Partial economic models (PEM)
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Socio-economic models: Partial economic sectors

Hermann Lotze-Campen (lotze-campen@pik-potsdam.de)

1 Introduction

Economic sectors are important descriptive units of an economic system. Partial economic sector models (PEM) have a focus on a certain sector of the economy, for which they provide much more structural detail than multi-sectoral general economy models can do. Sector models work on the simplifying assumption that major feedbacks between the specific sector and the economy as a whole, e.g. effects on employment and growth, can be neglected. Taking macroeconomic conditions and certain prices as given, the allocation and distribution effects within the sector can therefore be looked at more realistically. Moreover, specific environmental conditions and constraints can be taken into account.

2 Methodology

Most sector models are either partial equilibrium models or mathematical programming models which optimise a certain sectoral goal function. Consumption, production and prices of sector-specific goods and services are represented through mathematical equations. Model parameters are either derived from statistical time series data or calibrated to the conditions of a certain base year. The model can be driven through macroeconomic changes, policy changes or environmental changes. Depending on the structural detail of the model, a wide range of sector-specific policy instruments can be defined and implemented (e.g. commodity-specific taxes and tariffs, production quotas and direct subsidies).

3 Process

The following steps are involved:

- Generation of an appropriate database, mostly taken from official statistics, in some cases supplemented by surveys
- Collect and/or calibrate model parameters
- Develop scenarios to be analysed, including definition of external shocks and drivers of change, especially for forecasts, e.g. macroeconomic conditions, different policy options, climate change
- Adapt standard model to specific problem, e.g. parameter choices
- Run model scenarios
- Conduct sensitivity analysis with respect to critical model assumptions and parameters

4 Review

4.1 Evaluation results

PEM can be very rich in sectoral detail and specifics of certain economic activities, while they have to neglect macroeconomic consistency. PEM are very flexible in their structure and are better prepared to consider explicit links to environmental conditions and constraints than General economy models (GEM), which supports more integrative approaches. PEM are usually poor in covering dynamics of economic decisions, and they often focus on short- to medium-term changes. PEM have been used as important building blocks in many Integrated Assessment studies.
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4.2 Experiences

PEM are used for the analysis of sector-specific national and international policies, i.e. taxes and subsidies, trade negotiations, energy policies, agricultural policies, transport policies. PEM are standard tools for the support and analysis of sector-specific policy-making and distributional aspects for certain economic groups. They have been used for assessing the effects of climate change on food production and alternatives for future energy mixes. PEM are suitable for analysing scenarios on biofuel demand primarily in the short and medium term, where detailed policy instruments and substitution effects between sub-sectors do matter.

4.3 Combinations

Sector models depend on inputs from macroeconomic models for basic conditions. Agricultural sector models are partly overlapping with land use models. Energy models provide important links to the climate system. PEM are also used for scenario analysis and cost–benefit–analysis in a sector–specific context. Sector models with a focus on environmental economic linkages can be linked with biogeochemistry or hydrology models.

Sector models can provide inputs for climate models, land use models; Scenario analysis; Cost–benefit analysis. Sector models require inputs from general economy models; optional: from all types of biophysical models.

4.4 Strengths and weaknesses

Strengths:

- Detailed representation of specific economic sector
- Immediate link to policy formulation and implementation
- Flexible in structural representation of the sector, including distributional aspects between agent groups
- Links between economic decisions and environmental constraints
- Relatively simple structure
- Some spatial representation of economic activities possible

Weaknesses:

- Limited feedback with macroeconomic system
- Limited coverage of institutional settings
- Usually constrained to time scales of a few years due to structural rigidities
- Insufficient empirical base for many model parameters
- Strongly simplified behavioural patterns of economic agents
- Biophysical constraints usually taken as exogenous

4.5 Further work

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4.6 References of the tool

POLES (Energy sector model)

http://www.upmf-grenoble.fr
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**PRIMES** (Energy sector model)

http://www.e3mlab.ntua.gr/manuals/PRIMsd.pdf

**MARKAL** (Energy sector model)

http://ecolu-info.unige.ch/recherche/sutra/models/markal/energy_model.htm

**WATSIM** (Agricultural sector model)

http://www.agp.uni-bonn.de/agpo/rsrch/watsim/wats_ov_e.htm

**IMPACT** (Agricultural sector model)

http://www.ifpri.org/themes/impact/impactmodel.pdf

**CAPRI** (Agricultural sector model)

http://www.agp.uni-bonn.de/agpo/rsrch/capri/capri_e.htm

**RAUMIS** (Agricultural sector model)

http://www.agp.uni-bonn.de/agpo/rsrch/raumis_e.htm

**TREMOVE** (Transport sector model)

http://www.tremove.org