

## **RHOMOLO: A Dynamic General Equilibrium Modelling Approach to the Evaluation of the EU's Regional Policies**

Topic: Interregional analysis

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This paper describes a new dynamic general equilibrium framework (RHOMOLO) being developed at the European Commission for evaluating the EU Cohesion Policy. The model is constructed using the concept of Dynamic Spatial Computable General Equilibrium (DSCGE), which solves for Walrasian equilibrium in a sequence over time.

RHOMOLO is a micro-founded comparative static general equilibrium model employing the utility and production functions to describe the household, firm and government decisions by incorporating the modelling of (dis)economies of scale, external economies of spatial clusters of activity, continuous substitution between capital, labour, energy and material inputs in the case of firms, and between different consumption goods in the case of households. Firms operate under economies of scale in markets with monopolistic competition of the Dixit-Stiglitz type. The RHOMOLO model utilises the notion of the representative economic agent, which aims to capture the behaviour of each population group or sector through that of a single aggregate agent. The behaviour of each such an aggregate agent is driven by optimisation criteria, such as maximisation of utility or minimisation of costs. The model is neo-classical and assumes average cost pricing and no excess profits.

RHOMOLO has a detailed geographical dimension and full inter-regional input-output structure of economies. It models the EU economy as consisting of NUTS2 regions which are linked (both to each other and to the rest of the world) by trade, labour, capital and income flows.

The modelling of labour and capital flows is strongly influenced by the availability of data, as the availability of data at NUTS2 level is limited. Intra-country migration data are available at NUTS2 level; hence RHOMOLO models only intra-county between-region migration flows. Capital flows (FDI) data are available only at the country level; hence the model covers only country-to-country flows of capital. For their investments, countries draw from a pool of funds which consists of domestic savings and of savings coming from other EU countries and the RoW. This pool is assumed to be distributed among the regions and sectors by an 'investment bank' funding physical capital investments according to a specified investment rule.

Similarly, the modelling of interregional trade flows is largely determined by data availability. The only data available at regional level are data on the total origin-destination flow of commodities between the regions by type of commodity. There is neither information about trade between regions in services, nor information about differences in the geographical mix of the commodities bought by different sectors and households in the region. The lack of data results in a simplified structure of the model, which assumes no trade in services between the regions. There is also no difference in the geographical mix of the commodities bought by various sectors and households in a particular region. Under this assumption, the decisions of both sectors and households about buying commodities from a particular EU region are modelled as the decision of a representative agent.

The RHOMOLO model contains four spatial effects: (i) The market-access effect: monopolistic firms want to locate themselves in a big market and export to smaller markets. (ii) The variety effect: monopolistic firms (and consumers) want to locate themselves in a big market with the greatest variety to increase productivity (utility for consumers) via a larger choice of intermediate inputs. (iii) The cost of living effect: goods tend to be cheaper in a region with more economic activity since consumers in this region import less and reduce their transport costs. (iv) The market-crowding effect: monopolistic firms have an incentive to locate themselves in regions with few competitors. Whereas the first three effects are agglomeration forces, the last effect is dispersionary. Trade

costs, commuting costs and the regional availability of land and housing determine the relative strength of these forces.

Using an example of transport infrastructure investments, the paper shows how changes in transport costs trickle down through the inter-regional input-output structure of economies, affecting regional (as well as national) economic development. Transport costs affect prices directly and affect logistical costs and labour costs that influence the production process. The interaction between regional labour supply and demand and wages results in both national and regional changes in vacancies and unemployment. Changes in regional production affect intermediate demand, consumption and variety through the variety effect, the market-access effect, and the market-crowding effect.