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Land use policy impacts in the rural-urban region: a modelling framework

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Because land is a fundamental input of anthropogenic (production, residence, recreation etc.) as well as non-anthropogenic (ecosystem functioning, refuge, habitat etc.) activities, modelling such impacts require a conceptual framework multi-sectoral and multi-zonal in scope. This framework should account for flows of people, commodities and services from one sector to the other and from one zone to the other. Because of the very nature of the problem at hand, an urban and rural context needs also be given to the conceptual framework. In this paper we propose an extension to the PACE model inspired by the modelling approach of metropolitan input-output models (see Jun, 1999 and 2005).

PACE is comparative-static multi-region, multi-sector CGE model. Primary factors of a region include labour, capital, and fossil-fuel resources. While in PACE regions are usually countries and cities in metropolitan input-output models, in our conceptual framework we refer to the following three regions: urban, peri-urban and rural. Each region can be divided in sub-region depending on the spatial disaggregation of available data. Capital is divided into two categories: manufactured capital (including infrastructure) and non-manufactured capital (including forests, mineral deposits, fisheries, biodiversity etc.). We also add land as a further resource representing land that is not used for capital. In PACE the energy sector is modelled explicitly to better account for impacts of changes in climate policy. In our framework we add the real estate sector and show how the decision to develop land can be modelled using a real option approach.

Nested constant elasticity of substitution (CES) cost functions are employed to specify the substitution possibilities in domestic production between capital, labour, land, energy and non-energy, intermediate inputs, i.e. material. Final demand in each region is determined by a representative agent, who maximizes utility subject to a budget constraint.

In PACE, furthermore, labour and capital are intersectorally mobile within a region but cannot move between regions. A discussion on data needs to make this conceptual framework operative follows.