

Fæhn, Taran

Working Paper

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Discussion Papers, No. 195

Provided in Cooperation with:

Research Department, Statistics Norway, Oslo

Suggested Citation: Fæhn, Taran (1997) : Non-Tariff Barriers - the Achilles' Heel of Trade Policy Analyses, Discussion Papers, No. 195, Statistics Norway, Research Department, Oslo

This Version is available at:

<https://hdl.handle.net/10419/192179>

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Taran Fæhn

Non-Tariff Barriers - the Achilles' Heel of Trade Policy Analyses

Abstract:

This study demonstrates the quantitative, as well as the qualitative, role of non-tariff barriers (NTBs). The Norwegian nominal tariff and non-tariff barriers are identified and thoroughly quantified. Computations of effective rates of protection (ERP) show that NTBs entirely dominate tariffs as direct contributors to primary factor income, which again is an important determinant in allocation of resources among industries. The indirect input-output effects play a decisive role. This points to the importance of estimating the nominal trade barrier inputs properly; when a biased estimate is spread throughout the input-output system, not even the direction of the miscalculation will be easy to predict. In order to demonstrate the qualitative role, NTBs are categorised into price-oriented and quantity-oriented, respectively. ERP computations illustrate that the conclusions of policy analyses rely critically on the qualitative interdependency between quantity-oriented NTBs and other measures.

Keywords: Non-tariff barriers, Trade policy, ERP computations.

JEL classification: C80, F13, L60, L70.

Acknowledgement: I am grateful to Erling Holmøy, Leo Andreas Grünfeld, and Torbjørn Hægeland for comments on earlier drafts and to Birger Strøm and Wenche Drzwi for technical assistance. Financial support have been provided by the Norwegian Ministry of Finance and the LOS-programme of the Norwegian Research Council.

Address: Taran Fæhn, Statistics Norway, Research Department,
P.O.Box 8131 Dep., N-0033 Oslo, Norway. E-mail: tfn@ssb.no

1. Introduction

During the last twenty years, international and regional negotiations on trade liberalisation have progressed rapidly in the field of tariff reductions. However, the inventiveness of governments in establishing ever less transparent protective systems has developed accordingly. The size of the problem is not easy to map. To quantify and aggregate Non-Tariff Barriers (NTBs) involves careful considerations with respect to the purpose of the study as well as to the specific industrial organisation of the market in focus. Consequently, to match official statistical databases with NTB analyses is difficult. This problem was clearly elucidated during the Uruguay round of GATT, where NTB reductions were of major concern. The negotiations were complicated by deficiency of comparable information on the state of the art on the implications of commitments. Comprehensive databases are established, like the UNCTAD Multi-Country Database on Trade Control Measures, which lists several forms of NTBs and reports their frequencies within commodity groups. These are essential data, but unfortunately not designed for mapping the quantitative effects of trade policy and policy reforms¹.

Lack of statistical sources has led many trade economists to restrict their analyses to effects of tariffs, only². Alternatively, NTBs are represented by count measures similar or allied to the UNCTAD ratios³ or by estimating their effects in rough terms⁴. An early work of Roningen and Yeats (1976) represents an impressive multi-country, multi-commodity study, where NTBs are quantified by their estimated price effects. Even in several studies of more recent date, their estimates directly or indirectly constitute the empirical basis for NTB quantification. The problem is that the figures, dated 1973, are considerably out of date.

¹ See Roningen and Yeats (1976), who also illustrate this point empirically.

² See e.g. Brown et al. (1995) on protection to manufacturing industries and Roland-Holst et al. (1995).

³ See e.g. Brown et al. (1995) on service NTBs, Greenaway and Hine (1993), and Leamer (1990).

⁴ See e.g. Antille et al. (1993) and Haaland and Tollefsen (1994).

This study quantifies and categorises trade barriers in terms of price effects. Two main groups are identified: *Price-oriented* measures are tariffs and other penetration costs, which represent fixed, extra costs of providing foreign products. *Quantity-oriented* NTBs restrict import to certain amounts. Note that high penetration costs, that *in practice* prohibit import, also fall into this category. Maybe more severe than to miss in *quantitative* terms, is the inclination to neglect the *qualitative* difference between these two categories. While the price effect of penetration costs will not be affected by market changes, the equivalent price effect of quantity-oriented NTBs will. It is common to completely neglect this distinction, by either modelling all NTBs as penetration costs, or by treating them all as quantity-oriented with endogenous price effects. For a commodity subject to both classes of NTBs, the import, production, and output price will be explained by the stronger, while the other will have no independent effect. Thus, stating the *binding* measure and its qualitative nature is essential for proper NTB treatment. Many studies do for example fail to classify redundantly high tariffs as quantity-oriented NTBs.

With great respect for the overwhelming task of treating the various protection measures properly in large, general multi-country, multi-sectoral models, my contribution is, by a much simpler model, to make some points on the implications of applying quantitatively and qualitatively simplifying assumptions on protection. I apply an input-output price model for the Norwegian economy, that computes Effective Rates of Protection (ERPs) for the years 1989, 1991 and 1994. An ERP analysis estimates the direct effects from trade policy reforms on the ability of industries to reward their primary factors in unit terms, see e.g. Corden (1985). The precedence of ERP computations to nominal protection measures is that they capture not only weighted producer price changes, but also simultaneous effects of protection on input prices. Under certain conditions, ERPs may serve as indicators of the allocative effects of protection.

One result of the computations is that ERPs and nominal protection measures deviate significantly. This indicates that nominal measures provide poor information on the allocative effects of protection. The fact that input-output multipliers seem so important, also strengthen the need for proper estimation of the nominal inputs; miscalculations will be spread throughout the input-output system in a complex manner. A second finding is that the importance of tariffs is inferior in the Norwegian trade policy system. Thus, omitting NTBs in trade policy studies is quite misleading. Thirdly, the analysis states that the interdependency between quantity-oriented NTBs and other trade policy measures has significant implications in terms of ERP. This interplay is just as relevant in more sophisticated, general equilibrium models and need to be handled properly.

2. The ERP model

Nominal tariff rates are imposed on commodities. To shed light on allocative effects of the tariff system, input-output relationships between commodities have to be accounted for. This was the idea behind the concept Effective Rate of Protection, ERP, first introduced by Barber (1955) and extensively applied and developed in the following two decades. In partial industry studies, the ERP measure in a consistent way accounts for simultaneous effects of the complete tariff structure on that industry. Under certain restricting assumptions, ERP analyses which cover all industries, may shed light on the qualitative structural implications of the tariff system⁵.

⁵ ERPs may serve as allocative indicators, as long as the economy is described by a Heckscher-Ohlin-Samuelson (HOS) model. A known result in HOS analyses is that increasing the relative value added price of an industry, induces expansion of value added in that industry at the expense of other industries (see e.g. Woodland (1982)). The ranking of industry-specific ERPs indicates the qualitative structural implications of the tariff system. See Corden (1985), who also summarises the main limitations of ERP computations.

The ERP for industry j , is defined by

$$(1) \quad ERP_j = \frac{y_j^I - y_j^O}{y_j^O}$$

i.e. the relative change in y_j , *the effective output price (or value added per unit production)*⁶ in industry j , from moving from state 1, with tariffs present, to state 0, with tariffs absent (see Corden (1985)). Consider an industry with tradable outputs and inputs in fixed proportions. The effective output price in each state is determined by:

$$(2) \quad y_j = \sum_i b_{ij}^O P_i - \sum_i b_{ij}^I P_i$$

where P_i is the domestic price of commodity i and b_{ij}^I and b_{ij}^O are fixed input- and output coefficients of commodity i in industry j . By assuming perfectly competitive markets, arbitrage implies that P_i equals the lowest possible price of its foreign substitute included freight and insurance costs, P_i^w (in the following referred to as the *reference price*), corrected by possible nominal tariffs, t_i (in ad valorem terms) :

$$(3) \quad P_i = P_i^w (1 + t_i)$$

In state 0, t_i is equal to zero. Equation (1), (2) and (3) define ERP for industry j in terms of given tariff rates, reference prices and input-/output-coefficients.

While the ERP concept of the early literature merely included ordinary tariffs, this analysis is extended to embrace NTBs, as well. Besides being quantitatively prominent, the qualitative effects of NTBs on output prices and unit value added can be quite different from those of tariffs. To illuminate this, I distinguish between two classes of NTBs: *Price-oriented* and *quantity-oriented*.

⁶ Actually, the relevant relative change is in value added per unit of primary factor input. However, constant input coefficients are assumed, and the two concepts are thus identical.

Price-oriented measures represent a fixed penetration cost mark-up on the reference price. Tariffs are familiar examples. Other non-tariff examples are technical specifications, which rise production costs in the exporting country, or home preferences in government procurement, formulated as a fixed acceptable price gap between domestic and foreign bids. When we label the protection rate in ad valorem terms of such non-tariff penetration costs (or the penetration cost rate) t_j^P , we have domestic prices determined by:

$$(4) \quad P_i = P_i^w (1 + t_i) (1 + t_i^P), \quad i \in \mathbf{T}$$

\mathbf{T} includes all tradables freely traded or protected by tariffs or other price-oriented measures. It also includes exportables subject to export subsidies or other export promoting measures, that creates analogous gaps between producer prices and world market prices. Actually, under the assumption of perfect competition, existence of both import and export of the same good cannot represent an equilibrium, unless the policy instruments towards export flows and import flows are applied simultaneously and with the same strength.

Quantity-oriented barriers restrict the quantity of imports to a binding maximum amount or completely prohibit imports. Quotas and import prohibitions are examples; so are measures that in practice prohibit imports, such as redundantly high penetration costs. The rate of protection of such barriers may be measured by their tariff equivalent in ad valorem terms, t_i^Q , which is defined as the relative difference between the producer price and the import price inclusive of tariffs and non-tariff penetration costs:

$$(5a) \quad t_i^Q = \frac{P_i}{P_i^w (1 + t_i) (1 + t_i^P)} - 1, \quad i \in \mathbf{Q}$$

or analogously:

$$(5b) \quad P_i = P_i^w (1 + t_i) (1 + t_i^P) (1 + t_i^Q), \quad i \in \mathbf{Q}$$

where \mathbf{Q} is the set of (potentially) tradable commodities protected by quantity-oriented barriers.

The essential difference between price-oriented and quantity-oriented barriers relates to their output price formation. While exogenous variables determine output prices for all $i \in T$ in equation (4), equivalent tariff rates for quantity-oriented barriers, defined in equation (5), are endogenous. As long as a commodity is protected by the latter, e.g. a given import quota, its price will be determined by domestic marginal costs and consumers marginal willingness to pay. Thus, for given t_i and t_i^P , the equivalent tariff rate varies in response to shifts in demand and supply curves. Figure 1a illustrates a shift in the supply curve from S_i^0 to S_i^1 under a binding import quota, \bar{I}_i . The output price falls from P_i^0 to P_i^1 as t_i^Q adjusts to the shift. Quite similarly, t_i^Q would adjust to partial changes in t_i and t_i^P , and the result would be unaltered output price. An elimination of the tariff from a rate of t_i^0 , is shown in Figure 1b. The effect of the quota rises from t_i^{Q0} to t_i^{Q1} , and the price level is maintained. However, if penetration costs are shifted sufficiently upwards, they may come to dominate and turn an import quota impotent, as illustrated by the shift in tariffs to t_i^2 in Figure 1b. Then, exogenous penetration costs come to determine the output price.

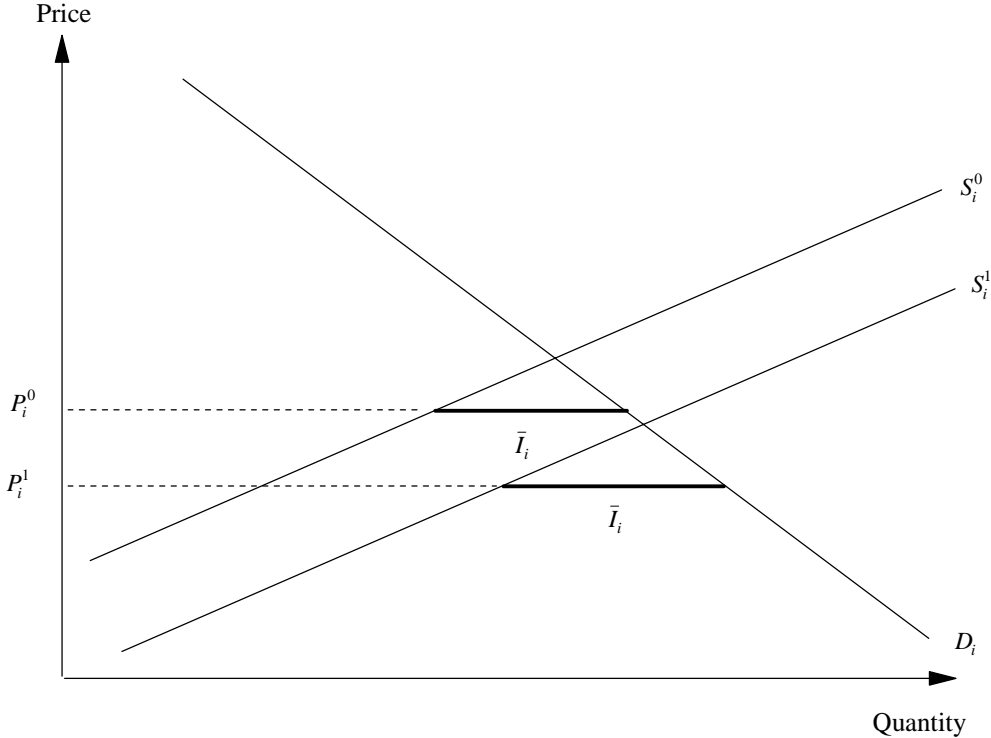
Imperfect competition can be regarded as a third kind of barrier. Several aspects of non-competitive market structures is incompatible with the ERP model⁷. However, market power that results from political shelter may be consistently included. By interpreting insufficient regulation of the monopoly power as protection policies, mark-ups may be relevantly included in the protection rates. Opening the markets will assumingly stimulate competition and erode mark-ups⁸.

⁷ See Fæhn and Grünfeld (1997).

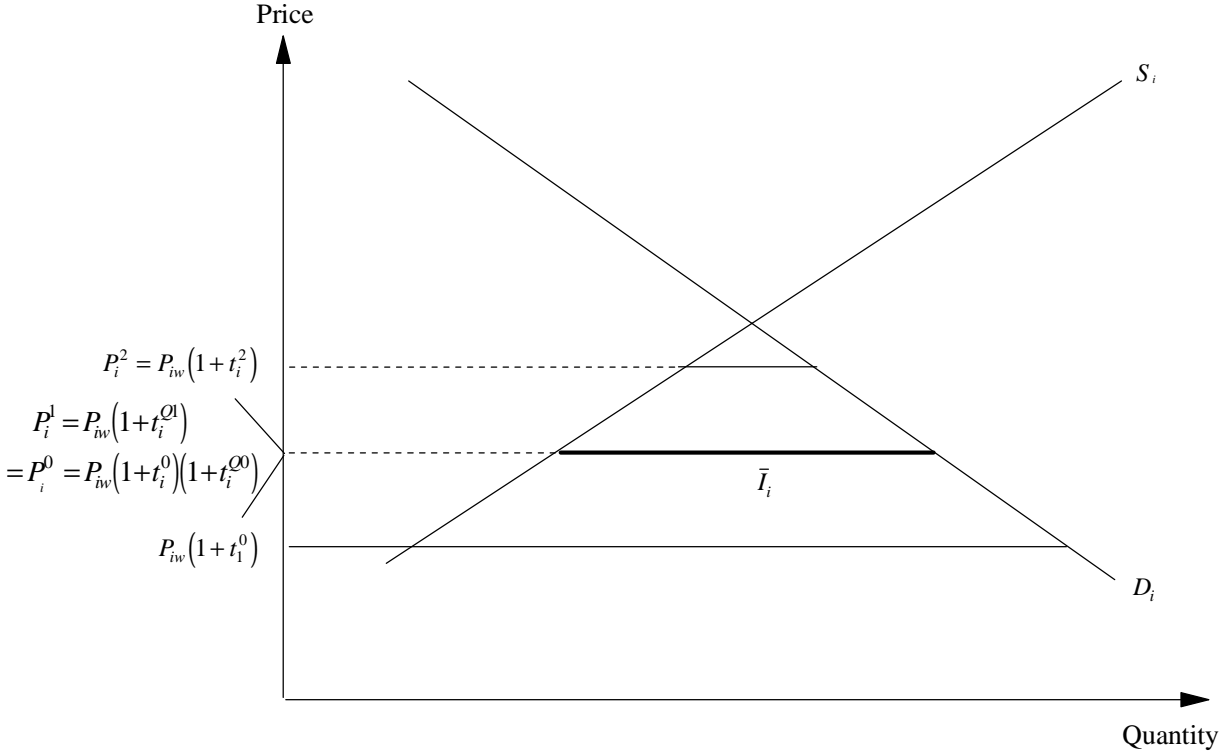
⁸ Natural monopolies may be regarded as natural barriers to trade, rather than protection.

Figure 1. Responses in the equivalent tariff rate to various shifts

1A.



1B.



To see the implications of prohibitive NTBs on value added formation and thus ERPs, the model used must be presented in more detail⁹. The three years in focus, 1989, 1991, and 1994, are represented by respective input-output matrixes for the Norwegian economy based on the National Accounts (NA)¹⁰. The production structure is of a Leontief type with fixed output- and input coefficients and constant returns to scale. Competition is perfect between producers of homogenous products. Most industries produce multiple outputs, including one (or few) *main product(s)*. If the main product of an industry belongs to the set of tradable goods, T , the industry is classified as *exposed to foreign competition*. Main products in the set Q are produced in so-called *politically sheltered* industries. A third class of industries are *naturally sheltered*, implying that their main products are non-tradables grouped in the set N . By accounting for all sets of commodities, relation (2), using (4) and (5), becomes:

$$(6) \quad y_j = \sum_{i \in T} b_{ij}^O P_i^w (1+t_i) (1+t_i^P) + \sum_{i \in Q} b_{ij}^O P_i^w (1+t_i) (1+t_i^P) (1+t_i^Q) + \sum_{i \in N} b_{ij}^O P_i^w (1+t_i) (1+t_i^P) (1+t_i^Q) - \sum_{i \in T} b_{ij}^I P_i^w (1+t_i) (1+t_i^P) + \sum_{i \in Q} b_{ij}^I P_i^w (1+t_i) (1+t_i^P) (1+t_i^Q) + \sum_{i \in N} b_{ij}^I P_i^w (1+t_i) (1+t_i^P) (1+t_i^Q)$$

For the main producer of a commodity $t \in T$, all trade policy changes will fully affect unit value added, y_j and thereby ERP_j . For the main producer of a commodity $q \in Q$ changes in protection rates will be counteracted by changes in t_q^Q , leaving y_j unaltered. This corresponds to the reaction of P_n for the main producer of a commodity $n \in N$, which will also exactly neutralise the effects on y_j . For politically or naturally sheltered industries ERPs will in other words equal zero, by definition. This may be regarded as a shortcoming of the ERP concept, which was originally designed for small, open economies with no sheltered industries. The ERPs calculated in our extended model is to be understood as *input-output corrected* ERPs, where effective protection of politically or naturally sheltered industries is accounted for through higher input prices in the exposed industries.

⁹ See Holmøy et al. (1993) and Fæhn et al. (1995) for more comprehensive presentations of the model (in Norwegian).

¹⁰ It is worth noting that comparability between 1994 and the two earlier years is somewhat reduced by revisions in the 1994 NA base. Also, the 1994 model aggregation is somewhat finer than in earlier versions.

3. Methods for estimating effects of protection

3.1. Alternative approaches

The price effects of protection will be reflected in the (sometimes hypothetical) import prices, which due to arbitrage will equal the price obtained by domestic producers. The most common and general approach to estimating protection, is to measure the price gap between free trade prices and prices affected by protection, and assign the difference to protection. The method measures the entire protection rate of a product, but cannot identify the policy measures which create this gap.

Interpreting the relative price gap as a protection rate should be done with care, as other features of the data or the markets in question may have affected the prices. Below, I will mention some general methodological problems that have been of special importance to this study.

3.1.1. Choice of commodity specification

First, the commodities under observation must be representative for the focused commodity aggregate with respect to trade policies. Second, the domestic and the reference product must be homogenous from the view of consumers. In practice, this is a great problem even at the finest statistical level. If the price of an import aggregate is used as reference, while only some of the items included are subject to protection, the composition of imports tends to be biased towards unprotected commodities, while the corresponding production aggregate will be biased towards the protected. The prices thus cannot be compared. A special heterogeneity problem arises if consumers have preferences related to the *origin* of the products, *per se*. The fact that exports often require a higher degree of processing (like packing etc.) than do deliveries to domestic markets, is another inherent problem of heterogeneity.

3.1.2. Choice of domestic price

As the purpose of this study is to identify the contribution of protection to unit value added, the producer price will be the most relevant¹¹. In case of imperfect competition, mark-ups will be included. I have argued that these may be relevant to include. Producer prices are not observable in the markets, thus difficult to identify. It may be necessary to deduce the producer price from observed prices after some distribution or processing. We then need information about excise taxes, value added and margins in the distribution and processing activities.

3.1.3. Choice of reference price

For importables, it is common to use the import c.i.f. price as reference. In many cases this price will overestimate the true reference price:

- If trade policies discriminate with respect to place of origin, imports will tend to come from countries with the lowest import price *inclusive* of the effect of import barriers, while the reference price is defined as the lowest import price *exclusive* of trade barriers. Normally, the import price will thus overestimate the true reference price. If imports from the cheapest country is totally excluded from the market, it may be difficult to identify from where free trade imports would originate. Due to problems of heterogeneity, it is not obvious that imports from countries with the highest trade barriers are to represent the reference. I will return to this problem in the discussion of aggregation issues below.
- Exporters may capture parts of the difference between the producer and the reference price, rendering the import c.i.f. price higher than the reference price. The occasion may be market power of exporters (often present in case of voluntary export restraints) or import barriers that represent real costs to the exporter (as technical barriers).

¹¹ For an input, the purchase price net of domestic taxes, which coincides with the producer price in the supplying industry, will be the appropriate price.

If the world markets are characterised by dumping (as e.g. markets for agricultural products), one may also argue that import c.i.f. prices *underestimate* the real reference price. When studying the Norwegian trade regime in isolation and in a descriptive manner, imports to cover the relatively small Norwegian market would probably be available at dumping prices. Therefore, they are regarded as relevant reference prices in this study.

If the import c.i.f. price is not representative or not available at all, some of the following alternative reference proxies may be applied:

- Lowest observed producer price in other countries (when adjusted by transport costs).
- The export f.o.b. price added with transport costs from a relevant supply country.
- The import c.i.f./export f.o.b. price of a neighbouring country.

Also, various *specific* methods are developed, in order to measure the isolated effect of particular protection measures. Laird and Yeats (1990) present a broad class of methods applied in studies of specific protection instruments. The advantage is that one may identify the isolated effect of the measure. Interdependency problems may, however, forbid to add up the estimates for each single import barrier, as only the *binding* determines the level of protection. Further, if price-oriented import barriers exceed the upper limit defined by domestic market conditions, the redundant part will only have *potential* protective force in case of changed market conditions.

3.2. The approaches of this study

For the two policy measures *tariffs* and *Voluntary Export Restraints (VERs)*, specific measurement methods are applied (see Section 4). This enables us to identify their partial effect. In case of VERs, the price gap method using import c.i.f. prices would most likely underestimate the equivalent tariff rate. First, VERs are applied to low-cost imports, only. The main share of import thus originates from

high-cost countries, which raises the average import price. Further, even providing country-specific import prices holds a problem, as quota rents are likely to be accrued by exporters.

For all other commodities sheltered by NTBs, the price gap method is applied, primarily on the basis of domestic producer prices and import c.i.f. (or occasionally, export f.o.b.) prices. In absence of relevant import c.i.f. data, foreign export prices or producer prices adjusted by transportation costs, form the reference prices. Unless strongly affected by protection, EU prices are chosen, to ensure a satisfactory degree of homogeneity. Where only international retail prices are available, differences in sales taxes, value added and margins are accounted for. To support NTBs as the plausible explanation to the gaps, information on industry structure and trade policy is studied thoroughly. The rates of NTB protection, t^Q and t^P , are derived by excluding the tariff rates from the total ad valorem price gap.

Collection of data is, when necessary, made on the finest Norwegian NA level (about 1500 commodity groups). If price data are available only for other years than those in focus, prices are developed by producer price indexes and import c.i.f. price indexes. Aggregates consisting of penetration cost protected as well as quantitatively protected commodities, have been split into two sub-aggregates, due to the different determination of prices. For each industry whose main product is subject to heterogeneous trade policy, two equations similar to (6) are introduced, one for each branch. This is possible, as information on output and trade policy is specified at the finest NA level. The input structures are, however, not mapped at this detailed level, and are as an approximation, assumed identical for the two sub-branches¹².

3.3. Aggregation methods

Calculation of protection rates requires aggregation along two dimensions; *countries of origin* and *products*. Aggregation problems with respect to place of origin are only topical if protection policies

¹² A detailed description of this procedure (in Norwegian) is available in Fæhn et al. (1995), Appendix 2.

towards exporters differ. This is the case for Norwegian tariff rates, which are zero for almost all manufactures (except from processed food) imported from EFTA and EU, as well as from several developing countries¹³, while remaining imports are subject to the Most Favoured Nation (MFN) rates of GATT. In addition, VERs on several textiles and clothes were undertaken exclusively by several low-cost producing countries in Asia and Eastern Europe. Current import patterns do partly reflect the preference structures of consumers, but they are also affected by these preferential policies. Ideally, weighting with the countries' import shares in the hypothetical case of no import barriers, would reflect the relevant rates. If high-cost countries still kept a positive import share in the hypothetical case of removed trade barriers, this would purely reflect preferences. The current import-weighted rate on the one side and the unconcessional rate on the other, may be regarded as the two extremes of a range covering the ideal rate. I have chosen the import-weighted average in this study, motivated by the fact that quality differences play an essential role in explaining imports of highly processed industrial products. Estimates for *Textiles and clothes* are particularly vulnerable to the choice of weights, as discrimination is strongly prevalent. Thus, here the ideal weights are approached, by using a hypothetical weighting scheme representing absence of quotas, but maintenance of tariffs (Melchior (1993)). To indicate the theoretical range, the unconcessional MFN tariff rates and VER equivalent tariff rates are also reported (in Table 2).

Aggregation of protection rates along single products has been comprehensively discussed in the literature. The bias of import weights is pointed out by for instance Johnson (1969). Basevi (1971) suggests that weights should generally be chosen according to the focus of the study. In the present, the question is how protection alter unit factor income in a sector, *both* through raising producer prices *and* through raising costs of intermediates. Production and input shares, respectively, are thus appropriate.

¹³ They are given concessional conditions through the General System of Preferences. Important exceptions applies to several food articles, textiles and clothes.

The chosen weights are:

$$(7) \quad \alpha_i = \frac{X_m P_m^W}{\sum_{m=1}^M X_m P_m^W}, \quad i \in T \cup Q$$

where X_m is quantity of one of the M single products in the production or input aggregate, i , in the relevant year. The production and input values are evaluated in reference prices, so that the price component is not affected by trade barriers, to obtain the same reference point as in the definition of protection rates (see equation (5a)).

4. Quantification

4.1. Tariff barriers

Ad valorem tariff rates are computed by dividing tariff revenues by values of imports on the finest NA level. This method excludes tariff rates that are prohibitive, which are by definition quantity-oriented and captured in the equivalent tariff rates.

In Table 1, average nominal tariff rates on outputs are reported for the years 1989, 1991 and 1994. The most striking data feature is that tariffs are of little significance in the Norwegian trade policy system. Only *Textiles and clothes*, *Processed food* and *Beverages and tobacco* had rates exceeding 1 percent. For *Textiles and clothes*, one might suspect the weighting scheme to produce underestimates, due to highly prevalent discriminatory tariff policy¹⁴. The upper limit, represented by the MFN rates in Table 2, is about 4-5 times higher. Evidence indicates increased substitutability between low-cost and Western products over the years, pulling the true rate closer to the MFN rates (Melchior (1994)). There is a decreasing tendency in the tariff rates from 1991 to 1994. With the Treaty on the European Economic Area (EEA) of 1994, Norway joined the European Common Market. The treaty only

¹⁴ The weights are adjusted for estimated effects of VERs.

reduced tariff rates on some agricultural and processed food products. Most of the decreasing tendency is due to weight shifts, *inter alia* explained by liberalised rules of origin in the EEA. Only for *Textiles and clothes*, the average rate increased, as weights shifted towards high tariffs. Stronger substitutability and increased supply capacity in developing countries, especially China, support this development.

Table 1. Weighted average tariff rates (%)

	1989	1991	1994
Agricultural products	0.2	0.4	0.2
Forestry products	0.1	0.0	0.0
Fish	0.0	0.0	0.0
Processed food	2.9	3.0	1.9
Beverages and tobacco	1.6	2.8	2.0
Textiles and clothes	2.7	2.7	3.1
Wood and wood products	0.1	0.1	0.0
Chemical and mineral products	0.3	0.4	0.1
Printing and publishing products	0.0	0.0	0.0
Pulp and paper articles	0.0	0.0	0.0
Industrial chemicals	0.4	0.4	0.2
Petrol	0.0	0.0	0.0
Fuel oils	0.0	0.0	0.0
Metals	0.1	0.1	0.1
Machinery and hardware	0.7	0.7	0.3
Repair	0.0	0.0	0.0
Ships	0.0	0.0	0.0
Oil platforms	0.0	0.0	0.0
Ocean transport and petroleum explor.	0.0	0.0	0.0
Raw oil	0.0	0.0	0.0
Natural gas	0.0	0.0	0.0
Pipe transport	0.0	0.0	0.0

4.2. Non-Tariff Barriers

For each output aggregate where non-tariff trade policy arrangements exist, the data and the resulting estimates are presented in detail below. Table 3 sums up the nominal non-tariff protection estimates for the outputs and their qualitative character (t^Q or t^P). For aggregates including goods with quantity-

oriented import restrictions, also the *coverage* of the average t^Q is reported, i.e. the percentage of the price¹⁵ influenced by quantity measures.

4.2.1. Agricultural products

The aggregate encompasses non-processed farm products. In all the years included, quantitative import restrictions and strict quality standards accommodated administered producer prices, stipulated in yearly negotiations between the government and the farmer organisations. Coverage is practically 100%. Farm products were little affected by the EEA treaty of 1994. The homogeneity of products, as well as the degree of industry regulation, makes data easily available. The basis for the estimates for *grain*, *meat* and *eggs* are the data constituting the *price support* component of the OECD Producer Subsidy Equivalents (PSE)¹⁶. For *milk*, the PSE figures would be irrelevant as agricultural protection. As reference, OECD uses the New Zealand farm gate price inclusive of transport costs for processed milk powder, which in my context would represent a confusion of the trade policy towards *Agriculture* and *Processing of food*. Raw milk produced in *Agriculture* is subject to considerable natural barriers to trade. In the free trade case, imports from Denmark would be a feasible substitute to domestic raw milk, and the Danish farm gate prices¹⁷ included tanker transport costs constitute the chosen reference price. Horticultural products are not represented in the PSE material. Here, producer prices are compared to import c.i.f. prices, or occasionally, adjusted foreign retail prices¹⁸. The calculations yield a somewhat declining t^Q over the years.

¹⁵ Prices are here weighted by shares of production value at reference prices.

¹⁶ See OECD (1990 and 1995).

¹⁷ See EUROSTAT (1994).

¹⁸ Producer prices are reported in Budget Committee for Agriculture (1990, 1992 and 1995)). Import c.i.f. prices are drawn from Statistics Norway (*monthly*) and Nersten et al. (1992), while foreign retail prices are found in Borg and Nersten (1993) and Statistics Norway (1989a).

4.2.2. Processed food

Motivated by quite different trade policy regimes, the food products are split into three model aggregates: *Fish products*, *Meat and dairy products*, and *Other food products*¹⁹. No trade policy is directed towards *Fish products*, while the remaining are protected by several arrangements, rationalised by the aim of sheltering agriculture. The very organisation of the *Meat and dairy production*, in farmer co-operatives, reflects this. Yearly agreements between the farmers and the industry are designed to ensure transfer of profits to the agricultural sector. This is made possible by a highly protective import quota system and strict phytosanitary standards. Except for a widening of the import quotas for cheese, the EEA treaty had minor effect on the import regime of *Meat and dairy products*. *Other food products* include, *inter alia*, grain, which is produced and traded by an intentionally non-profit state monopoly. It has purchase duty on domestic grain to regulated prices; fodder prices are also regulated, while flour prices are set by the monopoly. In effect, these arrangements were not touched by the establishment of the EEA. The rest of *Other food products* are mainly highly processed food from private enterprises. Tariffs or variable import levies, warranted by the so-called *Price compensation arrangements (PCA)* with EU and other EFTA countries, restrict imports. The intention of *PCA* is to compensate the industry for the extra costs related to their exclusion from the world market for agricultural inputs. A symmetric refunding arrangement applies to exportables. The EEA agreement intended to reform *PCA*, but the negotiations reached a deadlock and the old system still remained in 1994. We let the protection rate for *Other food products* endogenously respond to cost variations stemming from input price changes on *Agricultural products* and *Meat and dairy products*, in accordance with the intention of *PCA*. All other cost or income changes are assumed to leave the protection rate unaltered, as for an exogenous t^P . Thus, the coverage of prohibitive barriers in *Processed food* is thus endogenous, with a potential of 75%, if all protection of *Other food products* is included. The NTB protection rates for *Processed food* in Table 3 veil a

¹⁹ This applies to the 1994 version, only.

variance from zero rates for *Fish products* to 60-70% for *Meat and dairy products*, while protection of *Other food products* amounts to around average²⁰.

4.2.3. Beverages and tobacco

These products were first of all sheltered by technical import barriers, as well as an advertising prohibition, favouring already existing market participants. The NTBs are interpreted as penetration costs. Import, production and sale of wine and spirits was state monopolised. This arrangement is in conflict with the EEA rules, but were not altered until January 1996. However, several harmonised production and packing standards came into force from 1994. Comparing retail prices exclusive of taxes is here precarious, due to presumably large variations in mark-ups and unit value added. Rather, data for *beverages* are drawn from the Norwegian trade and industry statistics²¹. Problems of heterogeneity are present in the material. Export prices were chosen if the composition of exports presumably corresponded better to the composition of production. In case of *tobacco* trade and industry data were scarce, and we have rather undertaken retail price comparisons²². The estimated penetration cost rate gradually declined through the period.

4.2.4. Textiles and clothes

Imports of several low cost items were restricted by VER quotas²³. The quotas have gradually been widened or eliminated from 1990 to 1994. Their equivalent tariff rates are assumed endogenous in the simulations, which implies that they never touch the upper limit defined by the price of freely imported substitutes. Coverage of t^Q fell from 28% and 26% in the first two years, to 22% in 1994. Estimates are based on studies by Melchior (1993 and 1994). He uses an Armington model with three differentiated products: domestic, imports from low-cost countries and free imports. The idea is that

²⁰ Price data originate from several domestic and international sources (Statistics Norway (1989a, 1989b, 1990 and *monthly*), Nersten et al. (1992), Borg and Nersten (1993), ILO(1992) and EUROSTAT (1994)).

²¹ See Statistics Norway (1989a, 1990 and *monthly*).

²² See Statistics Norway (1989a).

²³ Norway participated in the Multi-Fibre Arrangement of GATT.

in case of quotas, preferences for heterogeneity allow prices on low cost imports to increase relative to the other imperfect substitutes. The quota rent is calculated from observations of the low cost and free imports' market shares for the concerned items in periods with export quotas, as well as the respective hypothetical shares in case of no quotas. The latter are induced from observations on market shares in periods without quota restrictions, adjusted for other observed changes in supply and demand. The estimates are supported by observed price changes in a period where the Norwegian system changed from import- to export quotas, as well as by quota prices in Hong Kong. Our model with homogenous products cannot explain the factual variation in prices among products of different origin, while Melchior's approach accounts for this. His equivalent tariff rates on the remaining regulated items amount to 22% in 1990 and 38% in 1994. The rise is largely explained by increased export capacity in Asian countries. As coverage has decreased, the weighted estimates in Table 3 blur this development. Average t^Q s are low. The upper estimates, giving the low-cost countries all weight, are 3-6 times higher, as reported in Table 2.

Table 2. Protection rates against imports of *Textiles and clothes* from low-cost countries

Year	MFN tariff rates (%)	Quota rents (%)	Total protection rate (%)
1989	13.0	6.4	20.8
1991	13.2	3.3	17.1
1994	14.1	6.3	21.4

4.2.5. Chemical and mineral products

The equivalent tariff rates and coverage for this aggregate, reported in Table 3, arise from protected *pharmaceutical products* and *cement products*. *Pharmaceutical products* were protected by technical barriers, as well as import regulation, intended to limit the number of substitutable products. The arrangement functioned as a quantitative restriction. The system was gradually liberalised from 1991, and in 1994 the import regulation was removed. Left was still a detailed procedure of control and approval, which had the character of technical price-oriented barriers. Estimated rates are based on a study by Norman (1991), who estimated an equivalent tariff of 42% for 1985. Monopolistic

competition and differentiated products were assumed and the result relies heavily on the price and scale elasticities assumed. Some observations, which indicate a price fall of up to 40% from 1990 to 1994 for items subject to substantial liberalisation after 1991, support Norman's estimate. We have index regulated Norman's estimate, attaining estimates of 25%, 20% and 16%, respectively for the years 1989, 1991 and 1994. For *cement products* there existed no formal barriers to trade. However, there are clear indications of trade having been prohibited by collusive behaviour and geographical market sharing between the major European producers. We interpret such imperfectly competitive behaviour as a consequence of implicit trade policy through insufficient competition policies regulating the domestic cement monopoly. Market sharing works much like quantitative trade restrictions. Quantification of the price gap is based on Sjørgard (1992). In spite of scarce import, he registered a significant increase from Sweden²⁴ in the Norwegian boom period from 1986 to 1988. Prices were 50% lower than Norwegian producer prices. As competition policy is probably not capable of persistently and completely eliminating the strategic barriers raised by the industry, a somewhat lower estimate of 80% is implemented for 1989 and 1991. From 1994 on, the competition rules of EU apply to the entire EEA. Article 53 in the EEA treaty explicitly prohibits collusive market behaviour. In 1994/95 the major cement producers of Europe, including the Norwegian, were substantially fined for infringement of this article. As control and sanction systems appeared quite efficient, the remaining price gaps are not interpreted to result from political action (or rather lack of action), and the NTBs are regarded as eliminated from 1994.

4.2.6. Industrial chemicals

Within this commodity group, *fertilisers* were the only products found to be protected. In presence of import restricting technical standards, domestic markets were strongly dominated by two suppliers. Gabrielsen (1989) explains the Norwegian market as a duopoly with tacit market sharing, working to quantitatively control imports. Governmental price regulations existed, but according to Gabrielsen,

²⁴ Imports from more remote countries are partly prohibited by transport costs.

duopoly power was still exploited in the domestic market. He estimates an equivalent tariff rate of 16% in 1988, based on the difference between domestic and German market prices adjusted for quality differences and transport costs. We have index-regulated this estimate to 1989 and 1991. From 1994, the EEA treaty imposes harmonisation of technical specifications on fertilisers, as well as abolishment of international price collusion. In absence of technical barriers, prices tended to fall in 1994, indicating procompetitive effects from the liberalisation. In light of the apparent efficiency of the surveillance authorities, remaining price gaps are not attributed to persistent lack of competition policy, and the equivalent tariff rates are set to zero.

Table 3. Effect, type and coverage of NTBs

Product Aggregate	1989		1991		1994	
	Effect	type (coverage)	Effect	type (coverage)	Effect	type (coverage)
Agricultural products	69	Q (100%)	71	Q (100%)	60	Q (100%)
Forestry products	-	-	-	-	-	-
Fish	-	-	-	-	-	-
Processed food	44	Q (100%)	49	Q (100%)	41	Q (75%)*)
Beverages and tobacco	35	P	30	P	25	P
Textiles and clothes	2	Q (26%)	1	Q (28%)	1	Q (22%)
Wood and wood products	-	-	-	-	-	-
Chemical and mineral products	8	Q (15%)	7	Q (13%)	1	P
Printing and publishing products	-	-	-	-	-	-
Pulp and paper articles	-	-	-	-	-	-
Industrial chemicals	3	Q (20%)	3	Q (20%)	-	-
Petrol	-	-	-	-	-	-
Fuel oils	-	-	-	-	-	-
Metals	-	-	-	-	-	-
Machinery and hardware	2	P	2	P	-	-
Repair	-	-	-	-	-	-
Ships	-	-	-	-	-	-
Oil platforms	3	P	3	P	-	-

«-» means not existing, «Q» means quantity-oriented, «P» means price-oriented.

*) Coverage is endogenous, with a maximum of 75%.

4.2.7. Hardware and machinery

Several electrical items and machines were subject to detailed technical specifications. In addition, domestically produced equipment has been favoured in procurements by central and local service providers of e.g. telecommunication, electrical power, railroad and highways. Before the establishment of EEA, domestic authorities specified the standards and controlled products. Within EEA, directives are now harmonised and approval in one country is sufficient for marketing within the whole area. Further, the EEA treaty requires formal bid-challenge procedures for large procurements and forbids discrimination. The estimates for 1989 and 1991 are price index regulated figures from Norman and Orvedal (1990), and lay between 10% and 50% for the various items. The calibration method presented by Smith and Venables (1988) is used in partial models with differentiated products and economies of scale. Observed higher market shares in domestic markets than in foreign markets are partly assigned to protection. In 1994, technical harmonisation and non-discriminatory procurement procedures have effectively abolished political trade barriers.

4.2.8. Oil platforms

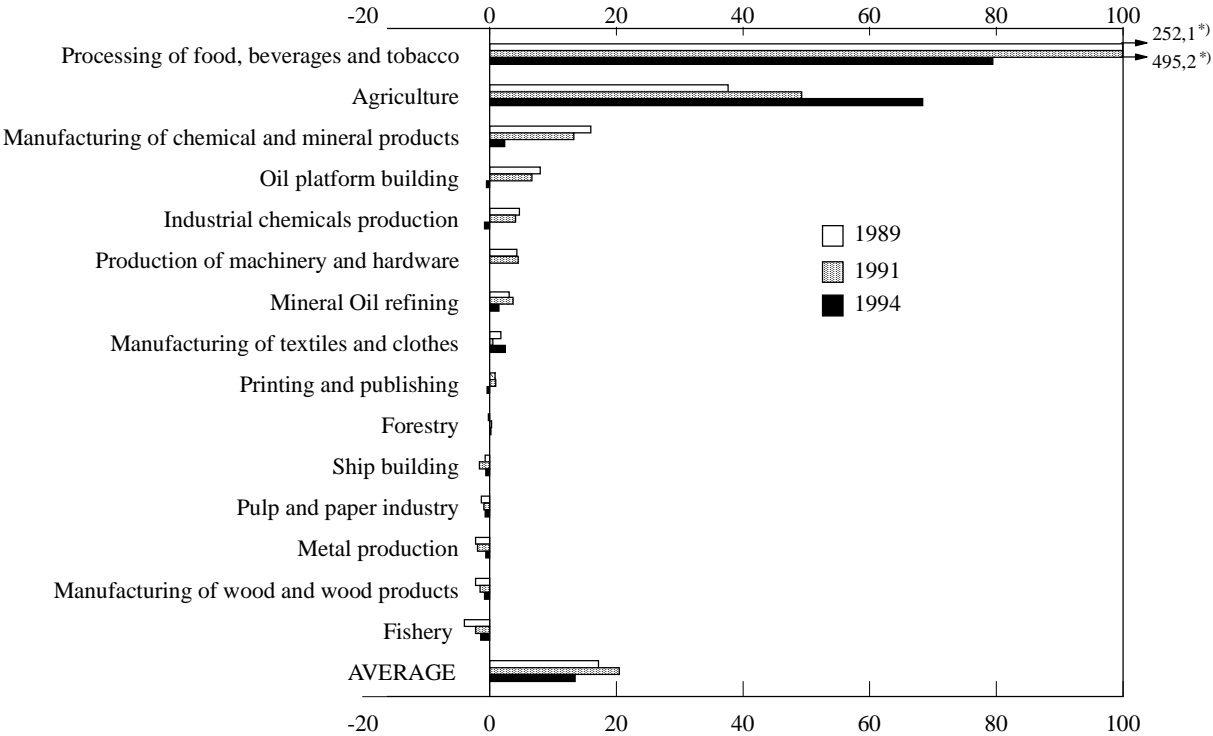
Several reports indicate discriminatory procurement policies from the large oil producing enterprises, who are aware of their reliance on concessions and goodwill from the Norwegian government. We have based our quantification on a study by Asbjørn Habberstad A/S (1985), updated by the Ministry of Oil and Energy (1989). Comparable average prices from domestic and foreign bidders are presented. Norwegian prices were found to exceed comparable foreign prices by 11% on average from 1986 to April 1989. As domestic contractors were nevertheless preferred in almost all the projects, the accepted tender price differences may be interpreted as penetration cost rates. No evidence suggests altered practice by 1991. After 1994, the possibilities for such discriminatory practices have disappeared, leaving t^P equal to zero.

5. Effective Rates of Protection

5.1. Effective vs. nominal protection rates

Figure 2 shows the time development of total ERP levels for all industries exposed to foreign competition. The ERPs reported are percentage changes in the effective industry prices from introducing the factual trade barriers into a reference state with free trade prices²⁵. Figure 2 indicates a strong allocative bias of the present trade policy in favour of *Processing of food, beverages and tobacco* and *Agriculture*, both industries with ERPs above average²⁶. This picture remains valid for all periods, though ERP differences are less marked in 1994, much due to the EEA treaty.

Figure 2. ERPs for exposed industries in 1989, 1991 and 1994²⁷



^{*)} Due to low included reference levels, ERPs for Processing of food, beverages and tobacco exceed the upper bound of the scale in 1989 and 1991.

²⁵ For industries with large absolute effects of protection on value added, the induced reference level (corrected for protection) will be low. This contributes to high relative changes and ERPs.

²⁶ The average ERPs are weighted with factor income valued by reference prices.

²⁷ The industries are ranked according to their ERPs in 1989.

Comparing the development of ERPs with the time movements in nominal protection rates in Table 1 and 3, shows that nominal measures are poor indicators on allocative effects. The figures reveal a rather poor correlation, especially for the industries producing food, beverages, tobacco, textiles and clothes. The precedence of ERP computations is that they capture not only producer price changes (weighted with each product's respective weight in the production), but also effects from changed protection of inputs as well as changes in value added shares over time. An increase in the reference value added share (i.e. corrected for protection) has the isolated effect of reducing ERP. The cases of *Agriculture* and *Processing of food, beverages and tobacco* may serve as illustrative examples: In spite of a fall in nominal protection rates for *Agricultural products* during the period, ERPs for *Agriculture* escalated sharply. The explanation is primarily that influence from protection of inputs is weaker than in previous years. In addition, a stronger output share of *Agricultural products* in 1994 more than outweighs the lower protection rate, resulting in a *stronger* effect on the industry price index than in previous years (See Table 4). Also for *Processed food, beverages and tobacco* the nominal rates fell (by a weighted average of 10%) during the period, but the fall in ERP was much more dramatic, amounting to almost 70%. Behind lies an increased disadvantage of protected inputs. This is combined with an increase in the reference value added share of 130% over the period, mainly explained by a narrowing of the gap between the observed and the corrected value added share as protection falls.

An important observation is thus that a non-negative direct product price support for all exposed industries is encountered by indirect effects of protection through input costs. For several industries these cost disadvantages dominate, rendering ERPs negative, as can be seen for industries like *Fisheries*, *Metal production* and *Manufacturing of wood products* in Table 4. Behind the figures for 1989 and 1991, when protection was markedly negative, we find protection of important tradable inputs. All the three industries consumed NTB-protected *Machinery and hardware*, and in the latter, protected textiles in furniture production were also important. Interestingly, though, a look behind the

table reveals that the strongest negative protection impulse comes from increased prices on *non-tradable* inputs produced in *Other private servicing* and *Construction*. These naturally sheltered industries were adversely affected by protection of tradable inputs, which increased their costs and

Table 4. Percentage change in prices from all trade barriers

Exposed industries	1989			1991			1994		
	Producer price	Input price	ERP	Producer price	Input price	ERP	Producer price	Input price	ERP
Agriculture	45.6	30.5	37.7	49.9	30.7	49.3	59.7	16.6	68.4
Forestry	0.2	2.4	-0.2	0.1	-0.3	0.3	0.0	-0.9	0.2
Fishery	0.0	2.0	-4.0	0.0	1.0	-2.2	-1.0	1.4	-1.4
Processing of food, beverages and tobacco	44.3	26.1	252.1	48.4	27.9	495.2	39.7	29.7	79.5
Manufacturing of textiles and clothes	4.5	5.8	1.8	3.5	5.5	0.5	3.6	4.3	2.5
Manufacturing of wood and wood products	0.2	1.4	-2.2	0.1	1.1	-1.9	0.1	0.3	-0.6
Manufacturing of chemical and mineral products	7.6	3.3	16.0	5.9	2.8	13.3	1.4	0.8	2.4
Printing and publishing	0.0	-0.6	0.9	-0.1	-0.8	1.0	0.0	0.4	-0.4
Pulp and paper industry	0.0	0.4	-1.3	0.0	0.3	-0.9	0.0	0.2	-0.7
Industrial chemicals production	3.5	3.2	4.7	3.3	3.1	4.1	0.3	0.7	-0.8
Mineral oil refining	0.8	0.2	3.1	0.7	0.2	3.7	0.2	0.2	1.5
Metal production	0.2	1.0	-2.2	0.3	0.9	-1.5	0.1	0.4	-0.8
Production of machinery and hardware	2.8	2.0	4.3	2.8	1.8	4.5	0.3	0.4	0.0
Ship building	1.4	2.2	-0.7	1.1	1.9	-1.6	0.0	0.3	-0.6
Oil platform building	2.9	2.2	8.0	2.8	2.2	6.7	0.0	0.3	-0.5
Sheltered industries									
Construction	1.6	2.6	-	1.5	2.2	-	0.5	0.8	-
Banking and Insuring	0.4	1.2	-	0.4	1.1	-	0.2	0.7	-
Production of electricity	0.1	0.3	-	0.2	1.1	-	0.2	0.6	-
Domestic transport	0.5	1.2	-	0.5	1.2	-	0.2	0.4	-
Wholesale and retail trade	0.1	0.2	-	-0.1	-0.2	-	0.3	0.7	-
Dwelling services	0.3	1.3	-	0.3	1.2	-	0.1	0.5	-
Other private services	1.7	4.6	-	1.6	4.4	-	1.1	2.6	-

producer prices. *Other private servicing*, which encompasses repairing, used protected machines and electrical articles. So did *Construction*, which, in addition, was negatively affected by NTBs on cement products. On top, both used input of non-tradable services, whose prices were again affected by protected inputs. Obviously, all this simultaneity is not easy to grasp without a model for ERP computation.

A strong political conclusion to draw from table 4, is that the policy of restricting imports of *Processed food*, purported to compensate for the high, protected agricultural input prices, seems to severely overshoot the mark. While accurate compensation should yield ERPs close to zero, *Processing of food, beverages and tobacco* attains higher ERP than any other industry.

5.2. The quantitative significance of NTBs

A decomposition of ERPs into effects from tariffs and NTBs are presented in Table 5. The ERP levels are completely dominated by NTBs. So is the ranking, which indicates the qualitative redirection of resources due to protection. If tariffs were to represent the trade barriers, *Manufacturing of textiles and clothes* would, quite misleading, be placed along with *Processing of food, beverages and tobacco* above the average ERP level, indicating a higher activity in this industry than if protection was absent. Focusing on tariffs would, further, completely ignore the resource diverting role of protection of *Agriculture*, which with respect to tariffs obtain among the lowest ERPs. Tariff movements are neither able to explain much of the *changes* in protection over time. The average ERP from NTBs increased from 1989 to 1991, until the liberalising EEA treaty reduced the effects of NTBs markedly in 1994. The corresponding changes in average ERPs from tariffs were much weaker, also in percentage terms.

Table 5. A decomposition of ERPs for exposed industries

	1989			1991			1994		
	tariffs	NTBs	all	tariffs	NTBs	all	tariffs	NTBs	all
Agriculture	-0.4	38.2	37.7	-0.1	49.4	49.3	-0.2	68.5	68.4
Forestry	0.1	-0.3	-0.2	0.0	0.3	0.3	0.0	0.2	0.2
Fishery	-1.3	-2.7	-4.0	-1.7	-0.6	-2.2	-0.4	-1.1	-1.4
Processing of food, beverages and tobacco	21.8	230.3	252.1	39.9	455.4	495.2	9.5	69.8	79.5
Manufacturing of textiles and clothes	3.6	-1.7	1.8	4.0	-3.5	0.5	4.8	-2.4	2.5
Manufacturing of wood and wood products	-0.2	-2.0	-2.2	-0.2	-1.7	-1.9	0.0	-0.5	-0.6
Printing and publishing	-0.1	1.0	0.9	-0.1	1.1	1.0	0.0	-0.4	-0.4
Pulp and paper industry	-0.2	-1.0	-1.3	-0.3	-0.6	-0.9	-0.1	-0.5	-0.7
Industrial chemicals production	0.5	4.2	4.7	0.4	3.6	4.1	0.2	-1.0	-0.8
Mineral oil refining	0.0	3.0	3.1	0.1	3.6	3.7	0.0	1.5	1.5
Metal production	-0.1	-2.2	-2.2	-0.1	-1.4	-1.5	0.0	-0.8	-0.8
Production of machinery and hardware	0.9	3.3	4.3	0.9	3.6	4.5	0.4	-0.4	0.0
Ship building	-0.3	-0.4	-0.7	-0.4	-1.2	-1.6	-0.3	-0.3	-0.6
Oil platform building	-0.5	8.5	8.0	-0.6	7.4	6.7	-0.1	-0.4	-0.5
Average ^{*)}	1.1	18.3	17.2	1.2	21.8	20.5	1.0	14.5	13.5

^{*)} Average ERPs are weighted with factor income valued by free trade (reference) prices.

Though the increasing importance of NTBs is recognised, their quantitative role relative to tariffs turns out to be remarkable strong and calls for more attention to proper measuring and estimation. The Norwegian case is hardly unique in this respect. Accurate nominal estimates become even more important, as their influence on resource allocation is a result of complicated multiplier effects - even in a simple model as applied here. The sensitivity of the results to the input estimates would be even more difficult to predict in a general equilibrium setting.

5.3. The qualitative role of NTBs

In a regime where quantity-oriented NTBs exist, imposing tariffs on outputs or inputs will leave ERPs unaffected. Introducing tariffs as the sole protection measure (or in presence of penetration cost barriers, only), will increase prices accordingly. In this second regime, ERP will increase in case of raised *output* prices and decrease in case of raised *input* prices. The potential for ERP differences between these two regimes is determined by the coverage of quantity-oriented protection (see Table 3)²⁸.

Table 6 compares the effects of introducing the factual tariff rates of 1989, 1991, and 1994 into these two different regimes²⁹. The figures reveal that the regime is of some importance to *Processing of food, beverages and tobacco* and *Manufacturing of textiles and clothes*. For the former, the value added price is hardly increasing in presence of NTBs, as coverage of prohibitive barriers is high. An interesting, though smaller, effect from the character of the regime is found for *Fishery*. Here, NTBs influence ERPs negatively, indicating that *inputs* are protected by tariffs and prohibitive barriers. This is true for fodder products included in *Processed food*, which are important inputs in fish farming.

The figures in Table 6 are generally low, indicating that when tariffs are as low as the Norwegian, endogenising tariff equivalents will not turn out as overwhelmingly important. My point is, however, just as relevant in studies of policy changes with a far stronger potential. First, Norway far from tops the international ranking when it comes to tariff levels and prevalence of quota arrangements (see OECD (1996)). For many countries, the qualitative aspect of NTBs will be more relevant to tariff policy studies. Second, my point also applies to changes in other commercial policy measures than tariffs. Consider subsidies; though these have traditionally not been regarded as trade policy

²⁸ Also the coverage of inputs, in an input-output-corrected sense, contributes to the difference.

²⁹ To provide comparable percentage changes, the same level of reference protection is used in the two simulations; only the functioning of the quantity-oriented measures differs.

instruments, they certainly affect competitiveness. Recent international agreements on trade issues, as the Maastricht treaty of EU of 1991 and the WTO treaty of 1995, have banned several forms of governmental support. As for protection, first order effects of *subsidies* on factor income may be measured by ERPs³⁰. Subsidy changes to exposed industries do not change prices, but affect ERPs through unit cost shifts, both directly and indirectly through price effects on sheltered inputs. Table 7 compares the isolated ERP effects of all net governmental support to Norwegian industries in the two cases with and without NTBs present.

Table 6. ERPs from tariffs in absence and presence of NTBs, respectively

	1989		1991		1994	
	NTBs present	NTBs absent	NTBs present	NTBs absent	NTBs present	NTBs absent
Agriculture	0.0	-0.3	0.0	-0.1	0.0	-0.1
Forestry	0.1	0.1	0.0	0.0	0.0	0.0
Fishery	-0.1	-1.4	-0.2	-1.7	-0.3	-0.3
Processing of food, beverages and tobacco	0.4	6.6	0.8	7.2	1.1	5.7
Manufacturing of textiles and clothes	1.7	3.6	2.1	4.2	3.3	4.9
Manufacturing of wood and wood products	-0.1	-0.2	-0.1	-0.2	0.0	0.0
Manufacturing of chemi-cal and mineral products	0.4	0.3	0.5	0.5	0.0	0.0
Printing and publishing	-0.1	-0.1	-0.1	-0.1	0.0	0.0
Pulp and paper industry	-0.2	-0.2	-0.2	-0.3	-0.1	-0.1
Industrial chemicals production	0.6	0.5	0.6	0.4	0.3	0.2
Mineral oil refining	0.1	0.1	0.1	0.1	0.1	0.0
Metal production	-0.1	-0.1	-0.1	-0.1	0.1	0.0
Production of machinery and hardware	0.9	0.9	0.9	0.9	0.4	0.4
Ship building	-0.2	-0.3	-0.4	-0.4	-0.3	-0.3
Oil platform building	-0.5	-0.5	-0.6	-0.6	-0.1	-0.1

³⁰ This extended ERP concept including effects from commercial policy measures other than protection, is often referred to as Effective Rate of Assistance (ERA). It was introduced by the Industry Commission of Australia by the mid 60's (see Plunkett et al. (1992)).

Table 7. ERPs³¹ from subsidies in absence and presence of NTBs, respectively³²

	1989			1991			1994		
	subsidy rate ^{*)}	pre-sence	ab-sence	subsidy rate	pre-sence	ab-sence	subsidy rate	pre-sence	ab-sence
Agriculture	43.3	0.0	205.8	42.8	0.0	235.6	43.4	0.0	128.8
Forestry	5.8	15.2	10.6	5.1	-9.8	9.1	7.3	9.6	8.1
Fishery	10.0	72.7	39.7	11.0	105.3	56.7	4.3	5.2	4.8
Processing of food, beverages and tobacco	0.4	-0.3	-8.0	0.5	-0.2	-4.4	1.0	-1.3	1.2
Manufacturing of textiles and clothes	1.0	4.2	0.9	1.4	5.4	2.1	0.7	3.4	0.2
Manufacturing of wood and wood products	0.6	0.0	-0.4	1.1	1.0	0.6	0.3	0.5	0.2
Manufacturing of chemical and mineral products	2.0	3.0	2.7	1.8	2.0	1.9	1.6	2.5	2.1
Printing and publishing	1.2	1.1	0.6	1.1	1.1	0.7	1.7	3.1	2.9
Pulp and paper industry	0.2	-4.4	-4.7	0.2	-6.1	-6.3	0.3	-1.1	-1.4
Industrial chemicals production	0.1	-4.2	-5.8	0.1	-4.9	-6.3	0.3	-0.8	-1.3
Mineral oil refining	0.0	-10.7	-11.0	0.0	-13.2	-13.3	0.1	-4.2	-4.6
Metal production	0.3	-11.1	-11.3	0.4	-11.7	-11.7	0.2	-1.0	-1.4
Production of machinery and hardware	0.7	0.2	-0.1	0.9	0.7	0.5	0.7	0.5	0.2
Ship building	8.4	32.3	31.9	6.7	35.1	34.8	9.5	35.1	34.8
Oil platform building	0.3	0.9	0.1	0.8	3.7	2.9	0.2	0.0	-0.3

*) Direct net subsidies per unit of gross production.

Given the elements of quantity-oriented barriers, high subsidy levels (input-output-corrected) increase the potential for ERP differences between the two regimes. The ERP figures from the simulations with no regard to NTBs, show that *Agriculture*, *Fishery*, *Ship building* and *Forestry* are all substantially net subsidised. Major contributions come from direct transfers, represented by net subsidy rates in Table 7. Observe also, that in spite of positive net subsidy rates, several industries are

³¹ The reference is here defined as value added prices in case of no subsidies, but with factual protection.

³² Note that the ERP levels *across* Table 6 and 7 may not be meaningfully compared, as the references for the changes are not similarly defined.

effectively net taxed. They use inputs either subject to excise taxes (this applies mainly to certain food commodities, electricity, fuel and petroleum), or provided by net taxed naturally sheltered production (most prominent in *Domestic transport* and *Wholesale and retail trade*), which shifts effects of taxes on to prices.

Table 7 reveals that now, proper modelling with endogenised equivalent tariff rates does matter significantly. There are two effects from quantity-oriented measures, when introducing net subsidies. In industries with quantity-oriented protection of *outputs*, prices decrease and dampen value added changes. The barriers thus cause ERPs to *fall* in case of net subsidies, and to *raise* in case of net taxes. Due to this, ERPs fall substantially in *Agriculture*, while they raise in *Processing of food, beverages and tobacco*. Also the remaining output-protected industries have elements of this, but here another effect dominates: With NTBs qualitatively in function, *inputs* with quantity-oriented barriers become cheaper when subsidised. Thus, consumers of these inputs get higher ERPs. This effect is observed in practically all industries, but note *Fishery, Forestry* and *Manufacturing of textiles and clothes*, in particular.

6. Conclusion

Quantifying NTBs involves careful considerations with respect to the purpose of the study as well as to the specific industrial organisation of the markets in focus. In several trade policy analyses, NTBs are only roughly treated, if included at all. The contribution of this paper is, within an ERP framework, to demonstrate that applying quantitatively and qualitatively simplifying assumptions on protection may have serious implications. NTBs are comprehensively identified, quantified and categorised with respect to their qualitative role. ERP computations show that proper quantification as well as considerations to input-output effects generate outcomes which are not trivial to forecast in advance. More severe than to be inaccurate in *quantitative* terms, is, however, the inclination to neglect the *qualitative* role of NTBs. In studies of liberalisation or commercial policy reforms of a

certain potential, the role of endogenous equivalent tariff rates must be considered carefully. The considerations made here with respect to estimation and modelling of protection rates apply to trade policy analyses in general, irrespective of the model complexity. So do the conclusions' emphasis on the allocative potential of NTBs, though only a complete computable model of the economy would be able to provide exhaustive and quantified results on their structural implications.

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