



Smart TIO

More smart, more TIO

Methodology

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Welcome to Smart TIO

More Smart, More TIO

What is Smart-TIO?

Smart TIO is a software that simulates socio-economic and environmental impact of events and economic shocks. Types of events and economic shocks:

- New policy introduction: sectoral subsidies, tax simulations, employment measures, environmental policy.
- Size and importance of a sector in the economy (direct, indirect and induced): Health, design etc.
- Impact of global trends: Environmental crisis, social inclusiveness, COVID

Methodology

The input-output model and the impact demand simulations

The input-output table (IOT) shows the productive intersectoral relations of an economy in a particular moment in time, usually a year. These intersectoral in the economy can be express based on the Leontief model which shows the interdependeces among sectors to satisfy the final demand of an economy. Thus, we will get a system of equations that can be expressed using matrices:

$$x = [I - A]^{-1}f \quad (1)$$

Where the production of a country or region (x), can be calculated based on the final demand (f) and the intermediate inputs requirement from other sectors (A). Thus, a technical coefficient (a_{ij}) from the matrix A , shows what the sector i needs to produce a unit of product of sector j .

Based on this model, we can do several simulations based on changes in different components of final demand (f), such as increase in households, NGO or government consumption, increase on international tourism consumption or increase of exports. Given new values to f , we can calculate which will be the new output, taken into account the direct and indirect effects, by applying equation 1.

Hypothetical introduction

Based on the Leontief Input-Output Model (Equation 1), we can also simulate which will be the effects if a sector disappear from the economy using hypothetical extraction. In hypothetical extraction, we calculate a new matrix, setting to zero all i -th row and column elements of corresponding sector in the A matrix \bar{A}_{ij} and as well as setting zero the final demand \bar{f}_j of the sector that we want to estimate the weight. So the previous model will be expressed in the following way:

Using the model for the new matrix, without the analyzed sector, the "reduced" amount of output (\bar{x}) can be calculated with the next expression:

$$\bar{x}(j) = [I - \bar{A}(j)]^{-1} \bar{f}(j) \quad (2)$$

Thus, the relative loss on output caused by the sector disappearing from the economy will be calculated as:

$$T(j) = 100[(x - \bar{x}(j))/x] \quad (3)$$

The Hypothetical Extraction has the following assumptions that should be taken in consideration:

- To calculate the weight of a sector, it is considered that, at the time of its extraction, the rest of the sectors of the economy remain unchanged, producing in the same way and receiving the same inputs. For more information about input-output models check Miller & Blair (2009)

Regionalization

Regionalization is done based on the algorithm describe in Pereira-López, et al. (2020).

Databases

Smart TIO is based on the domestic input-output table OECD for 2018 (last year available), and they are expressed in US Dollar, Millions (as well as results) (<https://www.oecd.org/sti/ind/input-outputtables.htm>)

Data for calculating the employment vectors are based on Socio Economic Accounts from the World Input-Output Database (WIOD) November 2016 Release. WIOD consists of a series of databases and covers 28 EU countries and 15 other major countries in the world for the period from 2000 to 2014. (<https://www.rug.nl/ggdc/valuechain/wiod/wiod-2016-release>)

Data for calculating the environmental vectors (carbon emissions and energy use by type of energy) are based on the environment accounts published by The Joint Research Centre of the European Commission fully consistent with the 2016-release of WIOD. (https://joint-research-centre.ec.europa.eu/scientific-activities-z/economic-environmental-and-social-effects-globalisation_en)

Data for regionalization will be selected for each case.

References

- Miller, R. E., & Blair, P. D. (2009). Input-output analysis: foundations and extensions. Cambridge university press.
- Pereira-López, X., Carrascal-Incera, A., & Fernández-Fernández, M. (2020). A bidimensional reformulation of location quotients for generating input-output tables. *Spatial Economic Analysis*, 15(4), 476-493.