Nowcasting in the project DESIRE â€“ Development of a System of Indicators for a Resource Efficient Europe

Topic: Industry Structure in Time
Author: Arnold Tukker
Co-Authors: Arjan de Koning, Konstantin STADLER, Richard WOOD, Tatyana Bulavskaya

Abstract for the session â€œBackcasting, nowcasting and forecasting multi-regional input-output systemsâ€• organized by Kirsten S. Wiebe

The main goal of the EU FP7 project DESIRE (3 Mio Euro) is to develop and apply an optimal set of indicators to monitor European progress towards resource-efficiency. We propose a combination of time series of environmentally extended input output data (EE IO) and the DPSIR framework to construct the indicator set. The project builds upon EXIOPOL and CREEA, with as main contributions
1. Creating long time series of detailed global MR EE IO tables (43 countries, 180 sectors and products) consistent with the UN main aggregates
2. Improving a variety of extensions and other information
a. Adding information on detailed critical material flows
b. Indicators that present information about biodiversity impacts and ecosystem service damage on the basis of regular extensions in the GMR EE IO table
c. â€˜Beyound GDPâ€™ reference values at country and sector level that form an alternative for GDP as reference in resource-efficiency assessments.

RESEARCH QUESTION: This particular talk will briefly discuss the construction of the GMR EE IO time series, and emphasise the nowcasting approach used in DESIRE. In the development of previous versions of EXIOBASE, we started with harmonizing the SUT of countries, and subsequently solved the issue of linking via trade via a procedure developed by Bouwmeester (2014). One of the problems we faced in the CREEA project is that the physical SUT developed in that project at country level, could not be reconciled anymore via trade without ending up without an inconsistent international price matrix, since the trade link procedure does change the monetary imports and exports in the harmonized country SUT to arrive at a balanced table at global level. Therefore, in the DESIRE project this procedure was reversed. First, making use of the import and export vectors of country SUT, a harmonized bilateral trade database (BACI), and other trade information from e.g. the IEA database, a fully harmonized and balanced â€˜trade cubicleâ€™ was developed providing all trade matrices, that came as close as possible to all original data used. This trade cubicle served as a basis for estimating both monetary and physical trade, with a consistent price layer. Imports and exports from this trade cubicle were subsequently imposed on country SUT, which were then harmonized and detailed using various additional detailed data sources for product output, industry turnover, and input and output co-efficients by industry in combination with an optimization routine rebalancing all data points at a more detailed level as in the original SUT.

METHOD: The now-casting procedure used the same balancing technique, but combined the most recent GMR SUT data for which we had full information on e.g. SUT, usually a few years old, with more recent available information on trade and GDP. Afterwards, value added per broad sector (ISIC A-B, ISIC C-E, ISIC D, ISIC F, ISIC G-H, ISIC I, ISIC J-P) and final demand per category (households, government, gross capital formation) were scaled to match the updated GDP and trade values. The macro economic data was then used to estimate the current trade and industry output values based on last available shares in the initial time series. These data were combined with now-casted SUT coefficients (which are based on historical change) to compile the initial

nowcasted SUT table. This SUT was balanced using the same mathematical programming approach used for the initial time series. A final estimate of the SUT system then is created by minimizing the difference between from the initial estimate of the SUT system via: [formula cannot be shown in this view]

with m, j, t representing rows (products and value added), columns (industries and final demand) and layers (supply table, use table basic prices domestic and import use, taxes, transport and trade margins) of the SUT system. A quadratic program target function to minimize the difference between initial and final estimate. The QP target function was constrained by a number of basic identities and boundary conditions (supply = use for products and industries, sums of trade and transport margins must be zero, final household consumption, government consumption and gross capital formation equals estimates based on scaled GDP, intermediate and final demand must be positive, etc.). Environmental extensions were estimated on the basis of now-casted co-efficients representing a four-year average trend. Energy-related emission were now-casted on the basis of now-casted emission relevant energy use by industry and emission factors.

RESULT: The result are time-series of the EXIOBASE GMRIO at an unprecedented detail of 160 industries by 200 products up to 2015.