



BATModel

better agri-food trade modelling for policy analysis

How to translate FTA legal
agreements into scientific
analysis

Houssein GUIMBARD



Trade Agreements implementation in applied models: « cookbook »

Houssein GUIMBARD

CEPII (France)

Session 1: **Modelling trade policies Theoretical and applied background – why
BATMODEL?**

How to translate FTA legal agreements into scientific analysis

Contents

1. Short reminder about CGEs
2. What is a trade agreement?
3. Building a tariff scenario from scratch
4. The cheese example (CETA)

Short reminder about CGEs

Definition of General Equilibrium (1)

- **General equilibrium theory** tries to explain the behavior of **demand, supply** and the resulting **prices** in a global economy (with several or many interacting markets).
- General equilibrium models consider **equilibrium in all markets simultaneously**
 - they consider **interrelationships** between different sectors in the economy
 - they explicitly represent the circular flow of income.
- Usually an applied general equilibrium is defined by:
 - **Factors and Goods** (1 or many) **(1)**,
 - **Agents** (Households, firms...) **(2)**,
 - **Markets** (to define prices) **(3)**.

Definition of General Equilibrium (2)

1. Production factors and goods

- Primary factors
 - **Labour**: High skilled, low skilled...
 - **Capital**: new (more productive, less pollution*), vintage...
 - **Land**: used by agricultural sector.
 - **Natural resources**: oil, coal, fish...
 - **Energy**: refined oil, electricity... in previous CGEs, energy was considered as intermediate inputs (now, could be substitute with capital: new generation of machine uses less energy than old ones...).
- Produced goods (Final Goods)
 - Produced by (mainly) firms using primary factors **and** intermediate inputs (also produces by firms using primary factors).

*: new capital could be better (more productive, less pollution) by unit, but not necessarily good for total CO2 emissions (world emissions can increase for example)

Definition of General Equilibrium (3)

2. 2-3 types of agents

- Households

- The representative household **owns** primary factors and **maximizes** its utility **subject to** its budget constraint. He/She consumes goods and services.

- Government

- The government **collects taxes** (on factor returns, consumption, trade,...), **transfers** income to households (i.e. itself) or firms, **produces** and **consumes** goods and services.
- Government can be **merged** with the representative household (it is the case in the MIRAGE model, CEPII) or modelled **separately**.

- Firms

- Produce goods from primary factors (and intermediate inputs),
- Rent primary factors from households,
- **Maximize profits**, subject to the available technology.

Definition of General Equilibrium (3)

3. Markets

- Prices equilibrate supply and demand.
 - Factors
 - Goods
- Depending on market organization (competitive, monopolistic...), **price** may or may not equal **marginal cost**.

GE Sequence (1)

- A general **equilibrium** is defined as:

$$F(\sigma, \theta, x, y) = 0$$

- Where
 - F : **set of equilibrium conditions** (behavioral equations, market equilibria)
 - σ : **behavioral** parameters (e.g. elasticities)
 - θ : **distributional** parameters (e.g. shares)
 - x : **endogenous** variables (e.g. consumption, trade, etc.)
 - y : **exogenous** policy variables (e.g. taxes, tariffs, subsidies...)
- What do we know? Only (x_0, y_0) from the data (generally one “**reference year**”). In our case, those data come from GTAP database for most of (x_0, y_0) . However, some y_0 come from other sources in MIRAGE (e.g. the tariffs data).

GE Sequence (2)

1. The model is **calibrated** to fit the base-year data. The calibration of a model consists in:
 - First, **determine** σ from the literature, estimation or “guestimation”.
 - Then, **compute** θ such that $F(\sigma, \theta, \mathbf{x}_0, \mathbf{y}_0) = 0$ is actually 0.
2. The **simulation** (i.e. the scenario. This can also concern the baseline) is a policy experiment:
 - Define a **new** set of policy \mathbf{y}_1 and find \mathbf{x}_1 such that

$$F(\sigma, \theta, \mathbf{x}_1, \mathbf{y}_1) = 0$$

- In our case, a trade agreement means changing the **tariffs** (\mathbf{y}_0 to \mathbf{y}_1). Consequently, the model finds the new values \mathbf{x}_1 .
 - s.t. the set of equations, « fixed » elasticities, share parameters (etc.)
 - Exogenous values for some variables (e.g. population by year).

Short reminder:

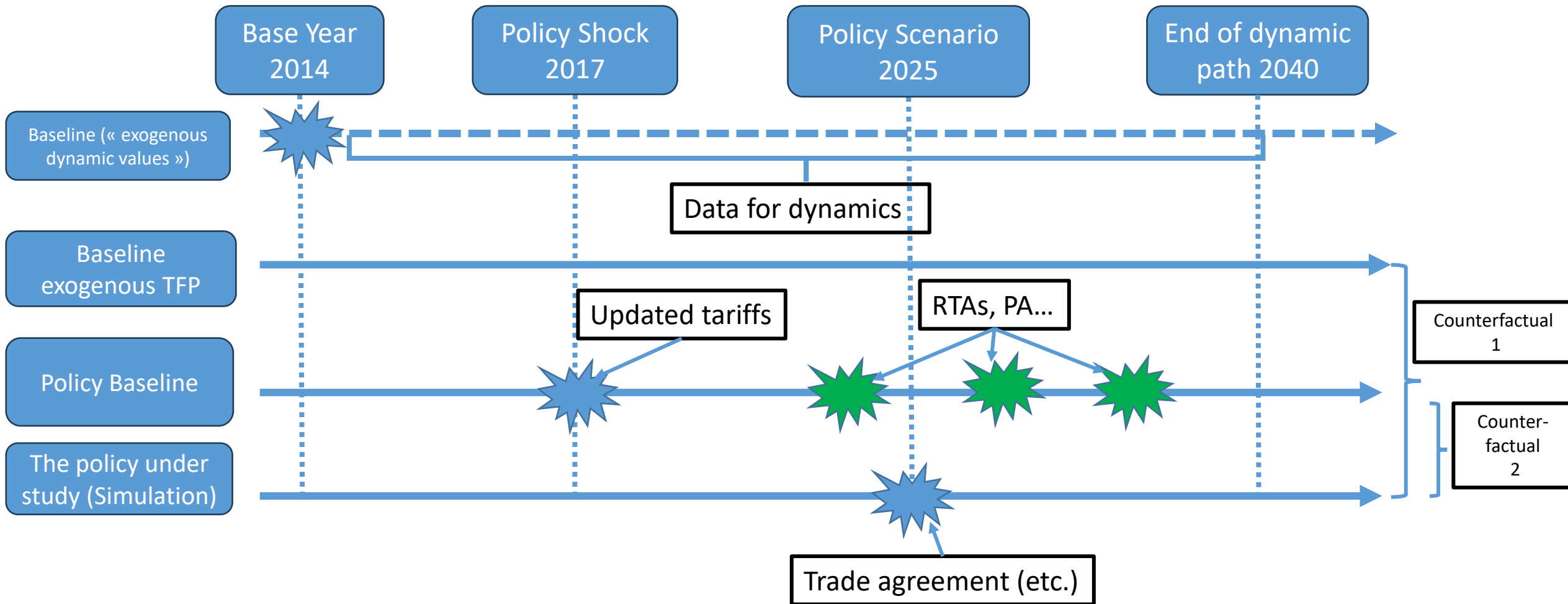
How to interpret the results in a CGE?

- Computing the difference between $F(\sigma, \theta, \mathbf{x}_0, \mathbf{y}_0)$ and $F(\sigma, \theta, \mathbf{x}_1, \mathbf{y}_1)$ is the aim of such counterfactual quantitative exercise in which a **simulation** is compared to a **baseline** (could be multiple baselines) for a given year (same applies for static models).
 - Generally, a baseline is a *statu quo* dynamic path in which (among other potential variables) population and GDP projections are used to compute the trajectory of the technological progress (TFP).
 - Most of the time it concerns **the last year**, in order to account for « complete » re-allocation effects (e.g. production factors going from one sector to another).
 - It is a « **What if** » situation which gives the variations between two equilibria: the simulation **includes** the « policy shock » whereas the baseline **does not**.
 - This gives results such as: « *as compared to the baseline, in 2040, the exports of cheese from the European Union to Canada will increase by 70%* ».

Short reminder: Baseline(s) and Simulation(s)

- In **dynamic** models, a policy baseline can be designed in order to implement ongoing/future changes in trade policies. It can include:
 - A **statu-quo** baseline: starting from the reference year, tariffs are kept constant. For example, the year is 2017 when using recent version of the GTAP database. Tariffs are then equal to their 2017 level for all years computed in the baseline.
 - A tariff shock that includes **updated tariff data**. For example, reference year is 2017 and you have tariff data for 2019. In that case, you can update the baseline with 2019 tariffs.
 - A tariff shock that includes **ongoing or planned tariff changes** (RTA like EU-Japan, Brexit, US-China trade war...).
 - This is « policy relevant » when the simulation is supposed to support policy makers' decisions.
 - An **hypothetic** tariff shock (trade agreements under negotiation, or implementing increase of tariffs). In that case, it could be useful to compute several baselines. One with real commitments (updated tariffs, in force RTAs...) and another one with potential trade policies.
- A **mixed of all that!**

Short reminder: Baseline(s) and Simulation(s)



Short reminder: Baseline(s) and Simulation(s)

- Same possibilities apply for **NTMs**.
- Same possibilities apply for other policy changes/shocks of importance(e.g. Ukraine-Russia war etc.).

What is a trade agreement?

What is a trade agreement

- **Any reciprocal trade agreement between two or more partners, not necessarily belonging to the same region.** It is an exception to the MFN case, allowed by GATT Art. XXIV (Goods, **337** notifications - 20240411) & GATS Art. V (Services, **206** notifications - 20240411), or enabling clause (**63** notifications – 20240411).
 - In WTO parlance, those agreements are called **Regional Trade Agreements (RTA)**, <https://rtais.wto.org/UI/PublicMaintainRTAHome.aspx>).
 - Moreover, **Preferential trade arrangements (PTAs)** refer to unilateral trade privileges such as General System of Preferences (GSP) schemes and non-reciprocal preferential programmes some WTO members implement for products from developing and least-developed countries (information on PTAs can be found here <http://ptadb.wto.org/?lang=1>) . The **Enabling Clause** is the WTO legal basis for the GSP. Technically, for a quantitative work, the **same methodology applies**.
 - In the academic literature (but not only), one can find **FTA** (Free Trade Agreement. At WTO, FTA is a particular case of RTAs, such as CU...), **RTA** (reciprocal trade agreement) or **PTA** (Preferential Trade Agreement). All of those are « kind of » the same concept. Unilateral preferences can be used to design GSP (etc.).

What is a trade agreement

- Regarding RTAs, those are legal texts with **commitments** (more or less binding) on tariffs, Non-Tariff Measures (NTMS, such as sanitary, technical barriers to trade, geographical indications...), but also other topics like trade facilitation, investment, domestic regulation, temporary entry of natural persons for business purposes...
- This presentation: focus on the **AVEs (Ad Valorem Equivalent) of tariffs** (same methodology applies if you want to use those tariffs in econometrics, such as in structural gravity, or in any regression that includes AVEs – or not – of tariffs).

What is a trade agreement

- The example of the Canada-European Union **Comprehensive Economic and Trade Agreement** (i.e. the CETA), from a Canadian point of view :
- “The European Union (EU) is one of the largest economies in the world and Canada’s second-largest trading partner. The Canada-European Union Comprehensive Economic and Trade Agreement (CETA) presents Canadian businesses with **preferential access** to and excellent opportunities for growth in the EU.
- September 21, 2023 marked the **sixth anniversary** of **CETA’s provisional application**. The Agreement will come into full effect when all EU Member States have completed the ratification process.
- Until then **provisional application of CETA will continue and remain accessible to Canadian and EU business alike.**”

CETA: Chapter summaries (Canada)

- [0. Preamble](#)
- [1. General Definitions and Initial Provisions](#)
- [2. National Treatment and Market Access for Goods](#)
 - [Protocol I: Rules of Origin and Origin Procedures](#)
- [3. Trade Remedies](#)
- [4. Technical Barriers to Trade](#)
- [5. Sanitary and Phytosanitary Measures](#)
- [6. Customs and Trade Facilitation](#)
- [7. Subsidies](#)
- [8. Investment](#)
- [9. Cross-Border Trade in Services](#)
- [10. Temporary Entry and Stay Of Natural Persons For Business Purposes](#)
- [11. Mutual Recognition of Professional Qualifications](#)
- [12. Domestic Regulation](#)
- [13. Financial Services](#)
- [14. International Maritime Transport Services](#)
- [15. Telecommunications](#)
- [16. Electronic Commerce](#)
- [17. Competition Policy](#)
- [18. State Enterprises, Monopolies and Enterprises Granted Special Rights or Privileges](#)
- [19. Government Procurement](#)
- [20. Intellectual Property](#)
- [21. Regulatory Cooperation](#)
- [22. Trade and Sustainable Development](#)
- [23. Trade and Labour](#)
- [24. Trade and Environment](#)
- [25. Bilateral Cooperation and Dialogues](#)
- [26. Administrative and Institutional Provisions](#)
- [27. Transparency](#)
- [28. Exceptions](#)
- [29. Dispute Settlement](#)
- [30. Final Provisions](#)
- [Protocol II: Mutual Acceptance of the Results of Conformity Assessment](#)
- [Protocol III: Good Manufacturing Practices for Pharmaceutical Products](#)

Building a tariff scenario from scratch

The various cases

How to construct a tariff scenario in a CGE*

- There are **3 main possibilities** to construct a **tariff scenario** for a trade agreement:
 - The **simplest** case.
 - The **simple case with some assumptions**.
 - The (more) **realistic case**.

How to construct a tariff scenario in a CGE: The **simplest** case.

- **Assume 0 tariffs between the involved countries.**
- **Pros:**
 - Easy to set tariffs to 0.
 - Moreover, it gives two interesting results:
 - an « upper bound » to what can be the outcome of the considered trade agreement.
 - It gives « immediate » results (save the time to process the RTA) and allows to have in mind some orders of magnitude.
- **Cons:**
 - (Most of the time) Too ambitious liberalization compared to what is/will be in the text.
 - Misses the striking figures due to sensitive products.

How to construct a tariff scenario in a CGE: The simple case with some assumptions

- **Assume 0 but exclude « GTAP sectors ».**
 - Could also be more aggregated sectors (e.g. the aggregated ones retained for the study).
 - Could also be product level if the model allows it. In that case, tariffs of sensitive products can be kept constant (could also be a small decrease of the average level etc.).
- **Pros:**
 - Still (but less) easy to set up.
- **Cons:**
 - Considering a complete sector as sensitive can be misleading: could be too liberalized or not enough! So it requires to carefully read the agreement in order to justify what is done.

How to construct a tariff scenario in a CGE: The (more) **realistic case**

- **Take the text « as is »!**
- Make it in a **convenient numerical format** to manipulate the tariff variable and implement the changes in tariffs. Then aggregate to the require level of sectoral/geographical classification retained for the study.
- **Objective:** having AVEs of tariffs or any other useful information that the model can handle, such as *per unit* expressed in currency by unit, quantities as well as inside and outside rate for TRQs...
- **Pros:**
 - The best way to tackle detailed issues/proposals.
- **Cons:**
 - More complex.
 - Still not reality (of course... it is a modelling exercise!).

How to construct a tariff scenario in a CGE: The (more) **realistic case**

- **Good news:** even if the model is then aggregated at the sectoral level (or region. For example, EU can be aggregated at the CU level) that's the **first best solution**.
- **Bad news:** there is **not a unique recipe**.
- Indeed, manipulating the text of an agreement always requires a **specific work** and making **assumptions** on:
 - Complex tariffs, incl. TRQs - HS6 nomenclature revision - Other required data
- The treatment can be more or less easily done in **any software**:
 - R, Python, SAS, Stata... Never easy, but experience helps and this **facilitates reproducibility**.
 - You can also do everything with excel. However, **changes might be more difficult to track**.*
 - GAMS is not well equipped to deal with this kind of files.
 - The good news for a simple trade agreement: the **corresponding dataset is small, about 10,000 to 25,000 lines** (in a two-countries case). This was not the case, for example, with « old » multilateral proposals from WTO in which a lot of countries were involved).

* One way could be to activate the macro VBA recorder...

How to construct a tariff scenario in a CGE

- Implementation in **one shot**: easier to work with! Mandatory for static models / Optional for dynamic models.
- **Dynamic implementation**:
 - Necessary to account for what happens on a year-by-year basis.
 - Useful to see the time schedule in a descriptive manner. Also useful when presenting results year by year is requested.
 - Not so useful for the model itself as interested results are the ones happening at the end of the simulation.
 - Most of the time, the official text classifies goods using categories for types of liberalisation.
 - Linear interpolation when necessary (or keep tariff constant until)
 - Can be done in any statistical software
 - Can be done in the software used for the simulation (e.g. GAMS), especially if the sectors considered only have a common treatment of the tariff (e.g. decrease in the beef sector are all linear and for the same period).

The various steps

- Depending on the data, **some steps may be inverted!** The order is broadly the same, but there are specificities in each scenarios!

1. Download

- **The text can be found on:**
 - WTO website.
 - National websites of involved countries.
 - If it is a proposal (under negotiation), then you have to find it (ministries, supra-national organisations...).
- **Download** the text. The format can be:
 - Pdf (most of the time)
 - Html (webpage)
 - Sometimes in .doc, .docx...
 - Generally, **not an excel file or csv...**
- Example of the **CETA**
 - The canadian website contains an html webpage which presents informations and tables for the tariff schedule.
 - The products that are listed are **the ones for which the tariff is not immediately set to 0.**

2. Conversion

- **Convert** this format into **xlsx** or csv (txt...).
 - Generally **not an easy task, especially when the document is provided in a pdf format**. This could be done with online tools, some routines also exist in Python etc... Results are never perfect. **Examples TPPs (pdf/xlsx)**.
 - However, an ugly **excel**/csv can be manipulated.
 - Using **excel** itself. Manual handling: cut/paste, remove lines or columns, find and replace specific characters... Could also be VBA programming to tackle several csv when more than 2 countries are involved (such as TTIP, RCEP...).
 - Importing the **xlsx**/csv into a **statistical software (Python, R, SAS, Stata...)**.
- Once done, there is a **new set of technical manipulations**. Those are linked to economics/trade policies and to the model that is used.

3. Additional tariff data

- In some cases, **downloading the MFN rates from WTO** can be mandatory/a good idea (e.g when the agreement use a specific base year to implement the tariff schedule).
- MFN data can be downloaded from the TAO website. <https://tao.wto.org/welcome.aspx?ReturnUrl=%2f> **Example**.
- It allows to directly process the raw MFN tariffs data and make the treatment **consistent** with the one of the tariff schedule of the agreement.
- Moreover, it also allows to have the (generally) outside rate for TRQs when those are MFNs.

4. Manipulation/What is a tariff?

- The next step consists in **organizing the database** to allow the user (you) to manipulate the tariffs, **both** for the **trade agreement** and the **MFN tariffs**.
- Most of the time, the user will have to **split the tariff column** (first best: the xlsx file has only one tariff column... Otherwise, extra-manipulation will be requested.).
- This tariff column **may contain a lot of information**, depending on the **nature of the tariffs**. This work is generally more complex for **developed countries** (EU, Canada...) than developing countries (which mainly use pure *ad valorem* tariffs).

4. Manipulation/What is a tariff?

- Tariffs can be **ad valorem (%)** or non-*ad valorem*. In that case, they can be:
 - **Per unit** tariffs: 148 €/t
 - **Compounded** tariffs: 12.8% + 176.8 €/100 kg/net
 - **Mixed** tariffs (with logical operator, such as min, max...): 238 % but not less than 30.8¢ each
 - Other **types of complex duties** (on the degree of alcohol, entry prices or even information outside the processed pdf/html page...): "See Annex 2 of Commission Implementing Regulation (EU) No 1101/2014 (p. 679-718)"
 - A **tariff rate quota** (TRQ), i.e. an **authorized quantity** taxed at **inside rate** (i.e. a preferential tariff, which can be pure adv or compounded) and an **outside rate** (generally the MFN) that is used when the imported quantity is outside the authorized quantity. TRQs also contain information on their **administration method** (historical partner, first-come first-serve...).

6. What is expected?

- Consequently, the column tariff « must » be split in:
 1. An *ad valorem* component (0 or positive).
 2. A *per unit* component (0 or positive).
 3. The currency used for the *per unit* component.
 4. The unit used for the *per unit* component.
 5. The logical(s) operator(s) for mixed duties.
 6. Inside rate for TRQ (possibly with columns 1-4 again)
 7. Outside rate for TRQ (possibly with columns 1-4 again)
 8. Authorized imported quantity for the TRQ (i.e. the volume).
 9. The TRQID.
 10. Any other relevant information!

Only if there are TRQs

7. Product level?

- At which « level » do we work?
 - Tariffs can be defined at the **tariff line level** (8 digits-12/14 digits).
 - They can be defined at the **HS6** (Harmonized System at 6 digits classification).
- If tariffs are directly available at the HS6 level, then work with it.
- If they are set at the TL level, there are **2 possibilities**:
 - Computing the AVE at the TL level.
 - After some manipulations, aggregate TL to the HS6 level and then compute the AVE.
- If the model can handle TL, it could be interested to work with TL.
 - **Pros**: no aggregation bias.
 - **Cons**: difficulties to find other useful data at this level, such as trade (you have to trust statistics from the importer only), unit values, conversion factors (for units used in per unit duties), trade...

MAcMap-HS6's methodology: TL

- Logical operators are **discarded**
 - “91011100 : 4.5 % MIN 0.3 EUR/p/st MAX 0.8 EUR/p/st” **becomes** “910111: 4.5%”.
- The two components of compound tariffs are **preserved**
 - for 2016 and EU: “17041010 : 6.2 % + 27.1 EUR/100 kg MAX 17.9” and “17041090 : 6.3 % + 30.9 EUR/100 kg MAX 18.2” **becomes** “170410: 0.0625+324.87453”. [simple average of 2 TL]
- Assumptions have to be made on **case by case** basis for more complex tariffs.
 - « Entry prices » for tomatoes in the EU can be a simple average of all tariffs or taken the maximum tariff (...).
- Units are harmonized to COMTRADE units (e.g. tons instead of 100 kg) and specific tariffs are **converted in USD/ton**, using conversion factors coming, for example, from the **BACI database** (CEPII) or from elsewhere is available.
- Exchange rates are used to convert the currency unit of the per unit component (if a common currency is required. For example, model is in dollars and *per unit* are expressed in euro by ton). Simple method: rely on annual average exchange rates

From TL to HS6

- Once done, tariff lines aggregate to the six-digit level by **simple average**.
 - Aggregating tariff lines within an HS6 position is a more limited challenge than to aggregate tariffs over a large set of products. The number of lines is limited. A simple average **reduces the risk associated with any aggregation** and avoids the need of a complex aggregator.
 - It requires (almost) **only information on tariffs**.
 - At the detailed level, tariff peaks are more frequent and a trade-weighted average will be much more biased.
- Generally, for *per unit* component, the units can be easily harmonized at the TL level (but not always), so averaging is not issue. Otherwise, you have to take care of that.

From TL to HS6

- You end up with a database with a ***per unit component*** express in USD/ton and an ***ad valorem component*** in percentage.
- At this step, one might need to **convert the HS6 classification into another one**. In that case: use comtrade correspondence tables, available here: <https://unstats.un.org/unsd/classifications/Econ> (some also available on WITS). See screenprint on next slide.
- Next step is to convert the *per unit* component into an AVE.

From TL to HS6

https://unstats.un.org/unsd/classifications/Econ

FROM / TO	HS 2017	HS 2012	HS 2007	HS 2002
★ New HS 2022				
HS 2017	-			
HS 2012	-	-		
HS 2007	-	-	-	
HS 2002	-	-	-	-
HS 1996	-	-	-	-

https://wits.worldbank.org/product_concordance.html

WITS
World Integrated Trade Solution

Trade Stats | Tariffs | Non-Tariff Measures | CVC | API | Analytical database | Tools

Home | About WITS

Product Concordance

World Integrated Trade Solution (WITS) offers information about various product nomenclatures and help with mapping between various product nomenclatures.

Use this section to download mapping between various nomenclatures. To learn more about product nomenclature visit the help section on product nomenclature. To learn more about product mapping visit the help section on product concordances. For downloading list of products within a product section.

Please download the mappings you need from the links provided below. You can also login to WITS to view and download the mappings, from the Product Nomenclature and Concordances sub-menu in the Support Materials menu.

- HS 1988/1992 or H0
 - H0 to BEC
 - H0 to ISIC Rev 3
 - H0 to SITC3
 - H0 to CCCN
 - H0 to SIC
 - H0 to SITC4
 - H0 to CPC
 - H0 to MTN
 - H0 to GTAP
 - H0 to SITC1
 - H0 to ISIC Rev 2
 - H0 to SITC2
 - HS 1996 or H1
 - H1 to BEC
 - H1 to ISIC Rev 2
 - H1 to SITC2
 - H1 to CCCN
 - H1 to ISIC Rev 3
 - H1 to SITC3
 - H1 to CPC
 - H1 to SIC
 - H1 to SITC4
 - H1 to GTAP
 - H1 to MTN
 - H1 to H0
 - H1 to SITC1
 - HS 2002 or H2
 - H2 to BEC
 - H2 to H1
 - H2 to SITC1
 - H2 to CCCN
 - H2 to ISIC Rev 2
 - H2 to SITC2
 - H2 to CPC
 - H2 to ISIC Rev 3
 - H2 to SITC3
 - H2 to GTAP
 - H2 to SIC
 - H2 to SITC4
 - H2 to H0
 - H2 to MTN
 - HS 2007 or H3
 - H3 to BEC
 - H3 to H1
 - H3 to MTN
 - H3 to CCCN
 - H3 to H2
 - H3 to SITC1
 - H3 to CPC
 - H3 to ISIC Rev 2
 - H3 to SITC2
 - H3 to GTAP
 - H3 to ISIC Rev 3
 - H3 to SITC3
 - H3 to H0
 - H3 to SIC
 - H3 to SITC4
 - HS 2012 or H4
 - H4 to BEC
 - H4 to H3
 - H4 to SITC4
 - H4 to GTAP
 - H4 to ISIC Rev 3
 - H4 to H0
 - H4 to SITC1
 - H4 to H1
 - H4 to SITC2
 - H4 to H2
 - H4 to SITC3
 - HS 2017 or H5
 - H5 to BEC
 - H5 to H3
 - H5 to SITC4
 - H5 to GTAP
 - H5 to H4
 - H5 to H0
 - H5 to SITC1
 - H5 to H1
 - H5 to SITC2
 - H5 to H2
 - H5 to SITC3
 - HS 2022 or H6
 - H6 to BEC
 - H6 to H3
 - H6 to SITC3
 - H6 to GTAP
 - H6 to H4
 - H6 to SITC4
 - H6 to H0
 - H6 to H5
 - H6 to H1
 - H6 to SITC1
 - H6 to H2
 - H6 to SITC2

How to manipulate tariffs: MAcMap-HS6's methodology to compute AVEs

- The last stage in converting *per unit* tariffs into AVEs involves the choice of **trade unit values** (trade prices being not available). Such values play a major role because any measurement error will have a proportional effect on the AVE of the specific tariff. For instance, using overestimated unit values will decrease the level of protection.
 - **Bilateral unit values?** Using bilateral unit values at the product level is unsatisfactory given their high volatility, which is often caused by statistical errors (quantity badly notified, abusive rounding). Moreover, they might not exist (no bilateral trade...). They also may lead to an Alchian-Allen effect (decrease level of protection).
 - **World unit values?** Do not account for country's characteristics.

How to manipulate tariffs: MAcMap-HS6's methodology to compute AVEs

- **MAcMap-HS6 unit values?**

- To get a relevant AVE, we need unit values to match two features: stability and relevance compared with the price heterogeneity of different exporters.
- The Exporter's reference group unit values (ERGUV) approach adequately responds to these requirements (see the description for MMHS6 2004 available [here](#)). A cluster analysis is performed, grouping exporters into five groups, according to GDP per capita and trade openness. For each group, and for the whole world, a product unit value (HS6) is computed using a weighted median of the trade data during a 3-years period (the middle one being the MAcMap-HS6 year).
- To ensure the stability of the AVE obtained, an additional filter is applied: ERGUVs are limited to an interval comprising between one-third and three times the world median unit value; extreme values are capped by the limits of this range.

Aggregation

- Most applications (CGE analysis, econometrics matching tariff data and domestic production/consumption series...) using protection data will require aggregated tariffs. The task is still a challenge for applied economists; none of the existing solutions is perfect. So, make your choice! Here some examples:
 - **Simple average**: Seems neutral. But it depends on the degree of disaggregation of the tariff structure of a country (number of tariff lines); and, most important, it has a poor level of economic relevance because it gives the same weight to a highly important product as it does to a marginal one. **Provides generally higher figures than other methods.**
 - **World trade** may appear to be a good weighting scheme, as it eliminates the endogeneity problem, but it also suppresses the specific features of trade patterns for exporters and importers.

Aggregation

- **Bilateral trade average**: remains the most widespread method in applied research. It preserves the hierarchy between different products, but at the same time it suffers from the endogeneity problem between protection and trade: a prohibitive tariff forbids any import, which in turn means no weight. So when tariff peaks exist, this technique moves the protection level downward compared with the simple average, which puts relatively more weight on non-traded tariff lines. **Provides generally the lowest average**. Good thing: consistent with tariff revenue in the SAM.
- **Trade Restrictiveness Index** and the **Mercantilist Trade Restrictiveness Index** developed by Anderson and Neary (2005): which are *uniform tariff equivalents* that maintain the *same value of trade or a welfare equivalent measure*, whose variations can be related to changes in the generalized mean and variance of the tariff schedule. These indicators lean on a theoretical justification; however, they rely on numerous assumptions about demand elasticities. And more important, using a constant elasticity of substitution framework, they do not deal satisfactorily with the endogeneity problem between trade and tariff, especially for prohibitive tariffs.

Aggregation

- **Ref. group's average (MAcMap-HS6):**

- The original approach proposed by CEPII (Bouët et al. 2004) aims to limit the endogeneity bias, preserving the specificities of the trade structures without requiring any assumptions on the demand parameters.
 - The approach is designed to use an “instrumental” variable for bilateral trade that reduces the endogeneity bias. Following this “reference group” methodology, bilateral applied tariffs are aggregated using the exports of a given country toward a group of countries (the reference group) to which the import country belongs, instead of bilateral trade.
 - Since different countries pertaining to the same reference group share common demand features but different trade policies—due to a different political-economic equilibrium, for instance—the endogeneity bias is reduced. Formula in annex.
- Other aggregator: [Laborde, Martin, and van der Mensbrugghe \(2011\)](#)

Dynamics

- Under CETA, Canada and the EU have committed **to eliminate or reduce tariffs on goods** imported from the other Party. Tariffs will be eliminated **within specified periods**, primarily through the following four phase-out categories:
 - Immediately upon entry into force of the Agreement (category A) **on 21 September 2017**
 - over 3 years through 4 equal cuts (category B)
 - over 5 years through 6 equal cuts (category C)
 - over 7 years through 8 equal cuts (category D)
 - shall be removed in three equal stages beginning on the fifth anniversary of the date of entry into force of this Agreement, and these goods shall be duty-free, effective January 1 of year 8 (category S)
 - Goods that are **excluded** from commitments by a Party to provide tariff preferences are denoted in category E.
 - CETA also provides preferential market access through the establishment of various tariff rate quotas (**TRQs**). TRQs provide for involve the application of a preferential tariff rate for a defined quantity of imports, and a higher tariff rate applied for imports above that quantity. The category AV0+EP eliminates the ad valorem component upon entry into force and keeps constant the *per unit* component.
- **Consequence**: technically, the **program will account for that if and only if a dynamic model is considered**. In that case, a **variable that indicates the category** (A, B, C, D, E, S, TRQ) can be created to ease the process of computing the dynamic.
- Example:
 - if category = "B" and year = 0 then applied = applied0;
 - if category = "B" and year = 1 then applied = applied0*0.75;
 - Etc. (could be also programmed in GAMS)

CETA (Official information – not to be read)

- 3. For originating goods from the other Party set out in each Party's Schedule to this Annex, the following **staging categories** apply to the elimination of customs duties by each Party pursuant to Article 2.4:
 - a. duties on originating goods provided for in the items in staging **category A** in a Party's Schedule shall be eliminated on the date this Agreement enters into force;
 - b. duties on originating goods provided for in the items in staging **category B** in a Party's Schedule shall be removed in four equal stages beginning on the date this Agreement enters into force, and such goods shall be duty-free, effective January 1 of year 4;
 - c. duties on originating goods provided for in the items in staging **category C** in a Party's Schedule shall be removed in six equal stages beginning on the date this Agreement enters into force, and such goods shall be duty-free, effective January 1 of year 6;
 - d. duties on originating goods provided for in the items in staging **category D** in a Party's Schedule shall be removed in eight equal stages beginning on the date this Agreement enters into force, and such goods shall be duty-free, effective January 1 of year 8. For greater certainty, when the European Union applies a customs duty for the items 1001 11 00, 1001 19 00, high quality common wheat of items ex 1001 99 00, 1002 10 00 and 1002 90 00, at a level and in a manner so that the duty-paid import price for a specified cereal will not be greater than the effective intervention price, or if there is a modification of the current system, the effective support price, increased by 55 per cent as set out in Commission Regulation (EC) No 642/2010 of 20 July 2010 on rules of application (cereal sector import duties) of Council Regulation (EC) No 1234/2007^{Footnote 1}, the European Union shall apply the tariff elimination staging category towards any calculated duty that would be applied as per the above regulation, as follows:

Year	Applied Duty
1	87.5% of the duty calculated as per EC Reg. 642/2010
2	75% of the duty calculated as per EC Reg. 642/2010
3	62.5% of the duty calculated as per EC Reg. 642/2010
4	50% of the duty calculated as per EC Reg. 642/2010
5	37.5% of the duty calculated as per EC Reg. 642/2010
6	25% of the duty calculated as per EC Reg. 642/2010
7	12.5% of the duty calculated as per EC Reg. 642/2010
8 and each subsequent year	0% of the duty calculated as per EC Reg. 642/2010 (duty-free)

CETA (Official information – not to be read)

- e. duties on originating goods provided for in the items in staging category S in a Party's Schedule shall be removed in three equal stages beginning on the fifth anniversary of the date of entry into force of this Agreement, and these goods shall be duty-free, effective January 1 of year 8;
- f. the *ad valorem* component of the customs duties on originating goods provided for in the items in staging **category "AV0+EP"** in a Party's Schedule shall be eliminated upon the date of entry into force of this Agreement; the tariff elimination shall apply to the *ad valorem* duty only; the specific duty resulting from the entry price system applicable for these originating goods shall be maintained; and
- g. duties on originating goods provided for in the items in staging **category E** in a Party's Schedule are **exempt from tariff elimination**.
 - 4. The base rate for determining the interim staged rate of customs duty for an item shall be the **MFN customs duty rate applied on 9 June 2009**.
 - 5. For the purpose of the elimination of customs duties in accordance with Article 2.4, interim staged rates **shall be rounded down** at least to the nearest tenth of a percentage point or, if the rate of duty is expressed in monetary units, at least to the **nearest 0.001 of the official monetary unit** of the Party.

Dynamic: implementation

- Tariffs dismantlement **can be computed outside the model**, leading to a value for tariff computed on a yearly basis.
- In the model, these new data **replace** the constant tariff originally implemented in the EU-Canada relationship.
- In the scenario, most of the time (for EU-Canada relationship):
 - $AVE_Scenario = AVE_CETA$
 - But could also be : $AVE_Scenario = \min(AVE_CETA, baseline_ave)$.
 - Why ?
 - Because of **changes of MFNs between the base year and the year of implementation**. For example, the new tariff for a sensitive product can be higher than the actual MFN (if MFN has changed!). For example, in CETA: The base rate for determining the interim staged rate of customs duty for an item shall be the MFN customs duty rate applied on 9 June 2009
<https://data.consilium.europa.eu/doc/document/ST-10973-2016-ADD-1/en/pdf>
 - Because of **existing « preferences »**, such as multilateral TRQs, if they are computed in the baseline.
 - This kind of implementation is mandatory with multilateral agreements (because they implement decrease of **bound tariff** (CTS), which can be lower than MFN tariff, but not lower than actual preferential applied tariffs (trade agreement, unilateral pref...)).

Implicit assumptions

- **Unit values**: those are supposed to be **constant** over years (i.e. what is implied by keeping an AVE of *per unit* duties).
- **Rules of origin**: those are **not considered**. In the model, a good produced in Spain is Spanish.
- **100% use of preferences granted** in the agreement. And this is clearly not the case in reality.
- When considering aggregated sectors, the **share** of each product is considered **constant within those sectors** (same thing for HS6 vs TL).

An example: Cheese in the CETA

An example: the « Cheese case »

- In the Canada-European Union Comprehensive Economic and Trade Agreement (CETA), **cheese** is considered as a sensitive product when Canada is the importing country.
- Those products **are not excluded** from the agreement, but benefits from a specific treatment, i.e. an increase of the volume of the previous TRQ and a change in the inside rate of the TRQ.
- Informations can be found here:
- <https://www.international.gc.ca/trade-commerce/trade-agreements-accords-commerciaux/agr-acc/ceta-aecg/text-texte/02-A.aspx?lang=eng>

An example: the « Cheese case »

- Under CETA, the Canada will establish **two** new tariff rate quotas (TRQs) for cheese originating in the European Union: one for **16,000,000 kg of cheeses of all types** and one for **1,700,000 kg of cheeses of all types to be used in food processing (industrial cheese)**.
 - The Government of Canada has decided to allocate the 16,000,000-kg **cheese quota (all types of cheese)** across the cheese value chain. The chain includes cheese manufacturers, distributors and retailers, with portions of the quota being specifically reserved for small and medium-sized enterprises.
 - The 1,700,000-kg **industrial cheese** quota will be made available entirely to further processors **who use cheese to manufacture food products**.
- *Additional details* (not relevant in a global CGE): Each of the two quotas will be completely open to **new entrant applicants** (companies that do not currently have an allocation under Canada's existing World Trade Organization cheese TRQ). Eligibility for an allocation will be assessed on the basis of each applicant's activity in Canada's cheese sector, not on a history of cheese importing activity. The policies also include specific measures to help small and medium-sized enterprises and new entrants participate meaningfully in the two new quotas.

Cheese

Cheese Tariff Rate Quota

16.

- a. Originating goods in the following aggregate quantities and provided for in items with the notation "TRQ Cheese" in Canada's Schedule to this Annex and listed in subparagraph (d) shall be duty-free in the years specified below:

Year	Aggregate Annual Quantity (Metric Tonnes ⁵)
1	2,667
2	5,333
3	8,000
4	10,667
5	13,333
6 and each subsequent year	16,000

⁵ Expressed in net weight.

CETA's new
inside rate

The schedule,
by year

The final
quantity

Canada uses a
more detailed
classification
than HS6, with
2 additional
digits

- a. Canada shall administer this tariff rate quota either through an import licensing system as outlined in the Declaration on Tariff Rate Quota Administration or as otherwise agreed to between the Parties.
- b. Notwithstanding subparagraph (b), paragraphs 19 and 20 shall apply to this paragraph.
- c. This paragraph applies to the following tariff lines:
0406.10.10, 0406.20.11, 0406.20.91, 0406.30.10, 0406.40.10, 0406.90.11, 0406.90.21, 0406.90.31, 0406.90.41, 0406.90.51, 0406.90.61, 0406.90.71, 0406.90.81, 0406.90.91, 0406.90.93, 0406.90.95, and 0406.90.98.

Industrial Cheese

Industrial Cheese Tariff Rate Quota

17.

- a. Originating goods in the following aggregate quantities and provided for in items with the notation "TRQ Industrial Cheese" in Canada's Schedule to this Annex and listed in subparagraph (d) shall be duty-free in the years specified below:

Year	Aggregate Annual Quantity (Metric Tonnes ⁶)
1	283
2	567
3	850
4	1,133
5	1,417
6 and each subsequent year	1,700

⁶ Expressed in net weight.

The prefix « ex » in front of a given HS6 code means that only *some* of the types of goods (scope) are covered by the HS6. Basically, it means “partially included in”

The tariff lines are the same as the one used in the previous TRQ.
Consequence: we can consider only **1 TRQ:** Cheese + Industrial Cheese

- a. Canada shall administer this tariff rate quota either through an import licensing system as outlined in the Declaration on Tariff Rate Quota Administration or as otherwise agreed to between the Parties.
- b. Notwithstanding subparagraph (b), paragraphs 19 and 20 shall apply to this paragraph.
- c. This paragraph applies to industrial cheese, which means cheese used as ingredients for further food processing (secondary manufacturing) imported in bulk (not for retail sale), classified in the following tariff lines:
- ex 0406.10.10, ex 0406.20.11, ex 0406.20.91, ex 0406.30.10, ex 0406.40.10, ex 0406.90.11, ex 0406.90.21, ex 0406.90.31, ex 0406.90.41, ex 0406.90.51, ex 0406.90.61, ex 0406.90.71, ex 0406.90.81, ex 0406.90.91, ex 0406.90.93, ex 0406.90.95, and ex 0406.90.98.

Additional information on quantities

- Imports of cheese into Canada are subject to import controls under Canada's EIPA. Accordingly, an import permit issued by Global affairs Canada is required for shipment of cheese to enter Canada. Import permits for shipments of cheese destined to the Canadian market are issued to traditional allocation holders under Canada's World Trade Organization (WTO) tariff rate quota (TRQ) for all types of cheese, which is administered by Global Affairs Canada.
- The access quantity for the WTO cheese TRQ is **20,411,866** is split into two reserves, one for cheese originating from the **European Union (EU)** and one for **non-EU origin cheeses**. Pursuant to Canada's commitment under the **Canada-EU Comprehensive Economic and Trade Agreement (CETA)**, Canada **committed to reallocate 800,000 kilograms from the non-EU reserve to the EU reserve**. Consequently, **14,271,831 kilograms** is reserved for EU-origin cheeses and **6,140,035 kilograms** is reserved for non-EU origin cheeses.
- <https://www.international.gc.ca/controls-controles/prod/agri/dairy-laitiers/notices-avis/906.aspx?lang=eng>

CETA article

WTO Cheese Tariff Rate Quota

18. Canada shall reallocate, beginning in year 1 of this Agreement, 800 tonnes of Canada's 20,411,866 kilogram WTO Tariff Rate Quota for cheese to the European Union.

Quantities for the Cheese TRQ

- In the **baseline**, the quantity for the Canadian Cheese TRQs (WTO cheese TRQs for the EU) is:
 - **13 472 tons**
- In the **simulation**, the new volume allocated to the EU by Canada becomes (in green: CETA TRQs):
 - **13 472 + 16 000 + 1 700 + 800 = 31 972 tons**
 - Removal of 800 tons from the canadian WTO Cheese TRQ to non-EU countries.

Initial information on the tariff component of TRQs

- To get the « actual » (i.e. pre-CETA) inside/outside rate, download MFN on WTO website (TAO ; remember: this is one of the « first » steps). See [CheeseMfnCanada.xlsx](#). There are **34** tariff lines. **What is important:**
 - Select: « 02- MFN statutory (legal/autonomous) duty » (other information are related to preferential duties, e.g. NAFTA, Peru, Colombia, LDCs... or the General tariff, which can be higher than MFN).
 - HS6 revision 2012 (is this compatible with the CETA offer? With trade data?...). **Csqce:** conversion?
 - The file splits « within access » and « over access » commitment. This is fine but **there are 1 TL code for each!** **Csqce:** manual manipulation with care and consistency required when merging with trade data or list of products in CETA. So 34 lines means, in reality, **17 products**.
 - All lines do not have the same inside tariff. **Csqce:** aggregation will generate bias. If trade is needed, then Canadian TL trade data are required as Canadian TL are not the same as European TL (reminder: only HS6 is « harmonized », by definition). In our case, this inside tariff is very low, so it is not a big issue.
 - Inside tariffs are *per unit* (S means specific). **Csqce:** trade unit values are required (for AVEs).
 - Outside tariffs are mixed: 1 *ad valorem* component and a condition expressed as a *per unit* tariff. **Csqce:** assumption on how to deal with this type of duties.

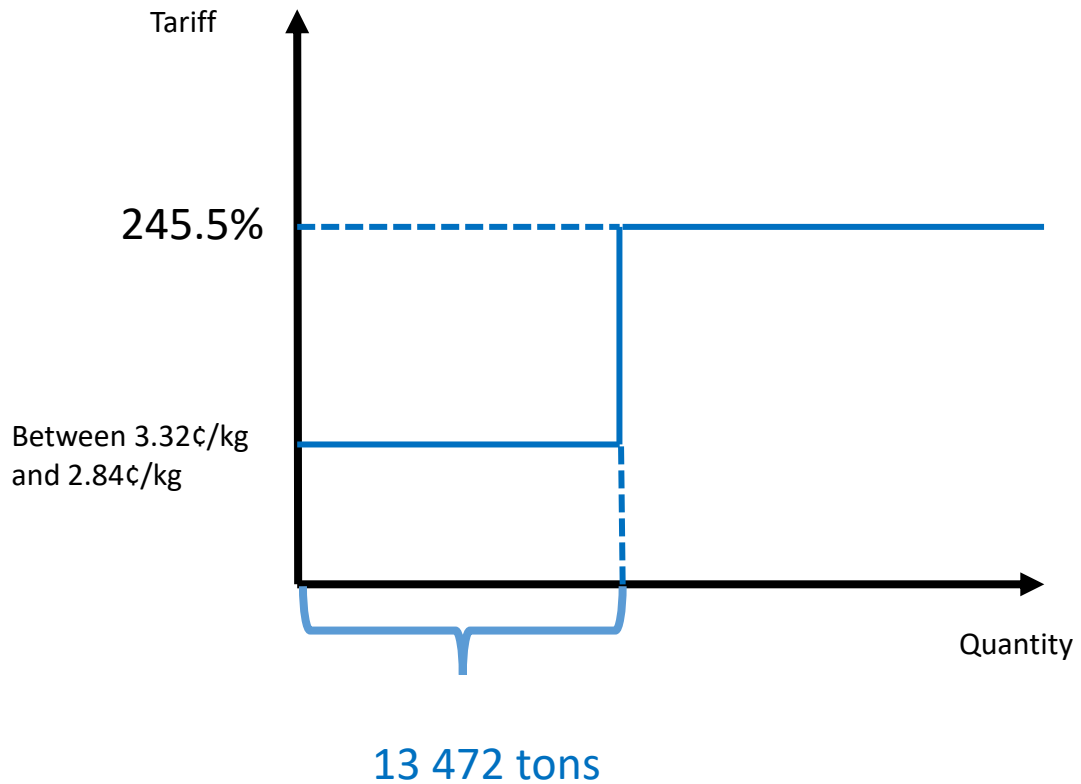
Using MAcMap-HS6 unit values:

Product Code	AVE MFN	Trade value	Trade quantities	AVE TRQ INSIDE INITIAL	AVE TRQ OUTSIDE INITIAL	AVE TRQ INSIDE FINAL	AVE TRQ OUTSIDE FINAL
04061020	245,5	524750,884	67,702	0,71	245,5	0	245,5
04062012	245,5	1727,96266	0,247	0,48	245,5	0	245,5
04062092	245,5	597492,596	44,921	0,56	245,5	0	245,5
04063020	245,5	4085390,2	449,053	0,58	245,5	0	245,5
04064020	245,5	12598051,3	1020,037	0,36	245,5	0	245,5
04069012	245,5	9918713,65	881,317	0,46	245,5	0	245,5
04069022	245,5	2815855,76	279,68	0,54	245,5	0	245,5
04069032	245,5	11855966,9	1009,72	0,54	245,5	0	245,5
04069042	245,5	35850920,2	3150,026	0,54	245,5	0	245,5
04069052	245,5	1327994,01	140,898	0,54	245,5	0	245,5
04069062	245,5	1935843,53	191,456	0,54	245,5	0	245,5
04069072	245,5	2536107,56	292,778	0,54	245,5	0	245,5
04069082	245,5	72748,9461	5,365	0,54	245,5	0	245,5
04069092	245,5	1485025,22	154,362	0,54	245,5	0	245,5
04069094	245,5	39980732,9	3052,955	0,54	245,5	0	245,5
04069096	245,5	4501485,6	407,904	0,54	245,5	0	245,5
04069099	245,5	27423519,8	2567,495	0,54	245,5	0	245,5

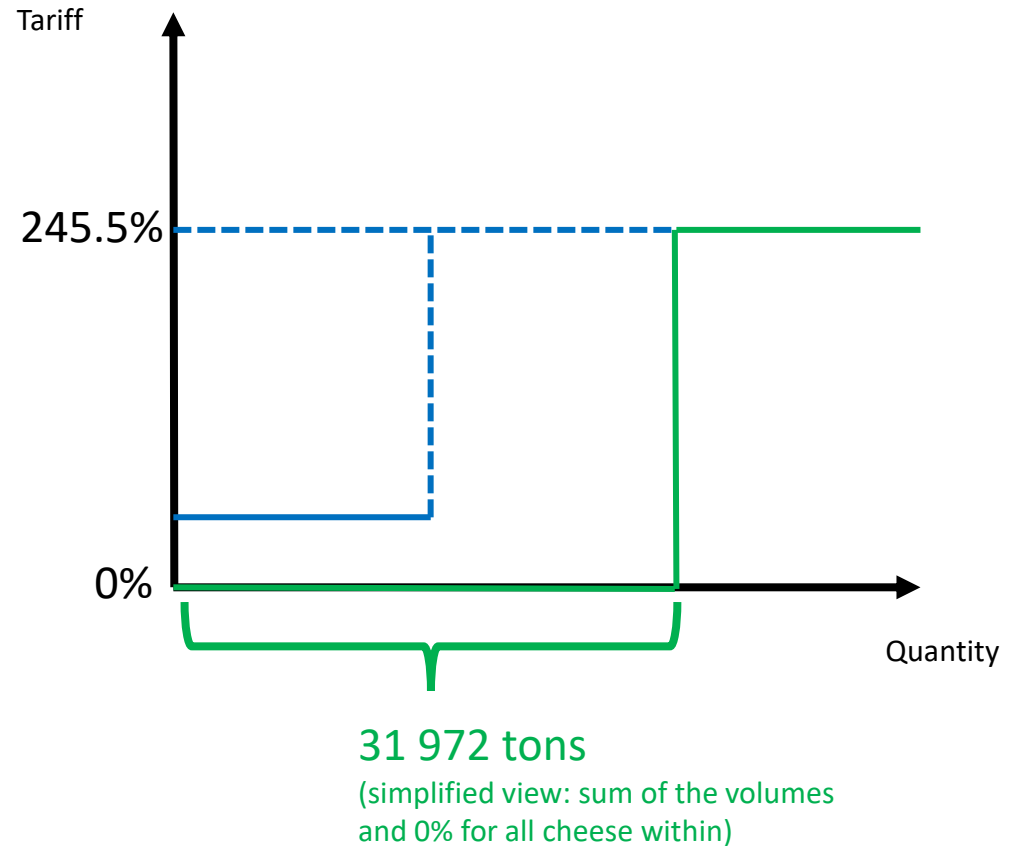
- Canadian's imports from the EU
- AVEs in %

Canadian TRQ Cheese allocated to the EU

Before CETA



After 6 years in CETA



Ex-ante computation of the AVEs

- Used of actual quantities from BACI (HS6!)/COMEXT(EU Side!)/Canadian statistics (available?)/COMTRADE TL.
- Inside and outside rates from WTO for MFN.
- Inside and outside rates from CETA text.
- Comparing imported quantities to authorized quantities at inside rate.
- Using the MAcMap-HS6 methodology to compute the filling rate.

MAcMap-HS6 methodology

- We compute the filling rate at the TRQ level. In our case the HS4 “0406”. The filling rate helps to define three TRQ regimes, as in MAcMap-HS6. The marginal tariff applied on imports under a TRQ will depend on the filling rate:
- When the fill rate is lower than 90%, the quota is not binding. Hence:

$$AVE^{CETA} = AVE^{In\ Quota}$$

- If the fill rate is between 90% and 98%:

$$AVE^{CETA} = \frac{AVE^{In\ Quota} + AVE^{Out\ of\ Quota}}{2}$$

- When the fill rate exceeds 98%

$$AVE^{CETA} = AVE^{Out\ of\ Quota}$$

Indicators	Value
TRQ Quantities BASELINE (HS 0406)	13472
Export EU to Canada	13715,916
Simple Average inside tariff (HS4 0406)	0,00534379
Simple Average outside tariff (HS4 0406)	2,455
Filling TRQ Baseline	243,916
Filling rate Baseline	101,81%
TRQ Quantities SCENARIO (HS 0406)	
(13472+16000+1700+800)	31972
Filling TRQ Scenario	-18256,084
Filling rate Scenario	42,14%

Consequence: Outside rate in the baseline. Inside rate in the simulation!

AVEs for MIRAGE

- With an ex-ante computation of the AVEs of the Cheese TRQ, it leads to:
 - **In the baseline:** 245,5%
 - **In the scenario:** 0%
- **To keep in mind:** the DAIRY sector in GTAP is **larger** than the HS4 « 0406 ». It also contains some sensitive products with high tariffs that are excluded from CETA.
 - **Consequence 1:** the average tariff in the scenario combine the 0% TRQs and high tariff, leading to an average that remains high.
 - **Consequence 2:** expected effects in MIRAGE may be (much) larger than in reality.
 - **Consequence 3:** when dealing with such sensitive products, sensitivity analysis may be important. Alternative modelling exists also (MCP with sigmoid function. See CGEBox, CAPRI...).

Conclusion

Conclusion

- For academic purposes, when it comes to applied modelling (and when the focus is not on the trade policy itself, one can make assumptions to keep life easy.
- For policy relevance, one must care about the details as they can greatly influence the outcome of any simulation.

Annex (MMHS6's weighting scheme)

Aggregation across products relies on averages weighted by imports of the importer's reference group. When aggregation is carried out across importers, these weights are scaled up to account for the importer's weight in the reference group's total imports. Aggregation across exporters relies on averages weighted by exports toward the importer's reference group. These aggregation procedures can be summarized by the following weighting scheme:

$$W_{i,r,s} = M_{i,r,R(s)} \times M_{\dots,s} / (M_{\dots,R(s)} - M_{\dots,s,R(s)})$$

Where $W_{i,r,s}$ is the weight affected in the aggregation process to product i sales from exporter r to importer s . M refers to imports, $R(s)$ to the importer's reference group, and subscript "." refers to the total over the category concerned.

The denominator of the last ratio only matters while aggregating across importers. Setting $W_{i,s,s} \equiv 0$, the formula used here is such that, for each importer, the sum of weights equals the sum of imports: $W_{\dots,s} = M_{\dots,s}$.