SEARCHING FOR AN APPROPRIATE AD VALOREM EQUIVALENT FOR TRQS: THE CASE OF CETA

Tatjana Döbeling, Janine Pelikan

tatjana.doebeling@thuenen.de

Thünen-Institut für Marktanalyse, Bundesallee 63, 38116 Braunschweig

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Abstract

Tariff-rate quotas have become an increasingly popular policy instrument in contemporary trade agreements; however, the real effect of this policy tool is often not very clear. One way to consider tariff-rate quotas in policy impact assessment is the calculation of ad valorem equivalents. Ad valorem equivalents can be used with little effort to compare different policies, summarize them or use them in large-scale modelling analyses. Such an ad valorem equivalent can be calculated with the help of the fill rate of the quota. For newly applied trade agreements that are phased in over a longer period of time, the fill rates of quotas are, however, not known. This makes a prefixed model necessary. We set up a demand driven model and compare different options for calculating ad valorem equivalents of tariff-rate quotas using the example of the trade agreement between Canada and the EU. We find that a marginal tariff can serve as a good ad valorem equivalent because it produces the same imports, welfare and prices as the quota. In our case study, it is also sufficiently robust in the sensitivity analysis, especially if a simplified version of it is being used.

Keywords

Tariff-rate quotas, bilateral trade agreements, EU trade policy

1 Introduction

Since September 21st, 2017, the Comprehensive Economic and Trade Agreement (CETA) has been provisionally applied. It covers virtually all areas of trade between Canada and the EU in order to reduce or eliminate trade barriers. For the agricultural and food sector, many tariffs are abolished but also tariff-rate quotas (TRQs) are introduced. How much market access does CETA provide to agricultural and food exporters in the EU? A comparison of tariffs before and after the implementation of the agreement seems to give a good indication; but elements such as tariff-rate quotas make it harder to tell the tariff level afterwards: Tariff-rate quotas are two-tiered tariffs which impose a low inside-quota tariff rate (IQTR) often equal to zero for imports up to a certain quota and a higher outside-quota tariff rate (OQTR) for imports beyond the quota. In CETA these quotas will be increased or eliminated over a period of eight years.

How can quotas be included in a pre-post comparison of tariff levels? Often, TRQs only apply to a very limited number of commodities: The aggregated import weighted tariff of dairy products includes 24 tariff lines at the 6-digit level of the Harmonized System (HS6-level). For exports from the EU to Canada, five tariff lines for cheese are subject to TRQs. Does it then even make a major difference, whether one reports the IQTRs or the OQTRs in the aggregated tariff? Indeed, whether one reports the IQTR or the OQTR for these five commodities in a pre-post-comparison strongly changes the level of protection in the entire dairy sector. While the IQTR indicates a strong liberalization, the OQTR indicates none: Before CETA, the trade-weighted average dairy tariff in Canada is 228%. After implementation of CETA, the aggregated tariff remains at 228% if the OQTR is applied but it decreases to 13% if the IQTR is applied. Since TRQs are commonly applied for sensitive goods, they are often important despite containing only a few tariff lines (GIBSON et al., 2001).

To evaluate the protection level of various trade barriers, CIPOLLINA and SALVATICI (2008) distinguish three methods: incidence measures, i.e. statistical measures, which describe the frequency of trade barriers, outcome measures, which give an ex-post estimation of the effects of trade barriers, and equivalence measures, which theoretically examine the effects of trade barriers and translate them in a tariff with a comparable effect. Of these, the ad valorem equivalent tariff (AVE) is, according to CIPOLLINA and SALVATICI (2008), the “natural” solution “to put various policy instruments together so that they can be compared, summed or used in large-scale modelling exercises” (p. 585).

AVEs are helpful in several situations. First, they can be used to compare different levels of protection between trading partners or sectors. With AVEs, it is also possible to distinguish effective liberalization from one on paper only. This is e.g. relevant when the OQTR is decreased, although only an increase of the quota would result in increased imports. Second, AVEs are used in trade models that lack mechanisms to deal with TRQs on the detailed tariff line level. Third, AVEs have also been used in the past to replace TRQs in custom duty tables while maintaining the current level of market access: e.g., when the EU replaced the TRQ system for banana imports with a “tariff only” regime, the question over an adequate, i.e. import equivalent tariff caused disputes within the World Trade Organization (WTO) and led to several studies which estimated ad valorem equivalents. While most approaches were based on assumptions of a perfect market, some also contained imperfect substitution (VANZETTI et al., 2005) or oligopolistic competition (SCOPPOLA, 2008). Since the policy change in the banana market went from the TRQ system to a “tariff only” regime, some studies deal with problems such as estimating how much rent was already contained in the databases on exporter’s prices – which had a major effect on the results, according to GUYOMARD et al. (2005). Also outside of the banana market, some articles on equivalent tariffs for TRQs appeared, for instance on how it can be calculated when the quota is allocated with an auctioning system (JOERIN, 2014).

While methods differed in the named studies, the equivalence in question was always one of import quantities. Yet, an AVE can also be calculated with respect to other economic effects: ANDERSON and NEARY (2005) developed the Mercantilistic Trade Restrictiveness Index (MTRI) and the Trade Restrictiveness Index (TRI) with which AVEs of trade barriers can be calculated. While the former measures protection in terms of import equivalence, the latter measures it in terms of welfare equivalence. We add another form of equivalence: the revenue equivalent tariff. In this case, tariff revenue is kept constant and an AVE that generates the same tariff revenues as the quota is determined. Another method to calculate an AVE from TRQs is the deviation of a marginal tariff, which is applied in the protection database of various trade models, e.g. in the GTAP model (GUIMBARD et al., 2012). We also clarify the relation of the equivalence measures to the marginal tariff.

How much do these equivalent tariffs differ? As far as we know, there is no study available that compares different forms of equivalence for TRQs. The objective of this paper is to fill that gap in the literature. For this, we develop a demand driven model. With this model we analyze the trade restrictiveness of Canadas and EUs trade barriers after the implementation period of CETA by calculating AVEs.

2 Setting up and calibrating a demand-driven model

To estimate AVEs, GUYOMARD et al. (2005) distinguish two general approaches: market model estimations and the empirical price gap method.

The price gap method seeks to directly identify the margin that the TRQ added to the price: Here, one calculates the distance between some price that is assumed to be the "true" or "external" supply price, such as the price including cost, insurance and freight (CIF), and the "internal" price that appears on the domestic market, such as the wholesale price. The results of this method strongly depend on the chosen prices and the quality of the price data: e.g., CIF-prices can be understated for fiscal purposes (SCOPPOLA, 2008). Furthermore, the quota rent can already be included in the observed external prices, as mentioned above. The advantage of the price-wedge method is its implicit inclusion of all meaningful circumstances – such as the administration method, the elasticities of supply and demand or the mode of competition. However, since price-wedged methods only work for ex-post analyses, model-based approaches are additionally necessary.

In model-based approaches, several assumptions are needed to set up a market model that calculates the AVE. In the following, we will develop a demand-driven model. In there, the exporting countries provide their commodities at the CIF-prices that they could offer before the agreement was implemented. Importing countries will distinguish goods based on the Armington assumption. According to this assumption, consumers distinguish between goods from different countries of origin and see them as imperfect substitutes. This assumption is not only common for sectors with much intra-sectoral trade but also seems particularly reasonable for certain goods that are subject to a TRQ in CETA, such as cheeses from different European countries.

With this, different AVEs for the TRQs in CETA will be calculated and compared.

For our model, the exporting countries $i \in \{1,\ldots,I\}$ show an elastic supply of all goods k at the trade unit value that they previously offered to country j. The importing partner maximized his utility according to an Armington CES function. The resulting demand function can be calibrated in a way that initial imports and prices are reached (compare CAMPICHE, 2009):

(1) $$X_{ijk} = \left(\frac{\alpha_{rjk}}{P_{rjk}}\right)^{\sigma_k} * \frac{budget_{jk}}{\sum_i\left(\alpha_{ijk}^{\sigma_k} * P_{ijk}^{1-\sigma_k}\right)} \; with \; \alpha_{rjk} = p_{ijk} * x_{ijk}^{1/\sigma_k}$$

In this, x_i and p_i stand for the initial levels of import quantities and prices (including tariffs), X_i and P_i are the final levels of import quantities and prices (including tariffs) reached after the agreement, $budget_{jk}$ is the budget spent on imports of the tariff line and σ is the Armington elasticity.

The budget for commodity k that j imports is fixed – so there are no substitution effects between different commodities and also none with the domestic market. The only substitution that occurs is between source countries. In the following, the countries i are split into partner countries p to whom the quota is allocated and other countries r.

Additionally, CETA's license-on-demand quota administration is taken into account. This system allows exporters to apply for quota licenses. If the applications exceed the quota, the requested volume is shortened proportionally. The allocation of quota licenses strongly influences the effect of a TRQ:

- It influences who benefits from the quota premium, which is a wedge between the marginal price of buyers and sellers that allows trading firms to be inefficient (MÖNNICH, 2003). Several rationing systems (apart from auction, see SKULLY (2001)) do not select according to cost efficiency but to some other criterion. Thereby, the implicit assumption that the imports inside the quota are also the most efficient ones is not automatically given and trade diversion can occur.
- It adds a transaction cost that may influence further who applies for the quota and how much the quota is filled
- It influences the competition: When licenses are allocated e.g. historically, exporters can still trade their licenses in several allocation mechanisms. SCOPPOLA (2008) argues that if licenses are as expensive as the OQTR, there will be a price competition à la Bertrand. If licenses are however much cheaper, operators will decide early on their exact export amount, leading to a Cournot competition. The initial allocation mechanism, specifically the amount of licenses handed out to small operators, influences the license price and, thereby, the form of competition and the outcome of the TRQ.

How many applications for licenses will there be for each combination of p, j, k in our model? For this, a hypothetical market situation is calculated in which the trade partners p may export at the IQTR and the other countries r export at their unchanged tariffs while no quantitative restrictions apply. The quantity x_{pjk} that country p can export when country j maximizes its utility is p's realistic assumption on how competitive he will be at the lower tariff rate without adding a quota premium, and is the amount he will apply for. Of course, exporters could strategically apply for a higher amount to get more quota licenses if the application quantities are shortened. However, the CETA agreement discourages bluntly exaggerated applications by punishing exporters with a fee if they cannot deliver the quota quantity they received as a license. Additionally, a proportionately equal exaggeration of all exporters does not have an effect on the final amount of quota licenses, as long as no single application has a volume beyond the quota volume and needs to be capped.

Additionally, this application behavior is based on the assumption that exporters apply for an amount that is worthwhile to them even if no rent accrues. It is possible to think of more complex rent-seeking behavior: If exporters (or whoever gains the quota rent) had some anticipation of the share of the quota rent that they could expect, they might apply for a higher amount according to the law of supply. On the other hand, as Armington exporters, they have a limited monopoly on their very commodity and could throttle supply to gain a higher rent. Both strategies are more risky for the applicants and require them to gather additional information on their market situation.

If the quota quantity is not entirely used by the applicants, then all applicants are given the quantity they applied for. If the applications exceed the quota quantity, all x_{ijk} will then be summed up and shortened, so that

$$(2) \qquad quota\ license_{pjk} = \frac{application_{pjk}}{\sum_p \sum_j \sum_k application_{pjk}} * quota$$

The costs for the application process are not added in our model. Since we assume that there is no efficient trade of licenses after the allocation, the quota licenses constitute some form of bilateral quotas: For all exports up to that amount, the low IQTR accrues; for all exports beyond the quota licenses, the higher OQTR accrues. The equilibrium amounts with the TRQ are then calculated with a MCP model which is a common method introduced by BISHOP et al. (2001) and used in variations e.g. by VAN DER MENSBRUGGHE et al. (2003), GRANT et al. (2006), GRANT et al. (2009) and JUNKER and HECKELEI (2012). Using OQ_{pjk} to denote the over-quota exports from the trade partners p and x_{rjk} to denote total imports from other countries r, one can write the model as follows:

(3) $$license_{pjk} + OQ_{pjk} = \left(\frac{\alpha_{pjk}}{P_{pjk}}\right)^{\sigma_k} * \frac{budget_{jk}}{\sum_i\left(\alpha_{ijk}^{\sigma_k} * P_{ijk}^{1-\sigma_k}\right)} \quad \perp \quad P_{pjk}$$

(4) $$X_{rjk} = \left(\frac{\alpha_{rjk}}{P_{rjk}}\right)^{\sigma_k} * \frac{budget_{jk}}{\sum_i\left(\alpha_{ijk}^{\sigma_k} * P_{ijk}^{1-\sigma_k}\right)} \quad \perp \quad X_{rjk}$$

(5) $$P_{pjk} = tuv_{pjk} * (1 + IQTR_{pjk} + premium_{pjk}) \quad \perp \quad premium_{pjk}$$

(6) $$premium_{pjk} = OQTR_{pjk} - IQTR_{pjk} \quad \perp \quad OQ_{pjk}$$

3 Estimating ad valorem equivalents

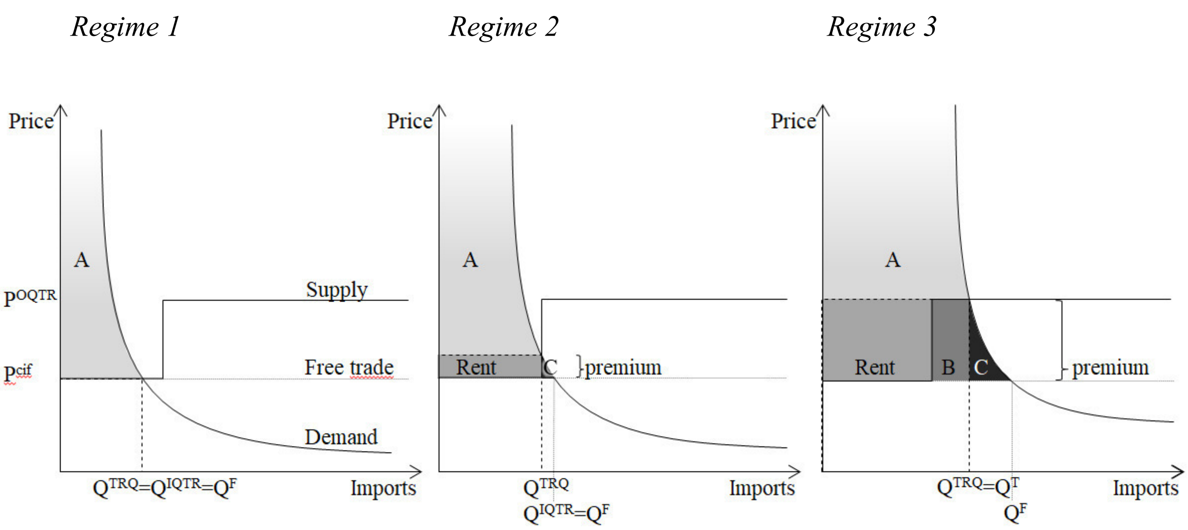
How should an ad valorem equivalent tariff be defined? BHAGWATI (1965), used the "implicit tariff" in a homogenous market with a unique world market price, i.e. the margin that is added on the exporter's supply price to equate to the domestic price. He then addresses the errors of this AVE once market power is introduced. With the Armington assumption, several price levels for commodities from different origins appear on the domestic market and our definition of an AVE has to be different – conveniently thereby also circumventing the issues with this AVE once we have the limited market power of Armington exporters.

AGBAHEY et al.AGBAHEY et al. (2018) take an average of the two tariffs that a TRQ comprises, weighting the IQTR with the imports that take place in the quota and the OQTR with the imports that take place outside the quota. When aggregating different tariffs of a sector, such a weighting method sometimes serves as an 'a-theoretic' approximation to an equivalence index (CIPOLLINA and SALVATICI, 2008), but has been subject to criticism for its endogeneity bias, as trade restricting, high tariffs are underrepresented (ANDERSON and NEARY, 2005). A similar problem appears with TRQs: if the IQTR and the OQTR would simply be weighted with their share of trade to find an AVE, a TRQ with a binding quota would get an AVE equal to the IQTR. Such an average can, therefore, not serve as an equivalent tariff, as the TRQ and the AVE would cause completely different import values, prices, tariff revenues, consumers' and producers' surplusses. It is not always possible to find an AVE that is literally equivalent in all these areas. Considering this trade-off, ANDERSON and NEARY (2005) decide to focus on two measurements: The TRI that is equivalent in the effects on the welfare and the MTRI that is equivalent in the effects on the imports.

What would the TRI and the MTRI look like when applied to TRQs? In Figure 1, we show the three possible equilibrium situations (so called regimes) of a TRQ: a demand that intersects with supply below the quota, at the quota and over the quota. For all three cases, Figure 1 shows the components of the welfare in a TRQ: the consumers' surplus A, the tariff revenue B, the dead weight loss C (in comparison to the free-trade quantity Q_F) and the quota rent. Due to the elastic export supply, there is no producers' surplus. Due to an IQTR of zero, there are also no tariff revenues for imports within the quota. With this we can show that the marginal tariff represents both, equivalent welfare and equivalent imports.

In regime 1, the quota is not entirely used and the IQTR is the binding element, i.e. the element that would have to be changed to see a change in imports. The marginal tariff is here equal to the IQTR. In regime 2, the quota is the binding element. Due to the supply gap, the prices rise. The marginal price is therefore the IQTR plus an additional quota premium. The resulting quota rent accrues either to the exporter or to the importer, depending on market power and quota administration. In regime 3, the OQTR is the binding element. In this regime, the marginal tariff is equal to the OQTR. One can easily see that if the marginal tariff was applied instead of the TRQ, the same import amounts Q_T would occur. The components of the welfare would differ, as the rent would turn into tariff revenues. Yet, even if the components of the welfare are not identical, the total bilateral welfare (i.e. the sum of consumers' and producers' surplus, tariff revenue, and quota rent) is the same. Using the marginal tariff as an AVE will, additionally, bring matching prices and, hence, produces an equivalent consumers' surplus.

Figure 1: Welfare in different regimes



Source: own graphical representation.

This is a convenient starting situation. To find the marginal tariff, however, one needs a detailed estimation of the demand function in order to find the quota premium in regime 2.
Therefore, the Market Access Map, a database that provides information about import tariffs applied by more than 200 countries, provides a simplified version of the marginal tariff: For imports that clearly did not reach the quota in the previous period (<80% of the quota) the IQTR is used, for imports over or very close to a filled quota (>98% of the quota), the OQTR is used, and for everything in between a simple average is used. The fill rates in MAcMap are periodically calculated using the latest available ITC (Trade Map) yearly data (GUIMBARD et al., 2012). To estimate a MAcMap-like AVE, an estimation of the fill rate would be sufficient and a precise estimation of the premium would not be necessary.

There is one important area where the marginal tariff and the MAcMap-approximation of it are not a good representation of the TRQ: The tariff revenues to the state.

The tariff revenues consist of tariffs that were collected inside the quota and tariffs that were collected outside the quota from the CETA partners p, as well as of tariffs collected from other trade partners r.
In regime 3, the marginal tariff creates large tariff revenue while a lot of this area is quota rent (which may well accrue to the exporter) in reality. Therefore, we derive a new AVE here: The revenue equivalent tariff (RET). We define the RET as a tariff which creates the same tariff revenues as the TRQ (while RET_r is fixed at the previous tariff level). Expressed as an equation, this means:

(7) $\sum_i x_{ijk}(RET_{ijk}) * \; tuv_{ijk} * RET_{ijk} = \; tariff\; revenues_{jk}$

The RET causes different prices and quantities than the TRQ.

Since the revenue function does not depend on RET in a linear way, a solution to this equation is not necessarily unique: A certain level of tariff revenue may either be reached by a low RET and accordingly high imports, or a high RET and accordingly low imports. This becomes most obvious at zero tariff revenues: These can either be reached with a RET of zero or any prohibitively high RET. While for a duty-free regime 1, setting the tariff to zero appears reasonable, for TRQ in regime 2 it is unclear which tariff level should be used. In this case the RET will be set to zero. Both the model described in Chapter 2 as well as the equations to gain a RET will be solved with the General Algebraic Modeling System (GAMS).

4 Data

For the initial trade quantities, a three-year average of 2014, 2015 and 2016 is calculated. Trade data is used from the CEPII BACI database (GAULIER and ZIGNAGO, 2010). The prices were taken from the CIF trade unit value database from CEPII (BERTHOU and EMLINGER, 2011). The price data are also three year averages, derived by a quantity weighted average or, if this was not possible because of missing data, a simple average. If no trade unit value was available for a good that did have a trade quantity, a proxy could have been calculated out of the values and quantities given in the BACI database. We calculated such proxies and compared them with existing unit values. We found that the magnitude of these proxies is strongly different from the existing trade unit value. Therefore, in this study we have decided not to consider these imports.

The base tariffs for the TRQs and their liberalization schedules are taken directly out of the CETA agreement (COUNCIL OF THE EUROPEAN UNION, 2016). For all other tariffs the AVEs from the Market Access Map are extracted from the ITC database of 2011 (GUIMBARD et al., 2012) are used. For Croatia, initial tariffs are set to the same level at which Slovenia exports and imports. The CETA agreement defines commodities at the eight digits tariff line level (HS8-level) while the necessary trade data is only available at the HS6-level. Therefore, we have aggregated the tariff data from the CETA agreement to the HS6-level using simple averages and translated it to the HS6 classification of 2007 to match the tariff data.

For the Armington elasticity σ, the Armington elasticities ESUBM are taken from the GTAP database Version 9 (AGUIAR et al., 2016). These elasticities belong to the GTAP sectors and thus not on the same level of detail as the tariff schedules.

5 Results

In CETA, 24 tariff lines of more than 10 000 tariff lines at the HS6-level are subject to tariff-rate quotas. All of them are levied on agricultural or fish products. As shown in table 1, all three quota regimes appear in CETA during the implementation period. TRQs which liberalize by expanding the quota quantity (cheese, beef, pork) can only fall into a lower regime over time. TRQs which liberalize over a decreasing OQTR (shrimps, cod, common wheat) can only fall into a higher regime. In the TRQ for sweetcorn, where both forms of liberalization are applied, the expansion of the quota quantity seems to dominate.

Table 1: Change in TRQ-regimes during the implementation of CETA

Year of Implementation	2017	2018	2019	2020	2021	2022	2023	2024
TRQs of Canada								

Cheese	40610	3	2	2	2	2	2	2	2
	40620	2	2	2	2	2	2	2	2
	40630	3	3	3	3	2	2	2	2
	40640	3	3	3	3	3	3	3	3
	40690	3	3	3	3	2	2	2	2
TRQs of the EU									
Beef	20110	0	0	0	0	0	0	0	0
	20120	2	1	1	1	1	1	1	1
	20130	2	1	1	1	1	1	1	1
	20210	0	0	0	0	0	0	0	0
	20220	0	0	0	0	0	0	0	0
	20230	2	1	1	1	1	1	1	1
	20610	0	0	0	0	0	0	0	0
	20629	2	1	1	1	1	1	1	1
	21099	2	1	1	1	1	1	1	1
Pork	20312	0	0	0	0	0	0	0	0
	20319	1	1	1	1	1	1	1	1
	20322	1	1	1	1	1	1	1	1
	20329	1	1	1	1	1	1	1	1
	21011	1	1	1	1	1	1	1	1
Shrimps	160520	2	2	2	2-3	3	3	3	E
Cod	30429	3	3	3	3	3	3	3	E
Common Wheat	100190	3	3	3	3	3	3	3	E
Sweetcorn	71040	0	0	0	0	0	0	0	0
	200580	2	1	1	1	1	1	1	1

1=in quote, 2=at quota, 3=out of quota, 2-3=at quota for some countries of the EU and out of quota for others, 0=not enough data, E= TRQ expired

Source: Own Calculation.

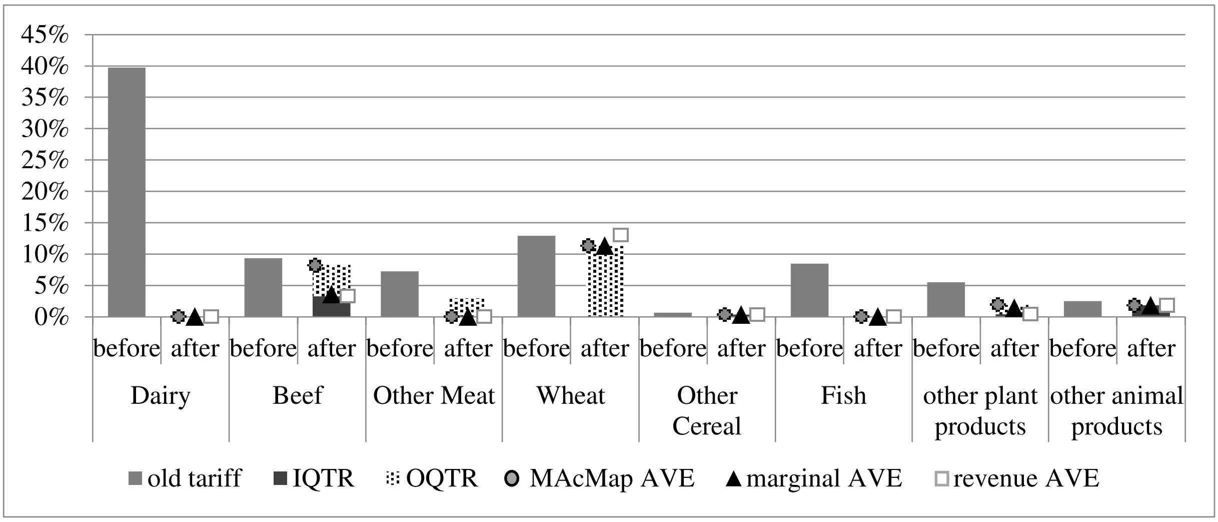
Figure 2 and 3 display the import weighted tariffs for agricultural and food products of the EU and Canada (aggregated with TASTE, HORRIDGE and LABORDE, 2008). The bars show the protection level before and in the first year after the implementation of CETA. The dotted area indicates the difference between the IQTR and the OQTR for all commodities that underlie a TRQ. Furthermore, the AVEs calculated with the methods presented above are included in both graphs.

Depicting tariffs in an aggregated way with a trade-weighted average is a common form of presentation. Yet, one has to be aware that this trade weighted average does not produce equivalent imports, welfare or tariff revenues when applied to the individual commodities. ANDERSON and NEARY (2005) discuss in more detail how tariffs can be aggregated in a way that does produce equivalent imports and welfare. If we would calculate equivalent tariffs and then aggregate them with a trade-weighted average to use them in models with a more aggregated set of countries and sectors, we would hence render our efforts for equivalence void. However, we use the trade weighted average here for a mere impression of the tariff levels that were generated with our previous model.

Which impression do we gain? It can be shown that although quotas only affect a small proportion of tariff lines, they have a major impact on the level of protection and trade restrictiveness. Even after the liberalization of most tariffs in CETA, quotas remain and restrict trade between the EU and Canada. This is particularly evident in trade in dairy products exported to Canada. Here a marginal tariff of 210% even remains after the full implementation of CETA. As can be seen from Table 1, all other quotas either expire or are not binding anymore by the end of the implementation period.

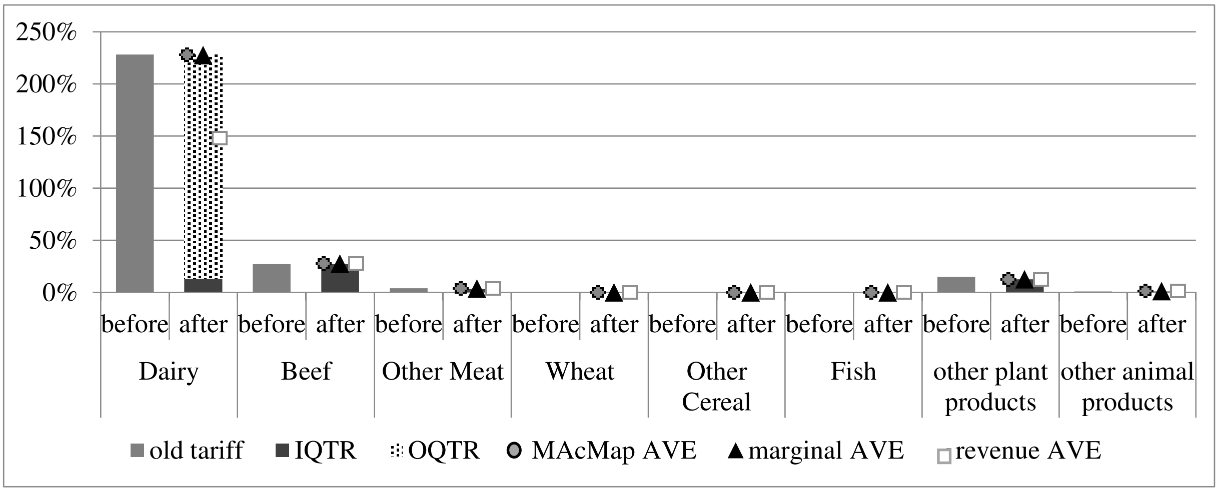
We also see that by considering different methods to calculate the AVE of a TRQ, the aggregated tariff can strongly differ, for instance in the beef sector.

Figure 2: Trade weighted EU-tariffs before and after the implementation of CETA



Source: Own Calculation.

Figure 3: Trade weighted Canadian tariffs before and after the implementation of CETA



Source: Own Calculation.

Which of them should be regarded as the best one? Revenue equivalent AVEs suffer from some drawbacks: They lack a clear definition in the case of regime 2, although a binding quota is the most interesting case for most analyses. And also for other regimes, more than one AVE could reflect a certain level of tariff revenues. In the continuous liberalization of CETA, the RET can even increase over time or have a changing trend. RETs can also take values outside the range of IQTR and OQTR, as happens here for wheat imports to the EU28, or have positive values for commodities that do not cause any tariff revenue, as happens for tariff line 040620.

The marginal tariff has the convenient property of serving as a trade restrictiveness index as well as a mercantilist trade restrictiveness index. It shows a clear, unique level between OQTR and IQTR and decreases when effective liberalization takes place.

The approximation of the marginal tariff that is used in the MAcMap database, finally, exaggerates the limiting effect of a TRQ in the case of a binding quota; apart from this, it is a convenient approximation that can be calculated with a simple model.

Another advantage of the MAcMap AVE can be seen in Table 2, which shows by how many percentage points the AVE differ when Armington elasticities are doubled or halved. For instance, when the Armington elasticities are doubled, 84% of the marginal tariffs deviate by less than ten percentage points but only 56% deviate by less than one percentage point.

As can be seen, the marginal tariff produces reasonably similar results with a changing Armington elasticity. The MAcMap-like AVE produces the exact same results most of the time when the Armington elasticity is changed. The stability of the MAcMap-like AVE arises from the limited amount of levels that appear around a filled quota: The marginal tariff aims at giving a precise estimation for the quota premium which can be misleading in its precision when the true Armington elasticity is unclear. The MAcMap-like AVE gives a rougher estimation of the situation by using just the IQTR, OQTR or an unweighted average of both.

The RET, finally, has a low robustness. This is because there are several TRQs in regime 2 where the RET is unclear and, thereby, automatically insecure. For those commodities entirely in regime 1 or 3, the RET can produce more robust results (shown in brackets). However, as explained earlier, these results still underlie the insecurity that there is not necessarily a unique value for the RET, even if the optimization program finds just one.

Table 2: Robustness of the tariffs to changing Armington elasticities

deviation		marginal tariff	MAcMap AVE	RET
sigma*2	<10%	84%	81%	70% (95%)
	<5%	72%	80%	66% (90%)
	<1%	56%	80%	52% (72%)
sigma/2	<10%	84%	97%	52% (71%)
	<5%	78%	97%	51% (70%)
	<1%	73%	97%	38% (52%)

Source: Own Calculation.

The robustness to σ is an important feature, considering that there is a lack of estimations for this elasticity on the disaggregated level.

5 Discussion and Conclusion

The Comprehensive Economic and Trade Agreement between the EU and Canada covers almost all areas of trade between both countries in order to reduce or eliminate trade barriers. For the agricultural and food sector many tariffs are abolished but also TRQs are introduced. We show that although TRQs only affect a small proportion of tariff lines, they have a major impact on the level of protection and trade restrictiveness: At the beginning of the implementation period, their restrictiveness is often equivalent to a tariff at the height of the OQTR. At the end of the implementation period, most TRQs expire or are not binding anymore. The trade with dairy products, however, is a case where TRQs continue to restrict trade even after the implementation period of eight years.

To compare the protection level before and after the implementation of CETA, we calculate ad valorem equivalents of TRQs. We find that not all AVEs are equally useful for all purposes: revenue equivalent AVEs do not fulfill reasonable expectations, such as having a unique definition for all regimes, always lying between IQTR and OQTR or monotonically decreasing with progressing liberalization.

The marginal tariff is the theoretically most convenient one, as it produces equivalent welfare, imports and consumer prices as the corresponding TRQ and is thereby, both, the trade restrictiveness index and the mercantilist trade restrictiveness index. In cases where the market situation and the price changes for the individual TRQ are of interest, it is probably the best AVE.

The MAcMap-like tariff is an approximation of the marginal tariff that is more robust to changes in the elasticity of substitution. Hence, it is a safe option in cases where there is no good estimation for the elasticity of substitution available at the level of disaggregation that matches with the definition of the TRQs. Additionally, it is consistent with models (e.g. GTAP or MAGNET) in which MAcMap is already the underlying database.

It should be mentioned that also marginal tariffs lose their favorable properties of equivalence once they are aggregated with some standard average which is usually weighted with imports or reference group imports. For future research, it would be very interesting to aggregate the AVEs with the help of TRI or MTRI. Furthermore, they could be integrated into a CGE model to determine the trade and welfare effects of CETA.

References

AGBAHEY, J., H. GRETHE and J. LUCKMAN (2018): Trade policy in a sovereign Palestinian State: what are the options in a final settlement? ERF annual conference. In: http://erf.org.eg/wp-content/uploads/2018/02/Agbahey_-Grethe-Luckmann.pdf. Call: 6.8.2019.

AGUIAR, A., B. NARAYANAN and R. MCDOUGALL (2016): An overview of the GTAP 9 data base. In: Journal of Global Economic Analysis 1 (1): 181–208.

ANDERSON, J. E. and J. P. NEARY (2005): Measuring the restrictiveness of international trade policy. MIT Press, Cambridge, Mass.

BERTHOU, A. and C. EMLINGER (2011): The trade unit values database. In: Economie internationale (4): 97–117.

BHAGWATI, J. (1965): On the Equivalence of Tariffs and Quotas. In: Caves, R. E., H. G. Johnson and P. B. Kenen (Eds.): Trade, growth and the balance of payments. Essays in honor of Gottfried Haberler: 53–67.

BISHOP, P. M., C. NICHOLSON, J. E. PRATT and A. NOVAKOVIC (2001): Tariff-Rate Quotas: Difficult to model or plain simple? Trade Working Papers No. 22011. East Asian Bureau of Economic Research.

CAMPICHE, J. L. (2009): Effects of changes in US ethanol production from corn grain, corn stover, and switchgrass on world agricultural markets and trade. Dissertation. Texas A&M University.

CIPOLLINA, M. and L. SALVATICI (2008): Measuring protection: Mission impossible? In: Journal of Economic Surveys 22 (3): 577–616.

COUNCIL OF THE EUROPEAN UNION (2016): Comprehensive Economic and Trade Agreement between Canada, of the one part, and the European Union and its Member States, of the other part, Annex 2. CETA.

GAULIER, G. and S. ZIGNAGO (2010): Baci: international trade database at the product-level (the 1994-2007 version).

GIBSON, P., J. WAINIO, D. WHITLEY, BOHMAN and MARY (2001): Profiles of Tariffs in Global Agricultural Markets. Agricultural Economic Report No. 796. Market and Trade Economics Division, Economic Research Service, U.S. Department of Agriculture.

GRANT, J. H., T. W. HERTEL and T. F. RUTHERFORD (2006): Extending general Equilibrium to the tariff line: US Dairy in the Doha Development Agenda. Paper presented on the 9th Conference on Global Economic Analysis.

GRANT, J. H., T. W. HERTEL and T. F. RUTHERFORD (2009): Dairy tariff-quota liberalization. Contrasting bilateral and most favored nation reform options. In: American Journal of Agricultural Economics (91.3): 673–684.

GUIMBARD, H., S. JEAN, M. MIMOUNI and X. PICHOT (2012): MAcMap-HS6 2007, an exhaustive and consistent measure of applied protection in 2007. In: International Economics 130: 99–121.

GUYOMARD, H., C. LE MOUËL, F. LEVERT and J. LAMBANA (2005): The tariff-only import regime for bananas in the European Union. Is setting the tariff at right level an impossible mission? XIth EAAE Congress: The future of rural Europe in the global agri-food system, Copenhagen, Denmark.

HORRIDGE, M. and D. LABORDE (2008): TASTE: a program to adapt detailed trade and tariff data to GTAP-related purposes. Presented at the 11th Annual Conference on Global Economic Analysis, Helsinki, Finland. In: https://www.gtap.agecon.purdue.edu/resources/download/4938.pdf. Call: 25.1.2019.

JOERIN, R. (2014): Improving Market Access: The Role Of Auctions In Converting Tariff-Rate Quotas Into Single Tariffs. In: Review of Agricultural and Applied Economics 17 (1): 24–30.

JUNKER, F. and T. HECKELEI (2012): TRQ-complications: who gets the benefits when the EU liberalizes Mercosur's access to the beef markets? In: Agricultural Economics (43.2): 215–231.

MÖNNICH, C. (2003): Tariff rate quotas: Does administration matter? Discussion Papers No. 16. Justus Liebig University Giessen, Center for international Development and Environmental Research.

SCOPPOLA, M. (2008): Tariffication of Tariff Rate Quotas under oligopolistic competition: the case of the EU import regimes for bananas. 2008 International Congress, August 26-29, 2008, Ghent, Belgium.

SKULLY, D. W. (2001): Economics of Tariff-Rate Quota Administration: Economic Analysis of TRQ Administrative Methods. Technical Bulletin TB-1893. US Department of Agriculture, Economic Research Service.

VAN DER MENSBRUGGHE, D., J. C. BEGHIN and D. AND MITCHELL (2003): Modeling Tariff Rate Quotas in a Global Context: The Case of Sugar Markets in OECD Countries. CARD Working Papers No. 368.

VANZETTI, D., S. F. de CÓRDOBA and V. CHAU (2005): Banana split: how EU policies divide global producers. No. United Nations Publications, Issue 31.