Uncertainty Analysis with Consideration of Correlation between the Elements of Input-Output Table

Topic: Methodological aspects of input-output analysis
Author: Yasushi KONDO
Co-Authors: Jian Jin

Despite its necessity and importance, the reporting of uncertainty indicators, such as standard deviation and confidence interval, is uncommon in input-output analysis (IOA). The Monte Carlo method has been widely used in IOAs for performing uncertainty analysis (Bullard and Sebald, 1988, Rev. Econ. Stat.; Lenzen, Wood, and Wiedmann, 2010, Econ. Syst. Res.; Rodrigues et al., 2018, Environ. Sci. Technol.). The Monte Carlo method can be applied to quantify the uncertainty indicators in an IOA if a joint distribution of the elements of an input-output table (IOT) or an input-coefficient matrix is specified. Normal, gamma, and log-normal distributions are examples of popular specifications. While the elements of an IOT are mutually correlated by construction, a common practice is to employ the independence assumption, according to which the elements of an input-coefficient matrix are independently distributed. Rodrigues et al. (2018), which is an excellent study of the uncertainty of consumption-based greenhouse gas emissions, is an exception; the method used in it to consider the correlation between the elements of an IOT is valid when multiple IOTs are observed. However, it is quite likely that only one IOT is observed for a wide range of IOAs. Given this background, this study proposes a method to evaluate the uncertainty in an IOA under the reasonable assumption of a joint distribution of the elements of an input-coefficient matrix. Our method is feasible even when just one IOT is available. At the conference, we will explain how the proposed method works by focusing on the difference in uncertainty between the cases where the independence assumption is used and those where it is not.