BATModel

better agri-food trade modelling for policy analysis

Non-Tariff Measures Scenario in the EU – New Zealand trade agreement

Houssein GUIMBARD

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WP 5.4

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Session 4: **Theoretical knowledge and empirical analysis of Geographical Indications (GIs) and Non-Tariff Measure (NTMs) in trade context**

Outline

- « Political » presentation of the context (WP, agreement)
- The MIRAGE model
- The baseline(s) and the scenarios
- Data and descriptive evidence on the european union and New Zealand
- Interpretation of the results
- Conclusion

Context

BATMoDel's context

- « Simple » exercise in **BATModel**:
  - Ex-ante simulation using a global CGE (MIRAGE, CEPII).
  - Simulation of an ***ad-hoc* scenario** for NTMs v.s. simulation of a scenario using a database with estimates of the changes in the AVEs of NTMs in trade agreement (work done by the World Trade Institute in WP2).
  - Focus on data.

- Additional work (not planned in BATModel):
  - The agreement contains provisions on the application of the Paris Agreement.
  - Baseline/simulations with the implementation of the Paris Agreement.
  - **Objective**: assess the consistency between the EU-NZ trade agreement and the Paris Agreement, using a baseline-scenario pair in which the PA is not included.

The Agreement

- “The European Union concluded negotiations for a comprehensive and ambitious trade agreement with New Zealand on **30 June 2022**.

- **Bilateral trade in goods** between the two partners has risen steadily in recent years, reaching almost €9.1 bn in 2022. The EU is New Zealand's **third-biggest** trade partner (NZ is about the **45-50th** trade destination for EU’s exports).

- According to an **impact assessment on the FTA** (European commission’s SIA), trade between New Zealand and the EU is expected to increase by 30%, with removing tariffs alone saving businesses €140 million in duties per year. Moreover, EU investment flows into New Zealand could increase by over 80%.

- The agreement, once it enters into force, will:
  - Create significant economic opportunities for companies, farmers and consumers;
  - Respect the Paris Climate Agreement and core labour rights, enforceable through trade sanctions as a last resort, and:
  - Cement EU ties with a like-minded ally in the economically dynamic Indo-Pacific region.”

https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/new-zealand/eu-new-zealand-agreement_en

The Agreement

- “Negotiations began **in June 2018** and took place over 12 negotiating rounds. Following the conclusion of the negotiations, the negotiated draft texts went through a process of legal revision, and were translated.

- The agreement was **signed on 9 July 2023.** Following signature, the text is transmitted to the European Parliament.

- Once the European Parliament has given its consent, and once the agreement has been ratified by New Zealand, it can then enter into force”

- The agreement entered into force as of ***1st May 2024*.**

https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/new-zealand/eu-new-zealand-agreement_en

The Agreement

- The text of the agreement can be found here: https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/new-zealand/eu-new-zealand-agreement/text-agreement_en

- Also available on NZ’s website.

The MIRAGE model

The MIRAGE model in a nutshell

- MIRAGE is a multi-country, multi-sector GE model, similar, in the spirit, to other global « GTAP-like » CGE models.

- Developed at CEPII since 2001
  - Bchir et al. (2002);
  - Decreux and Valin (2007).

- Used extensively to assess trade policies (Doha round, accession to WTO, RTAs…).

- Developments:
  - Energy-oriented version, MIRAGE-e (Fontagné et al., 2013).
  - Land-use change version, MIRAGE-Biof (Laborde and Valin, 2012, IFPRI).
  - Mirage with MRIO (MIRAGE-VA).
  - Numerous alternative specifications (with Household surveys, with government… part of done at IFPRI).

The MIRAGE model in a nutshell

- Actual use of the model:
  - Still **trade policies** (trade agreements – ZLECAF…, US-China trade war…), but also **environmental issues** on the long run (CBAM, Paris Agreement… with some new developments, e.g. a new representation of the electricity sector)

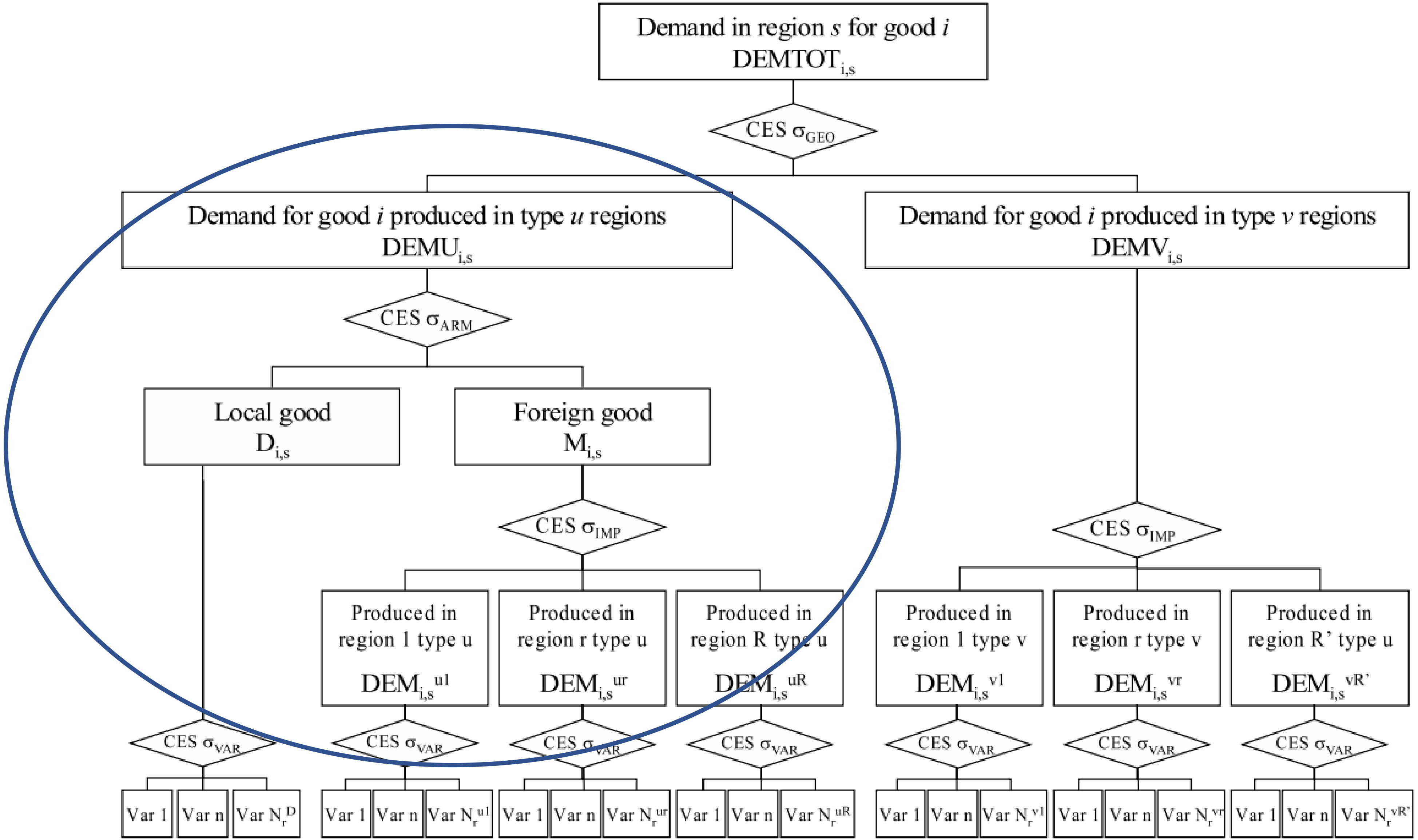
- No « modelling development » within BATModel
  - Involved in **WP1**: top-down interaction with the partial equilibrium model dedicated to european agriculture (CAPRI).
  - Involved in **WP5**: integration of « new » data on NTMs (this presentation).

The MIRAGE model: demand side

- Representative household + Government (LES-CES utility maximization), owns 5 production factors (Skilled and Unskilled labor, Land, Natural resources and Capital).

- 2-stage Armington approach with CES functions to depict international trade:
    1. Domestic versus import origin
    2. Different import regions (with higher substitution elasticity)

- Assumes that quality differentiation depends (solely) on where something is produced (all French or even (if aggregated) EU cheese is the same cheese…).



Demand in region s for good i
DEMTOT i,s
CES σGEO
Demand for good i produced in type u regions
DEMU i,s
Demand for good i produced in type v regions
DEMV i,s
CES σARM
Local good
D i,s
Foreign good
M i,s
CES σIMP
CES σIMP
Produced in region 1 type u
DEM i,s u1
Produced in region r type u
DEM i,s ur
Produced in region R type u
DEM i,s uR
Produced in region 1 type v
DEM i,s v1
Produced in region r type v
DEM i,s vr
Produced in region R' type u
DEM i,s vR'
CES σVAR
Var 1
Var n
Var N r D
Var N r u1
Var N r ur
Var N r uR
Var N r v1
Var N r vr
Var N r vR'

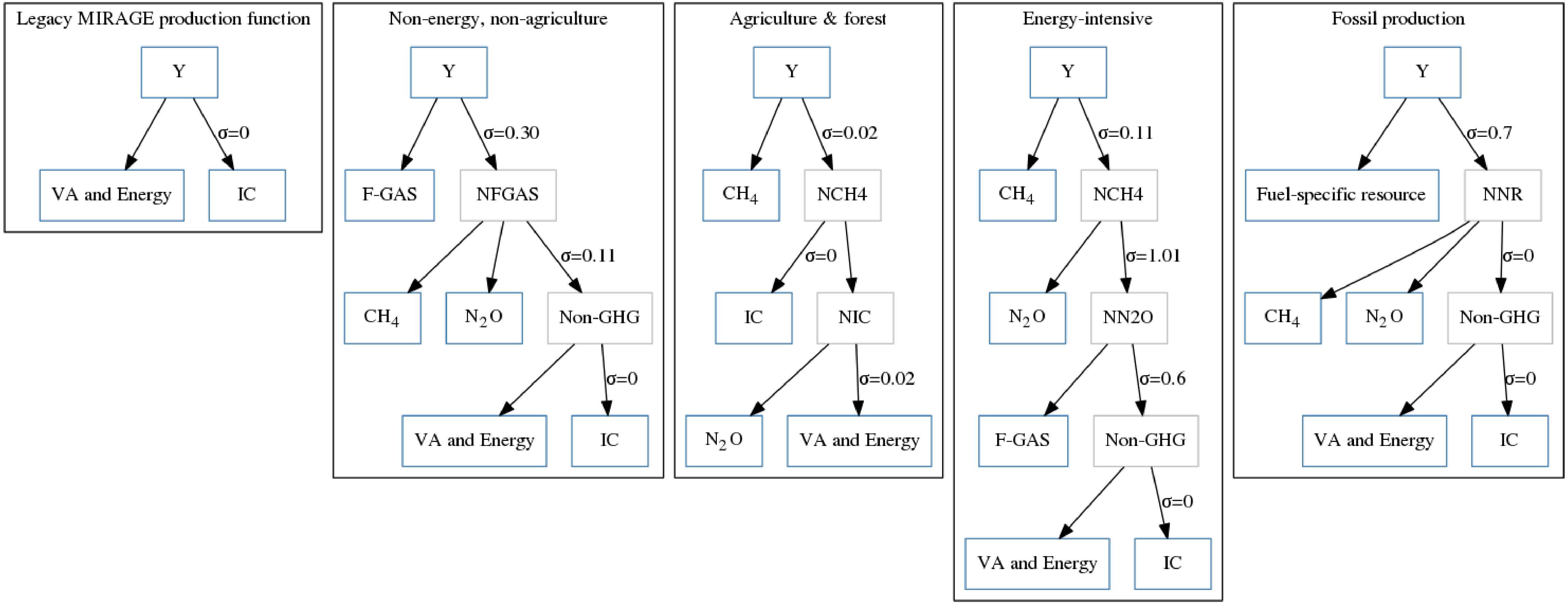
The MIRAGE model: supply side

- Firms: one per country/sector (profit maximization), perfect competition/imperfect competition.

- In the basic settings, the production of the firm is represented by a **Leontief** production function, which assumes perfect complementarity between intermediate inputs and value added.

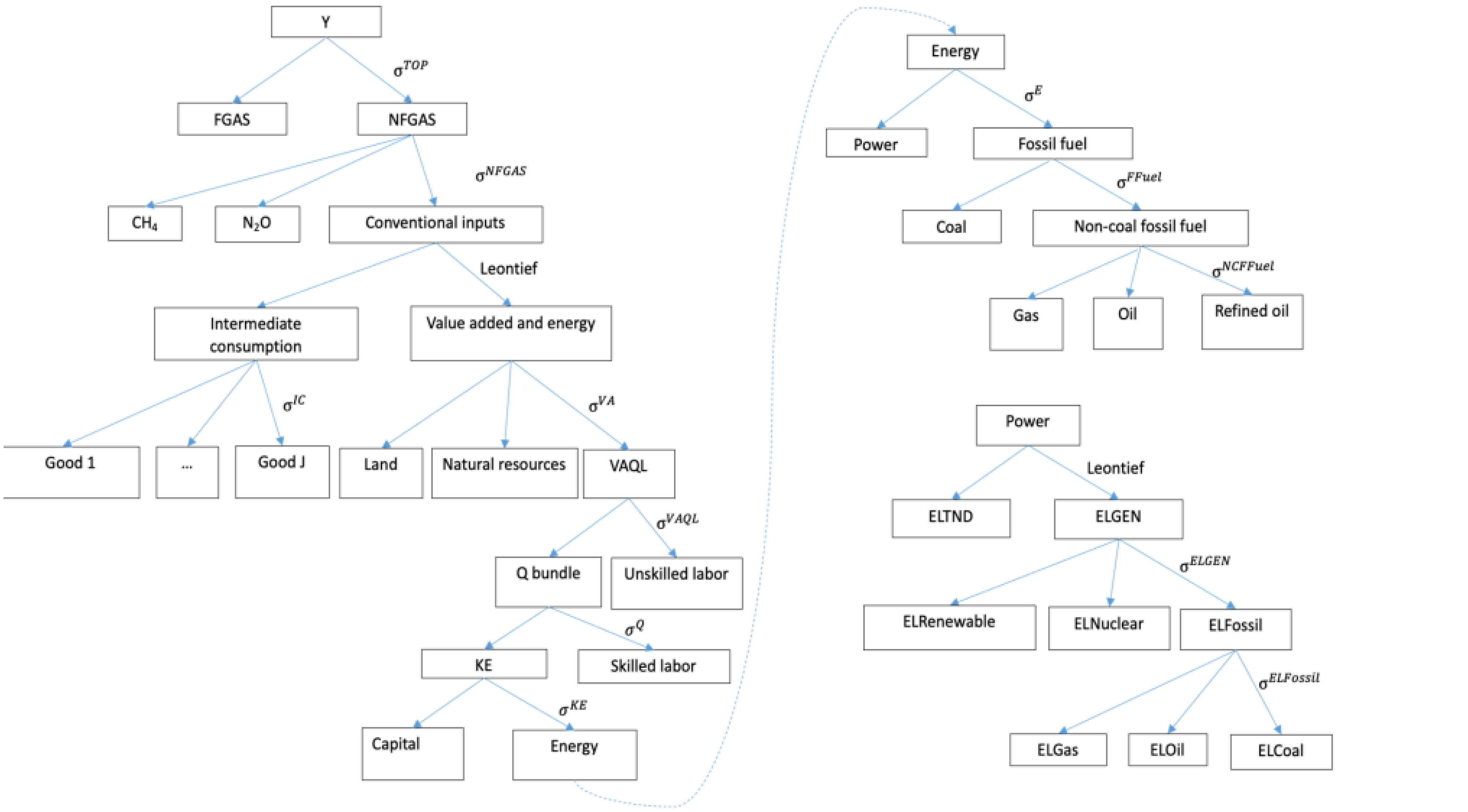
The MIRAGE model: environment

- Several features of MIRAGE-Power ("new name") help in analyzing trade policies in more detail, with a focus on energy.
- First, it is an energy-oriented model: energy is not considered an intermediate consumption but is directly substituted with capital in the production function.
- Second, the model incorporates GHG emissions from both production and household consumption. Firms emit CO2 during the intermediate use of fossil fuels (coal, refined oil and gas).
- Emissions of non-CO2 gases (methane, nitrous oxide and fluorinated gases) are also associated with the production process and are thus **modelled as production factors.**
- Households emit CO2 and non-CO2 gases based on their consumption.
- (See Figure A2 in next slides. It shows the detailed structure of the production function for the manufacturing and services sectors in the MIRAGE-Power mode).



Legacy MIRAGE production function
Y
σ=0
VA and Energy
IC
Non-energy, non-agriculture
Y
σ=0.30
F-GAS
NFGAS
σ=0.11
CH_4
N_2O
Non-GHG
σ=0
VA and Energy
IC
Agriculture & forest
Y
σ=0.02
CH_4
NCH4
σ=0
IC
NIC
σ=0.02
N_2O
VA and Energy
Energy-intensive
Y
σ=0.11
CH_4
NCH4
σ=1.01
N_2O
NN2O
σ=0.6
F-GAS
Non-GHG
σ=0
VA and Energy
IC
Fossil production
Y
σ=0.7
Fuel-specific resource
NNR
σ=0
CH_4
N_2O
Non-GHG
σ=0
VA and Energy
IC

Figure A2. Structure of the production function for the manufacturing and services sectors in the MIRAGE-Power model



Tnd: transmission and distribution

The MIRAGE model: dynamic*

- The model's dynamics is exclusively of a **sequential nature**: the equilibrium can be solved successively for each period (no rational expectations). Time span can be freely chosen, usually around 15 to 20 years.

- Except for capital, the growth rate of production factors is set exogenously and the technical progress is calibrated in order to fit GDP forecast (coming from ECONMAP, CEPII – Next slide).

* The model also runs in static

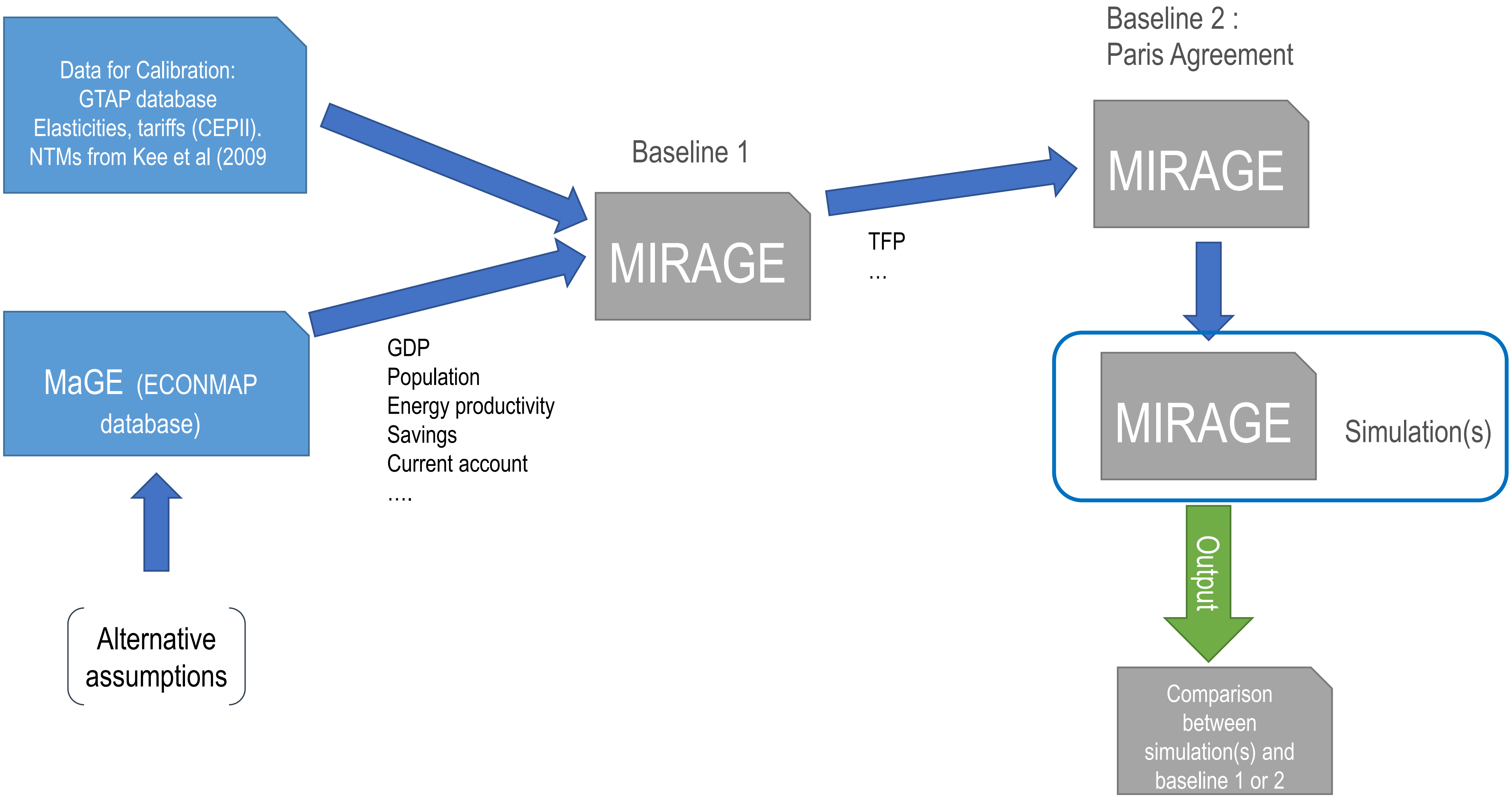
ECONMAP

- For its dynamic, MIRAGE relies on **EconMap**.

- It is the database developed by the CEPII in 2010 to picture the world economy in the long term. It provides GDP at constant or current prices, as well as production factors and technical progress from 1980 to 2100 for 170 countries.

- EconMap is produced from the **MaGE** (Macroeconometrics of the Global Economy) model. Using a **three-factor production function** (labor, capital and energy) and two technological advances, it proposes different growth scenarios for 170 countries by 2100.

- The model is based on the projections of the United Nations, the International Labour Organization and the International Energy Agency, as well as on econometric estimates of (i) capital accumulation, (ii) savings rates, (iii) the relationship between capital and investment, (iv) education, (v) women's participation in the labour market, and (vi) technical progress (total factor productivity and energy-specific productivity).



Data for Calibration:
GTAP database
Elasticities, tariffs (CEPII).
NTMs from Kee et al (2009
MaGE (ECONMAP database)
Alternative assumptions
GDP
Population
Energy productivity
Savings
Current account
….
Baseline 1
MIRAGE
TFP
…
Baseline 2 :
Paris Agreement
MIRAGE
MIRAGE
Simulation(s)
Output
Comparison between simulation(s) and baseline 1 or 2

A word on the GAMS software

- MIRAGE uses the GAMS software. GAMS means **G**eneral **A**lgrebraic **M**odeling **S**ystem. https://www.gams.com/

- Demo (free) version: allows to use a subset of solvers, for a limited number of equations.

- Widely used for large-scale models, such as global CGE models/PE models (my own view), and by engineers (*dixit* GAMS).

- Uniform interface to more than **30 solvers**. Models are portable **across operating systems** (Windows, MacOS, Linux).

- Designed for modeling and solving **linear**, **nonlinear** and **mixed-integer optimization** problems.

A word on the GAMS software

- GAMS:
  - User guide (including **tutorial**), McCarl Expanded GAMS User Guide
  - GAMS **model library** (online & inside GAMS).
  - Online GAMS documentation Center.
  - Solver manual (when working on serious problem, take the time to read the documentation of the solver you are using). Solver of most interests: Conopt, Minos, Path, Ipopt.

- **GAMS Cheat sheet** (A reference card with the main elements of GAMS programs), **Christophe Gouel**.

- BATModel: **redbook guidelines** by **Wolfgang Britz** (UBO) and co-authors (BATModel crew). This includes also guidelines for GEMPACK.

A word on the GAMS software: Strengths

- A high-level modelling system for **mathematical optimization**. GAMS is designed for modeling and solving linear, nonlinear, and mixed-integer **optimization problems.**

- Linked to the **best equations solvers** (see online comparisons).

- Make **model development easy** and intuitive by focusing on the equations and not on the numerical methods.

A word on the GAMS software: Weaknesses

- Poor graphic capabilities.
- **Not as versatile** as **MATLAB/Python** (for example) or as popular.
  - If one needs to do more than optimization, it may be frustrating to use GAMS that it is not well suited for other specific tasks (statistics etc.).
- **No free alternative**: other algebraic modeling language are also proprietary software (such as AMPL, **GEMPACK**).

A word on the GAMS software: alternatives

- **GEMPACK** (**G**eneral **E**quilibrium **M**odelling **PACK**age) is a suite of economic modelling software.
  - Some of the more **well-known CGE models** solved using GEMPACK: **GTAP model** of world trade (also available in GAMS), the MONASH model.... https://www.copsmodels.com/gempack.htm
  - **MAGNET** in BATModel ☺

- **AMPL** (https://ampl.com/)

- **MS Excel**
  - If the model is **simple**, you may only use **formulas** in spreadsheets.
  - If the model is more complex, Excel has its **own solver**. However, it is **not suitable** for medium- to large-scale model development.
  - You can also code your (a small one) model using the **VBA language**.
  - Some **simple CGE models** developped in excel are available online.
  - Excel can also be used **as an interface** to manage/introduce the **input data** in other software and to **present graphically** the results (R is a nice alternative to excel regarding this aspect, but requires more skills).
  - Free alternatives: Google sheets, Excel Online, Open Office Calc…
  - Not suitable for global CGEM.

A word on the GAMS software: alternatives

- **Software/languages** with **optimization solvers**
  - Highly versatile (data management, graphics) and linked to reasonably good solvers, but not the best ones,
  - Require some knowledge of numerical methods to use properly.

➢ Matlab

- Widely used by engineers, in finance and by macroeconomists.
- **Dynare**: software platform for handling economic models, such as dynamic stochastic general equilibrium (**DSGE**) and overlapping generations (**OLG**) models. **TomLab** (inside Matlab): Modeling platform for solving applied optimization problems.
- Free alternatives: **Octave, Scilab (INRIA), Julia…**

➢ Python, Cpython

- Libraries (numpy, scipy and matplotlib) and functions for almost any statistical operation / model building. Since introduction of **pandas** **(Python Data Analysis Library)**, it has become very strong in operations on structured data. Interface with **GAMS**. https://www.gams.com/latest/docs/API_PY_OVERVIEW.html
- Very **versatile** : data, model, graphics, statistics and econometrics…Huge community (open source).

➢ R

- **Versatile** : data, model, graphics, statistics and econometrics…Huge community (open source).
- However not well suited for such models (my own view). Some examples can be found online for NQTMs.
- Interaction with **GAMS** https://www.gams.com/latest/docs/API_R_GAMSTRANSFER.html

A word on the GAMS software: an example

- The basic structure of a GAMS program reflects the logical order, with the (main) following **statements** (example) :

  - **Sets** : indices of commodities, countries, etc. They allow to define parameters, equations, variables over various domains to avoid painful copy/paste and to ease the reading.

  - **Parameters**: exogenous variables (slopes, intercepts, taxes, tariffs etc…). Those are fixed until the modeler decide to change them. These parameters are the one which change when one want to perform a scenario.

  - **Variables**: endogenous variables (price, quantity, income etc.). They are determined by the model in order to find a solution.

  - **Equations**: structural relationship between variables (e.g. behavioural equations).

  - **Model**: collection of equations. A simple statement in which you an define 1 or multiple model(s) depending on the equations you want to use.

  - **Solve**: solver to be used. A simple statement in which you define the type of mathematical problem you want to solve and the solver you decide to use to solve the problem.

Modelling choice for the nature of NTMs

- Several possibilities to **model NTMs** (see session on CETA tomorrow).

- In this project, NTMs are modelled as an **iceberg trade cost**: when a good is produced for a foreign country, it takes more production factors (capital, labour, natural resources, etc) and more intermediate consumption to produce it. So price increases.

- Removing this iceberg trade cost leads to **more efficiency** (the trade cost is pure inefficiency. See session on CETA).

The baseline(s) and the scenarios

The Paris Agreement in MIRAGE

- The Paris Agreement is an international treaty on climate change adopted in 2015. It concerns mitigation and adaptation to climate change as well as their financing. After ratification by the EU, enough countries have ratified the agreement for it to enter into force on **November 4, 2016**.

- The **EU-NZ trade agreement makes it enforceable for both parties**.
  - Article 19.6: "Each Party shall effectively implement the UNFCCC (United Nations Framework Convention on Climate Change, 1992) and the Paris Agreement, including commitments with regard to nationally determined contributions."
  - A Party's commitment to effectively implement the Paris Agreement under paragraph 2 includes the obligation to refrain from any action or omission that materially defeats the object and purpose of the Paris Agreement.

The Paris Agreement in MIRAGE

- The Paris Agreement is implemented in the **second baseline**. To do so, following Bellora, Fontagné and Zheng (2023), the modelling of this climate policy consists on imposing a constraint on GHG emissions in 2030. Hence, an **endogenous tax** is implemented in the model and limits the GHG emissions of a selected number of countries. This tax can be seen as a shadow price of all policies implemented by countries (e.g. carbon tax, ETS, regulations…).

- This second baseline thus considers countries' **National Determined Contributions** (NDCs) from COP27.

- Only commitments by countries **having a carbon market** are considered (with the assumption that those countries will fulfil their Paris Agreement commitments).

The Paris Agreement in MIRAGE

- The objectives in **GHG reduction** are **country-specific** and each one committed to lower their total GHG emissions by **2030**, as compared to a former situation (in general 1990 or 2005).

- For example, the **EU** is committed to decrease **by 55% its 1990 level of GHG emissions, by 2030**. Consequently, to be consistent with its commitments, as the baseline starts in **2017**, the EU will decrease by **approximatively 44% its GHG emissions by 2030 in the model**. This decrease is **linearly** implemented between 2017 and 2030.

- Thus the **endogenous tax** is computed by the model to ensure that countries comply with those climate objectives.

- Depending on the countries, the objective can be set in absolute terms (i.e. the level of GHG emissions) or in intensity terms (the intensity being computed as the ratio between GHG emissions and GDP). In this latter case, in the case the GDP grows more than the GHG emissions of the country, the latter may increase its GHG emissions as compared to the initial value of its emissions.

The scenario

- **Scenario 1**: 1 scenario with only tariff.

- **Scenario 2 (main scenario):** 1 scenario with **tariffs** and **cut in NTMs coming from WTI's estimates**.

- **Scenario 3**: 1 scenario with **tariffs** and an **across-the-board cut** in the AVE on NTMs in goods (-25%).

- BATModel's deliverable to deliver in may 2024. However, some **additional work** will be done:
  - Ongoing treatment of EU's tariff schedule, with TRQs and so on. NZ should be easy.
  - Include the service sector in an other scenario (across-the-board cut in the AVEs of NTMs).
  - Perhaps alternative assumptions on the baseline (about PA).
  - Sensitivity on the modelling of the AVEs of NTMs (see tomorrow).

WTI Database

- Work done within the BATModel project.

- **Reference**: Fernandez-Amador, O., Francois, J. and Vogt, A. (2021), 'A database of product-level estimates of regulatory convergence, v0', mimeo

- The authors estimate the following standard, cross-sectional (2014) gravity equation separately for each product i (4100 HS6) using a standard Poisson (PPML) estimator:

$$Y_{odi} = exp[\beta Z_{od} + \theta t_{odi} + \beta PTA_{od} + \beta RegDist_{odi} + \mu_o + \eta_d]\varepsilon_{odi}$$

WTI Database

- Based on the tariff elasticities and coefficients for regulatory distance and PTA for each product *i* they follow Bekkers et al. (2018) and construct the tariff-equivalent effect of regulatory convergence by means of a PTA or a reduction of regulatory distance, i.e. AVEs, which are calculated the following way:

$$AVE_{od}^{\Delta 1\%} = \left[(0{,}99)^{\frac{\beta}{\theta}} - 1\right] * 100$$

$$AVE_{od}^{PTA} = \left[\exp\left(\frac{\beta^{PTA}}{\theta}\right)(0{,}99)^{\frac{\beta}{\theta}} - 1\right] * 100$$

- Thus, they define the AVE for regulatory distance by the tariff equivalent of a 1% reduction in regulatory distance.

- In contrast, AVE_{od}^{PTA} is simply the tariff-equivalent reduction in iceberg trade costs due to the presence of a PTA.

Implementation

- The implementation is done at the HS6 level following this formula:

$$NTM_{hs6,r,s,t,sim} = \min(NTM_{hs6,r,s,t,ref}; \mathbf{max}(\boldsymbol{NTM_{hs6,r,s,t,ref}} - \boldsymbol{AVEDecrease_{hs6,t,ref}}; \mathbf{0}))$$

- Once done, both values of the baseline and simulation are aggregated to the sectoral level for both EU and NZ using **MAcMap-HS6’s** reference group weights.

Geographical and Sectoral Aggregation

Geographical and Sectoral Aggregation

- Generally, MIRAGE works with a (approximatively) **30*30 matrix**.

- As said there is a number of constraints in this study:
  - EU and New Zealand must be **individualized** (EU can and is aggregated into a single region).
  - **Energy** and **electricity** production are individualized (so far, the writting of equations does not allow to be flexible. If, for example, energy sectors are not individualized, the model comes back to the original specification in which energy is considered as intermediate consumption).
  - The rest of the countries are grouped following a « Paris Agreement » logic (same kinds of commitments).

- After several tests, the retained aggregation depicts **35** sectors and **27** countries.

Data and descriptive evidence

Descriptive evidence: tariffs and NTMs (%)

importer	exporter	sector	mfn	ave_ntms
European Union	New Zealand	All	16,2	61,8
		Agriculture	26,3	79,5
		Industry	2,4	37,4
New Zealand	European Union	All	2,4	35,9
		Agriculture	2,1	40,0
		Industry	2,5	35,2

Source: MAcMap-HS6 for tariffs (2017) and Kee et al (2009) for NTMs

Descriptive evidence: tariffs

importer	sector	count mfn 0	share mfn 0
European Union	All	1 341	24,9
	Agriculture	210	28,0
	Industry	1 131	24,4
New Zealand	All	3 118	57,9
	Agriculture	509	68,0
	Industry	2 609	56,3

Descriptive evidence: tariffs

importer	sector	count mfn peak	share mfn peak
European Union	All	37	0,7
	Agriculture	37	4,9
	Industry	0	0,0
New Zealand	All	1	0,0
	Agriculture	0	0,0
	Industry	1	0,0

Descriptive evidence: protection and trade

- See:
- European Union as importer
- New Zealand as importer
- Tables are available in the deliverable

Results

Macroeconomic results: World

Variable	Sc 1 - Only Tariffs	Sc 2 - Tariffs + NTMs (WTI changes)	Sc 3 - Tariffs + 25% NTMs
Exports (vol)	0,006	0,009	0,015
Imports (vol)	0,006	0,009	0,015
World emissions due to international freight (MtCO2-eq)	0,005	0,008	0,020
World GDP (vol)	0,001	0,001	0,002
World GHG emissions (MtCO2-eq)	0,004	0,004	0,004
World GHG emissions by firms (MtCO2-eq)	0,004	0,005	0,005
World Welfare	**0,001**	**0,001**	**0,002**

- Trade Agreement between EU and NZ (a « small country ») : almost no effect worlwide (3 digits required to see welfare or GDP impacts…). As expected!
- Positive effects means however that economic gains for EU/NZ higher than potential losses for the ROW.
- Small increase of GHG emissions mainly due to international transport, or countries not involved in the PA.

Macroeconomic results (country level)

Country	Scenario	Welfare	GDP (vol - Fisher index)	Terms of trade	Exports (vol)	GHG emissions (MtCO2-eq)
EU27	Sc 1 - Only Tariffs	0,00	0,00	-0,01	0,03	0,00
	Sc 2 - Tariffs + NTMs (WTI changes)	0,01	0,01	-0,01	0,04	0,00
	Sc 3 - Tariffs + 25% NTMs	0,01	0,01	-0,01	0,07	0,00
NZ	Sc 1 - Only Tariffs	0,16	0,15	0,54	1,00	-0,03
	Sc 2 - Tariffs + NTMs (WTI changes)	0,28	0,28	0,59	1,52	-0,01
	Sc 3 - Tariffs + 25% NTMs	0,61	0,62	0,69	3,09	0,02

- Small but asymetric results for EU and NZ.
- EU experiences a small welfare increase (+0.01%).
- NZ experiences a 0.28% welfare Increase.
- Due to:
  - EU is a much larger market than NZ (NZ's GDP is 2022 about 250 Bn USD ; EU about 16,000 Bn): more opportunies for NZ exports
  - EU suffers from a negative ToT effect: EU liberalizes itself more than NZ, so its export prices have to decrease in a CGE in which current account is fixed.
- **Comp sc2-3**: EU almost no change. NZ: sc2 halved compare to sc3.

Trade

Sector	Exporter: EU27 & Importer: NZ			Exporter: NZ & Importer: EU27		
	Sc 1 - Only Tariffs	Sc 2 - Tariffs + NTMs (WTI changes)	Sc 3 - Tariffs + 25% NTMs	Sc 1 - Only Tariffs	Sc 2 - Tariffs + NTMs (WTI changes)	Sc 3 - Tariffs + 25% NTMs
Agriculture	1,8	14,0	46,1	32,1	39,0	138,8
Manufacture	18,5	36,9	76,7	101,7	116,3	164,1
Services	0,3	0,2	0,1	-0,3	0,0	0,5

- Almost no effect on services (there is nothing done in the scenario. Those sectors are thus only impacted through GE effects).
- Industrial exports experience the highest variation, both in EU and NZ, in all scenario.
- EU to NZ: Sharp increase of exports between sc2 and 3.
- NZ to EU: increase is « less » (rel. Variation) pronounced, but remains high. Large differences in agriculture (+138.8% vs +39%).

Sector	Exporter: EU27 & Importer: NZ				Exporter: NZ & Importer: EU27			
	Sc 1 - Only Tariffs	Sc 2 - Tariffs + NTMs (WTI changes)	Sc 3 - Tariffs + 25% NTMs	Diff in pp (Sc3-Sc2)	Sc 1 - Only Tariffs	Sc 2 - Tariffs + NTMs (WTI changes)	Sc 3 - Tariffs + 25% NTMs	Diff in pp (Sc3-Sc2)
Textile	35,2	44,4	102,7	58,3	39,6	61,6	134,5	72,9
Vehicles	29,9	66,9	72,6	5,6	9,5	32,5	133,5	101,0
Wool	23,8	26,0	32,2	6,2	1,1	1,0	0,6	-0,4
Metal	17,9	29,8	70,8	41,0	11,1	27,9	66,6	38,6
Other manufactures	16,7	31,8	88,6	56,8	7,2	26,3	75,2	48,8
Meat products nec	16,1	16,0	16,0	-0,1	185,3	186,0	186,6	0,6
Cattle	13,7	13,8	14,5	0,6	27,1	26,3	22,0	-4,3
Other food	10,7	17,6	88,2	70,7	31,2	49,5	136,8	87,4
Other manufactures energy intersive	8,3	16,7	102,5	85,8	0,5	12,6	75,1	62,6
Beverages and tobacco	8,1	9,1	26,8	17,7	33,4	47,4	81,6	34,1
Animal products nec	7,0	7,0	7,2	0,1	46,8	47,0	47,4	0,4
Chemistry	6,1	15,4	63,2	47,8	26,3	53,9	124,5	70,6
Dairy products	6,0	6,1	6,4	0,4	383,4	383,4	381,3	-2,2
Electronic	5,4	15,9	60,8	44,9	2,8	20,3	54,4	34,1
Animal products	2,8	17,3	109,6	92,3	57,3	133,8	307,2	173,3
Refined oil	2,0	11,3	49,9	38,7	2,4	22,9	49,8	26,9
Bovine meat products	2,0	2,0	2,2	0,2	439,5	439,9	439,3	-0,6
Crops	1,7	15,5	39,6	24,1	29,5	38,4	169,0	130,5

- Most of time, effects of an A-T-B cut are much higher, meaning that ad hoc scenario is more ambitious in terms of reduction of the trade cost.
- Some differences for NZ's exports in some sectors.
- For sensitive sectors, most of the effect comes from the tariff reduction (dairy, beef, when EU is exporter or textile when NZ is importer)

Consequences for the Paris Agreement

- As the model accounts for the PA, GHG emissions **do not increase** for the countries/sectors committed to respect the PA (air transport and sea transport are not included).

- This is the case for both EU and NZ.
  - The total variation GHG emissions by country is **very close to zero**.
  - On the European side, the very small increase is due to the **international transport sectors** which are not included in the Paris Agreement.
  - On NZ, the variation is close to 0 and negative.

- Consequently, the core simulation, whithout PA, is run against a baseline in which there is no Paris Agreement in order to quantify the GHG emissions resulting from the implementation of the EU-NZ trade agreement.

Consequences for the Paris Agreement

- In the model, as said, the Paris Agreement **prevents the increase of GHG emissions** (except for sectors or countries that are not included), but the absence of it shows how countries might behave when the constraint is relaxed.

- Regarding the **EU27**, a pair "baseline-scenario 2", both without the Paris Agreement, leads to an important increase of GHG emissions (X2, **in absolute terms**, in 2040), but the implementation of the EU-NZ trade agreement **does not change the emission of the EU** (in relative terms, in 2040).

Consequences for the Paris Agreement

- For **New Zealand**, in the same case, the increase of GHG emissions is much higher when the Paris Agreement is not considered (+4% vs -0%).

- Finally, accounting for the Paris agreement in both baseline and simulation leads to **smaller macroeconomic effects of the EU-NZ trade agreement**.
    - For the EU27, the **welfare effects are halved** (+0.2% as compared to +0.1%).
    - For New Zealand, the variation in welfare gains can be as high as **+0.76%** in this configuration (as compared to **+0.28%** in the core scenario with the Paris agreement).

- This indicates that the Paris agreement acts as a real economic constraint, but, **given the low economic impacts (simulated without the Paris Agreement),** the economic cost that it represents for this agreement is relatively modest **compared to the expected gains of the Paris Agreement itself** (as said, GHG emissions for the EU are almost divided by 2 in the baseline).

Conclusion

Conclusion

- As expected, differences in variations of the NTMs shows differences in results.

- This is nothing new here, but as always, a **better quantification** means **more useful results** for both economists and policy makers.

- WTI's work shows interesting heterogenous effects when studying the effects on merchandises (agriculture/industry).