The market dynamics of tariff-rate quotas in the case of CETA

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Abstract

After the conclusion of the Comprehensive Economic and Trade Agreement between the EU and Canada, both trading partners gradually open their markets. For the agricultural and food sector, many tariffs are abolished but also tariff-rate quotas are introduced for sensitive agricultural commodities. In this paper, we analyze the market dynamics that are caused by such tariff-rate quotas, while putting special attention to the effects of an efficient quota license allocation. Additionally, we compare our model results with the real trade figures of Canada and the EU that appeared since the implementation of their trade agreement. As our analysis shows, the restrictiveness of tariff-rate quotas does not only lie in their limited volumes or their high tariffs outside the quota – rather, through an efficient allocation of quota licenses, more expensive commodities have a much better chance of entering the market compared to cheaper commodities. Thereby, tariff-rate quotas are a measure to make sure that market prices do not plummet as a result of a liberalization effort.

Keywords: tariff-rate quotas, CETA, license administration

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1 The CETA Agreement

The Comprehensive Economic and Trade Agreement (CETA) between Canada and the EU, which has been provisionally applied since September 2017, contains a wide range of commitments e.g. on the liberalization of tariffs, intellectual property rights or geographical indications. In CETA, agricultural and food commodities are treated as sensitive commodities that are liberalized via tariff-rate quotas (TRQs), which exacerbate impact analyses of the market access. TRQs are trade barriers that allow a certain quantity of goods to be imported at a low or zero inside-quota tariff rate (IQTR) and beyond this, any quantity to underlie a higher out-of-quota tariff rate (OQTR). This way, TRQs grant access to the domestic market on the one hand while maintaining some control over the import quantities on the other hand.

However, in theoretical explanations a simplified picture prevails, in which tariff-rate quotas result in a kink in the supply curve. Suppliers at the left side of the supply curve, which can offer their product at a low price, are now granted additional market supply through the quota. Suppliers further right in the supply curve have to offer outside the quota.

What if, however, this common conception ignores the allocation of quota licenses, which could put cheap supplies at disadvantage? This is hard to grasp in a market with a homogeneous product, where only one commodity from one country enters through the quota. However, such a situation is usually also far from a realistic trade situation. In the case of CETA, for instance, seven commodity groups are traded through TRQs, involving Canada and all states of the European Union, and most of them comprising more than one commodity code at the HS six-digit level. With the help of a nested Armington model, we aim at understanding better the market dynamics of tariff-rate quotas that include several commodities from different exporting countries, which are not perceived as perfect substitutes. Our results indicate that tariff-rate quotas give a preferential access to more expensive commodities and trade partners, resulting in a form of liberalization that does increase market access, while the average price of the

commodity group from the trade partner may even increase compared to the previous tariff regime. Chapter 2 provides an overview of the theory of TRQs and the model framework. Chapter 3 describes the underlying data base and its modifications. In Chapter 4 the results are discussed. Here, we present the changes in trade due to the implementation of CETA. In addition, the model results of the first years are compared with the real trade figures. Chapter 5 concludes.

2 The modelling

2.1 Theory of TRQs

To the common depiction, TRQs add a kink to the supply curve. Depending on where the demand curve and the supply curve intersect, three regimes appear. Figure 1 depicts these three regimes, where A is the consumers' surplus, B is the tariff revenues and C is the deadweight loss. For reasons of simplicity, the supply curve is depicted as perfectly elastic and the IQTR is set to zero (as this is the case for all TRQs in CETA).

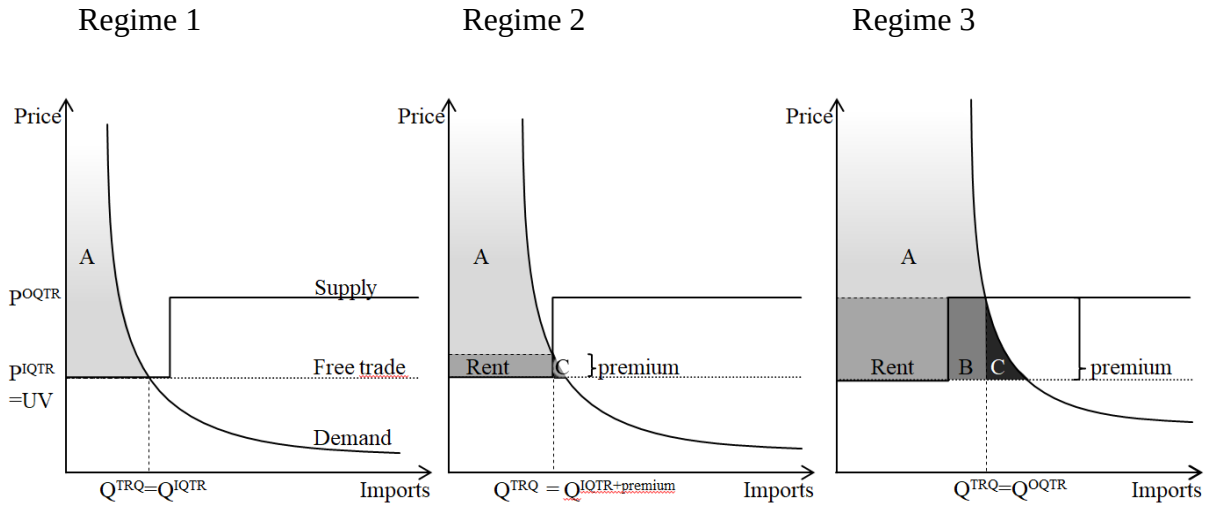

Figure 1: Simplified depiction of the different regimes that TRQs cause. Source: Döbeling and Pelikan (2020).

In the first regime, the quota is not binding and the IQTR applies to all imports of the trading partner. In the second regime, the quota is binding. Here, the surplus demand creates a margin at a given quantity that is added to the export price, commonly referred to as the quota premium.

Depending on market power and the form of administration, the rent that accrues out of the premium is gained by some party along the supply chain. In the third regime, there is trade beyond the quota, for which an OQTR has to be paid. The imports inside the quota will be sold at the market price P^{OQTR}, leading to a quota premium that is equal to the OQTR.

However, when several commodities share one quota, this simplified picture does not quite catch the results: Although exports beyond the quota might take place, the quota can appear binding for some commodities (if the price with the OQTR is too high for the respective demand), non-binding for others, and finally some goods will only have exports outside the quota, while their exporters were not able to get hold of any licenses, if those are distributed efficiently. Moreover, if the supply curve is not depicted as perfectly elastic but shows an upward slope, the depiction implies that cheap importers are the one to access the quota first. This is misleading for a case where several commodities can access over one TRQ: An efficient license allocation favors expensive trade partners and commodities as license holders. This phenomenon has already been discussed in Vousden (1992) and will become clearer in the setup of the model.

2.2 TRQs in CETA

In the CETA agreement, TRQs are defined for six product groups on the European side (for shrimps, cod, common wheat, sweetcorn, pork, and three TRQs for bison meat/beef) and one product group on the Canadian side (cheese, divided by its further usage for retail or further processing). The TRQs are defined at a high level of detail, going beyond the six-digit scheme of the Harmonized System (HS). The six-digit scheme, however, is the highest level at which internationally harmonized trade data is available. Therefore, the TRQs have to be translated to the six-digit level, which is why the TRQs for bison meat and beef as well as the two TRQs for cheese have to be merged in the following analysis.

2.3 Set-up of the MCP model

Bishop *et al.* (2001) elaborates why mixed complementarity problems (MCPs) are a convenient problem formulation for modeling TRQs. It was then used in variations e.g. by van der Mensbrugghe, Beghin and Mitchell (2003), Grant, Hertel and Rutherford (2006), Grant, Hertel and Rutherford (2009) and Junker and Heckelei (2012).

The partial equilibrium model seeks to identify which commodities gain access to the quota, and at which quota premium. With the new trade agreements, certain commodities from the preferentially treated partner country become cheaper and a higher portion of them is demanded. In the process, the profit maximization on the supply side is considered, as well as a nested Armington demand structure that relies on a constant elasticity of substitution utility function with strong parallels to the structure of the Global Analysis Project Model (GTAP), as well as an endogenous license allocation. However, in order to not overcharge the model with complexity, several more complex forms of interaction (such as substitution between different commodity codes or changes in incomes, changes in factor prices or changes in prices for domestically produced competing commodities) where not included in the model.

In the following, *HS* will denote the six-digit tariff lines included in the TRQ (with the HS nomenclature of the 2007 edition), *mim* will be the CETA members as importing countries (i.e. either Canada or the member states of the EU) and *ex* will be all exporting countries. The exporting countries will be further split into partner countries *mex* that have access to the quota (i.e. the member states of the EU or Canada) and the other countries *oex*. The different years of the schedule are labeled with the index *y*. Variables of the first nest include a 1 in their label, such as the summarized value of imports of one HS line to one importer mim ($V1_{mim,HS,y}$), while variables of the second nest, such as the trade volume ($X2_{ex,mim,HS,y}$) or the unit value ($UV2_{ex,mim,HS,y}$) include a 2 in their variable. The same applies for the share parameter $\alpha 2_{mim,HS}$ as well as the Armington elasticities $\sigma 1_{mim,HS}$ and $\sigma 2_{mim,HS.}$ The competition for licenses in the

second nest is further described by a variable for the shadow value of a quota license ($licenseprice_{mim,HS,y}$), the quantity share of a bilateral export that is imported under a license ($licenseshare_{mex,mim,HS,y}$) and the quota premium that is added to the unit value and the IQTR ($premium_{mex,mim,HS,y}$).

In the MCP approach, ten variables are linked to their respective equation:

$eq\_CES2_{ex,mim,HS,y} \perp UV2_{ex,mim,HS,y}$

$eq\_V1_{mim,HS,y} \perp V1_{mim,HS,y}$

$eq\_profitmax_{ex,mim,HS,y} \perp X2_{ex,mim,HS,y}$

$eq\_quota_{mim,HS,y} \perp licenseprice_{mim,HS,y}$ (lower bound at 0)

$eq\_premium_{mex,mim,HS,y} \perp licenseshare_{mex,mim,HS,y}$ (lower bound at 0, upper bound at 1)

$eq\_unitrent_{mex,mim,HS,y} \perp premium_{mex,mim,HS,y}$ (lower bound at 0, upper bound at OQTR-IQTR)

The ⊥-symbols are so-called perps that are used in mixed complementary problems (MCPs). Perps indicate a pair-wise complementarity between an inequality constraint and the variable and its bounds. If the variable is equal of one of its bounds, the constraint applies in the form of an inequality. If the variable is between its bounds, its corresponding equation has to be binding with an equality sign. Sometimes a variable only has one bound (either an upper bound or a lower bound), which is equivalent to a second bound equal to negative or positive infinity, which will never be reached. All equations are explained in the following. For better readability, the indices will be left away as far as possible. Variables are written in capitals.

The first equation (eq_CES2) describes how each import quantity depends on its own price and the price of all competing commodities of the same HS code according to an Armington CES function

$$\mathrm{X2} = \left(\frac{\alpha 2}{\mathrm{UV2} * (1 + \mathrm{iqtr} + \mathrm{PREMIUM})}\right)^{\sigma 2} * \frac{V1}{\sum_{ex} \alpha 2^{\sigma 2} * \left(\mathrm{UV2} * (1 + \mathrm{iqtr} + \mathrm{PREMIUM})\right)^{1-\sigma 2}} \quad (1)$$

However, imports also compete with domestic commodities. For this, we implement a higher nest in which the sum of all imports competes with domestically produced commodities (equivalently to the GTAP demand side). The first nest is then also described by a CES function – but in order to just rely on information on values rather than quantities, it looks slightly different (eq_V1).

$$\frac{\mathrm{V1}}{expenditures - \mathrm{V1}} \geq \frac{(\mathrm{UV2}_0 * (1 + \mathrm{previous\_tariff}))^{\sigma 1 - 1}}{(\sum_{ex} \frac{\mathrm{X2}}{\sum_{ex} \mathrm{X2}} * \mathrm{UV2} * (1 + \mathrm{iqtr} + \mathrm{PREMIUM}))^{\sigma 1 - 1}} * \frac{V1_0}{expenditures - V1_0} \quad (2)$$

On the supply side, the unit values are the result of a profit maximization, in which marginal revenues are equal to marginal costs. The marginal costs on the right are simply a constant fc, since there are no economies of scale and we assume factor prices not to change through the liberalization. The marginal revenues are a more complex function, as the suppliers of the imperfectly substitutable Armington commodities have some limited market power (eq_profitmax).

$$\frac{\partial\,(UV2(X2) * X2)}{\partial\, X2} = fc \quad (3)$$

The imports X2 can either be imported with quota licenses, or imported at the higher OQTR. Which share of the imports are imported with licenses is described by the variable Licenseshare. The sum of the given licenses may not exceed the quota volume (eq_quota). Once the quota is filled, licenses are a scarce resource and receive a (shadow) price, which is more or less visible

in the market, depending on the efficiency of the market for quota licenses. This explains the perpendicularity between this equation and the variable Licenseprice: if the equation becomes binding, a positive price for licenses appears.

$$quota \geq \sum_{mex,mim,HS} LICENCESHARE * X2 \tag{4}$$

Obviously, the variable Licenseshare can lie anywhere between 0 and 1. If it is equal to 1, all imports between this preferentially treated exporter and the importer are traded with a quota license. In that case, the premium is smaller than OQTR-IQTR (technically, one can imagine the premium to be at the maximum coincidentally, which is also allowed for by the model). If some or all exports are exported without a license, those exports will automatically underly the high OQTR, and since only one market price applies for each commodity, the premium has to be at its maximum in that case (eq_premium):

$$PREMIUM \neq oqtr - iqtr \tag{5}$$

The shadow price of licenses, at which they are sold in an ideal market, is equal to the rent that is gained from receiving an additional license (i.e. the unit value UV2 times a premium). If their rent per unit cannot afford them to gain a license, they have to sell outside of the quota and the corresponding variable – the premium – will be at its maximum.

$$UV2 * PREMIUM \neq LICENSEPRICE \tag{6}$$

The market for licenses that are assumed here is an idealization of the real market situation. The quota license allocation in CETA takes place with a mix of license-on-demand and first-come-first-serve mechanisms, which does not guarantee market efficiency (Skully, 2001). However, since license holders are able to transfer their quota licenses, we assume that the results will

resemble a market allocation of the quota licenses. Furthermore, we separated the license market of the profit maximization process. Theoretically, one could imagine that additional quota licenses are paid for by marginal profits that accrue due to an expanded production, or that the willingness to pay for licenses is diminished by lowered revenues, which resulted from the lowered prices that the liberalization entailed. However, since quota holders for Canadian quotas are firms on the importing side (Kerr and Hobbs, 2015), it is not clear how much the quota rent and the license prices will really influence the decisions in production, which is why we decided to keep those market decisions separated.

3 Data

Trade volumes are taken from the CEPII BACI database (Gaulier and Zignago, 2010), CIF unit values from the TUV database from CEPII (Berthou and Emlinger, 2011). For both, a simple three-year average of 2014, 2015 and 2016 is calculated. Where unit values are missing, a proxy could be calculated out of the values and quantities given in the BACI database. But the magnitude of these proxies strongly differs from the existing trade unit values. Therefore, in this study, we decide not to consider these imports.

In the initial data base the data from the Market Access Map (MAcMaps, 2019) are used. For the elasticities of substitution, we rely on the estimations by Fontagné and Guimbard (2019).

Since there are no data on the domestic prices and volumes at the HS six-digit level of the commodities, we will make an estimate of the values based on the GTAP database. From there, we extract the relation between domestic and imported commodities for each sector and country and assume that this relation is also valid for all corresponding tariff lines. We then formulate our equations in a way that they do not rely on volumes and prices for domestic commodities, but solely on the estimation of domestic values.

Later in the text, we will show that there are indications for a small-shares-stay-small problem, which causes quotas to be underused. To fix this, we replace certain trade relations with zero bilateral trade with data of reference groups. Those reference groups are taken from Horridge and Laborde (2008).

4 Results

As an exemplary illustration for quota access, Figure 2 shows the modelled access to the tariff-rate quota for cheese in 2020. One can see that licenses are not automatically distributed to the biggest exporters, but rather to exporters with high unit values. This was to be expected, as a moderate quota premium on an expensive good can yield the means to afford the price for a license. Less expensive commodities would need a much higher premium to yield a rent per unit that can afford them a quota license, and this premium may cost them their competitiveness in the market.

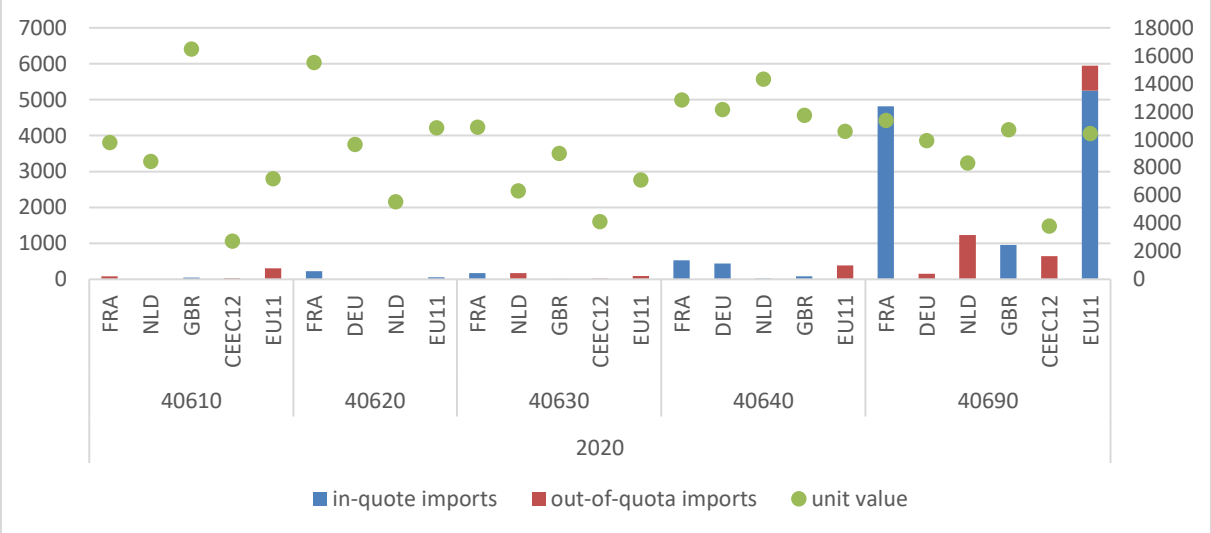

Figure 2: Imports and distribution of licenses across different commodities and exporting countries for cheese

As a result, the tariff-rate quotas do not grant equal access to all commodities that are allowed within them, but they give advantage to more expensive commodities. With respect to liberalization efforts, this means that tariff-rate quotas can increase the volume of imports, but distort the market towards more expensive imports, resulting not in lowered, but even in

increased average prices. This is illustrated by the developments of the tariff-rate quota for common wheat in Figure 3. While the volume of EU-imports increases, the immediate effect of the additional imports is a rising average price, since the additional imports are of a higher price segment. In the following years, the liberalization is proceeded with a decreasing OQTR, until the tariff protection is completely abolished in 2024. Thereby, more or the lower priced imports can enter without a quota license over the year and the average prices turn to their undistorted initial value.

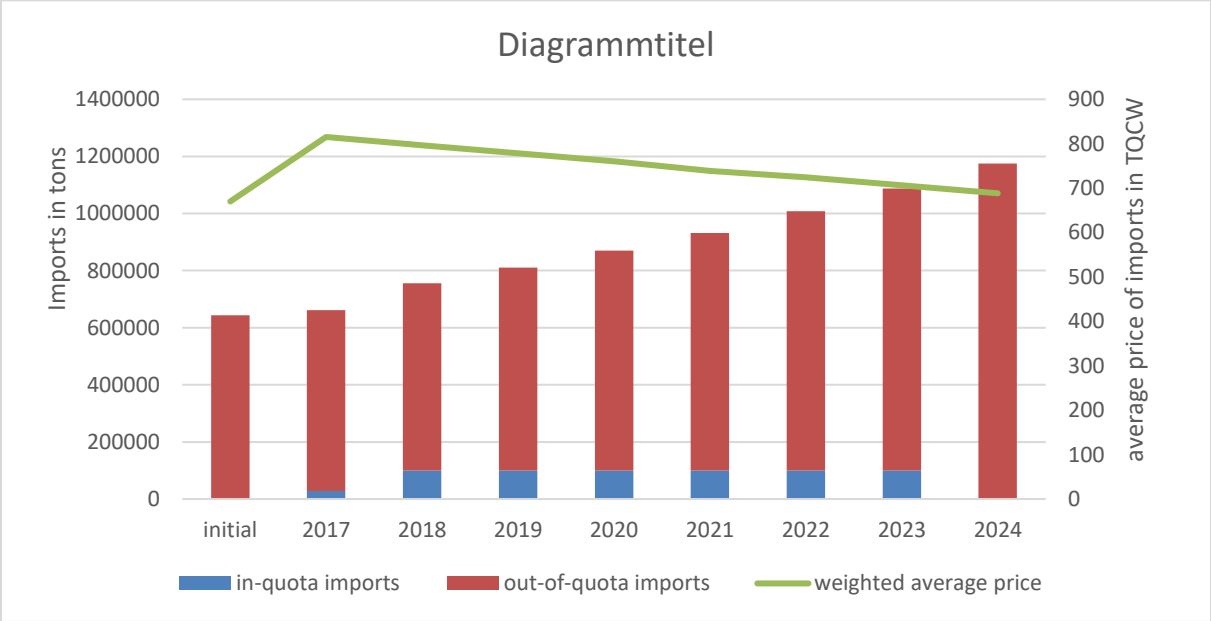

Figure 3: Aggregated EU-imports in the tariff-rate quota for common wheat with their weighted average price

A schedule that uses the quota quantity instead of the OQTR as a lever to liberalization can therefore have a different effect on prices. Cheese imports from the EU to Canada, which are liberalized over an increasing quota, see a sharp increase in their average prices, which fluctuates and even increase later over the liberalization period.

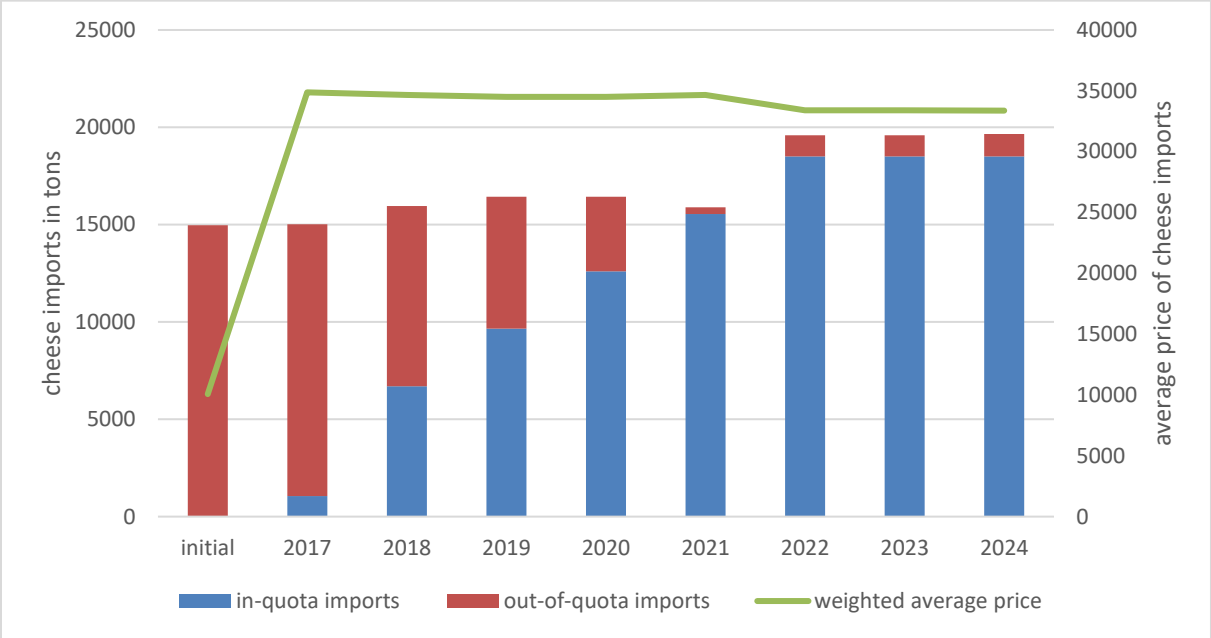

Figure 4: Aggregated Canadian imports for cheese in the tariff-rate quota with their weighted average price

In our dataset, some commodities had very little or no imports in the base period. The TRQs for Sweetcorn, Pork and Beef all contain at least one tariff line for which the trade values are at zero in the initial database. This can be due to a lack of data, or due to the infeasibility of imports under a high level of protection before CETA. This so called "Small shares stay small" problem results in a limited increase of our model outcomes and quotas remain underfilled. Considering that TRQs are usually applied to the most sensitive commodities – i.e. commodities which are considered to have a high market potential, for which a sudden trade liberalization may harm prevailing suppliers on the domestic market – it does not seem reasonable that quotas with zero import tariff inside the quota would not be entirely used. Rather, the high protection before the CETA agreement may conceal the true market potential of these commodities.

Therefore, we run a second simulation, where certain exporters within the association agreement are assumed to suffer from the small-shares-stay-small problem if they fit certain criterions:

- the exporting country has no export volumes,

- ❖ the exporting country exports to countries of the importing country's reference group,
- ❖ the importing country imports from countries of the exporting country's reference group,
- ❖ the importing country initially imposes a higher tariff rate towards the exporting country than towards other countries (on average) that did manage to export to the importing country
- ❖ and the prices (including tariffs) of the exporting country are higher than those that the reference groups have on average in the importing country.

Their export volumes will then be adapted: If they had had a lower tariff, they would have been able to export to the same extent as countries of their reference group. For the calibration, their export quantities, unit values and tariffs will, therefore, be set to the average of the countries of their reference group. After the calibration, the tariffs will be set back to their initial height, their unit values to the average that they could offer to other countries of the reference group and their quantities will be calculated according to the Armington demand function. Several zero-imports are thereby replaced with small quantities that reflect the export potential of those countries.

To our surprise, even with these adaptations some tariff-rate quotas, such as those for Pork or Beef, remained underfilled at least in the later years of the liberalization. Interestingly enough, these are TRQs that were indeed not always filled in their entirety since the implementation of CETA (Le Conseil des Canadiens, 2021). This brings up our last key point: The comparison of our model results with real trade data that appeared since the implementation of CETA.

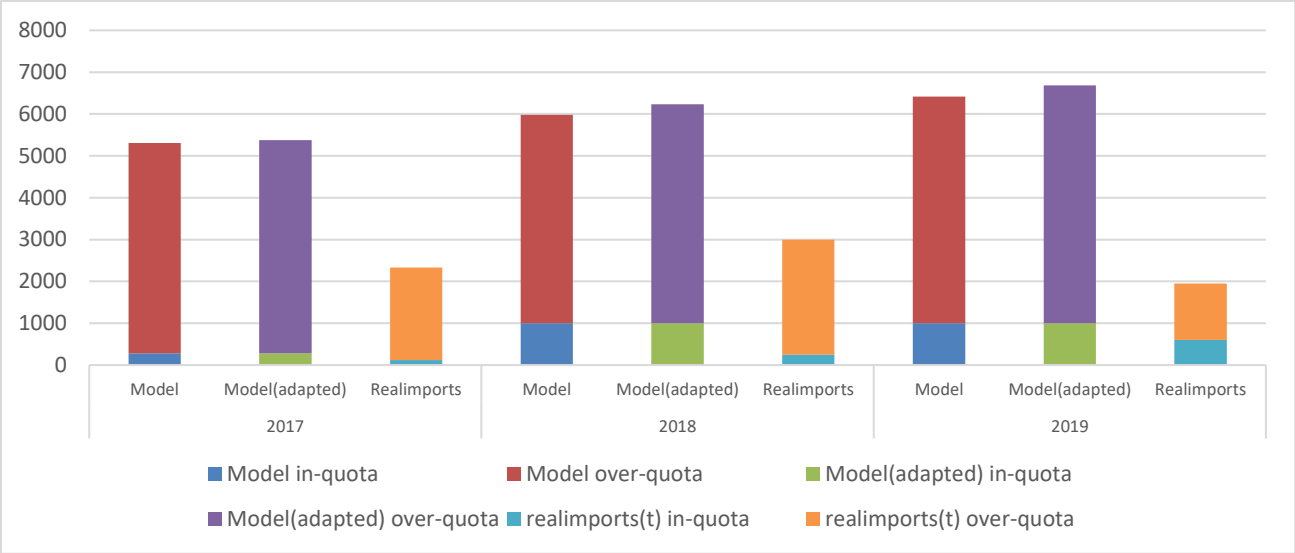

Figure 5: EU-imports of Cod

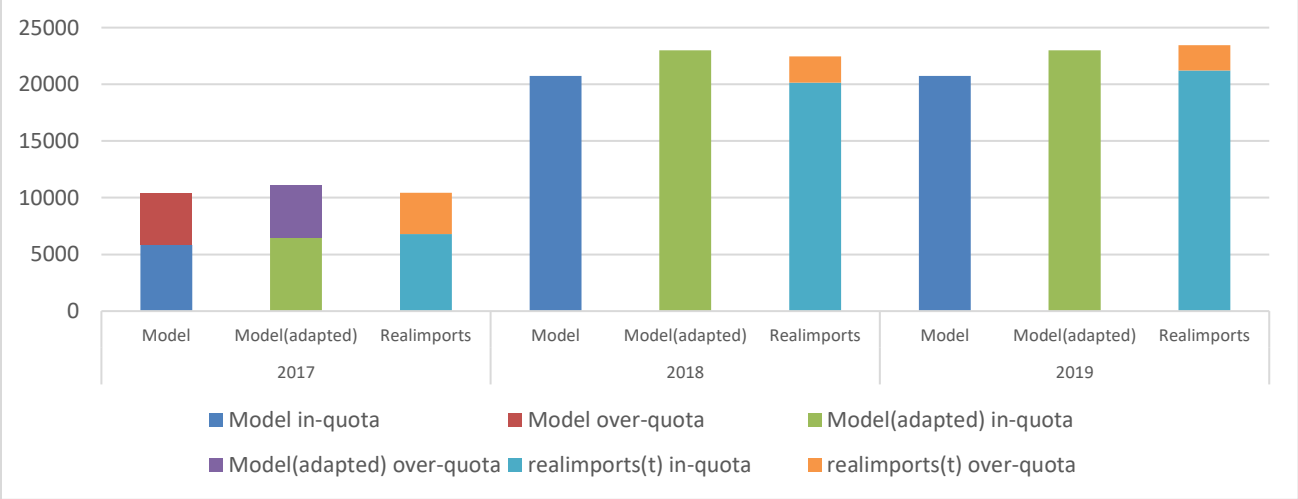

Figure 6: EU-imports of Shrimps

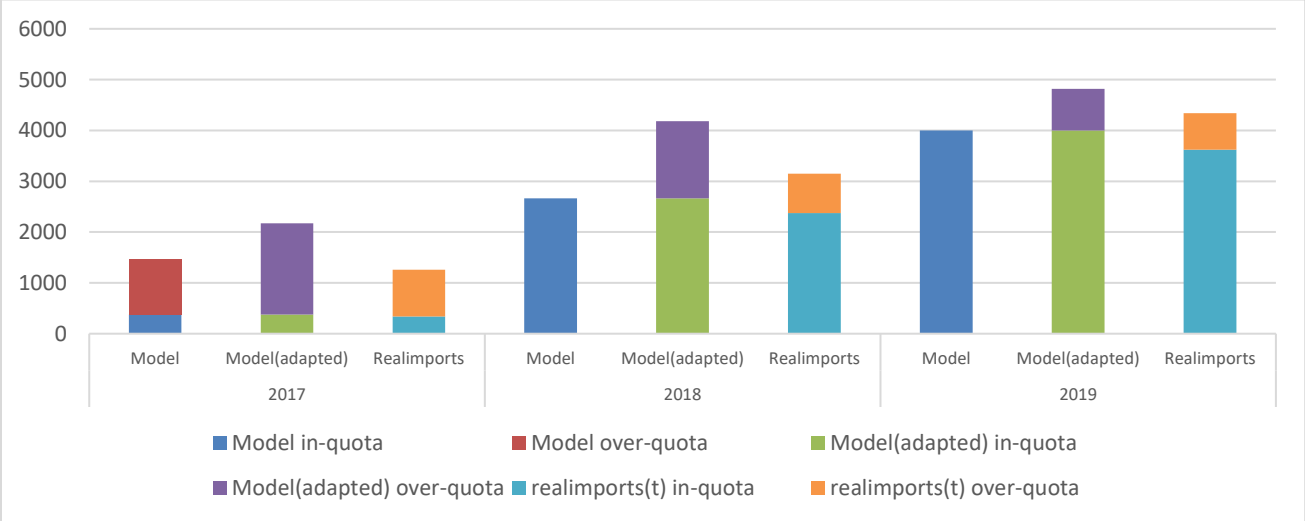

Figure 7: EU-imports of Sweetcorn

While the trade data that we could find for imports within the TRQs was not sufficient to give a full picture over all TRQs (European Commission, 2021), it was enough to give a comparison over three commodity groups: Cod, Shrimps and Sweetcorn. As becomes apparent from this, our model overestimated the market potential of Cod – not even the quota is entirely used. This may indicate that the requirements beyond the HS six-digit level, which we could not consider in our model. Kerr and Hobbs (2015) for instance lay out the differing production requirements for Canadian meat producers, who commonly use hormones in their beef production and the growth promotant ractopamine in their pork production exporters for their domestic consumers, but may not use these if they want to qualify for the European tariff-rate quotas. Equally, an inefficient quota allocation could inhibit the full potential usage of the quota. This issue can also resolve around market decisions under uncertainty that accrue from quotas: Kerr and Hobbs (2015) explain how the decision for a hormone free growth cycle has to be made before the acquisition of a quota license can be ensured, which results in a considerable risk for beef producers. For all three commodity groups, the imports of the first year appear lower than in the model, but this is probably due to the fact that CETA only came into effect in September of 2017, whereby the quota for this year was cut accordingly. In the case of sweetcorn, one can see that the model that was adapted to consider the small shares stay small problem does a better job at showing that imports beyond the quota are feasible. Unfortunately, the provided trade data gives no further insights into the allocation of licenses for specific HS codes, whereby our outcomes on a market distortion in favor of more expensive commodities cannot be confirmed.

5 Conclusion

Tariff-rate quotas are a popular instrument to grant some form of market access, while keeping the volumes of those imports in check. As our analysis showed, the restrictiveness of tariff-rate quotas does however not only lie in their volumes – through an efficient allocation of quota licenses, more expensive commodities have a much better chance of entering the market

compared to cheaper commodities. Thereby, tariff-rate quotas are a measure to make sure that market prices do not suddenly plummet as a result of the liberalization.

Since several commodities were not traded at all before CETA, important knowledge about prices and potential demand with lowered tariffs is missing for some parts of the TRQs. We tried to tackle this problem with estimations that are based on reference group trade data.

With the results of both estimations, we were able not only to give a theoretical estimation of effects on trade, but some first comparisons with real world trade data of the first years since the implementation of CETA. The proximity of real trade data and our estimated results yields some optimism for this form of analysis, although there is still need for further studies considering trade restrictions beyond the HS six-digit level.

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