The spatial effect of changes in regional characteristics

Interregional[1] IO (IRIO) tables are a powerful tool to analyze the regional dissemination of economic shocks. Social accounting matrices (SAM), which are understood here as IO tables with at least one explicit household sector, allow for a welfare analysis of these shocks.

This paper introduces a discrete location choice spatial computable general equilibrium (SCGE) model, which can be exactly calibrated to a benchmark given by an interregional SAM (IRSAM). The latter can be obtained from a national IO table/SAM through regionalization methods (e.g. Jahn, 2016; Többen and Kronenberg, 2015). Let it be noted right away that a spatial IRIO model is obtained from the equilibrium model by fixing the price variables. However, the paper considers the case of flexible prices and thus, the general equilibrium approach.

Spatial computable general equilibrium (SCGE) models, in contrast to conventional multi-regional CGE models, allow for explicit location decisions of agents. A special class of applied CGE models, which is called discrete location choice SCGE model in this paper, was introduced by Alex Anas and co-authors (e.g. Anas and Liu, 2007). A discrete location choice SCGE model is defined here as a computable general equilibrium model consisting of more than one model zone, where random components in the utility function of households turn the utility maximization (across model zones) into a discrete location choice problem for households.

Apart from Anas and Liu (2007), the most relevant publication around the discrete location choice SCGE models for this paper is Anas and Xu (1999). Anas and Xu (1999) consider a regional general equilibrium model with endogenous location and travel choice of households, which builds on an earlier model (Anas and Kim, 1996). The two models overcome the limitation of the (still wide spread) central business district (CBD) approach, where all employment is concentrated in the CBD. Instead, the number of zones in the region, their geography and the relation between each other is not restricted. The final goal in Anas and Xu (1999) is to determine the general equilibrium effects of congestion tolls, in particular on land use. The main reference of this paper (Anas and Liu, 2007) is an even further development of the model which (additionally) considers (interzonal) input-output (IO) relations, a dynamic housing market and a more complex urban transportation network (for commuting and shopping).

In order to further understand the reasoning behind these models, Anas and Liu (2007) state that their model is "suitable to study the effects of a menu of policies spanning capacity expansion,

1 The term „interregional“ is used as opposed to „multiregional“ in order to highlight that all possible IO relations are considered explicitly, no matter if sectors are in the same or in different regions.

pricing, finance and investment of transportation, building and income taxation, and land-use planning and controls." The focus of this paper, however, is slightly different.

First, the model is not restricted to (processes in) urban areas. In fact, as long as there is a certain mobility of households between the constituting regions, the scale might be anything between an urban area and a world region. Second, the model shall be built in a way that the input data determining the benchmark equilibrium is displayed in a transparent way. This implies, in particular, that the model is exactly calibrated and not numerically calibrated. The model will thus be much easier to apply and the obtained results will be easier to replicate. The third goal is to account for IO relations between sectors as these determine the structure of the considered economy. A process to calibrate discrete location choice SCGE models to an interregional SAM is developed and allows for reaching goals two and three.

The fourth and final goal is to build a model which allows assessing the impacts of a change in regional characteristics such as environmental amenities on a spatial general equilibrium. It is known that the location choice of households may depend on a possibly large set of regional characteristics/amenities such as sunshine hours, recreational spaces and so on. The calibrated location choice parameters can be regressed on these regional characteristics in order to explain the benchmark location choice. The welfare analysis of changes in these characteristics is illustrated by the example of air quality.

Literature:

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