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/2021/124

COMMISSION STAFF WORKING DOCUMENTIMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) n° 910/2014 as regards establishing a framework for a European Digital Identity

Supporting model(s)

IO-DSGEM

Impact assessment
SWD/2021/124

Fact sheet on model contributions

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

Date of Report Generation: 06/10/2021

Dissemination: Public

Overview

Title
COMMISSION STAFF WORKING DOCUMENTIMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) n° 910/2014 as regards establishing a framework for a European Digital Identity

Document ID
SWD/2021/124

Year of publication
2021

Led by
CNECT

Model(s) used
IO-DSGEM

Additional information on model use for this Impact assessment

-

IO-DSGEM

Full title
Input-Output Dynamic Stochastic General Equilibrium Model

Run for this impact assessment by
Sapienza University of Rome: Department of Economics and Law – Applied Macro Laboratory

Contributed to
Baseline and assessment of policy options

Helped to assess the following impacts

Supporting study: https://digital-strategy.ec.europa.eu/en/library/study-support-impact-assessment-revision-eidas-regulation

Impact area	*Impact category*	*Impact subcategory*
Economic impacts	Trade and investment flows	Investment flows & trade in services
Economic impacts	Competitiveness (sectoral) of business	Market share & advantages in international context
Economic impacts	Innovation and research	Innovation for productivity/resource efficiency
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	Specific regions or sectors	Significant effects on sectors
Economic impacts	Macroeconomic environment	Economic growth and employment
Economic impacts	Macroeconomic environment	Investments and functioning of markets
Economic impacts	Macroeconomic environment	Macro-economic stabilisation
Social	Employment	Impact on jobs
Social	Employment	Impact on jobs in specific sectors, professions, regions or countries
Social	Employment	Indirect effects on employment levels
Social	Employment	Opportunities and incentives of workers/specific groups to work
Social	Working Conditions	Wages, labour costs or wage setting mechanisms
Fundamental rights	General	Fundamental rights

IO-DSGEM

Input-Output Dynamic Stochastic General Equilibrium Model

Fact sheet

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

Date of Report Generation: 06/10/2021

Dissemination: Public

Overview

Acronym IO-DSGEM
Full title Input-Output Dynamic Stochastic General Equilibrium Model

Main purpose
The main objective of the model is to analyse and predict the sectorial economic effect of possible changes of the eIDAS (electronic IDentification Authentication and Signature) Regulation. In particular, the model allows to estimate and simulate the effects of a policy change on output, prices and interindustry flows.

Summary
The model is an Input/Ouput based Dynamic General Equilibrium model (IO-DGEM) of the European economy. The model is simulated conditional to an exogenous variation in the use of digital identity triggered by the perspective revision of the European Digital Identity (eID) Act (eIDAS). The model allows to estimate the sectorial economic effect of possible changes to the eIDAS Regulation in the short, medium and long-term period. For the analysis of the proposal for a European Digital Identity regulation (SWD(2021)124), the model estimates looked at the impact over a time period of 2, 5 and 10 years.

In this estimated/calibrated general equilibrium model, the supply-side is based on input-output relationships among industries, while the demand side is fully specified under the hypothesis of monopolistic competition among industries, such that firms are price-setters, i.e. they consider a mark-up over marginal costs in their pricing decisions, and demand is defined considering the full set of industry-specific relative prices.

Production takes place considering an input/output production technology, in which the input mix is chosen optimally based on the relative prices of intermediate factor inputs. A flexible trans-log production technology employing 16 factor inputs is adopted for describing the supply side: sectors are those of the two-digits NACE classification (Rev. 1.1) . The attractive feature of the trans-log functional form is that it imposes no a priori restrictions on substitution and price elasticity, that can be derived from the estimated parameters of the implied cost share functions. On the demand side, following a quite standard approach, sector-specific demand and price setting functions are analytically derived under the hypothesis of monopolistic competition.

The IO-DGEM allows a scientific evaluation of the potential macroeconomic effects of policy changes at a high level of detail (58 sectors). Thus, its use is of particular relevance to assess possible policy changes of Regulations and Directives.

Keywords
scenario analysis , Input-Output model

Model category (thematic)
Economy

Model home page
No information provided

Ownership & license

Ownership
Sole ownership [3rd party]

Ownership details
No information provided

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

IO-DSGEM structure and approach

In this estimated/calibrated general equilibrium model, the supply-side is based on input-output relationships among industries, while the demand side is fully specified under the hypothesis of monopolistic competition among industries, such that firms are price-setters, i.e. they consider a mark-up over marginal costs in their pricing decisions, and demand is defined considering the full set of industry-specific relative prices.

Production takes place considering an input/output production technology, in which the input mix is chosen optimally based on the relative prices of intermediate factor inputs. The telecommunication sector is isolated, detailed into its mobile, fixed telephony and internet subsectors, the latter disaggregated further in order to take into account changes in rules affecting digital identity investments, and included into the several production functions, such that a simulated investment decision affects each sector both directly and indirectly through the other sectors' responses. The impact in each sector is captured by a digital identity-specific variation in the telecommunication input, leading to production effects and substitution effects, the latter driven by relative price's changes.

A flexible trans-log production technology employing 16 factor inputs is adopted for describing the supply side: sectors are those of the two-digits NACE classification (Rev. 1.1) . The attractive feature of the trans-log functional form is that it imposes no a priori restrictions on substitution and price elasticity, that can be derived from the estimated parameters of the implied cost share functions.

On the demand side, following a quite standard approach, 58 sector-specific demand and price setting functions are analytically derived under the hypothesis of monopolistic competition.

The IO-DGEM thus provides an instrument that allows a scientific evaluation of the potential macroeconomic effects of changes in the use eID service at a high level of detail. For expositional convenience, and given the specific goals of the analysis for the European Digital Identity regulation, simulation results are summarized considering only output variations, labour input variations and price changes.

Given the limited sample size and the nonlinearity of the key output production functions and of the related cost shares, the Bayesian estimator is employed to parameterize the supply side of the model. The parameterization of the demand side is instead calibrated.

The instantaneous and cumulated effects on output and employment are evaluated in terms of both percentage deviations from control (i.e. a situation in which no investment occurs) and in terms of variations of volumes, i.e. output value effects (in Euros), and employment effects (in jobs).

The estimation requires detailed statistical information on sectoral outputs and inputs, i.e. industry by industry input-output tables, publicly provided by the Eurostat (European System of Accounts -

ESA 95), while other variables and data are obtained from the Eurostat Structural Indicators and from the STAN - OECD database.

Input and parametrization

The model parameterization is obtained from the information provided by a panel of years and sectors. The time-period ranges from 1995 to 2014. According to the 2-digit NACE classification systems, 58 production sectors are included in the estimates and in the model simulation (NACE-P is omitted because of data constraints). These 58 economic sectors cover all the economic activities, that is, only mentioning the macro-areas (1-digit NACE): Agriculture, hunting and forestry (A), Fishing (B), Mining and quarrying (C), Manufacturing (D), Electricity, gas and water supply (E), Construction (F), Wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods (G), Hotels and restaurants (H), Transport, storage and communication (I), Financial intermediation (J), Real estate, renting and business activities (K), Public administration and defense; compulsory social security (L), Education (M), Health and social work (N), Other community, social and personal service activities (O).The econometric analysis relies on the following set of data:

- values of the 1-digit 17 inputs used (including labour) at purchaser prices
- values of the 2-digit sectoral output at basic prices
- inputs' prices (except labour)
- labour compensation

All this information is obtained by three main data sources:

- OECD – STAN STructural ANalysis Database;
- Eurostat - Industry, trade and services – Industry and construction Industry;
- ESA 95 Table – Input-output tables – Eurostat.

Main output

The model presents the impact of different policy scenarios in terms of "EU value added" and employment impact. The impact is simulated at different time scales (2 years, 5 years and 10 years).

Spatial - temporal extent

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

Parameter	Description
Spatial Extent / Country Coverage	EU Member states 27 and UK; ALL countries of Europe
(Spatial) resolution	National
Temporal extent	Up to 10 years

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?	yes	Simulations are performed considering the posterior mean values of parameters. Model uncertainty can be given in percentiles
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	yes	Global sensitivity analysis is performed to detect the most relevant parameters for stability and dynamics
Has the model undergone external peer review by a panel of experts, or have results been published in peer-reviewed journals?	yes	The model has been peer-reviewed in previous applications (EC, Italian Telecommunication Authority)
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	not_applicable	The model, in the current setting, is for ex-ante policy simulation purposes. Unconditional in-sample prediction performances are evaluated at the estimation stage

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

- No references provided in MIDAS

Transparency

Question	Answer	Details
Is the model underlying database (i.e. the database the model runs are based on) publicly available?	yes	The model uses three main data sources: OECD – STAN STructural ANalysis Database; Eurostat - Industry, trade and services – Industry and construction Industry; ESA 95 Table – Input-output tables – Eurostat
Can model outputs be made publicly available?	yes	
Is the model transparently documented (including underlying data, assumptions and equations, architecture, results) and are these documents available to the general public?	yes	A detailed description has been included in the final Study to support the IA for revision of the eIDAS regulation (https://digital-strategy.ec.europa.eu/en/library/study-support-impact-assessment-revision-eidas-regulation). In addition, peer reviewed literature is available.
Is the model source code publicly accessible or open for inspection?	no	The model code is not publicly accessible due to intellectual property reasons, but open to the inspection of financing entities upon request

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
- Education and training
- Taxation
- Employment and social affairs
- Regional policy
- Competition
- Digital economy and society
- Business and industry
- Research and innovation
- Trade
- Banking and financial services

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

- Formulation

The model's potential

The model can simulate the sectorial economic effects of policies/investments/exogenous shocks affecting any sector in the demand and supply-sides of the economy. In the recent past, previous model versions have been used to anticipate the effects of disruptions (e.g., cyber-attacks) in digital networks at the EU country-level, to evaluate the effects of terrorist actions on gas and oil pipelines at the EU level, and to anticipate the effects of broadband investments at the Italian level.

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

Use of the model in ex-ante impact assessments since July 2017.

In the Year	IO-DSGEM contributed to the Impact assessment called	Led by	By providing input to the	The model was run by	Details of the contribution
2021	Impact Assessment Accompanying the document Proposal for a Regulation of the European Parliament and of the Council: amending Regulation (EU) n° 910/2014 as regards establishing a framework for a European Digital Identity SWD/2021/124 final	CNECT	Baseline and assessment of policy options	*Sapienza University of Rome: Department of Economics and Law – Applied Macro Laboratory*	The model helped to assess the following impacts: - Investment flows & trade in services - Market share & advantages in international context - Innovation for productivity/resource efficiency - Budgetary consequences for public authorities - Prices, quality, availability or choice of consumer goods and services - Significant effects on sectors - Economic growth and employment - Investments and functioning of markets - Macro-economic stabilisation - Impact on jobs - Impact on jobs in specific sectors, professions, regions or countries - Indirect effects on employment levels - Opportunities and incentives of workers/specific groups to work - Wages, labour costs or wage setting mechanisms - Fundamental rights

Bibliographic references

- *No references provided in MIDAS*