



Strengths and Limitations of the GTAP Modeling Framework

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Strengths of the GTAP Framework: Data

- **GTAP is first and foremost a global data base describing bilateral international trade, production/consumption for entire economy**
- **Assembling a high quality, internally consistent, peer-reviewed global data base is a tall order**
- **Accomplished with input from leading international agencies as well as member agencies from Asia, Europe and the United States – 26 advisory board members**
- **National Contributions from hundreds of national researchers**

Strengths of the GTAP Framework: Flexibility

- **While there is one GTAP data base, there are many GTAP-based models (hundreds or more).**
- **Each new policy application may entail:**
 - **Aggregation of sectors and regions**
 - **Modification of theory (e.g., co-products, Agro-Ecological Zones)**
 - **Estimation of new parameters (elast of substitution between ethanol and other fuels)**
 - **Addition of new data (e.g., land use by AEZ)**
- **The validity of such extensions can only be evaluated through the peer-review process; fortunately there is a large community of GTAP users (7,500+)**

Strengths of the GTAP Framework: Ease of Use

- **Modifications of GTAP facilitated by careful documentation/modular structure. Easy to change.**
- **In response to large user community, excellent software has been developed (RunGTAP) which permits versions to be archived, sent around the world (or at least to Sacramento) and results immediately replicated! This is non-trivial and would NOT be possible for the other models being used to assess global land use impacts**
- **Built-in framework for systematic sensitivity analysis: User specifies extent of uncertainty about parameters, and model generates confidence intervals on results.**

Limitations of the GTAP Framework: Ease of Use

- **In the end, the policy model is an just organizing framework permitting careful analysis of complex issues; if individual doing the analysis is not trained in economic theory, does not understand the model, or simply seeks to get a particular result, the outcome will not be useful**
- **In much of the ‘critical’ work done to date on the land use issue, individuals have played around with the model enough to figure out which parameters drive the results and then they have focused exclusively on that parameter – e.g., raising the crop yield response to commodity prices from 0.25 to 25! The model will not complain; it will just proceed and compute the new results.**

Limitations of the GTAP Framework:

Parameter Uncertainty

- **There are many parameters in the GTAP model, and they are all uncertain to some degree**
- **Economics profession and policy makers under-invest in estimation of these parameters; GTAP can't change this**
- **Virtue of GTAP model is that it is easy to see which parameters are most important to results:**
 - **Yield response to commodity price**
 - **Yield response to cropland expansion**
- **Controversy over these parameters has stimulated demand for additional research; that is very good**
- **In the meantime, King Solomon might have suggested ignoring both of these effects (leave yields exogenous)**

Limitations of the GTAP Framework: Baseline

- **Impossible to have a peer-reviewed, fully-vetted, published and documented data base which is also fully up-to-date:**
 - **National and intl stats come out with a lag**
 - **Once finalizing base year, we spend a year or more in “pre-release” mode with consortium**
 - **Will always working with “out of date” data**
- **Problem is compounded in this case since only one published global data base on spatially explicit yields and harvested area; these differences in yields are key to question at hand**

Solutions to the Baseline Problem

- **Invest in new data bases: important in long run**
- **Do analysis based on older data and adjust for key changes in simple way afterwards; current approach (assume balanced growth worldwide)**
 - **Transparent**
 - **Easy to change assumptions**
- **Project base data forward: this is what dynamic models do. However, unless peer reviewed, hard to evaluate results, and differences in yields are central to results**

Summary

- **Models help identify key sources of uncertainty; subsequently invest in research to narrow range of uncertainty**
- **ARB, EPA and others must invest resources in such research; requires a longer fuse**
- **Models are just models; in the end, expert use and judgment are required to get sensible outcomes**
- **ARB must invest in staff capacity to undertake and evaluate GTAP analyses**