GTAP Board Report
International Food Policy Research Institute
July 2011 – June 2012

Most of the GTAP-related work carried out at IFPRI has been done at MTID (Markets, Trade and Institutions Division)-Globalizations and Markets Research Program (GRP2).

The globalization and markets research program (GRP2) is designed to help national policy makers, researchers, international organizations and agriculture-sector stakeholders in developing and developed countries to better evaluate the implications of different scenarios of trade liberalization and globalization. It is also designed to help decision makers develop adequate related policies and societal responses for rural development, poverty alleviation, and food security, including alleviation of the economic barriers that prevent farmers in developing countries from benefiting from greater market-based opportunities. Policy changes supported by this research are expected to accelerate income growth through increased access to both domestic markets and international trade.

The research under this program emphasizes global agricultural trade negotiations, linkages between domestic policies and globalization, the impact of developed-country policies on developing-country food security, and pro-poor policies along the entire food chain, given the growing importance of consumers and retail industries as food system drivers.

The globalization and markets team is currently composed of: Valdete Berisha, Antoine Bouet, Lauren Deason, Eugenio Diaz-Bonilla, Betina Dimaranan, Carmen Estrades, Fabienne Femenia, Yuan Gao, David Laborde, Sam Morley, David Orden, Shahidur Rashid, Kathryn Pace, Devesh Roy, and Marcelle Thomas, Fousseini Traore.

Selected Trade-Related Projects in 2011-2012
The work carried out in IFPRI's MTID-GRP2 that employs GTAP database addresses six broad themes: poverty, trade liberalization, economic implications of GMOs, export taxation, biofuels, and gender.

1) The evaluation of the impact of trade liberalization or other shocks on the world markets on poverty with a new version of MIRAGE that includes households' heterogeneity.

There are three studies that apply the poverty module of the MIRAGE model. **The first study** examines the impact of trade liberalization at the household level. Therefore, a version of the MIRAGE model with household heterogeneity and a public is developed to better analyze the impact of trade liberalization and other trade reforms on real income and welfare at the household level. In a first step, the model disaggregates the representative household into up to 13-39 households in five developing countries (Brazil, Pakistan, Tanzania, Uruguay and Vietnam). The sources of income and consumption structure reflect disaggregated statistical information coming from households' surveys. The new model better captures the behavior of the public agent in terms of revenues collected and in terms of expenditures. Since domestic remittances may constitute an important determinant of income redistribution, the new version also endogenizes private inter-households transfers.

This new version of MIRAGE takes into account the reaction of households to these shocks in an integrated and consistent framework. We study the impact of full trade liberalization on these

households. This study concludes that: (i) while the impact of full trade liberalization may be small at the macroeconomic level, the effect on households' real income may be quite substantial at the household level with a great heterogeneity in terms of results; (ii) the major channel of heterogenity of the impact of trade liberalization on households' real income is productive factors' remuneration while the channel of consumption prices of commodities has limited impact; (iii) various domestic policies simultaneously implemented to trade liberalization like modification of public transfers to households or changes in income taxation may significantly change the picture and offer compensation for negative effects of this shock or amplify direct impact of full trade liberalization; (iv) the impact of trade reform on poverty and inequality is significant and diverse from one country to the other.

The second study analyses the EU-MERCOSUR free trade agreement. In 2010, after several years of being stalled, negotiations between MERCOSUR and the European Union (EU) to build a Free Trade Agreement (FTA) were resumed. This FTA is expected to have an important impact on MERCOSUR economies, especially if both blocs reach an agreement regarding the agriculture sector. For a small country as Uruguay, one of the small economies of MERCOSUR, the conclusion of this agreement may have an important impact on the economy, and also on income distribution and poverty, as the FTA will have differentiated impact on the different sectors of the economy.

A special focus of the study is distributional impacts on Uruguay. For doing so, we apply an improved version of MIRAGE with household heterogeneity. The representative agent in the standard version of MIRAGE model is decomposed into a private and a public agent for all regions, and into a high number of households for Uruguay. Results show that a trade agreement between MERCOSUR and EU would have a significant impact on trade flows between both blocs. MERCOSUR economies would increase agriculture exports to EU and industrial imports from EU. Welfare increase in all countries participating in the agreement, but are more pronounced for small countries of MERCOSUR: Paraguay and Uruguay. In this last country, welfare increase for different categories of households, but the richest households are the most benefited. In spite of this, income distribution improves as a consequence of the agreement, and poverty rates fall along the country.

The third study, uses the new version of MIRAGE, MIRAGE_HH (MIRAGE-Households; see Bouet, Estrades and Laborde 2012), to evaluate the potential impact of the Doha Development Agenda on households' welfare, poverty and inequality in developing countries. MIRAGE_HH is a version of the MIRAGE model of the world economy which includes households heterogeneity in order to studying the impact of trade reforms on real income and welfare at the household level. In six developing countries (Brazil, Indonesia, Pakistan, Tanzania, Uruguay and Vietnam), the model disaggregates the representative household into up to 80-120 households by country. The sources of income and consumption structure reflect disaggregated statistical information coming from households' surveys.

The new model better captures the behavior of the public agent in terms of revenues collected and in terms of expenditures. Various public sector closures are available. Inter-households private transfers are endogenized according to a "tempered altruism/ enlightened self interest" assumption (Lucas and Stark, 1985). This new version of MIRAGE allows studying the impact of various policy shocks and identifying which households are expected to win, which households are expected to lose and why, while taking into account the reaction of households to these shocks in an integrated and consistent framework. We study the impact of a potential Doha Development Agenda, according to the most recent official guidelines. This multilateral trade reform is implemented at the tariff line level. In order to illustrate the benefits of multilateral

cooperation, we also evaluate the potential impact of a protectionist shock applied to the world economy. In order to make this shock realistic we calculate the liberalization implemented worldwide during the last 15 years and we implement a return to this level of protectionism throughout the world taking into account current bound import duties. We calculate the impact of both trade reforms (cooperation vs non-cooperation) on the real income of 80-100 households in Brazil, Indonesia, Pakistan, Tanzania, Uruguay and Vietnam, and also calculate the impact on poverty and inequality by computing the well-known FGT poverty indicators (poverty headcount, poverty gap and poverty severity) and the Gini and Theil indicators concerning income distribution.

2) Trade liberalization under the Doha Round

A recent book edited by Will Martin and Aaditya Mattoo of the World Bank includes three chapters by IFPRI authors that make use of the GTAP database.

First, the chapter on agricultural market access (Chapter 2) examines the key features of the modalities for liberalizing AMA. The authors first consider the impacts of the negotiating formulas on average tariffs, and then assess the implications of the flexibilities for different members and commodities permitted under the modalities. Throughout most of the chapter the authors focus on the impacts on the weighted-average tariff rates applied by, and facing, individual countries and groups of countries. While these are imperfect measures, they provide a well-understood indication of the effects of the agreement.

Second, the chapter on duty free access for least developed countries (Chapter 6) examines whether the interests of LDCs are favoured by the DDA proposals currently on the table. First, the chapter characterises LDCs' trade and market-access situations. More specifically, it examines whether LDCs benefit today from significant trade preferences compared with other groups of countries, and evaluates the implications of potential preference erosion from multilateral liberalisation.. Then, the chapter provides a detailed simulation of a realistic DDA. This is done using the MIRAGE model of the world economy with detailed assessments of this trade reform on market access and economic variables concerning LDCs. In order to understand which elements of the global package are important for LDCs, Section 4 will carry out a sensitivity analysis, while Section 5 provides major conclusions.

Third, the chapter focusing on the role of binding overhang in lowering the cost of trade wars (Chapter 12) uses a computable general equilibrium model of the world economy in order to simulate a 'trade war' and to see how the implementation of the DDA can reduce the negative consequences of this eventuality. In fact, WTO members negotiate a reduction of bound tariffs and the binding of tariff lines unbound until now. Doing so, the WTO imposes more commitments to each of its members and reduces their room for manoeuvre, locking many unilateral trade liberalisation episodes that have occurred in the past. After the adoption of a potential DDA, WTO members will get less flexibility to increase import tariffs. Consequently, trade wars will be less devastating in terms of trade and real income.

Aside from the DDA scenario, we study two protectionist scenarios that are characterised by different orders of magnitude in terms of trade conflict and different approaches to trade restriction: either we consider the adoption of bound tariffs by each WTO member on each product, or we simulate the imposition of the maximum tariffs applied by each country on each product between 1995 and 2006, taking into account the current level of bound duties. We implement these different tariff scenarios in the MIRAGE model of the world economy in order

to evaluate the economic consequences of these potential outcomes using a similar approach to Bouët and Laborde (2010).

3) Studying the opportunity cost of adopting genetically modified organisms under CGE

There are three studies that employ CGE to examine the impact of adopting GMOs. **First**, a computable general equilibrium model is applied to evaluate the opportunity costs of not adopting Bt cotton, a genetically-modified (GM) insect resistant cotton, in Benin, Burkina-Faso, Mali, Senegal, Togo, Tanzania, and Uganda when it is adopted in other countries. Our model uniquely employs country-specific partial adoption rates and factor-biased productivity shocks in the cotton and oilseed sectors of all adopting regions. Assuming a 50% adoption rate, the opportunity cost of not adopting Bt cotton in the seven surveyed countries amounts to $41 million per year, which is a significant but lower cost than that suggested by the results of previous studies. Trade liberalization only marginally increases this estimate.

The second study assesses the global economic implications of the proposed strict documentation requirements on traded shipments of potentially genetically modified (GM) commodities under the Cartagena Protocol on Biosafety. More specifically, we evaluate the trade diversion, price, and welfare effects of requiring all shipments to bear a list of specific GM events (the does contain rule) in the maize and soybean sectors. Using a spatial equilibrium model with 80 maize- and 53 soybean-trading countries, we show that information requirements would have a significant effect on the world market for maize and soybeans. But they would have even greater effects on trade, creating significant trade distortion that diverts exports from their original destination. The measure would also lead to significant negative welfare effects for all members of the Protocol and nonmembers that produce GM maize, soybeans, or both. While non-GM producers in Protocol member countries would benefit from this regulation, consumers and producers in many developing countries would have to pay a proportionally much heftier price for such a measure.

The third study examines the international welfare effects of biotech crop adoption, based on a transversal literature review and a case study of the introduction of genetically modified (GM) food crops in Bangladesh, India, Indonesia, and the Philippines. The analysis is based on (a) a review of lessons from the applied economic literature and (b) simulations using an improved multimarket, multicountry, computable general equilibrium (CGE) model, calibrated with productivity hypotheses formulated with local scientists in the four Asian countries.

The use of a CGE model allows for accounting for cross-sectoral effects, and for regulations affecting bilateral trade flows, but it also has a number of limitations. The model used here, like the ones used in the other papers in the literature, is static, based on an aggregated representation of the global economy (GTAP database), and assumes perfect competition. This means that the absolute results of each scenario may not perfectly represent the actual welfare effects engendered by the adoption of biotech crops. Still, what matters here is the comparison of the relative welfare effects across countries and scenarios. The simulations are also done ex-ante, so, even if the model here was calibrated with country-based data, the results do depend on hypothetical assumptions about the performance of the selected technologies.

4) Economic analyses of export taxation

Two studies under this subject have used the GTAP database. **The firs study**, provides an economic analysis of the use of export restrictions by (1) presenting a general theoretical overview of the effect of these policy instruments; (2) analyzing their impact in two specific

sectors on the basis of two new partial equilibrium models; and (3) making a global assessment of this policy applying a general equilibrium model.

First, the potential impact of export restrictions on trading partners in two case studies is examined using partial equilibrium models developed for each case. These models (designed especially for this study) illustrate some of the frequently stated objectives of export restrictions, notably the improvement of terms of trade (by increasing the world prices of commodities exported), the reduction of domestic prices of inputs for downstream manufacturing sectors, the better management of natural resources, and the increase in tax revenue.

Then, the last part of the study uses a global equilibrium model (MIRAGE) to assess the impact of removing export restrictions worldwide, across all raw materials sectors. Since the coverage of export taxes by the GTAP 7.1 database is imperfect (outdated data, mix of different tools, no coverage of agriculture, missing countries), we developed a new database defined at the exporter/HS6 level than can be fed with ad valorem or specific export taxes data. As compared to the initial GTAP 7.1 database these changes do not modify greatly the global picture: the average export tax on global merchandise trade is 0.48 percent – instead of 0.5 as assessed by the initial GTAP 7.1 database. However, they lead to a pronounced change in the sector and country profile of the use of export taxes. Argentina jumps from an average export tax of 0.3 percent to more than 9 percent; and export taxes disappear from the apparel sector and concentrate in raw agricultural products (raw hides, oilseeds, cotton, cocoa), minerals, processed oilseed (soybean oil and palm oil), aluminum and iron (scraps and semi-processed), and timber (rough and logs). However, the bulk of export taxes continue to be imposed on energy products and the export tax level applied by Russia on natural gas (which is kept from GTAP) is the main source of global distortion.

The second study uses a new detailed dataset to address the impact of export restrictions on global welfare. The MIRAGE Computable General Equilibrium (CGE) model, which is multisectoral, multiregion, and dynamic, is used to investigate how global removal of export taxes affects global trade and real income of major trading blocks. The limited analysis of export taxation under a global and multisectoral framework is largely due to the lack of data.

5) The impact of biofuel policies on the poor

The study on biofules analyses the effects of the EU biofuel policies on food security and poverty in developing countries. It assesses the overall impact of the biofuel policies on food availability and food prices, and it makes a special focus on how the feedstock crops used in the production of biofuel determines the outcomes. In order to evaluate the overall impact of the EU biofuel mandates, this paper applies the MIRAGE-Biof model, a dynamic general equilibrium model of the world economy with a focus on the energy sector. Then, in order to evaluate the impact of biofuel policies on poverty, we apply two different approaches. The first one is a top-down approach which feeds the results from the MIRAGE-Biof model into microdata for six developing countries: Brazil, Uruguay, Indonesia, Tanzania, Pakistan and Vietnam. The different countries are of interest because of their condition of net importers of food (Tanzania) or producers of feedstock crops (sugar for ethanol in Brazil, palm oil in Indonesia). The second approach is to combine the MIRAGE-Biof model with MIRAGE-HH model with household disaggregation. This second approach constitutes a major improvement in terms of modeling, and it is an important step to evaluate if there is a feedback effect that needs to be captured, e.g., if the reaction of households to changes in prices and available food supply has in turn an effect on prices, thus accentuating or reducing the impact on poverty.

6) A database and a new version of MIRAGE that accounts for gender issues is being developed and relies partly on the GTAP database

As part of the Globalization and Markets (GRP2) research program to help countries to better evaluate the implications of different trade liberalization scenarios, we have launched a project to quantitatively assess the gender-differentiated impacts of multilateral and regional trade reforms. As a first step, the study aims to develop a gendered global database where male and female employment are incorporated by sector and country. *Building on work done by Tsigas and Weingarden (2010) in generating employment shares across five occupational levels for use in updating the skilled and unskilled labor splits in the GTAP database, we use employment and wages data across occupations and industries, differentiated by gender, from the International Labor Organization (ILO). Statistical methods will be employed to extend the coverage of the gendered labor data from 40 countries to the full GTAP set of regions.* The current MIRAGE model is modified to enable the assessment of the gendered impacts of trade liberalization. This important development will constitute a cornerstone in analyzing the gender dimensions of trade agreements and can be used in subsequent research on the gendered impacts of other global shocks. A future application is in analyzing the linkages between gender, trade and poverty, using the MIRAGE poverty model with disaggregated households.

IFPRI's contributions to the GTAP 2011-2012

Lacina Balma of IFPRI, thorough AGRODEP, has recently contributed the IO tables for three African countries, Burkina Faso, Togo, and Guinea".

Eight AGRODEP members will attend and present their work at the forthcoming GTAP conference in Geneva through the auspices of the WTO

David Laborde of IFPRI has also contributed bilateral export subsidies data for 16 GTAP sectors for exports from 36 countries to 213 destination countries, for the year 2007.

Antoine Bouet and Yuan Gao of IFPRI has also prepared a review of protection data for the GTAP board meeting that will take place in Geneva end of June 2012.

GTAP- and trade-related publications

ARTICLES IN PEER-REVIEWED JOURNALS & CHAPTERS IN COLLECTIVE BOOKS

Bouët, A. and G. Gruere. 2011. Refining estimates of the opportunity cost of non-adoption of Bt cotton: the case of seven countries in Sub-Saharan Africa. *Applied Economic Perspectives and Policy* 33(2):260-279. http://aepp.oxfordjournals.org/content/early/2011/06/15/aepp.ppr010.full

Bouet, A. & Laborde, D., 2011a. Duty Free, a Round for Free and the Least-Developed Countries. In W. Martin & A. Mattoo, eds. *Unfinished Business? The WTO's Doha Agenda.* Washington D.C: The World Bank. Available at: http://go.worldbank.org/L8904MG5A0.

Bouet, A. & Laborde, D., 2011b. The Hidden Gain of the Doha Round: Lowering the Cost of Trade Wars by Reducing the Binding Overhang. In W. Martin & A. Mattoo, eds. *Unfinished Business? The WTO's Doha Agenda.* Washington D.C: The World Bank. Available at: http://go.worldbank.org/L8904MG5A0.

Gruere, G., Bouet, A., and S. Mevel. 2011. International Trade and Welfare Effects of Biotechnology Innovations: GM Food Crops In Bangladesh, India, Indonesia and the Philippines. Chapter 12 in *Genetically modified food and global welfare* edited by Colin Carter, Giancarlo Moschini and Ian M. Sheldon. Frontiers of Economics and Globalization, Volume 10. Bingley, UK: Emerald. http://www.emeraldinsight.com/books.htm?chapterid=1943103

Laborde, D. & Martin, W., 2011. Agricultural Market Access. In W. Martin & A. Mattoo, eds. *Unfinished Business? The WTO's Doha Agenda.* Washington D.C: The World Bank, pp. 35-54. Available at: http://go.worldbank.org/L8904MG5A0.

BOOKS, MONOGRAPHS AND RESEARCH REPORTS

Bouet, A., Estrades, C. & Laborde, D., 2012. Cooperation vs. non cooperation in the multilateral trading system: the impact on poverty and inequality in developing countries, *Paper submitted for 15th Annual Conference on Global Economic Analysis.*

Bouet, A., Laborde, D., Estrades, C., & Evenett, S. 2012. Modelling the Effects of Export Taxes and Restrictions. *Report prepared for DG Trade under contract TRADE/O7/A2.*

Bouet, A., Estrades, C., & Laborde, D. 2012. A Global Assessment of The Economic Effects of Export Taxes. Paper submitted for 15th Annual Conference on Global Economic Analysis

Estrades, C., 2012. Is MERCOSUR external agenda pro-poor? An assessment of the EU-MERCOSUR free trade agreement on Uruguayan poverty applying MIRAGE.

Estrades, C. & Laborde, D., 2012. Biofuel policies and the poor: an assessment of the impact of EU biofuel policies on food consumption and poverty in developing countries applying MIRAGE.

Estrades, C. & Laborde, D., 2012. Households heterogeneity in a global CGE model: an illustration with the MIRAGE-HH (MIRAGE-HouseHolds) model. *Forthcoming as an IFPRI Discussion Paper.*