

The MIT Joint Program on the Science and Policy of Global Change made extensive use of the GTAP data set for research and analysis conducted in the program over the past year (See following publication list). GTAP data serves as the principal economic data for the Program's Emissions Prediction and Policy Analysis (EPPA) Model, a global CGE model of the world economy with details on the energy sector and on emissions of greenhouse gases and other air pollutants. The EPPA model is a component of the Program's Integrated Global Systems Model (Figure 1), a model that represents the earth's oceans, atmosphere, and terrestrial systems as they are affected by emissions of greenhouse gases and other pollutants.

We have continued a process of updating our EPPA model to use GTAP 5.0 data, and look forward to soon incorporating the GTAP 6.0 data particularly with regard to breakout for Russia. While the process of updating to new GTAP data is fairly straightforward, we include a variety of ancillary data on greenhouse gas emissions, air pollutant emissions, and greater disaggregation of the energy sector particularly the electricity sector and this complicates the process of updating the model because we need to also update this ancillary data. (See Table 1.)

The main areas of work, partly reflected in publications but in some cases still ongoing is:

- (1) Economic costs of climate policy recognizing the existence of significant economic distortions in energy markets, and in capital and labor markets. This is an important area of work in the climate policy arena, and reflecting correctly other pre-existing taxes and distortions can have large effects on the cost of proposed policies and affect the efficiency of policy instruments and suggest how they might be better designed.
- (2) Interactions of climate change and air pollution. There are many elements of this work that reflect interactions throughout the systems modeled in our IGSM. The main work of direct interest to GTAP and economic modeling has been an effort to endogenously value health effects within the CGE framework. A thesis and forthcoming paper re-evaluated the benefits of clean air regulation in the US from 1970-2000, and the remaining burden of air pollution on the economy using a newly developed version of EPPA, EPPA-HE.
- (3) Personal Transportation (i.e. automobile) disaggregation. We have completed and will present at the GTAP conference work to produce a household transportation sector in EPPA that disaggregates personal automobile use for all EPPA regions. A GTAP technical paper is nearly finished, with detail on methods and data sources with the hope that this disaggregation can become a regular component of the GTAP data. Private automobiles are a very important user of energy, and thus of emissions of CO₂ and other pollutants. Unique regulations are often directed at automobiles (high fuel taxes, CAFÉ standards) and thus it is critical in environmental policy to have this important sector explicitly identified.
- (4) Agriculture and Land. Reilly is a co-PI on an EPA sponsored GTAP project to produce supplemental physical accounts for land in the GTAP data base. This would be similar to the physical accounts for energy. We ultimately must develop a closer link between our EPPA model and a detailed model of terrestrial ecosystems (the TEM component of our IGSM). Toward this end, we are further disaggregating our model to identify separate crop, livestock, and forest sectors in agriculture. We are obviously able to take advantage of the detail in GTAP.

We can then use results from TEM on the environmental impacts on vegetation on cropland to evaluate productivity effects. Work so far has investigated the impacts of tropospheric ozone on carbon storage in vegetation, and the consequent added cost of climate policy to make up for this damage. Preliminary work is investigating the impacts of climate change and ozone damage on crop production and the consequent economic impacts. Ultimately, once a physical supplemental data set is available we plan to formally link EPPA and TEM, to represent the feedbacks between the economy and vegetation and land use modeled explicitly in the TEM.

(5) Technology and technical change. There is much current interest in the role of technology. We have been investigating induced technical change and have been improving and adding more descriptions of non-extant technologies in EPPA that may contribute in the future depending on how energy prices change, and under different climate policies that increase the cost of using fossil fuels.