The Global Trade Analysis Project: Issues and Future Directions

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OBJECTIVES, GOALS AND ACCOMPLISHMENTS

In keeping with past tradition, we open this background paper with a statement of the objective of GTAP for your recollection, review and comment.

Objective of GTAP

GTAP is dedicated to the development and support of a global research network, data base, and modeling framework for the analysis of international trade, environment and resource issues.

More specifically, GTAP comprises:

*   a fully documented, publicly available data base,

*   a standard modeling framework and associated software which are well-documented and flexible, and which lend themselves to straightforward replication of analyses by third parties,

*   a global network of researchers, linked together via email and a Worldwide Web site, and finally,

*   a Consortium of national and international agencies providing leadership and a base level of support. The vehicle, which has been set up for Consortium members to provide this guidance and direction, is the *GTAP Advisory Board*.

The Board advises the Director on matters of policy, research agenda and funding. In so doing, it helps to set the direction of future developments in the GTAP network, training courses, data base and modeling framework. In keeping with the title of "*advisory* board," responsibility for the final decision in these matters rests with the Director. In this way we hope to keep the project moving ahead on an effective and timely course.

Assessment of Goals for Past Year

The goals for the past year, as laid out at the 1999 GTAP board meeting, are listed below, along with an assessment of our progress towards accomplishing these goals. (A complete summary of last year's board meeting is available from the consortium page of the GTAP web site.)

1. Implementation of our plan for multiple updates on the prerelease as major improvements are made, converging on the final data base three months prior to the public release.

Assessment: We have followed this plan, with three major pre-releases prior to the final release of the data base. From our perspective, this has been a good idea, since there have been so many changes to the data base and to the underlying procedures used in constructing it. The quality of some aspects of the first pre-release was relatively poor – leading to some frustration on the part of consortium members. However, the changes from version 4 to version 5 were quite substantial. The services sector

was disaggregated to identify separately alternative modes of transportation, including: air, sea, and land, and financial services, insurance and communications sectors were all broken out. In addition, 21 new countries were added, as well as the incorporation of the energy volume and price databases from GTAP-4E. But the biggest difference between these two releases is the way in which they are being produced. The degree of automation and version-control is light-years beyond version 4. We have also largely implemented regional flexibility throughout the process, thereby making it much easier to add additional countries in the future. Rather than varying with each data source and each version of GTAP, source data are now maintained at the level of 200+ standard countries. This all helps to explain why some aspects of pre-release #1 were given relatively little attention (e.g., agricultural protection). Pre-releases 2 and 3 have each addressed major areas of concern and we appear to be converging on a very high quality final release for version 5.

2. Introduction of a web board for discussion of data base related concerns, as well as posting of related information and news.

Assessment: We believe that this mode of communication is well-suited to discussion of the pre-release data bases. The web board is restricted to consortium members, and it is a threaded discussion board so that it keeps track of discussion on different topics. Furthermore, it is open to all members on an "as needed" basis – but members are not harassed on a daily basis with bug-reports. For all of these reasons we believe it dominated email. However, the fact remains that most of the board members check their email regularly, whereas the web board appears to get relatively little attention. Most web board communications are posted by staff at Purdue, based on email messages received from consortium members. *We would appreciate your thoughts on how to use the web board more effectively in the future.*

3. Public release of the version 5 data base.

Assessment: Our goal is now early June for the final release. The major changes from prerelease #3 will be: (1) greatly improved targeting of energy prices and quantities (Rob McDougall has turned his attention to this issue in the past several weeks), (2) revised MFN tariff data from the World Bank/UNCTAD WITS system (Recall that there were problems identifying preferential tariffs in prerelease #3 so we simply went with MFN tariffs.), (3) further revisions to disaggregation of input-output tables. In addition, there will be a number of smaller adjustments which will be posted on the web board prior to final release of the data.

4. Release of a new version of the standard GTAP model, featuring a modular structure and accessible via the web with version control features.

Assessment: When this goal was written (early 2000) we were not fully aware of the extent of the changes to this new model. An interim version (version 5 of GTAP.TAB) that featured the revised, modular structure was developed for the August, 2000 short course.   Subsequently, however, Robert McDougall proposed a new structure for final demand and welfare decomposition in the GTAP model (the latter developed in conjunction with Kevin Hanslow). There are now two new technical papers on

these two topics – one by Hanslow and one by McDougall (to be made available at the board meeting). The revised GTAP.TAB file – version 6.0 – incorporates these changes as well. It therefore represents a very substantial change from the original model. It is now available on the web site. It is designed to lend itself easily to extensions, and we expect it to provide a stable platform for standard modeling exercises over the next several years.

5.   Release of a dynamic GTAP model featuring international capital mobility and explicit accounting for ownership of foreign and domestic assets.

Assessment: In October of 2000 we held the first ever dynamic GTAP short course. This marked the formal release of GTAP-Dyn, a recursive-dynamic model featuring international capital mobility and cross-ownership of assets. It is documented in GTAP Technical Paper #17, authored by Elena Ianchovichina and Robert McDougall. The model is now in use at a handful of locations and we are continuing with development work, addressing a number of issues that arose in the context of the course, and extending the model to address climate change questions (Jean-Marc Burniaux is doing the latter). We anticipate offering another dynamic short course in 2002 at which point we hope to make the model more widely available. (It is a much bigger job to make such a dynamic model "bullet-proof" than is the case with the static model.)

6.   Successful delivery of the Eighth Annual Short Course – to be held in August 2000 at Purdue University.

Assessment: We had another outstanding group of participants and instructors in the August, 2000 course. About half of the participants took part in the eight-week, web-based course prior to the intensive short course. On the basis of their enthusiastic response, we have now made this a standard part of the short course – to be taken by all participants. The most important new development in the short course included the use of AnalyseGE. This is a fantastic tool for analyzing model results. I recommend it to you, if you have not yet used it.

7.   Validation of the GTAP model in conjunction with a back-casting exercise aimed at estimation of trade elasticities for the standard GTAP model .

Assessment: The Ph.D. student working on this topic, Jing Liu, recently completed his dissertation and a paper based on that work will be presented by Channing Arndt at the upcoming conference. In addition to this back-casting work that has been presented at earlier board meetings, we have been collaborating with David Hummels, a recent addition to the Purdue Economics faculty, on the estimation of disaggregated trade elasticities for use in the GTAP model. David will be presenting a GTAP short on this at the board meeting. He will also be presenting a workshop on econometric analysis of trade on the final day of the conference. I encourage you to attend that session.

8. A successful Third Annual Conference in Global Economic Analysis in Melbourne, Australia

Assessment: I am pleased to report that the staff at Monash University did a superb job organizing this conference. The venue was excellent and the program was very well put together. Attendance was at the same level as the European and North American conferences, and the organizers didn't lose money on the conference. In short, this experience bodes well for future conferences held on other continents. (Recall that next year's conference will be in Taiwan.)

9. GTAP support for outreach efforts aimed at building capacity to analyze trade policy in in Africa.

Assessment: While GTAP has been largely a demand-driven project, we have recognized that some of the biggest potential policy-payoffs may be in regions of the world where there is currently minimal capacity, and therefore apparently little demand for data, training and research. Sub-Saharan Africa stands out in this regard. Accordingly, we have taken a pro-active approach in this region, working to stimulate interest in the use of quantitative analysis of economic policies, as well as providing training and data for researchers to utilize. Over the past three years, Channing Arndt has taken the lead in these activities, and the fruits of his labors are beginning to become evident. Version 5 breaks Sub-Saharan Africa up into 10 regions, with 8 of these corresponding to specific countries. This new disaggregation was facilitated by collaboration with IFPRI, using funding from the UK Department for International Development. (IFPRI's earlier work was funded by the Danish and German aid agencies: DANIDA and GTZ.) Channing organized a Southern Africa workshop for discussion of the prerelease data and potential research applications in September of 2000. Based on feedback obtained there, some modifications were introduced in the subsequent prereleases of version 5. Channing will make a presentation on these developments in capacity building at the upcoming board meeting. Also, Sherman Robinson will discuss a proposal by IFPRI to coordinate future data base contributions for Africa.

10. Begin the process of incorporating improved government and external accounts into the GTAP data base.

Assessment: This is another area where progress has been slower than hoped. We really need a staff member/graduate student to take charge in this area. Ken Itakura has shown a strong interest and he has now finished his prelims, so we hope for substantial progress on this goal in the coming year.

11. Development of new distance learning modules on advanced topics in collaboration with researchers at other institutions.

Assessment: Little progress has been made on the development of new materials – although the graduate course which draws on this material was successfully offered to students at the Cornell University, Purdue University and the University of Illinois, during the spring semester, 2001.

12.   The addition of 3 - 5 more technical papers on the web site.

Assessment: This year has seen the publication of some important technical papers on the web site. The first of these, authored by Ianchovichina and McDougall, offers the long-awaited documentation of the dynamic GTAP model. This was followed by a technical paper on bilateral tariff rate quotas by Elbehri and Pearson. GTAP technical papers 19 (Hanslow) and 20 (McDougall – pending final revisions) address limitations in the current GTAP theory – in the areas of welfare decomposition and final demand. These ideas have already been folded into the new GTAP model file (version 6.0) available on the web.

DATA BASE DEVELOPMENT

Data Base Management

Betina Dimaranan and Robert McDougall have proven to be a very effective data base development team. As you may have noticed with the prereleases of version 5, they have raised the professional standards considerably. We can now "make" the data base at one press of a button (followed by a lot of computing!). This means that whenever some new information becomes available (e.g., and updated country data base, or a new set of protection data), it can be readily incorporated into a new version of the full GTAP data base. Each new version is archived so that it may be reproduced at a later date. This permitted us to generate multiple prereleases, while keeping track of older data releases for purposes of comparison. As a consequence, the changes will be far less radical between the last pre-release and the final release. (Energy will be the main area of difference – due to some significant improvements introduced over the past month.)

Another important step in the process of data base management has been the introduction of standards to facilitate regional flexibility. Prior to version 4, all source data were obtained and processed at the current GTAP regional level of aggregation. This meant that it was very costly to add new regions to the data base. Beginning with version 4, we have begun collecting source data at the country level. Robert McDougall has now introduced a further refinement on that concept, whereby all source data are related to a set of "standard countries". This facilitates the introduction of regional flexibility, whereby new regions can be added with a relatively modest amount of work. *This raises the possibility of producing "interim" data bases as new regions become available.* The way this might work is as follows:

- June 2001: version 5 final release becomes publicly available (66 regions)
- July – November, 2001: several new GTAP-ready data bases are contributed
- December 2001: version 5.1 (70 regions) released to data contributors and also made available to consortium members.
- December – May, 2002: several more GTAP-ready data bases contributed, including 2 new regions and 5 updated regions
- June 2002: version 5.2 (72 regions) released to data contributors and also made available to consortium members

- Etc. until version 6.0 is released.

A key element in this proposal involves the separation of the national data bases from the rest of the data base programs. Versions 5.1, 5.2, etc. will be exactly the same as version 5.0, excepting for the new regional coverage, or updated national data bases. We will consciously avoid fixing known problems in programs in order to ensure comparability across version 5 releases. Meanwhile, a separate build stream will be underway in which these problems will be fixed and other improvements introduced. This revised programs, combined with updated trade, protection, macro and energy targets, will be used in conjunction with the most recent regional data bases in order to build the first prerelease of version 6.

We believe this kind of a schedule will prove attractive for individuals seeking to mount specialized projects using the GTAP data base. They can wait a few months after submitting their new data base, but a few years is too long! In addition, we believe this will make it easier to get out a high quality first prerelease of version 6, since most of the new regional data bases will already be in the build stream. One could even envision a bit of an industry developing around the preparation of GTAP-ready data bases in support of special projects. *This is a strategic issue that deserves discussion at the board meeting.*

Getting the data base documentation out the door has been a major challenge in the past. Coordinating dozens of authors (many of who would prefer to be modeling or working with data instead of writing) is no small chore! What we have begun to do this time parallels what we have been doing with the data base itself. That is, implement a process of continuous improvement to the documentation which is posted on the web from an early stage. Betina Dimaranan is in charge of putting together the version 5 documentation this time around and we are looking forward to an excellent product. With the increased number of sectors and regions, some parts of the documentation (lengthy tables, for example) will only be available in electronic form. The glossy data base publication will focus on key aspects of the documentation as well as the most widely used summary tables.

Individual Region Data Bases

As you know, the GTAP data base consists of bilateral trade, transport, and protection matrices that link individual country/regional economic databases. The regional databases are derived from individual country input-output tables, from varying years. Version 1 of the GTAP data base relied exclusively on IO tables inherited from the Industry Commission's SALTER project. For this reason, GTAP adopted the SALTER concordance that identified 37 sectors/commodities. In the version 3 data base, 11 of the national databases still traced their roots back to the Australian Industry Commission's SALTER project. (Of course they were updated for each new release using the FIT program.) These IO tables were heavily concentrated in the Pacific Rim, reflecting SALTER's focus on APEC issues. Six of these were updated in version 4 (New Zealand, China, Philippines, Thailand, Taiwan, and Canada). This left old IO tables only for Japan, Korea, Malaysia, Singapore, and Hong Kong. Given the re-export problem with Singapore and Hong Kong, those economies will likely always present major problems. The good news with version 5 is that both Japan and Korea have now been updated. This

leaves only Malaysia, Singapore, and Hong Kong as out-of-date databases. We are currently working with the Institute for Developing Economies (IDE) in Japan to bring into the GTAP data base some of their national data bases. Of particular interest are their IO tables for: Malaysia, Philippines, Singapore and Thailand. This would leave only Hong Kong as a domestic data base without recent support. Since Hong Kong does not maintain an official IO table, this state of affairs may persist for quite some time.

In addition to these updates of the original SALTER IO tables, version 4 featured updates of four more existing regional databases, as well as entirely new databases for 14 countries (Vietnam, Sri Lanka, Venezuela, Colombia, Uruguay, UK, Germany, Denmark, Sweden, Finland, rest of EU, Turkey, Morocco and South Africa). Version 5 has updated 10 national data bases (Australia, China, Japan, Korea, Taiwan, Vietnam, India, Colombia, United States, United Kingdom,) and added 22 more countries, including:

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bgd   !     Bangladesh
per   !     Peru
aut   !     Austria
bel   !     Belgium
fra   !     France
grc   !     Greece
irl   !     Ireland
ita   !     Italy
lux   !     Luxembourg
nld   !     Netherlands
prt   !     Portugal
esp   !     Spain
che   !     Switzerland
hun   !     Hungary
pol   !     Poland
bwa   !     Botswana
mwi   !     Malawi
moz   !     Mozambique
tza   !     Tanzania
zmb   !     Zambia
zwe   !     Zimbabwe
uga   !     Uganda
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The remaining 10 regions in the 66 region, version 5 data base are made up of composite databases representing groups of countries. The social accounting matrices (SAMs) for these *composite regions* are based on subsets of the 55 original databases and a one-to-one mapping between these individual regions and those countries in each of the composite regions. As new SAMs have been added to the data base, the economic size of these composite regions has rapidly diminished, and our ability to match up with the unknown countries has simultaneously improved. For example, in version 2 we had a single "South Asia" region, with "real data" only for trade and macro-economic totals. In version 3, India was added and the structure of the Indian economy was used as a starting point for estimating the SAM's for several other countries in the "rest of South Asia" region. In version 4, Sri Lanka was added. This further reduced the size of the "rest of South Asia" region, while providing another proxy country to be used in estimating the structure of countries in that residual region. In

version 5, Bangladesh has been added. This leaves a residual, "rest of South Asia" region that is dominated by Pakistan. This is an excellent example of how the GTAP system of dealing with missing domestic databases has led to a continual improvement of the data base.

There are essentially two ways that we have for renewing country databases and adding new ones. The first method is for individual contributors to step forward and offer a GTAP-ready data base. This has been the predominant vehicle in the past. There are basically three incentives for contributing to this public good: (1) this assures the user that they have the best available national data for their own country in any GTAP applications undertaken, (2) contributors receive a free copy of the final data base, as well as an aggregation of the pre-release, and (3) it's the right thing to do. (There are still some idealists out there!) These individual contributions are sometimes simply one-off exercises that are not repeated. However, in many cases, once we have an established relationship with a contributor, they will update their contribution as new data become available.

The second vehicle for obtaining new databases is through special projects, aimed to support some particular line of research or policy analysis. In version 5 there have been several such projects. The first, funded by the European Commission and executed by the LEI, involved the production of a set of 15 new databases for the member countries of the EU. The purpose of this project is to support improved analysis of issues such as WTO2000 and EU enlargement and their impact on individual EU members. Since the EU-15 represent a very large share of world GDP, and since this work has been done with the latest available information, at the full, 57 sector level of disaggregation in version 5, it represents a very substantial upgrade to the full data base. A related development has been the contribution of two new country databases for Central Europe – Hungary and Poland. These were developed by Martin Banse, with support from the European Commission. They should greatly expand the scope for credible analysis of EU enlargement with respect to these two prospective entrants.

A second major project with an important data base component is that mentioned above in conjunction with African activities. It was led by Channing Arndt and funded by DFID in the UK. This basically covered Mark Horridge's time, as well as a small amount of the Center's staff time, in order to bring in a set of SAM's provided by IFPRI for the Southern African region, as well as some improved trade and protection data. In this case, DFID was interested in fostering improved policy analysis of global issues in the region, and they saw the lack of data as a critical constraint. Mark Horridge has completed this work, and as a result, we now have a credible data base for the Southern Africa region.

In addition to the challenges of extending regional coverage, and keeping it up-to-date, we also face increasing problems of inadequate sectoral disaggregation in the source databases. This has been exacerbated by the further disaggregation of food and agricultural sectors in version 4, and of services in version 5. For example, it is not uncommon for individual IO tables to have only one aggregated agricultural sector and one food processing sector. Yet the v.5 GTAP data base has 20 farm and food sectors! In the version 4 data base, many individual contributors attempted to perform this disaggregation themselves, and this led to numerous anomalies and errors. Therefore, in version 5, we have taken a more active role in the disaggregation of these sectors. Agricultural disaggregation has been supported by the work of Everett Peterson, at VPI University who has combined the FAO data

with supplementary price information and detailed input-output relationships from some countries, in order to create a country-level data base containing targets for agricultural disaggregation. This was used in version 5, prerelease #3.

While the disaggregation is most severe in agriculture, it also crops up in other cases. When no other information is available, our default option is typically to use a worldwide representative IO table developed as the simple summation of the set of IO tables for which full sectoral detail was available. Wherever autos and parts, electronic equipment, or services need to be split, this representative table is used. As users of this data base, you need to be aware of these limitations. In particular, if you are looking at the auto industry in one of these regions — say Canada — the trade and protection data will be authentic, 1995 information. However, the structure of production, intermediate usage, and consumption will be derived from the representative table, subject of course to control totals for the relevant cells within the aggregated transport equipment sector.

Bilateral Trade Data

Merchandise trade: The bilateral merchandise trade data linking the regional databases in GTAP comes from the Statistical Office of the United Nations. These data are ideal for our purposes, but their reliability is questionable. What exporters report as going to importers rarely coincides with importers' documentation of the same transaction. Mark Gehlhar, at ERS/USDA, has developed a set of procedures for reconciling discrepant trade statistics and producing balanced bilateral trade and transport matrices and he is the source of all of these data used in the GTAP data base. In addition to quality control, obtaining all of the trade data from one source assures us of consistency in procedures. Furthermore, as ERS/USDA continues to invest in improvements in these basic procedures, the GTAP data base will be able to capitalize on them. Mark's version 5 work closely parallels that for versions 3 and 4 and his general approach is documented in GTAP Technical Paper #10.

Trade in Services: Bilateral trade data for non-factor services present a much more difficult problem and this has been the focus of much of our work over the past two years. Versions 3 and 4 build on data from a variety of international institutions as well as the University of Michigan. In particular, Alan Fox (based on his joint work with Deardorff and Stern for 1990) supplied us with a bilateral matrix which forms the starting point for determining these flows. His data were then modified at Purdue to fit into the GTAP country/commodity concordance, and to match target totals from the IMF. Specifically, a RAS procedure is used in which the Michigan shares provide the starting values. We rely on the individual country IO tables to provide estimates of the composition of total exports and imports of services. Unfortunately not all of these tables apply the same conventions in classifying services. The area of government services trade is particularly weak and our RAS procedure has been problematic in this case. These weaknesses, combined with the likely importance of services in the upcoming WTO2000 negotiations, led us to launch a major initiative on trade in services as part of the version 5 data base.

There are two threads to this trade in services initiative. The first is additional disaggregation, so that the different types of services and different protection regimes can be more readily isolated. In particular, transport services are disaggregated by mode: land, sea and air, and finance, insurance and communications are disaggregated. The second thread involves obtaining improved data on services trade flows. Considerable progress was made by Wusheng Yu, during a short internship at the WTO in the fall of 1998. Under the direction of Mukela Luanga and Robert McDougall, he managed to assemble most of the publicly available information on bilateral trade flows of non-factor services. Robert McDougall has developed on a methodology (presented at last year's conference) for estimating the missing flows in this matrix, and reconciling the discrepant bilateral information. Unfortunately that work has proven more problematic than anticipated, and Robert has been diverted by other data base problems. As a consequence, *the version 5 data will not contain outside information on bilateral flows.* We hope to make further progress on this during the remainder of the year. We plan to make these improvements available to consortium members as they are completed.

One strategic question that should be addressed at the board meeting and the subsequent conference, is how we might take better advantage of current research on services trade being undertaken at the World Bank and elsewhere. Aaditya Mattoo is directing the World Bank project in this area and he will be attending this year's conference. He is particularly interested in the movement of people across national boundaries. We hope to collaborate with him in the future in order to make improved data on services trade more widely available to those individuals conducting policy analysis.

Transport margins: With the additional detail on transport services, it becomes interesting to disaggregate the international transport margins by mode as well. This requires a new piece of data: VTWR(m,i,r,s) which corresponds to the amount of margins services of type m used to transport commodity i from region r to region s. These data are inferred based on commodity-specific modal shares (e.g., 80% by sea, 15% by air and 5 % other modes for commodity X) taken from US statistics, as provided by Mark Gehlhar. In the future we hope to add more empirical content to these data. *Your thoughts on sources for such estimates would be greatly appreciated.*

Protection Data

Merchandise tariffs: In spite of the large amount of time and energy already invested in this area, we are still looking forward to improvements in the tariff data base. At the board meeting we will hear about the joint World Bank/UNCTAD effort to develop a protection data base and software interface (nicknamed "WITS" for accessing current merchandise tariff information. The good news is that this software is working and it allows us to obtain trade-weighted, MFN-applied tariffs based on the most current and disaggregate data available. The bad news is that the tariff preferences, which are in theory available through WITS, remain elusive. Adding these, alongside the MFN rates, would enable researchers to conduct a much greater number of innovative experiments and policy analyses.

Agricultural tariffs: Due to the prevalence of specific and compound tariffs in agriculture, it is often necessary to draw on supplemental price data to compute *ad valorem* equivalent values for tariffs. This requires special expertise, which has been supplied by Paul Gibson, John Wainio and

Daniel Whitley of ERS/USDA. Paul Gibson headed up the consortium of agencies (including three of our consortium members: ERS, OECD, and UNCTAD) involved in developing the Agricultural Market Access Database (AMAD) which is the premier data base in this area. (More information is available at: http://www.amad.org.) They contributed tariff data for food and agricultural commodities for all of the major trading partners in the world. These data were used in preference to the data sourced directly from WITS in light of the improved treatment of *ad valorem* equivalents. Where possible, applied rates were used. Where these were not available, bound rates were taken.

Agricultural Support: Accurate assessment of the economic effects of agricultural support remains a specialized task requiring careful treatment, lots of data and good judgment. This has become more challenging as countries have sought to "de-couple" their agricultural support by shifting the emphasis from output subsidies to payments based on historical production as well as payments based on planted acreage and livestock numbers. Two of the consortium members – ERS/USDA and the SJFI – have worked extensively on this topic and we have had some lively debates about the treatment of certain controversial policies. As a result, we have adopted a two-track approach, whereby the public version 5 data base will have a relative simple division of agricultural support between output subsidies, intermediate input subsidies, and subsidies to land and capital, based on the OECD's broad categorization of Producer Subsidy Equivalents (PSEs). Specialized users such as USDA may deviate from these allocations based on detailed knowledge of the programs in question, thereupon stimulating debate and perhaps consensus on future improvements in this relatively simple allocation scheme. In order to "get the ball rolling" in this debate, we are organizing a special session at the June conference at which differing perspectives on EU and US policies will be presented and discussed.

Textiles and Apparel Quotas: The only area in which we have NTB coverage in the version 5 prerelease has to do with textiles and apparel quotas. In prerelease #3 as well as the final release, we have taken on board recent estimates of the associated quota rents made by Joseph Francois, and Dean Spinanger, from the Kiel Institute for International Economics. They have recently concluded a comprehensive study for an industry association based in Hong Kong.

Barriers to Services Trade: Finally, there is the question of barriers to services trade. These flows are becoming an ever more important feature of global trade. Furthermore, there is a perception that barriers in this sector are much larger than in merchandise trade. (See for example Table 10.1 in the chapter by Brown *et al.* in the Martin and Winters book on the Uruguay Round.) Therefore, omission of these barriers in our analyses has severe consequences for the analysis of changes in allocative efficiency following any simulation that reallocates trade between services and non-services goods. The Productivity Commission, under the leadership of Philippa Dee, in collaboration with Australia National University has a major project in this area. Results are reported at their web site:
http://www.pc.gov.au/research/memoranda/servicesrestriction/index.html
An important question that needs to be addressed at the board meeting is the timetable and approach for bringing these estimates into the GTAP data base.

Energy Volumes Data Base

As most of you know, we received funding from the US Department of Energy to extend the GTAP 4 data base to include volume flows. This resulted in the version 4E data base which many of you used for climate change/energy policy analysis. Obtaining the volume flows was a simple exercise. Getting prices to go with these flows, and then reconciling the resulting values with the GTAP data base has proven to be a significant challenge. This challenge was only partially met in version 4E, because many of the energy targets appeared to be simply infeasible.

In the context of producing the version 5 data base, we have continued to wrestle with this problem, and it appears that the combined horsepower offered by Jean-Marc Burniaux and Robert McDougall has finally been sufficient to bring these two diverse views of the global energy economy into balance. Jean-Marc has spent a great deal of time over the past year going over the energy data and sorting out what makes sense and what doesn't. His adjustments to the incoming price and usage data have helped overcome a great many of the infeasibilities. The rest of these infeasibilities have been tackled by Robert with some major modifications to the infamous "FIT-E" program. We think that you will be pleased with the resulting energy data base. It is now very closely aligned with the original IEA source data.

We believe that the next challenge in the energy area will be to develop stronger collaboration with the agencies originating these data. If we operate by analogy with the tariff data – in versions 1 and 2 these were obtained from WTO Trade Policy Review Publications. Then we got the WTO and the World Bank involved in the process of supplying these data directly. Now UNCTAD has gotten involved, which has brought us directly to the source of the tariff data. *We would like to do something similar with the energy data. Do any of the board members have good contacts at the IEA? How can we institutionalize this aspect of the data base?*

Development of a Open-source Data Base on Land Use

At last year's board meeting we discussed an open-sourcing proposal solicited by the US National Science Foundation.   This was further developed and submitted to the NSF last summer. It was a large proposal ($4 million over 5 years) and the text will be made available in the board meeting notebooks. But if you would like a copy before then, please let us know and we will email it to you. In January, we received word that the proposal was not funded. The interdisciplinary committee liked it, but the disciplinary committee (economics) was not as enthusiastic. This reflects differences in research priorities and interests among the competing groups at NSF.

Having developed this proposal, we are now in a position to market it (or parts of it) to other potential funding sources. A first step in this direction was a proposal submitted to the US DOE program on the Integrated Assessment of Climate Change. (Jean-Marc Burniaux, Roy Darwin, John Reilly, and Tom Rutherford are co-PIs on this project.) This proposal (see Appendix 2) is aimed at supporting analyses seeking to evaluate the economic implications of managing carbon beyond simply examining emissions reductions. It would build on the work of Roy Darwin and his colleagues at ERS/USDA in order to provide supplemental data on land use, by land class, GTAP sector and region. In addition we have proposed to develop open source software to support user-specified revisions to this data base. This open-source approach also provides a formal mechanism for interacting with users in the integrated assessment community and with experts on land use who can improve the quality of the data and help assure that these data can be updated when future GTAP updates are conducted.

Non-land, Primary Factor Usage

This area of the data base has been dormant for the past three years. Version 4 incorporated the skilled/unskilled labor splits developed by Jing Liu and Nico van Leeuwen based on data from a sample of 14 countries. We have had surprisingly few complaints about these splits, but this is probably largely due to a lack of scrutiny. Much like the energy area, this is a feature of the data base where a great deal of quantity-based data is available. The International Labor Organization (ILO) maintains a data base reporting the number of workers by sector and skill. However, we do not have price data (wages) to go with this information. There is clearly scope for great improvements in this area, but it will take a special project, such as the US DOE project in the energy area, in order to make further headway.

The other area that was new in version 4 had to do with the introduction of natural resource inputs into the extractive sectors. The current approach to this problem is to determine a share which, when combined with the elasticities of substitution in the model, replicates a target level of supply response (based on estimates in the literature). This is inherently undesirable, as it introduces a model-dependency into the data base. A preferred approach would be to obtain direct estimates of natural resource rents. Some work along these lines has been undertaken by the Environment Department of the World Bank, but once again, a special project will be required to bring this into the data base. The opportunity for more work is there – it is just a question of competing priorities.

Dividing value-added among the various primary factors of production is the most fundamental problem that we face in the primary factor area. In agriculture, where value-added is particularly volatile, we have taken the approach of relying on econometric studies of the sector. This has the advantage of eliminating the idiosyncrasies of the base year for the domestic data base, but it has the drawback that all agricultural sub-sectors within the economy exhibit the same primary factor intensities. In the case of non-agricultural sectors one of the biggest problems is the treatment of self-employed labor. To the extent that labor payments exclude these workers, then the returns to capital will be over-stated. There is good reason to believe that this measurement error has contributed to an excessive capital intensity of many developing countries' economies in the GTAP data base. Again, there is scope for a special project in this area aimed at straightening this relationship out.

Distribution of the GTAP Data Base

Products and pricing: Data base sales are becoming an increasingly important part of the GTAP budget (about 25% currently and likely to rise). Consortium membership has leveled off at 17 members, while the number of data base users has continued to expand. At last year's meeting, the board proposed a substantial increase in the price of the data base for government and private sector users (who could become consortium members, but choose not to do so). Academic rates were kept constant. A comparison of version 4 and 5 rates follows:

	Version 4	Version 5
Government/Private sector	$2500	$4000
Upgrade	$1500	$2500
Multiple Academic users	$1500	$1500
Upgrade	$750	$800
Single academic user	$800	$800
Upgrade	$400	$400

We also sell an aggregation-constrained version of the GTAP data base for half the price of the full data base. This is particularly well-suited to students and faculty interested in small-dimensioned applications. If they decide later on that they want the full data base, they can upgrade by paying the balance and receiving a license file that releases their aggregation constraint. Also, we will now be making available the aggregation-constrained version 4 data base at cost. This could be used in teaching and for other purposes where being current is of primary concern. It will also facilitate replication and extension of existing research applications.

Prerelease access: We generally remind board members once a year about the restrictions on our prerelease policies. Our main goal with the prerelease has been to attempt to identify any mistakes or peculiarities in the data base before it gets wider distribution. A side benefit to the Consortium members is the early access to a new data base release. In this context, it is very important to avoid sharing the prerelease data with researchers outside of the Consortium members' immediate organizations. Such sharing poses two problems. First, it makes it more difficult to keep control of the prerelease as a preliminary product to be substituted with the final release as soon as it is available. A second problem with leaks of the prerelease data is that it risks diluting the benefits to of joining the GTAP consortium. The GTAP policy on this is:

> "that the prerelease data be *restricted* to use within the funding agency. In cases where joint work is under way with individuals outside the Consortium agency, please contact GTAP first before proceeding to share the prerelease data with the outside collaborators."

We also request that you rerun any applications, to be published, with the final release data prior to publication. This is probably just common sense, but it also bears repeating. In some cases the changes from prerelease to final release are quite substantial and may affect your findings.

MODEL DEVELOPMENT

The basic philosophy behind GTAP has been "one data base -- many models". Therefore, model development has naturally played a lesser role at the board meetings. Since many board members have their own models that utilize the GTAP data base, there is little need to agree on a common model structure. However, we do seek to provide a standard model with a suite of extensions. This model is used by quite a few member agencies, in addition to hundreds of researchers in the broader GTAP network. Furthermore, we have found that it is important to involve Center staff in a combination of modeling and data base activities as a way of preserving balance, retaining perspective on the data and continuing to attract high caliber individuals to the Project. This section reports on some of the recent modeling activities that we would like to bring to the attention of the board members.

Standard model: For those who use the standard GTAP model, or variants thereof, you will want to obtain the new GTAP.TAB file. The new TAB file, version 6.0, remedies the problems with final demand and welfare decomposition identified by Robert McDougall and Kevin Hanslow in their recent GTAP technical papers (#19 and #20 – the latter is still forthcoming pending a few minor edits, but is listed presently under working papers on the web site). It also makes available many additional handy features that are used with increasing frequency. We will provide a brief summary of the major changes at the board meeting and Robert will be presenting his paper at the conference for those interested in more detail on this topic. We aim to announce these changes, along with the availability of the new TAB file, on GTAP-L in the coming week.

We will also have a new version of the new RunGTAP software available on the web and a CD-ROM will be distributed at the board meeting. This new RunGTAP version is designed to run with the version 5 data base, as well as earlier versions (recall that the data structure has changed in version 5, due to the presence of multiple modes of international transport). It also permits users to choose from many different models. This has permitted us to incorporate all of the GTAP technical papers into the new RunGTAP CD-ROM, thereby making replication and extension of these more complex papers a trivial exercise and eminently feasible in the context of a short course.

Given the large number of GAMS users in the research community using the GTAP model, it is also important to have available a version of the model which is readily accessible to GAMS users. Most of you are aware of the fact that Tom Rutherford has developed a general-purpose model, nick-named "GTAPinGAMS", that will run on top of the GTAP data base. There are quite a few significant differences between this model and the standard GTAP model. In addition, the data preparation stage for GTAPinGAMS introduces a few more differences. It would be attractive to narrow this gap and permit replication of work using either approach. However, this is a non-trivial job, and we do not currently have the time and resources to do this in-house. One strategic question to be addressed at the board meeting is how we can foster further development of a standard suite of models in GAMS.

Parameter estimation and model validation: As GTAP-based models become more widely used, the issue of model validation has begun rearing its head with greater frequency. With the ready proliferation of different model structures, we need some method of discriminating amongst alternative

specifications. Even more basic is the question of parameter values. Are the trade elasticities in the standard GTAP model too large – as the structuralists would have us believe? Or are they too small, as the more market-oriented economists argue? Ultimately this is an empirical issue with which we must come to grips. Channing Arndt will be presenting a paper at the conference (coauthored with Liu and Hertel) on this topic, as will Joe Francois. I have also asked David Hummels to briefly discuss his work on the estimation of trade elasticities at the board meeting, as I believe it is also quite promising. Clearly the area of parameter estimation and model validation is a challenging one, but it is also critical if our work is to gain increased credibility – both in academic and policy circles.

Dynamic GTAP model: After five years of development work, under the leadership of Robert McDougall and Elena Ianchovichina, the dynamic GTAP is being used by a small group of individuals beyond those involved directly in its development. This was greatly facilitated by the Dynamic GTAP short course, offered in October of 2000. Preparation of the course was valuable in its own right – enforcing a higher level of documentation (e.g., GTAP technical paper #17). In addition, the scrutiny and discussion at the short course has pointed the way forward for further fine tuning of the model and its accompanying applications. We plan to offer another course in 2002, this time with a draft book in hand. The book will include applications focused on a variety of topics, including: trade and the environment, climate change policy, trade liberalization and the impacts of economic growth on patterns of trade.

As most of you know, Jean-Marc Burniaux is currently on leave from the OECD and working with the Center as a Visiting Associate Professor. In addition to helping us sort out the energy data, he has been developing an extension of the dynamic GTAP model that is oriented towards climate change and energy policy applications. In effect, he has merged the static GTAP-E model with the dynamic GTAP model. He will be presenting a plenary paper at the GTAP conference in which he evaluates the "leakage" due to international capital flows in the face of CO_2 emissions taxes. He will also give a short presentation at the board meeting on future developments in this area of modeling.

One of the most important by-products of the work with the dynamic model has been the development of a set of standard "GTAP baseline". Discussion of such a baseline was first initiated by Thomas Rutherford at the 1999 board meeting. There have been discussions of this at the past two board meetings, and we plan to feature a short presentation by Terrie Walmsley on this topic at this year's meeting. The basic idea is maintain country-level projections for population, skilled and unskilled labor, investment, capital stocks and GDP, as well as selected policies (e.g., completion of the Uruguay Round, China's accession to the WTO). These can then be aggregated up in much the same was as the static GTAP data base in order to support baselines developed by a variety of researchers, who may or may not include all of these elements in their own modeling baseline. (Note that the common baseline consists of a set of data inputs, *not* model outputs.) Many of the key inputs for the current baseline come from the World Bank, but the CPB has also contributed on the labor side, and no doubt others could contribute in other areas. *The strategic question we must address relates to how we should collaborate on future development of this baseline.*

Income distribution and poverty: From its inception, GTAP-based analyses have tended to focus on the *inter*-regional incidence of policies, as opposed to the *intra*-regional incidence. This is clearly the comparative advantage of a multi-region, global model. However, as GTAP becomes more widely used, the pressure to say something about the distributional impacts of trade policies within countries – especially the developing countries – will become greater. This was clearly the case at the conferences on WTO2000 that took place throughout 1999. Naturally this is first and foremost a problem of data – how do we come up with information on expenditure and factor earnings profiles for disaggregate groups of households when we are struggling to simply put together a national data base for many countries? This is a topic that is receiving a great deal of attention at present and several papers will be presented at the conference outlining different approaches to tracking the domestic distributional consequences of trade shocks. *Is there a way in which GTAP can facilitate the collection, standardization and dissemination of data to support such analyses? Discussion of this topic is needed at the board meeting.*

ANNUAL CONFERENCE ON GLOBAL ECONOMIC ANALYSIS

As noted previously, the Third Annual Conference was a great success and preparations for the Fourth Annual Conference on Global Economic Analysis are nearly complete. It is due to take place June 27-29 at Purdue University. We have some outstanding plenary papers and we also had 90 contributed papers submitted this year, many of these have been accepted either for poster presentations or for short or longer presentations. A detailed program will be available as soon as the papers are received (due date is May 30). This will be posted on the web.

The board has already approved the 2002 conference proposal submitted by Professor Chung-Huang Huang of the National Tsing Hua University in Taiwan. Professor Huang is already well-down the organizational road for this conference and it looks like it will be an outstanding event. Professor Huang will have a program committee meeting at the conference next month. I have also asked him to make a short presentation to the board in order to give you a chance to have some additional input into this conference. *It is also not too soon to begin thinking about a site for the 2003 conference.*

WEB SITE DEVELOPMENT

The GTAP Web site has become our most important window to the outside world. Under the leadership of Melanie Bacou, we recently released a totally new web site which has taken on an even more significant role in our activities. For example, this year's conference has been managed almost entirely via the web-driven data bases, including: submission and review of papers, management of the review process and final decisions, registration, etc. Having done this all the "old-fashioned" e-mail way, I can attest to the efficiency gains of this new approach. We also offer members of the GTAP network around the world the chance to build their own profile on the web site – complete with their own research applications. In this way we envision the web site facilitating networking among individual researchers conducting applied general equilibrium analysis of global economic issues. Melanie Bacou will provide a short demonstration of the new web site at the board meeting and discuss options for future development of this important tool.

NOMINATIONS FOR RESEARCH FELLOWS

Please consider nominating deserving individuals whom you think exhibit the kind of capabilities and commitment to excellence in global economic analysis that warrant this honor. To do so, simply submit their name, a brief statement of why you think they are appropriate, and their CV in advance of the board meeting.