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## Kurzbeitrag

### Aggregation of Tariff-Rate Quotas – Aggregation von Zollkontingenten

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### Abstract

For an analysis of Tariff-Rate Quotas the question arises how to aggregate them. In this paper, two alternative aggregation methods are compared, based on the magnitude of aggregated tariffs or the aggregated quota rent.

### Key words

Tariff-Rate Quota; Aggregation; General Equilibrium Modeling

### Zusammenfassung

Zollkontingente werden für einzelne Zollpositionen angewendet. Für Analysen auf einem aggregierten Niveau stellt sich daher die Frage nach deren Aggregation. Der Artikel beschreibt zwei Verfahren, die entweder die Höhe der aggregierten Zollsätze oder die aggregierte Zollkontingentsrente berücksichtigen.

### Schlüsselwörter

Zollkontingente; Aggregation; Allgemeine Gleichgewichtsmodelle

## 1. Introduction

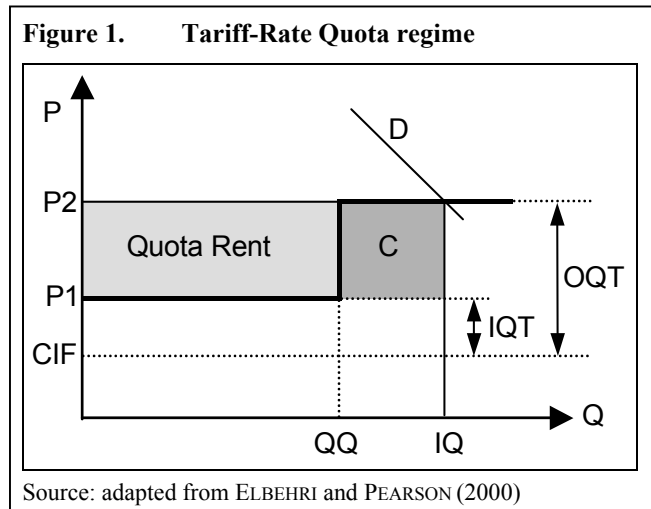
An important outcome of the Uruguay Round of the World Trade Organization (WTO) was to improve market access. Countries agreed to permit minimum access of 5 percent of domestic consumption by the end of the implementation period. Although the agreement also includes a tariff reduction, in the case of the EU it was unlikely to achieve this goal since the initial tariffs for a number of products were too high (BUREAU and TANGERMANN, 2000). In order to meet the market access criteria, the instrument of Tariff-Rate Quotas (TRQ) was introduced. Applied on a tariff line level (6- or 8-digit) TRQs are widely used: 37 WTO member countries have a combined total of 4 993 tariff lines with a TRQ (ABBOTT, 2002).

Using general equilibrium models ELBEHRI et al. (2000) as well as VAN DER MENSBRUGGHE et al. (2003) analyze the enlargement of quota quantities for sugar TRQs. TRQs are also intensively used for other commodities like meat, dairy products or fruit and vegetables (ABBOTT, 2002). Data specification of these goods in general equilibrium models

does not normally focus on a single tariff line, but rather on product groups. The latter are also denoted as sectors. Within a sector each tariff line may have a TRQ. Consequently, the question arises how to aggregate them.

## 2. Aggregation of quantities and tariffs

The TRQ of a single tariff line is defined by four coefficients (figure 1): the quota quantity (QQ) and the effectively imported quantity (IQ) as well as the in-quota (IQT) and the over-quota tariff (OQT) are used. These can be found in annual trade statistics and tariff lists.



If a sector consists of several tariff lines, all the coefficients have to be aggregated in order to get a sector-wide TRQ. For instance, in Switzerland the 'meat of ruminants' sector includes cattle, sheep, goat and horse meat products. Every type of meat has several tariff lines and each of them has its own TRQ regime. The situation of these tariff lines may differ: in some cases, the imported quantity exceeds the quota quantity and consequently, the over-quota tariff is used, while other tariff lines are below their quota quantity and the in-quota tariff is applicable. For the aggregation we assume that all the TRQs within a sector are completely independent of one another.

## 2.1 Quantities

The position of the aggregated TRQ can be indicated by the fill rate. Therefore, the imported quantities ( $IQ_i$ ) and the quota quantities ( $QQ_i$ ) of all the  $i$  tariff lines have to be aggregated:

$$(1) \quad \text{Fill Rate} = \frac{\sum_i IQ_i}{\sum_i QQ_i}$$

If the aggregated quota quantity is exceeded the fill rate is greater than one. A value below one indicates that the aggregated quota quantity is not reached.

An additional assumption is necessary: we assume that the sector-wide TRQ also reaches or exceeds the aggregated quota quantity if at least one tariff line reaches or exceeds its quota quantity. The import of this one tariff line yields a quota rent, and consequently, the aggregated or sector-wide quota rent is greater than zero. This also means that the aggregated import quantity must reach or exceed the aggregated quota quantity. Otherwise, there would be no quota rent. In some cases, equation 1 may violate this assumption. As an illustration, let us assume that there are two TRQs to aggregate. The first of these exceeds its very small quota quantity, while the other does not attain its large quota quantity. Although one TRQ exceeds its quota quantity, the aggregated quota quantity is greater than the aggregated import quantity. In this case, we suggest defining the fill rate as equal to or slightly greater than one. In this way, we can maintain the above assumption.

## 2.2 Tariffs

The obvious way to aggregate the in-quota and over-quota tariffs would be to take a weighted average of all the tariff lines. For the weights ( $\delta_i$ ) either the imported quantity or the trade volume can be employed. In- and over-quota tariffs for all the tariff lines are weighted and finally aggregated to the sector-wide in- (IQT) and over-quota (OQT) tariffs:

$$(2) \quad IQT = \sum_i IQT_i \cdot \delta_i$$

$$(3) \quad OQT = \sum_i OQT_i \cdot \delta_i$$

This kind of aggregation reflects the real magnitude of the aggregated in- and over-quota tariffs quite clearly, and we therefore call it the aggregation method considering tariffs. Its weakness is illustrated by an example, for which we again aggregate two TRQs. We assume that in- and over-quota tariffs as well as quota quantities are identical. Furthermore, we assume that the first TRQ slightly exceeds the quota quantity, while the second TRQ almost reaches its quota quantity. If we apply the first suggested aggregation method, the aggregated tariffs are equal to those of the two TRQs. Since the first TRQ exceeds its quota quantity, this is also true for the aggregated TRQ (section 2.1). The resulting aggregated quota rent is approximately twice the quota rent of the first TRQ because almost twice the quan-

tity of the first TRQ is imported. This result is not correct because the aggregated quota rent is identical with the quota rent of the first TRQ. The second TRQ has no quota rent. Thus, we have to conclude that the aggregation method considering tariffs leads to an inexact or rather an overestimated aggregated quota rent. Therefore, we suggest a second aggregation method, which considers the sector-wide quota rent.

To calculate the sector-wide quota rent, we sum up the quota rents of all the  $i$  tariff lines:

$$(4) \quad QUOTA RENT = \sum_i [(OQT_i - IQT_i) \cdot QQ_i \cdot \alpha_i]$$

The quota rent of a single tariff line is the difference between over- and in-quota tariffs times the quota quantity. A tariff line only has a quota rent if its quota quantity is reached or exceeded. Otherwise, the quota rent is zero. Therefore, the coefficient  $\alpha_i$  is necessary. If the quota quantity is not reached ( $IQ_i < QQ_i$ ),  $\alpha_i$  is equal to zero. Otherwise, ( $IQ_i > QQ_i$ )  $\alpha_i$  is defined as equal to 1. For the special case where the imported quantity is equal to the quota quantity, we assume that the over-quota tariff is applied ( $\alpha_i = 1$ ).

In addition, we require the coefficient  $C$ , which indicates the tariff revenue from the over-quota quantity (Figure 1):

$$(5) \quad C = \sum_i [(OQT_i - IQT_i) \cdot (IQ_i - QQ_i) \cdot \alpha_i]$$

Finally, we get the aggregate over-quota tariff:

$$(6) \quad OQT = IQT + \frac{QUOTA RENT + C}{\sum_i IQ_i}$$

The second aggregation method offers an accurate sector-wide quota rent, but distortions must be accepted with regard to tariff magnitudes. Unfortunately, it is impossible to achieve both accurate quota rent and accurate magnitude of tariffs when TRQs are aggregated. Generally speaking, if one tariff line exceeds its quota quantity and at least one tariff line does not reach its quota quantity, the aggregation method considering tariffs leads to a higher over-quota tariff since the sector-wide quota rent is overestimated. In two cases both methods lead to the same result: either if no tariff line reaches its quota quantity or if all the tariff lines exceed their quota quantities.

## 3. An illustrative example

We apply the ELBEHRI and PEARSON's (2000) approach to introduce TRQs into the model of the Global Trade Analysis Project (GTAP; HERTEL, 1997). The GTAP model is a comparative static multi-sector and multi-region general equilibrium model and is widely used for worldwide trade analyses. For example, a recent article by BROCKMEIER and SALAMON (2004) analyzes the WTO Doha Round. We use an aggregation of the GTAP database (DIAMARANAN and McDOUGALL, 2002) with two regions (Switzerland and the Rest of the World) and 9 sectors among them 'meat of ruminants' and 'other meat'. Both sectors consist of 16 or more tariff lines. The TRQ regime is applied to all of them. At least three of the tariff lines exceed their quota quantities. Consequently, the aggregated sector-wide TRQs ex-

ceed their quota quantities. Table 1 contains for both sectors the fill rate, the cost insurance freight (CIF) price and the aggregated in- and over-quota tariffs. In order to reconcile those coefficients with the GTAP database, we carry out an adjustment process (ELBEHRI and PEARSON, 2000). In detail, the tariff revenue in the database is split into the quota rent and in- and over-quota tariff revenues. Figure 2 illustrates qualitatively the outcome of this process for both sectors.

**Table 1. Fill rate, CIF price, in- and over-quota tariffs**

	Fill rate	Values in SFr.			
		CIF Price	In-quota Tariff (IQT)	Over-quota tariff (OQT)	
				Considering tariffs	Considering quota rent
Meat of ruminants	1.01	902	55	1132	270
Other meat	1.05	419	38	1098	59

Source: LIPS (2002)

In an illustrative simulation, we double the existing Swiss quota quantities for both sectors. The simulation is carried out twice, using each aggregation method. As a result, in both simulations the quota quantities are no longer binding. Due to different aggregation methods the import price reductions in Switzerland are larger using the method considering tariffs. Accordingly, the import of ‘meat of ruminants’ increases about 15 percent. Using the aggregation method considering quota rent the referring change is 11 percent. The results for the imported quantities of ‘other meat’ are 22 and 8 percent, respectively.

#### 4. Conclusions

If the Tariff-Rate Quotas (TRQs) of several tariff lines have to be aggregated towards a sector-wide TRQ, the question arises how to tackle this problem. Two methods are suggested: either considering the magnitude of tariffs or the sector-wide quota rent. As a conclusion, we suggest calculating the model twice, using each aggregation method. The lack of a compelling argument in favor of one specific approach supports this procedure. Using both methods can

be regarded as a sensitivity analysis of the aggregation process.

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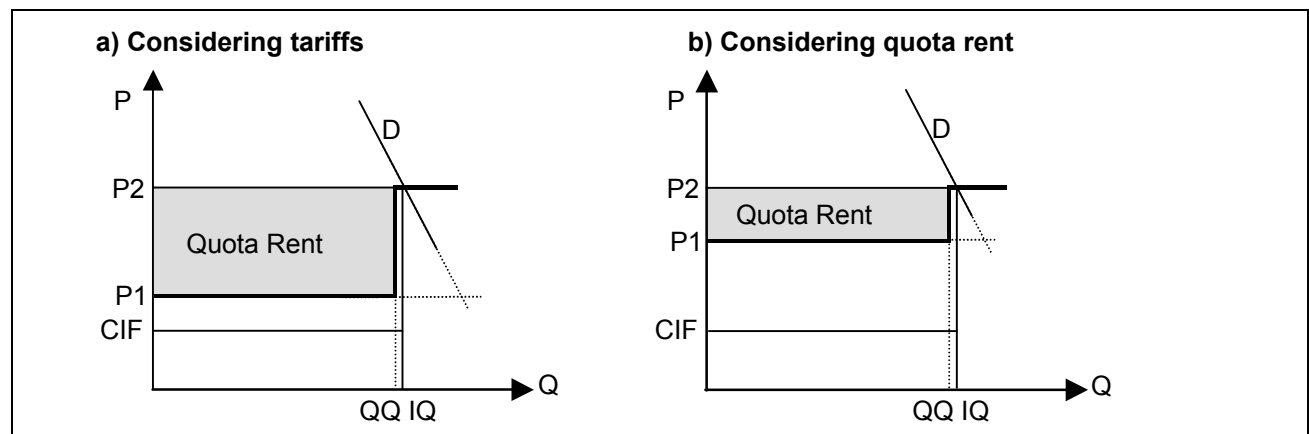
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**Figure 2. Two aggregation methods**



Source: own depiction