. This means that the sum of the weights for $\ln\left(\frac{t_{j\ell}}{t_{k\ell}}\right)$ in (3.6) add to unity. λ_k is hence homogenous of degree one in the tariff rates $t_{j\ell}$, where $j, \ell = 1, \ldots L$, $\ell \neq j$ and $\underline{j \neq k.}$ The indices

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2) Double-weighted indices are discussed in Adams et.al (1969) and Robinson et.al (1979).

λ_k is also homogenous of degree zero in $t_{j\ell}$, where $j = 1,\ldots L, j \neq \ell$, because the sum $\sum_{j \neq \ell} (s_{j\ell} - \delta_{k\ell})$ equals zero.

The homogenety properties of λ_k means that if all the t_{ij} are for example increased by 10 per cent - all countries rise their tariffs against all other countries by 10 per cent - the value of λ_k would remain unchanged. But if all other countries than country k were to face such an increase on all export markets, and the tariffs facing country k remained unchanged, the index λ_k would increase by 10 per cent. The magnitude of λ_k will not be effected if one country raises its tariffs against all countries by the same percent. If country k is met by the same tariff as its competitors on all her export markets, the value of λ_k will be equal to one.[3] A value of λ_k greater than one means that country k's competitors on the average face higher tariff rates than country k on its export market. The magnitude of λ_k is hence an expression of the tariff discrimination other countries face compared with country k on k's export markets.

The computed values of λ_k for each country are presented in table 3.2. It will be seen that Canada, the United States and Japan have all encountered generally higher tariff rates than their competitors, or equivalently, their competitors have been favoured by generally lower tariff rates: λ_k is less than one for these three countries during the entire period (1960-1977). This is obviously due to the fact that these countries have been discriminated against on the European market because they have been outside both EFTA and the EEC. This has been of relatively less importance to Canada where λ_k during the entire period has deviated by less than one per cent from one. This may be ascribed to the fact that

3) The weighted sum of t_{ij} will be zero, and λ_k will be equal to one since $\ln(0) = 1$.

Table 3.2. Computed values of the relative tariff restrictions for exports of manufactured goods from each of the 15 countries[1]. 1960-1977.

Year	Canada	U S A	Japan	Belgium Luxembourg	Nether-lands	West Germany	France	Italy	U K	Nor-way	Swe-den	Den-mark	Fin-land	Aus-tria	Switzer-land
1960	0.999	0.991	0.997	1.022	1.018	0.997	0.999	1.000	0.994	1.001	0.998	1.000	1.000	0.997	0.996
1961	0.998	0.984	0.995	1.023	1.020	0.999	1.004	1.004	0.991	1.003	0.999	1.001	1.002	0.994	0.994
1962	0.997	0.977	0.993	1.024	1.019	1.002	1.007	1.007	0.989	1.007	1.001	1.004	1.006	0.993	0.993
1963	0.997	0.972	0.991	1.024	1.020	1.004	1.010	1.009	0.987	1.009	1.002	1.005	1.007	0.992	0.991
1964	0.996	0.969	0.990	1.025	1.020	1.004	1.011	1.011	0.986	1.012	1.004	1.007	1.010	0.992	0.992
1965	0.996	0.965	0.989	1.025	1.020	1.006	1.014	1.012	0.985	1.015	1.005	1.009	1.012	0.991	0.991
1966	0.995	0.960	0.988	1.025	1.020	1.008	1.017	10.14	0.983	1.017	1.006	1.011	1.015	0.991	0.990
1967	0.994	0.957	0.986	1.026	1.020	1.006	1.017	1.015	0.985	1.025	1.011	1.017	1.022	0.993	0.994
1968	0.994	0.956	0.986	1.025	1.020	1.008	1.020	1.017	0.983	1.021	1.008	1.014	1.018	0.990	0.991
1969	0.995	0.957	0.986	1.024	1.019	1.010	1.020	1.017	0.982	1.018	1.006	1.011	1.015	0.989	0.989
1970	0.995	0.960	0.988	1.022	1.018	1.009	1.019	1.016	0.983	1.017	1.006	1.010	1.014	0.989	0.989
1971	0.995	0.964	0.989	1.020	1.016	1.008	1.017	1.014	0.985	1.015	1.005	1.009	1.012	0.990	0.990
1972	0.996	0.968	0.990	1.018	1.015	1.007	1.015	1.013	0.986	1.013	1.004	1.008	1.011	0.991	0.991
1973	0.995	0.965	0.989	1.017	1.014	1.008	1.015	1.013	0.989	1.012	1.005	1.008	1.010	0.994	0.994
1974	0.995	0.962	0.988	1.015	1.013	1.009	1.013	1.011	0.994	1.012	1.006	1.008	1.011	0.998	0.998
1975	0.994	0.960	0.987	1.014	1.013	1.009	1.013	1.011	0.998	1.011	1.007	1.008	1.011	1.002	1.002
1976	0.994	0.957	0.986	1.012	1.012	1.010	1.012	1.010	1.002	1.011	1.008	1.008	1.011	1.006	1.005
1977	0.994	0.956	0.986	1.012	1.011	1.010	1.011	1.010	1.004	1.011	1.009	1.008	1.011	1.008	1.007

1) In the table we have presented λ_k which is defined by (cf. (3-5))

$$\ln\lambda_k = -\frac{1}{d_{kk}} \sum_j \sum_{\ell \neq k} w_{k\ell} (s_{j\ell} - \delta_{kj}) \ln t_{j\ell}.$$

λ_k is a geometrically weighted average of the ratio between the tariff rates manufactured goods from country k encounter on each of the export market.

most of Canada's exports go to the United States where the country is not

discriminated against. The European market is in relative terms of con-

siderably greater importance to both the United States and Japan than to

Canada: for the United States the value of λ_k is 0.956 in 1977. This

means that in 1977 competitors of the United States generally encountered

tariff rates which were $4\frac{1}{2}$ per cent lower than those encountered by tne

U.S. on her export markets.

Prior to the tariff adjustments in EFTA and the EEC, according to

our information, no tariff discrimination between the countries existed

except for the customs union between Belgium-Luxembourg and the Netherlands

from 1948. If we had computed λ_k for the various countries for 1958, these

would therefore have been approximately equal to 1 (but less than 1) for all

the countries excluding Belgium-Luxembourg and the Netherlands.[4] This

gives us an opportunity to analyze which countries registered an improve-

ment in their competitive position and which countries registered a deterio-

ration in their competitive position in connection with the tariff adjustments

carried out by the EEC and EFTA. When we look at the λ - values for 1967 [5]

we find that the "losers" (in the sense that they encounter higher tariff

rates than other countries' exporters on their own export markets) were the

United States, in particular, and the United Kingdom, Japan, Austria and

Switzerland. The fact that the competitive position of the United States

and Japan showed a deterioration is not particularly surprising - both these

4) This follows from the fact that no tariff discrimination between
   any of the countries means that $t_{k\ell} = t_{j\ell}$ (for all k, j and ℓ) and
   as a result that $\ln\lambda_k = 0$ ($\lambda_k = 1$) for all k. But since Belgium-Luxem-
   bourg and the Netherlands already had eliminated tariffs on each others
   trade and hence on the average were facing lower tariffs than other
   countries on their export markets, computed values for those two countries
   would have been greater than one and therefore less than one for all other
   countries.
5) 1967 is the last year before the tariff reduction within the Kennedy Round.

countries were outside the EEC and EFTA. The reasons for the deterio-
ration in the competitive position of the United Kingdom, Austria and
Switzerland, on the other hand, are not so obvious. These three countries
were all members of EFTA from the start and gradually benefited from
tariff reductions carried out by other EFTA countries. The reason why
these countries none the less registered a deterioration in their competitive
position, as we have computed it, must be that the relatively favourable
tariff treatment given by other EFTA countries was more than offset by the
relatively less favourable treatment given by the EEC countries. In
addition to the EEC countries' reductions of internal tariffs, important
export markets like the Benelux countries and West Germany raised their
tariff barriers towards third countries in the same period. Viewed
independently, a country will "lose", in the sense we use the word
in this note, when a free trade area, of which it is not a member, is
established, but will "benefit" by participating in a free trade area that
discriminates against third countries. Switzerland, Austria and the United
Kingdom were those countries which "lost" in connection with the establish-
ment of the EEC and EFTA because they delivered a relatively higher share
of their exports than the other EFTA and EEC countries to countries outside
their own free trade area, i.e. to the EEC. The Nordic countries in EFTA,
on the other hand, registered an improvement in their competitive position
as a result of the establishment of EFTA and the EEC because they to a
greater extent than the United Kingdom and Austria delivered their exports
to other EFTA countries, among which the United Kingdom was the most
important market.

The implementation of the tariff reductions within the Kennedy
Round (1968-1972) resulted - in contrast to the establishment of the EEC
and EFTA - in an improvement in the competitive position of the United

States, Japan and Canada. For the United States, the Kennedy Round
entailed that the tariff rates the country encountered were reduced by
about one per cent in relation to the tariff rates other countries en-
countered. These three countries were those which registered an improve-
ment in their competitive position on their export markets because they
encountered lower tariff barriers in all the other countries, while the
EFTA and EEC countries could only reduce tariff barriers towards countries
which were outside their own free trade areas since the internal tariff
was abolished in both EFTA and the EEC when the Kennedy Round's tariff
reductions were initiated on 1 January 1968.

The entry of Denmark and the United Kingdom into the EEC and
the reduction of tariffs between the EEC countries and the remaining EFTA
countries led to a new deterioration in the competitive position of the
United States. From 1972 to 1977 the tariff rates American exporters en-
countered relative to other countries increased by 1,2 per cent. The com-
petitive situation for the United Kingdom, on the other hand, improved in
the same period; the relative tariff burden encountered by British exporters
fell by slightly more than $1\frac{1}{2}$ per cent.

The Treaty of Rome was the first of the international agreements on
tariff reductions which are taken account of in this note. EFTA was established
when attempts to create a larger European free trade area had failed (Södersten
1970, p. 404). The creation of EFTA can be looked upon as an attempt of the
EFTA-countries to try to resist the reduction in competitiveness for export
industries that would be the result of the Rome Treaty. A quantification of
the decline in competitiveness to other countries which would have resulted if
EEC had remained the only custom union or free trade area in Europe can be
given by a special calculation of the indices λ_k. The value of these indices

which would have prevailed after the tariff changes in the Treaty of Rome
had been implemented and no further tariff reductions had been performed, are
found in table 3.3. The "gainers" in the sense of encountering reduced
tariffs on their export markets would of course have been the EEC-countries.
After the implementation of the tariff changes in the Treaty of Rome these
countries would on the average face 2-3 per cent lower tariffs on their

Table 3.3 Calculated values of the relative tariff restrictions, λ_k,
on exports if <u>only</u> the tariff changes in the Treaty of
Rome were implemented.[1]

Country	λ_k
Canada	0.996
USA	0.959
Japan	0.987
Belgium-Luxembourg	1.031
Netherlands	1.028
West-Germany	1.023
France	1.029
Italy	1.025
U.K.	0.967
Norway	0.981
Sweden	0.976
Denmark	0.980
Finland	0.980
Austria	0.965
Switzerland	0.962

1) For a definition of λ_k see equation (3.5) and table 3.2.

markets than their competitors outside the EEC according to our methods of
calculations. Worst off would have been the United States, Austria, Switzer-
land and the United Kingdom: the tariffs their own exporters would have
encountered would have been 3-4 per cent higher than those facing their compe-
titors. For the Nordic countries the relative increase in tariffs on their
export markets would have been 2-2½ per cent.

The creation of the EEC and EFTA meant discrimination of countries out-
side these areas, among these of course the United States. As a consequence
the Kennedy administration introduced in 1962 a bill aimed at vast reciprocal
tariff reductions and thus took the initiative to the so called Kennedy
Round in GATT. The discrimination imposed on Canada, the United States and
Japan by the tariff changes of the EEC and EFTA was discussed above,
and an estimate of the relative tariff restriction on the United
States can be read out of table 3.2. But at the same time as the Kennedy
administration proposed tariff reductions in GATT, strong attempts were being
made to create a European free trade area (or customs union) for all the EEC
and EFTA countries. There can therefore be of interest to try to measure
how large the deterioration in the competiveness of the United States
exporters the creation of such a free trade area would have been. If we
assume that in such a hypothetic free trade area (which in fact almost has been
implemented in the 1970's) the EFTA countries would have adopted the EEC's
"most favoured nations" tariffs, we can calculate a value of λ_k of 0.925
for the United States. Hence, after the implementation of the tariff changes
in such a hypothetic European free trade area and before the Kennedy Round,
the United States' exporters of manufactures would on the average encounter
$7\frac{1}{2}$ per cent higher tariff rates than their competitors on her export market.

Norway has together with the other Western European countries parti-
cipated in the reciprocal tariff reductions within EFTA in the 1960's and
through the trade agreements with EEC in the 1970's. It can be of some
interest to compare the actual relative tariff restrictions that have faced
Norwegian exports with those that would have prevailed if Norway had stayed
outside the reciprocal trade reductions implemented by the EEC and EFTA.

Norway would then have encountered "most favoured nations" tariffs on all her

export markets. The value of λ_k for Norway (λ_N) that can be calculated under

these assumptions is to be found in table 3.4. column (2) and is there com-

pared with the value of λ_N we find in table 3.2. The loss to the Norwegian

export industries would have been increasing throughout the 1960's and

would have reached a high point in 1967, the last year before the implemen-

tation of the Kennedy Round tariff reductions. According to these calcula-

tions the EFTA membership had by that time resulted on the average in 6 per

cent lower tariffs on Norwegian exports compared with the alternative of

Table 3.4. Calculation of the effect for Norway's relative tariff restriction on exports market of the EFTA membership and the trade agreement with EEC.[1]

Year	(1) The value of λ_k for Norway (λ_N) in table 3.2	(2) Calculated value for λ_n if Norway had not participated in the reciprocal tariff reductions in the EFTA and the EEC	(3) [(1)-(2)]/100
1960	1.001	0.995	0.6
1961	1.003	0.989	1.4
1962	1.007	0.984	2.3
1963	1.009	0.981	2.8
1964	1.012	0.978	3.4
1965	1.015	0.974	4.1
1966	1.017	0.971	4.6
1967	1.025	0.966	5.9
1968	1.021	0.967	5.4
1969	1.018	0.968	5.0
1970	1.017	0.971	4.6
1971	1.015	0.973	4.3
1972	1.013	0.976	3.7
1973	1.012	0.973	3.9
1974	1.012	0.968	4.4
1975	1.011	0.963	4.8
1976	1.011	0.959	5.2
1977	1.011	0.957	5.4

1) For a definition of λ_k see equation (3.5) and table 3.2.

staying outside EFTA.   This advantage was gradually reduced as a conse-
quence of implementation of the Kennedy Round tariff reductions.[1] The en-
largement of the EEC and the rest-EFTA's trade agreements with the EEC would
then again have contributed to a deterioration in the competiveness of
Norwegian export industries.

We would like to emphasize that these calculations are accompanied
with considerable uncertainty. Our primary concern was to develop a model
of international trade and a set of import and export tariff indices con-
sistent with this model. The quality of the indices will depend on the
realism of the assumptions of the model, particularly the assumption of a
common elasticity of substitution on all markets. We have also used con-
stant trade weights based on a 1970 trade matrix, but patterns of trade have
changed over the period altering the relative importance of trading partners.
The choice of logarithmic approximation makes our indices into geometric
averages, while perhaps other averages would have been superior. But we
still believe that these indices anchored in a theoretic model have showed
themselves valuable in measuring the effect of the changing tariffs.

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1) The Kennedy Round trade reductions would under these assumptions diminish
    the discrimination of Norwegian export industries because tariff encounter
    Norwegian exports would have been reduced in all countries but tariff
    encounter other European countries exports would have been reduced only
    against countries outside their own free trade area. The tariffs within
    EFTA and the EEC was then - 1968 - nearly abolished.

<div align="right">A P P E N D I X   A</div>

THE CALCULATION OF TIME SERIES FOR TARIFFS

Introduction

The price of country ℓ's imports of manufactured goods exported from country k is given by (2.4):

$$(A.1) \quad p_{k\ell}^{B} = t_{k\ell} h_{k\ell} p_{k}^{E} \qquad k,\ell=1,\ldots,L; \quad t\neq k$$

where p_{k}^{E} is the price of exports of manufactured goods from country k, $t_{k\ell}$ is the average tariff rate on country ℓ's imports of manufactured goods from country k, and $h_{k\ell}$ is the difference between f.o.b. and c.i.f prices on this commodity flow[1]. The determination of the tariff index λ_k and τ_ℓ (see section 3) require time series for tariff rates classified by exporting and importing country for the commodity group manufactured goods (SITC 5-8, excluding 68 and 735). Such time series have not previously been published for this commodity group, and we have therefore made our own calculations of such tariff rates for the period 1960-1977. In this appendix we will describe in details how these tariff rates have been computed. In the first part we will discuss the general changes in tariffs which have occured under the auspices of the EEC, EFTA and GATT. Thereafter we shall provide a description of the procedures used for computing the tariff rates we have used in the estimation of the model.

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1) In the empirical work on the model it was assumed that $h_{k\ell}$ was constant in the period of estimation.

In this note a tariff rate will refer to a fixed duty on a specific good, precisely defined according to a commodity nomenclature, and a tariff incidence will be a computed average tariff rate for a commodity group where the weights are the individual commodity's share in the aggregated commodity.

Tariff reductions within the EEC

The EEC countries have carried out the following reductions of internal tariff rates on manufactured goods:

Table A.1. Tariff reductions within the EEC[1]

Date	Reduction as a percentage of an index of basic tariff rates[2]	Tariff rates after the reduction as a percentage of an index of basic tariff rates
1 January 1959	10	90
1 July 1960	10	80
1 January 1961	10	70
1 January 1962	10	60
1 July 1962	10	50
1 July 1963	10	40
1 January 1965	10	30
1 January 1966	10	20
1 July 1967	5	15
1 July 1968	15	0

1) Source: Norwegian Ministry of Foreign Affairs (1967-1977).
2) The basic tariff rates are those which prevailed on 1 January 1957.

On 1 July 1968 all tariffs on trade in manufactured goods between the EEC countries were therefore abolished. The reductions in tariffs were thus carried out 1 1/2 years earlier than envisaged in the Treaty of Rome.

The establishment of a common external tariff wall by the EEC countries

The Treaty of Rome also aimed at establishing a common external tariff wall around the EEC countries. The common tariff was in principle calculated as an unweighted arithmetical average of the tariff rates applied by the four customs territories within the EEC on 1 January 1957. (France, Italy, West Germany and the Be-Ne-Lux countries.) Exceptions were made for the so-called List G goods. In addition, it was decided that the tariff rates for certain raw materials (List B) were not to exceed 3 per cent, for certain semi-manufactures (List C) 10 per cent and for certain manufactured goods (List D) 15 per cent.

In connection with the progressive introduction of the common tariff the EEC implemented the following schedule for tariff changes (Norwegian Ministry of Foreign Affairs (1967-1977)):

1 January 1961	-	30 per cent
1 July 1963	-	30 per cent
1 July 1967	-	40 per cent

(This rate of change is computed as the reduction in percentage points of the difference between the national tariff rate on 1 January 1957 and the common tariff.)

The Treaty of Rome also allowed the various member countries to apply to the EEC commission for temporary exemptions from the reductions in tariffs, i.e. to establish a temporary extra tariff. The Norwegian Market Committee's reports (Norwegian Ministry of Foreign Affairs

(1967-1977)) suggest that the opportunity to levy extra tariffs was not
been used by the member countries to any significant extent.

Tariff reductions within EFTA

The agreement concerning the establishment of EFTA (Stockholm
Convention) was signed om 4 January 1960 by Norway, Denmark, Portugal,
the United Kingdom, Switzerland, Sweden and Austria. The main objective
of the agreement was the gradual elimination of tariffs and the abolition
of other trade barrieres on trade in manufactured goods between the
countries. The EFTA countries, on the other hand, did not aim at estab-
lishing a common external tariff as was the case with the EEC countries.

In the Stockholm Convention (Article 3, section 2) a timetable
was drawn up for the elimination of the member countries' tariffs. This
was later accelerated and the reduction in tariffs on most manufactured
goods was effected on the basis of this timetable:

Table A.2.   Tariff reductions within EFTA[1]

Date	Reduction as a percentage of an index of basic tariff rates[2]	Tariff rates after the reduction as a percentage of an index of basic tariff rates[2]
1 July 1960	20	80
1 July 1961	10	70
1 March 1962	10	60
31 October 1962	10	50
31 December 1963	10	40
31 December 1964	10	30
31 December 1965	10	20
31 December 1966	20	0

1) Source: Stortingsmelding 33 (1966-67).
2) The basic tariff rates are - with certain exceptions - those which
    prevailed on 1 January 1960.

Some one year after the signing of the Stockholm Convention
the EFTA countries and Finland signed an agreement which aimed at eli-
minating tariff restrictions between EFTA and Finland. In this agree-
ment (signed in Helsinki on 21 March 1961) a timetable was drawn up for
dismantling Finland's tariffs on imports from the EFTA countries. This
tariff reduction schedule was also later accelerated and the reductions
followed this timetable:

Table A.3. Gradual elimination of Finland's tariff rates on imports from
EFTA countries[1]

Date	Reduction as a per-percentage of an index of basic tariff rates[2]	Tariff rates after the reduction as a percentage of an index of basic tariff rates[2]
1 July 1961	30	70
1 August 1962	10	60
30 April 1963	10	50
1 May 1964	10	40
1 March 1965	10	30
31 December 1965	10	20
31 December 1966	10	10
31 December 1967	10	0

1) Source: The table has been drawn up by the authors on the basis of
   information from the Norwegian Ministry of Commerce.
2) The basic tariff rates are those which prevailed on 1 July 1961.

The other EFTA countries' gradual abolition of tariffs on imports
from Finland followed the general plan for eliminating tariffs within the
free trade area.

The Kennedy Round - sixth round of trade negotiations in GATT

The background for the Kennedy Round was the U.S. Trade Expan-
sion Act, an enabling act adopted by Congress in October 1962. "The
Act empowered the President to cut U.S. tariffs by up to 50 per cent,

subject to reciprocity. Tariff rates of 5 per cent or less could be eliminated". (Stortingsproposisjon nr. 21 (1967-68), page 3.) Politically, the initiative for the Kennendy Round was an attempt on the part of the United States to avoid being adversely affected by the establishment of tariff exemption within EFTA and the EEC.

The final agreement was signed on 30 June 1967, the day before the time limit set by the American enabling act expired. As a main rule a 50 per cent reduction in tariff rates for manufactured goods was accepted. But the various countries gradually presented relatively long lists of goods which should be exempted. The average tariff reductions were therefore considerably lower, on the order of 35-40 per cent. In the agreement two different timetables for carrying out the reduction in tariffs were set out:

> "a) A participating country which begins reducing tariffs on 1 January 1968 shall put into effect a fifth of the full reduction towards the final rate on this date and four fifths of the full reduction in four equal cuts on 1 January 1969, 1970, 1971 and 1972.
> b) A participating country which begins reducing tariffs on 1 July 1968 or on a date between 1 January and 1 July 1968 shall put into effect two fifths of the full reduction towards the final rate on this date and three fifths of the full reduction in three equal cuts on 1 January 1970, 1971 and 1972." (Op.cit., p.22).

In the agreement the other countries had drawn up two alternatives for reducing tariffs on chemical goods. The most far-reaching presupposed an abolition of the so-called ASP system[1], while the least far-reaching should enter into force if the U.S. Congress refused to abandon the ASP system. The U.S. Congress later rejected a proposal to discontinue the ASP system.

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1) The ASP system (American Selling Prices) entails the calculation of tariffs in relation to the price of the competing American product(s) and not in relation to the price of the imported good.

Enlargement of the EEC and tariff reductions between original members of the
EEC and EFTA

Based on negotiations between the EEC and EFTA the following tariff
reduction and adjustment schedules were adopted:

Table A.4.   Reduction of tariffs between EFTA countries and the EEC.   Adjustment to the EEC's external tariff for new EEC member countries[1]

Date	Reduction of internal tariff rates as a percentage of an index of basic tariff rates[2]	Adjustment to the EEC's external tariff[3]
1 April 1973	20	–
1 January 1974	20	40
1 January 1975	20	20
1 January 1976	20	20
1 July 1977	20	20

1)   Source: Norwegian Ministry of Foreign Affairs (1967-1977).
2)   The basic tariff rates are those which prevailed on 1 January 1972.
3)   Reduction as a percentage of the original difference between the EEC's common external tariff barrier and the new member countries' tariff barrier prior to entry into the EEC.

The schedule for the progressive elimination of tariffs was to
be applied between all EFTA countries and the EEC, while the adjustment
schedule was only to be applied by the new member countries in the EEC - the
United Kingdom, Ireland and Denmark. Exceptions from the schedule for tariff
elimination were later made for Norway and Finland where the first stage in
the internal reductions in tariffs was implemented three monthes later than
for the other countries. Otherwise the schedule for tariff reductions and
adjustments was carried out.

It was also decided that the tariff reductions for so-called
"sensitive" goods should be effected over a longer period. In principle,

the tariff on such "sensitive" goods was to be eliminated over a period of 7 or 11 years. At the same time, however, an import ceiling was established in the form of an upper limit on the quantity of goods which could benefit from the tariff reductions.

The list of "sensitive" goods varied from one country to another. For the original EEC countries it included, among others, rayon wool, unwrought aluminium, iron and steel products, ferro-alloys, paper and board and paper products. Denmark and the United Kingdom reimposed tariffs on paper, board and paperboard products towards former EFTA countries on 1 January 1974, raised the tariff to 8 per cent in stages to 1 July 1977 and shall thereafter follow the same reduction schedule as the other EEC countries. The list of sensitive goods for Norway comprised, among other things, textiles and clothing, colour television receivers, plastic raw materials and plastic products, rubber products, footwear, glass products, various electrical products, etc.

Those tariff rates in Denmark, Ireland and the United Kingdom which did not deviate more than 15 per cent were fixed equal to the EEC's common tariff on 1 January 1972.

Computing the average tariff rates ($t_{j\ell}$)

Most of the information on tariff rates is available according to an extremely detailed commodity classification - based on the 4-digit BTN classification or even more detailed. It is of course on such a level the tariff rates are stipulated by the authorities and used by those who levy the tariff on the imported goods. Even though we could obtain such time series for tariff rates for the various products, the task of computing the average tariff rates we are interested in would be far too comprehen-

sive. We have therefore chosen the following procedure for our calcu-
lations:

1)   We have started out with a set of "most favoured nation" tariff
incidences computed by GATT (GATT (1974)). The tariff incidences are com-
puted as a weighted average of tariff rates on a more disaggregated level
where we have used the tariff incidences which are computed with the vari-
ous commodities' relative importance in imports in 1970-1971 as weights.
GATT has computed weighted averages for what they have called raw materials,
semi-manufactures and finished manufactures. We have used a weighted
average of the last two categories. (Cf. table A.5.) GATT's calculation
referred to the tariff rates prevailing on 1 January 1973, i.e. after the
tariff reductions from the Kennedy Round had been carried out. The compu-
tations covered all the countries in our export model excluding Denmark
and the United Kingdom (probably because these two countries at that time
had become members of the EEC even though they had not introduced the EEC's
common external tariff rates).

For the United Kingdom we have computed the tariff incidence for
manufactured goods on 1 January 1973 with the aid of information from
Preeg (Preeg (1970), pp. 208-211). We have assumed that the ratio computed
by Preeg between the U.K's and the EEC's tariff incidence for manufactures
will be the same as the corresponding ratio according to GATT's commodity
classification and weighting method.

Based on a corresponding principle, we have computed the tariff in-
cidence for Denmark and for the various EEC countries (the GATT publication
only gave one customs tariff for the EEC countries because the common ex-
ternal tariff had by this time already been established). Based on infor-

Table A.5. "Most favoured nation" tariff incidence on 1 January 1973 for manufactured goods. Percentages.[1]

Canada	7.3
United States	8.1
Japan	9.7
Belgium/Luxembourg	7.4
Netherlands	7.4
West-Germany	7.4
France	7.4
Italy	7.4
United Kingdom[2]	9.3
Norway	2.6
Sweden	4.2
Denmark[2]	3.8
Finland	4.4
Austria	11.2
Switzerland	2.8

1) Source: GATT (1974). The figures are computed as a weighted average of the tariff incidences for "semi-manufactures" and "finished manufactures".
2) Computed by the authors as described in this appendix.

mation on average rates (Joint Economic Committee (1961)), the "most favoured nation" tariff rates for 1961 have been computed by taking into account that the tariff reductions within EFTA and the EEC were already under way and that the approximation to the common external tariff in the EEC had begun. For Denmark these computations gave an average "most favoured nation" tariff equal to 0.83 of Sweden's in 1961. The computations for the four customs territories within the EEC gave the following relative average "most favoured nation" tariff rates for manufactured goods prior to the adjustment to the common tariff (as a share of the EEC's later established external tariff barrier):

Be-Ne-Lux: 0.87

West Germany: 0.58

Italy: 1.33

France: 1.22

We have assumed that all the countries have applied the so-called "most favoured nation" tariff rates towards all countries excluding those within the EEC and EFTA.

2)   In order to compute changes in the tariff incidence over time we have taken the following events into account:

- Tariff exemption between the Be-Ne-Lux countries since 1948.

- Reductions of internal tariff rates within the free trade area EFTA.

- Reductions of internal tariff rates within the EEC and the establisment of the common external tariff for the EEC-countries.

- Implementation of the Kennedy Round within GATT.

- The entry of Denmark and the United Kingdom (and Ireland) into the EEC and the other EFTA countries' trade agreements with the EEC.

All the tariff reductions (under the auspices of the EEC, EFTA and GATT) are assumed to have been implemented as late as possible within the limits of the agreements. (This means we have assumed that a tariff reduction which, according to the agreement, should be implemented before 1 July of a given year, was in fact implemented on 30 June.)

For the tariff reductions as a result of the Kennedy Round we have used computations carried out by Preeg (1970) for the EEC countries, the United Kingdom, Japan and the United States. For the commodity group manufacturings he has computed the tariff reductions for these countries at 36 per cent, 39 per cent, 39 per cent and 36 per cent, respectively (Preeg (1970), pp. 208-211). Computations for the other

countries are not available as far as we have been able to ascertain.
Discretionary - and following contact with the Norwegian Ministry of
Commerce and GATT - we have assumed that a) the other EFTA countries (ex-
cluding Finland) have followed the U.K. and Japan and b) Canada and Fin-
land have reduced the tariff rates by the same percentage as the U.S.
and the EEC countries.

For our method of computing the tariff incidence it makes no
difference as to which of the two tariff reduction schedules in the
agreement based on the Kennedy Round the various countries followed.

The tariff adjustments under the auspices of the EEC and EFTA
entailed a number of deviations from the general tariff adjustment sche-
dules, as discussed in the introduction. For practical reasons we have
been forced to disregard these exceptions.

The tariff rates, classified by exporting and importing countries,
which were estimated for 1960 are to be found in table A.6.

Table A.6. Estimated average tariff rates in 1960 on manufactured goods classified by exporting and importing countries.[1]

Exporting country \ Importing country	Canada	USA	Japan	Belgium Luxembourg	Netherlands	West-Germany	France	Italy	UK	Norway	Sweden	Denmark	Finland	Austria	Switzerland
Canada	-	12.7	15.9	10.1	10.1	6.7	14.2	15.4	15.2	4.3	6.9	5.7	6.9	18.4	4,6
USA	11.4	-	15.9	10.1	10.1	6.7	14.2	15.4	15.2	4.3	6.9	5.7	6.9	18.4	4.6
Japan	11.4	12.7	-	10.1	10.1	6.7	14.2	15.4	15.2	4.3	6.9	5.7	6.9	18.4	4.6
Belgium Luxembourg	11.4	12.7	15.9	-	0	5.7	12.1	13.1	15.2	4.3	6.9	5.7	6.9	18.4	4.6
Netherlands	11.4	12.7	15.9	0	-	5.7	12.1	13.1	15.2	4.3	6.9	5.7	6.9	18.4	4.6
West-Germany	11.4	12.7	15.9	8.6	8.6	-	12.1	13.1	15.2	4.3	6.9	5.7	6.9	18.4	4.6
France	11.4	12.7	15.9	8.6	8.6	5.7	-	13.1	15.2	4.3	6.9	5.7	6.9	18.4	4.6
Italy	11.4	12.7	15.9	8.6	8.6	5.7	12.1	-	15.2	4.3	6.9	5.7	6.9	18.4	4.6
UK	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	-	3.9	6.2	5.1	6.9	16.6	4.1
Norway	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	-	6.2	5.1	6.9	16.6	4.1
Sweden	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	3.9	-	5.1	6.9	16.6	4.1
Denmark	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	3.9	6.2	-	6.9	16.6	4.1
Finland	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	3.9	6.2	5.1	-	16.6	4.1
Austria	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	3.9	6.2	5.1	6.9	-	4.1
Switzerland	11.4	12.7	15.9	10.1	10.1	6.7	14.2	15.4	13.7	3.9	6.2	5.1	6.9	16.6	-

1) An element in this matrix is $t_{k\ell}^{*}$, where $t_{k\ell}^{*} = t_{k\ell} - 1$. (See equation 2.4 where $t_{k\ell}$ is introduced.)

Table B.1. The weights d_{kj} used for constructing price indices of competing exports for each country (k).

$$p_k^C = \sum_{j \neq k} d_{kj} p_j^E, \text{ where } d_{kj} = \sum_{\ell \neq k} w_{k\ell} s_{j\ell}. \text{ (The diagonal elements are equal to } d_{kk} = \sum_{\ell \neq k} w_{k\ell}(s_{k\ell}-1))^{[1]}$$

Country k \ Country j	Canada	U S A	Japan	Belgium, Luxembourg	Netherlands	West Germany	France	Italy
Canada	-0.7113	0.0228	0.2458	0.0338	0.0182	0.1466	0.0426	0.0574
United States	0.0100	-0.5477	0.0381	0.0484	0.0390	0.1456	0.0628	0.0500
Japan	0.2282	0.0803	-0.7976	0.0423	0.0263	0.1522	0.0551	0.0601
Belgium, Luxembourg	0.0341	0.1111	0.0460	-0.8636	0.0606	0.2286	0.0964	0.1044
Netherlands	0.0259	0.1266	0.0405	0.0858	-0.9057	0.1994	0.1286	0.1008
West Germany	0.0497	0.1122	0.0556	0.0768	0.0474	-0.6848	0.0809	0.0654
France	0.0372	0.1247	0.0518	0.0834	0.0787	0.2084	-0.8586	0.0833
Italy	0.0580	0.1149	0.0654	0.1046	0.0714	0.1949	0.0965	-0.8913
United Kingdom	0.0727	0.1402	0.0795	0.0665	0.0469	0.2304	0.0791	0.0657
Norway	0.0304	0.1273	0.0396	0.0613	0.0561	0.2227	0.0793	0.0634
Sweden	0.0441	0.1207	0.0534	0.0631	0.0523	0.2203	0.0773	0.0649
Denmark	0.0373	0.1184	0.0472	0.0626	0.0527	0.2231	0.0766	0.0642
Finland	0.0435	0.1352	0.0498	0.0663	0.0562	0.2080	0.0801	0.0683
Austria	0.0310	0.1351	0.0472	0.0849	0.0672	0.1926	0.1169	0.0919
Switzerland	0.0539	0.1398	0.0585	0.0808	0.0610	0.2207	0.0915	0.0819

Country k \ Country j	United Kingdom	Norway	Sweden	Denmark	Finland	Austria	Switzerland
Canada	0.0770	0.0035	0.0219	0.0066	0.0059	0.0065	0.0227
United States	0.0653	0.0064	0.0264	0.0092	0.0080	0.0125	0.0259
Japan	0.0782	0.0042	0.0246	0.0077	0.0062	0.0092	0.0229
Belgium, Luxembourg	0.0711	0.0071	0.0316	0.0112	0.0090	0.0181	0.0344
Netherlands	0.0708	0.0092	0.0371	0.0133	0.0108	0.0202	0.0367
West Germany	0.0827	0.0087	0.0371	0.0134	0.0095	0.0138	0.0316
France	0.0731	0.0080	0.0335	0.0118	0.0094	0.0216	0.0337
Italy	0.0703	0.0074	0.0326	0.0115	0.0093	0.0196	0.0349
United Kingdom	-0.9082	0.0107	0.0439	0.0170	0.0113	0.0154	0.0288
Norway	0.0987	-0.9688	0.0637	0.0333	0.0303	0.0239	0.0391
Sweden	0.0936	0.0148	-0.8965	0.0227	0.0140	0.0201	0.0353
Denmark	0.1018	0.0216	0.0636	-0.9563	0.0269	0.0227	0.0377
Finland	0.0887	0.0259	0.0515	0.0354	-0.9707	0.0231	0.0389
Austria	0.0774	0.0130	0.0472	0.0190	0.0148	-0.9712	0.0329
Switzerland	0.0724	0.0107	0.0416	0.0158	0.0124	0.0165	-0.9574

[1] The symbols are defined in section 2 and section 3. This table is derived from a trade matrix for the 15 countries in 1970. (Source: Statistics of Foreign Trade 1970, Series C, OECD.)

REFERENCES:

Adams, F. G., H. Eguchi, and F. Meyer-zu-Schlochtern (1969): An econometric analysis of international trade, OECD, Paris.

Armington, P. S. (1969): A theory of demand for products distinguished by place of production, IMF Staff Papers 16, 159-176.

Deppler, M. C., and D. M. Ripley (1978): The world trade model: Merchandise trade, IMF Staff Papers 25, 147-206.

Frenger, P., E. S. Jansen, and M. Reymert (1979): Modell for norsk eksport av bearbeidde industrivarer. (A Model for Norwegian Export of Manufactured Goods). Rapporter fra Statistisk Sentralbyrå 79/29, Oslo.

GATT (1974): Basic documentation for the tariff study. Summary by industrial product categories. March 1974, Geneve.

Joint Economic Committee (1961): Trade restraints in the western community, Subcommittee on foreign economic policy of the Joint Economic Committee, Congress of the United States, Washington D.C.

Norwegian Ministry of Foreign Affairs (1967 - 1977): Rapport om de europeiske fellesskap i året 19.., diverse rapporter (I-XI) fra Markedsutvalget (for hvert år i perioden fra 1966 til 1976). (Reports on the european communities in the year 19.., several reports from the Market Committee for the period 1966 to 1976).

Preeg, E. H. (1970): Trades and diplomats, The Brookings Institutions, Washington D.C.

Robinson, W., T. R. Webb, and M. A. Townsend (1979): The influence of exchange rate changes on prices: A study of 18 industrial countries, Economica 46, 27-50.

Samuelson, L. (1973): A new model of world trade, OECD Economic Outlook: Occasional studies (December 1973), Paris.

Södersten, B. (1970): International economics, Macmillan Press Ltd, Basington, London.

Stortingsproposisjon 21 (1967 - 1968): Om samtykke til avgivelse av erklæring om godkjenning av resultatet av handelsforhandlingene i Geneve 1964-67 under Generalavtalen om tolltariffer og handel (GATT). (On the concent to the delivery of a declaration of approval of the result of the trade negotiations in Geneve 1964-67 under the General Agreement on Tariffs and Trade (GATT).)

Stortingsmelding 33 (1966 - 1967): Om samarbeid i det Europeiske Frihandelsforbund (EFTA). (Cooperation in the Europen Free Trade Area).

United Nations (1961): Standard International Trade Classification, Revised, Statistical Papers Series M No 34, New York.

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