MIDAS includes the descriptions of models in use by the Commission in support to the policy cycle. MIDAS is developed and managed by the **Competence Centre on Modelling** of the European Commission.

Find out more at https://ec.europa.eu/knowledge4policy/modelling_en
Contact: EU-MIDAS@ec.europa.eu

Factsheet

SWD/2021/266

COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on applying a generalised scheme of tariff preferences and repealing Regulation (EU) No 978/2012 of the European Parliament and of the Council

Supporting model(s)

MIRAGE

Impact assessment
SWD/2021/266

Fact sheet on model contributions

Source: Commission modelling inventory and knowledge management system (MIDAS)

Date of Report Generation: 25/10/2021

Dissemination: Public

Overview

Title

COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on applying a generalised scheme of tariff preferences and repealing Regulation (EU) No 978/2012 of the European Parliament and of the Council

Document ID

SWD/2021/266

Year of publication

2021

Led by

DG TRADE

Model(s) used

MIRAGE

Additional information

-

MIRAGE

Full title
Modelling International Relationships in Applied General Equilibrium

Run for this impact assessment by
European Commission

Contributed to
Baseline and assessment of policy options

Helped to assess the following impacts

Impact area	Impact category	Impact subcategory
Economic impacts	Trade and investment flows	EU Exports & imports
Economic impacts	Competitiveness (sectoral) of business	Market share & advantages in international context
Economic impacts	Public authorities	Budgetary consequences for public authorities
Economic impacts	Consumers and households	Prices, quality, availability or choice of consumer goods and services
Economic impacts	Consumers and households	Impact on vulnerable consumers
Economic impacts	Specific regions or sectors	Significant effects on sectors
Economic impacts	Third countries and international relations	Impacts on third countries
Economic impacts	Third countries and international relations	Impacts on developing countries
Economic impacts	Third countries and international relations	Goods traded with developing countries
Economic impacts	Macroeconomic environment	Economic growth and employment
Social	Employment	Impact on jobs in specific sectors, professions, regions or countries
Social	Working Conditions	Wages, labour costs or wage setting mechanisms
Environmental	Climate	Emission of greenhouse gases
Environmental	International environmental impacts	Environment in third countries
Environmental	Land use	Change in land use

Documented in: Study in support of an impact assessment to prepare the review of GSP Regulation No 978/2012 (http://www.gsp-study.eu/en/; https://op.europa.eu/en/publication-detail/-/publication/706f539c-f0db-11eb-a71c-01aa75ed71a1)

MIRAGE

Modelling International Relationships in Applied General Equilibrium

Fact sheet

Source: Commission modelling inventory and knowledge management system (MIDAS)

Date of Report Generation: 25/10/2021

Dissemination: Public

Overview

Acronym MIRAGE

Full title Modelling International Relationships in Applied General Equilibrium

Main purpose

MIRAGE is a Computable General Equilibrium Model (CGE). In the European Commission it is used mainly for trade policy analysis, but it has also been used for analysing other policy areas such as agriculture and climate.

Summary

MIRAGE is a recursive-dynamic, multi-region, multi-sector CGE model used to analyse policy scenarios. It has been developed by the Centre d'Études Prospectives et d'Informations Internationales (CEPII) in Paris.

It is described in detail in Decreux, Y. and Valin, H. (2007) [1] and in Bchir, M.-H., Decreux, Y., Guérin, J.-L., and Jean, S. (2002) [2]. It is programmed in the General Algebraic Modelling System (GAMS) software.

The model has been used in-house in DG Trade for several years.

The model can be used for ex-ante analyses of policy changes to answer "what-if" type of research questions. It has also been used for ex-post analyses. The scenarios are formulated by changes to economic policy parameters, such as tariffs, non-tariff barriers, subsidies and taxes. These policy changes are usually sector specific or (less commonly) factor-specific as well as country or country-pair specific.

The standard version in MIRAGE uses the GTAP 9.2 database (Global Trade Analysis Project: https://www.gtap.agecon.purdue.edu/databases/default.asp) with the base year of 2011. In 2020, the version of the model used in DG Trade was updated to the GTAP 10 database with the base year of 2014, which is the most recent publically available version of the database also used by other CGE models such as e.g. MAGNET. For ex-ante questions, DG Trade uses recent macroeconomic projections by the IMF and the World Bank.

MIRAGE has been used in DG Trade for Impact Assessments and ex-post analyses, but would lend itself also to Sustainability Impact Assessments (SIA) carried during negotiations in order to inform negotiators, stakeholders and the general public or Economic Analyses of Negotiated Outcome (EANO) carried out after negotiations to inform co-legislators in the approval process (in fact a version of the model has been used by an external contractor for a EANO once: https://trade.ec.europa.eu/doclib/docs/2016/june/tradoc_154663.pdf).

[1] Decreux, Y. and Valin, H. (2007) "MIRAGE, Updated Version of the Model for Trade Policy Analysis with a Focus on Agriculture and Dynamics", CEPII Working Paper 2007-15

[2] Bchir, M.-H., Decreux, Y., Guérin, J.-L., and Jean, S. (2002) "MIRAGE, A CGE Model for Trade Policy Analysis", CEPII Working Paper 2002-17

Keywords

Climate , agriculture , CGE , GTAP , trade , recursive-dynamic , ex-ante Impact Assessment , Non-tariff barriers

Model category (thematic)

Agriculture, Climate, Economy, Energy

Model home page

http://www.mirage-model.eu/miragewiki/index.php?title=Main_Page

Ownership & license

Ownership
Sole ownership [3rd party]

Ownership details
MIRAGE Consortium

Licence type
Non-Free Software licence. The license has one or more of the following restrictions: it prohibits creation of derivative works; it prohibits commercial use; it obliges to share the licensed or derivative works on the same conditions.

Details

MIRAGE structure and approach

The model structure is described in detail in Decreux and Valin (2007) and in Bchir et al. (2002).

MIRAGE is similar in structure to most other CGE models, such as the GTAP model.

The key features by which MIRAGE differentiates itself from the dynamic GTAP model (Gdyn) are:

- Recursive-dynamic formulation (optionally, the user can use a comparative-static version)

- Imperfect Competition (optional)

- Additional layer in Armington nesting to reflect quality differences between high-income and developing countries (optional, can be switched on for specific sectors)

- Reduced labour mobility between rural and urban sectors (optional)

Input and parametrization

- GTAP database

- CEPII estimates of non-tariff barriers in services

- World Bank estimates of non-tariff barriers in goods

- Macroeconomic projections by: IMF; World Bank; CEPII – based on various primary sources

Main output

Macroeconomic variables:

- GDP

- Wages (by skill level)

- Consumer Prices

Sector-specific variables (unless specifically mentioned, these can be added up to macro-level results):

- Bilateral imports and exports

- Total imports and exports

- Output (cannot be added up)

- Value-added

- Factor demand (Labour and capital, cannot be added up)

- CO2 emissions

Spatial - temporal extent

The output has the following spatial-temporal resolution and extent:

Parameter	Description
Spatial Extent / Country Coverage	Global
(Spatial) resolution	Country level (some countries are grouped into regions)
Temporal extent	Base year 2014. Projections into the future are possible
Temporal resolution	Years

Quality & transparency

Quality

Question	Answer	Details
Models are by definition affected by uncertainties (in input data, input parameters, scenario definitions, etc.). Have the model uncertainties been quantified? Are uncertainties accounted for in your simulations?	no	CGE models routinely perform sensitivity analyses with respect to the value of key parameters or assumptions regarding the model structure. DG Trade for its in-house analyses has not engaged in quantifying these uncertainties. However, sensitivity analyses with respect to key parameters have been carried out e.g. Laborde, D., Padella, M., Edwards, R. and Marelli, L. (2014) (see references)
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	yes	See response regarding uncertainties
Has the model undergone external peer review by a panel of experts, or have results been published in peer-reviewed journals?	yes	Analyses using the model have been published in peer-reviewed scientific journals.
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	no	No validation has to our knowledge been published so far inside or outside of the European Commission.

References related to external peer-review and publication in scientific journals:

- Bouët, A., Berisha-Krasniqi, V., Estrades, C., & Laborde, D. (2012). Trade and investment in Latin America and Asia: Perspectives from further integration. Journal of Policy Modeling, 34(2), 193–210. doi:10.1016/j.jpolmod.2011.09.004

Transparency

Question	Answer	Details
Is the model underlying database (i.e. the database the model runs are based on) publicly available?	no	The GTAP database requires a subscription.
Can model outputs be made publicly available?	yes	In-house analyses contributing to DG Trade evaluation studies have regularly been published as well as academic research.
Is the model transparently documented (including underlying data, assumptions and equations, architecture, results) and are these documents available to the general public?	yes	Please refer to the documents detailed in the summary
Is the model source code publicly accessible or open for inspection?	no	

References related to documentation:

- No references provided in MIDAS

The model's policy relevance and intended role in the policy cycle

The model is designed to contribute to the following policy areas

- Agriculture and rural development
- Climate action
- Economy, finance and the euro
- Energy
- EU enlargement
- Transport
- Consumers
- Customs
- Single market
- Trade

The model is designed to contribute to the following phases of the policy cycle

- Formulation
- Implementation
- Evaluation

The model's potential

The model can be used for ex-ante analyses of policy changes to answer "what-if" type of research questions. It has also been used for ex-post analyses. The scenarios are formulated by changes to economic policy parameters, such as tariffs, non-tariff barriers, subsidies and taxes. These policy changes are usually sector specific or (less commonly) factor-specific as well as country or country-pair specific.

Although this is less commonly applied, the model can also be used for ex-post analyses. The research question would be formulated as follows: What would the situation in the last year (or the most recent year for which data is available) have been if the policy had not been implemented? And how does this compare to the actual observed situation?

These policy changes can apply to trade, including intra-EU trade, agricultural policy, climate, energy, transport and others.

Previous use of the model in ex-ante impact assessments of the European Commission

Use of the model in ex-ante impact assessments <u>since July 2017</u>.

In the Year	MIRAGE contributed to the Impact assessment called	Led by	By providing input to the	The model was run by	Details of the contribution
2021	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on applying a generalised scheme of tariff preferences and repealing Regulation (EU) No 978/2012 of the European Parliament and of the Council	TRADE	Baseline and assessment of policy options	European Commission	The model helped to assess the following impacts: EU Exports & imports • Market share & advantages in international context • Budgetary consequences for public authorities • Prices, quality, availability or choice of consumer goods and services • Impact on vulnerable consumers • Significant effects on sectors • Impacts on third countries • Impacts on developing countries • Goods traded with developing countries • Economic growth and employment • Impact on jobs in specific sectors, professions, regions or countries • Wages, labour costs or wage setting mechanisms • Emission of greenhouse gases • Environment in third countries • Change in land use

Bibliographic references

- *Progress in estimates of ILUC with mirage model. - 10.2790/24062*

- *Bouët, A., Berisha-Krasniqi, V., Estrades, C., & Laborde, D. (2012). Trade and investment in Latin America and Asia: Perspectives from further integration. Journal of Policy Modeling, 34(2), 193–210. doi:10.1016/j.jpolmod.2011.09.004*