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Some methodological and practical issues of using CGE models to evaluate free trade areas: the roles of initial trade patterns, baseline projection, and Armington elasticities

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1. Introduction and objective

In recent years many free trade agreements have come into force. Still many other potential agreements are under negotiations. As a result, there has been increasing demand for model-based evaluations of the potential economic impacts of these agreements. Computable general equilibrium models have been frequently used by analysts to provide numerical answers to satisfy this demand.

A typical FTA will usually be fully implemented within a few years from the time when the deal is reached, with trade barriers being gradually reduced during that period. Thus, the typical CGE modeling exercise for evaluating the potential effects of an FTA usually starts with a database featuring trade patterns and protection structures amongst the FTA member countries in a given year that is understandably earlier than the year when the FTA will be fully implemented. Due to the cost associated with constructing the large data set to be used for these exercises, analysts are most likely only equipped with a data base describing the trade and protection patterns of a year that is also earlier than the current year. This means that before modeling the actual reductions of trade barriers in relation to the FTA, analysts need to first conduct projection runs of their model to generate a "business-as-usual" baseline which reflects their best "guess" of the concerned economies at the time when the FTA will be fully implemented and with the assumptions that any trade policy changes related to the FTA will not be implemented. The effect of implementing the FTA will then be computed by conducting another model run against the baseline where the FTA will be implemented.

There are several issues associated with this exercise that can significantly impact its reliability. First, trade patterns reflected in the database prior to the baseline projection may differ significantly from the current trade patterns, for example if the original database has an earlier base year or if rapid

economic growth in a certain member country drastically changed its trade patterns. Second, the typical projection exercise that directly targets macroeconomic variables such as forecasted GDP growth rates usually does not take into consideration the realized changing trade patterns between the base period and current period, thereby ignoring potentially useful information that is known at the time of conducting the analysis. Both of these suggest that the policy scenario (i.e. the formation of the FTA) to be simulated will be conducted against a base of unreliable projected trade patterns. Third, the widely used Armington trade structure can potentially compound the above problems. For instance, if in the original database certain trade flows do not exist or are of small volumes for certain product but in the current year there are significant trade flows for this product, then after the projection run such trade flows may continue to be nonsexist or remain small. Therefore, any removal of trade barriers would not be able to correctly increase the said trade flows. Note that this is a different issue from the uncertainties with the estimated Armington elasticities themselves, as identified by Hertel et al. (2007)

The objective of this study is to take advantage of the various versions of the GTAP database (versions 5 to 8 with base years in 1997, 2001, 2004 and 2007) to illustrate the above-mentioned issues with evaluating the impacts of a particular free trade agreement – the proposed free trade agreement between the European Union and India that is still under negotiations – and to propose remedial actions to improve the reliability of CGE-based evaluations on impacts of FTAs.

2. The EU-India FTA

The European Union (EU) and India decided to start negotiations on a free trade area (FTA) in 2006 at the EU-India summit in Helsinki. The actual negotiations kicked off in 2007 and are still ongoing at the moment. The aim of the negotiations is to improve trade between the two sides by eliminating "substantially all import tariffs on both countries' exports, improve the access for suppliers of services and for investors, and tackle non-tariff barriers to trade" (EU, 2010). The scope of the negotiations encompasses trade liberalizations for goods and services, as well as areas such as investment, competition, intellectual properties, public procurement, and so on. There have been several existing studies on the potential impact of the FTA on both India and the EU, including quantitative assessment using computable general equilibrium models. Decreux and Mitaritonna (2007) use the MIRAGE model to assess two scenarios in the liberalization of merchandise trade and in service trade. The database underpinning the analysis is GTAP database version 6, which has 2001 as its base year. A more recent study by Achterbosch et al (2008) offers a more carefully designed study on evaluating a set of hypothetically scenarios of liberalization under the proposed FTA on merchandise trade. This study is based on the GTAP version 7 database with 2004 being the base year.

In the past decade, total bilateral merchandise trade between the EU and India increased from around US$34.4 billion in 2000 to about US$89.8 billion in 2010 (see Table 1). However, the trajectory of trade expansion in the past decade has not always been monotonic rise. In fact, in 2008,

total bilateral trade already reached about the same level in 2010. Perhaps due to the global financial and economic crisis, there was a significant drop in 2009 before the peak level of 2008 was reached again in 2010. Somewhat surprisingly, the initial trade surplus enjoyed by the EU in 2000 has not increased much on relative terms. As a result, the bilateral trade balance has more or less remained constant with a small trade surplus in favor of the European Union.

This relatively balanced bilateral trade pattern, however, masks the very different shares of imports in the two countries' total imports. Take 2007 as an example (Table 2), India's total merchandise imports from the EU valued at US$38.9 billion were about 19.3% of India's total imports. EU's total merchandise imports from India – slightly lower at US$ 34.9 billion – only had a 0.8% share in EU's total imports. When service trade is considered, import share of the EU in the Indian market increases to 22.2%, whereas imports share of India in the EU market remains at 0.8%. Therefore, in relatively terms, EU exports are much more important to Indian market, as compared to the importance of Indian exports in the EU market.

Trade flows between the two sides were mostly concentrated in the manufacturing sectors and the service sectors, with both sides' shares of bilateral imports of manufacturing and services in total bilateral imports exceeding respectively 62% and 20%. Within manufacturing, however, India's imports from the EU were concentrated in electronics and machineries (US$14.4 billion), other manufacturing (6.6 billion), vehicles (4.7 billion), and metal products (4.5 billion). In the case of the EU's imports from India, textile and wearing apparels claimed the highest share (11.5 billion), followed by metal products and electronics and machineries. The EU was a very small exporter of food and agricultural products to India, with US$ 415 million exports which represents a 0.8% share of India's total imports from the EU. India, on the other hand, was able to export more food and agricultural products to the EU, with exporting value reaching US$ 2.7 billion and its share in India's total imports to the EU exceeding 6%.

To speculate potential trade expansions resulted from the EU-India free trade area, it is useful to examine the above trade patterns vis-à-vis the bilateral trade barriers the two sides maintained against each other's exports. These are presented in Table 2 as the average ad valorem protection levels. In the manufacturing sectors, average ad valorem protections maintained by India generally ranged between 10 and 15 percent. In the agricultural and food sectors, India's protection levels were much higher, with peaks of nearly 100 percent for wheat, 62% for vegetable oils, 55% for sugar, and 47% for vegetables and fruits. Against the nearly US$ 31 billion of manufacturing imports from the EU, eliminating the tariff barriers in these sectors by India as part of the EU-India FTA would have the potential to attract more EU imports in to the India. The same potential cannot, however, necessarily be expected in the areas of agricultural and food products, despite the even higher tariff barriers maintained by India. This is because the EU has neither been a major agricultural exporter to India nor to the rest of the world, particularly in the areas of most of the basic agricultural commodities. In fact, total agricultural and food imports (excluding beverage and Tabaco) form the EU amounted to less than US$ 300 million.

The burden for the EU to reduce trade barriers in the context of the FTA is considerably lower. Average protection levels imposed by the EU on imports from India are almost negligible in the areas of manufacturing. The lone exception is textile and wearing apparels, where the average tariff barrier is about 6.8% and where India has been an important exporter. In the agricultural and food sectors, significant tariff barriers mainly concentrated in several products, including rice, sugar, and meats. However, India appeared to be a serious exporter only for rice. Because of this, further expansions of India exporters to the EU due to removals of these tariff barriers by the EU cannot be over-estimated.

3. Methodology and experiment design

To realize the first objectives, we first conduct a series of baseline projections to a common future year from the same CGE model but with different versions of the GTAP database. The extrapolations will be based on a common set of macroeconomic and other necessary shocks to bring all the difference versions of the GTAP database to the same (or at least similar) state of all the relevant economies in the context of the EU-India FTA. From there, we simulate a common set of policy scenarios, aiming at revealing the different baseline trade patterns and the different predicted effects of the same FTA policy scenario based on those different baselines. By doing so, we examine the sources of the biased results vis-à-vis the issues identified in the introduction section.

The second part of the analysis focuses on a proposal to use the information embodied in the various versions of the GTAP database, especially the observed differences in trade patterns over the different base years that cannot be explained by the different trade barriers across the different years. Following the structure of the "historical" and "forecasting" scenarios proposed for the MONASH model (Dixon and Rimmer, 2002) and the method used by Liu and Arndt (2004), before constructing the baseline, we conduct some validating simulations by exogenizing trade patterns to the observed levels but endogenizing other model variables such as Armington trade elasticities. The results solved from these simulations will be then used in model to generate more reliable projection of the baseline, which is then used in the policy scenario to evaluate the effects of the EU-India FTA.

(detailed experiment design to be added)

4. Results

(to be added)

5. Conclusion and discussions

(to be added)

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Table 1. Aggregate trade flows between the EU and India (US$)

Period	Reporter	Partner	Export Value	Import value
2000	EU-27	India	$12,573,084,408	$11,818,706,961
2001	EU-27	India	$11,582,463,151	$12,055,714,882
2002	EU-27	India	$12,468,842,774	$12,681,101,567
2003	EU-27	India	$16,497,575,000	$15,905,101,445
2004	EU-27	India	$21,333,508,994	$20,357,564,460
2005	EU-27	India	$26,478,950,422	$23,705,685,122
2006	EU-27	India	$30,653,966,461	$28,394,036,157
2007	EU-27	India	$40,474,163,928	$36,507,510,684
2008	EU-27	India	$46,467,865,379	$43,313,175,410
2009	EU-27	India	$38,428,380,641	$35,382,395,912
2010	EU-27	India	$46,062,578,014	$43,701,549,016

Data source: UN Comtrade database.

Note: export values are based on FOB price whereas import values are based on CIF price.

Table 2. Bilateral import flows (million US$) and tariff structure (%) between the EU and India: 2007

	India's tariff on imports from EU27	Imports from EU27	Total imports into India	share of EU imports in total India imports	EU's average tariffs on imports from India	Imports from India	Total imports into EU 27	share of imports from India in total EU imports
wheat	98,8	22	575	3,8%	6,4	0	7731	0,0%
other grains	0	0	4	0,0%	9,9	3	9062	0,0%
vegetable &fruits	47,5	37	2163	1,7%	3,1	276	49332	0,6%
oil seeds	25,9	0	75	0,0%	0	92	9282	1,0%
plant fiber	13,1	3	271	1,1%	0	14	952	1,5%
other crops	24,7	25	328	7,6%	1,5	581	27057	2,1%
other animal products	3,6	40	116	34,5%	3,3	44	10137	0,4%
beef and veal	22,4	2	11	18,2%	80,6	1	16313	0,0%
other meats	28,7	5	14	35,7%	8	2	31703	0,0%
vegetable oils	61,9	17	4179	0,4%	1,7	127	21291	0,6%
milk	31	31	58	53,4%	3,9	36	35179	0,1%
rice	54,8	0	4	0,0%	56,6	136	1417	9,6%
sugar	46,9	1	33	3,0%	26,5	70	5850	1,2%
other food	36,1	87	404	21,5%	6,6	1091	131644	0,8%
bevergage &tabacco	142,9	123	201	61,2%	20,7	18	48976	0,0%
textile, wearing apparels and leather products	14,8	547	4018	13,6%	6,8	11512	291809	3,9%
metal products	17	4540	31017	14,6%	0,3	4104	492742	0,8%
vehicles	10,2	4712	15274	30,8%	2,2	1801	673110	0,3%
eletronics and machineries	12,7	14379	46007	31,3%	0,2	3566	1092294	0,3%
other manufacturing products	14,9	6646	39717	16,7%	0,4	10352	1248776	0,8%
Severices	0	10191	19823	51,4%	0	10312	865919	1,2%
Total		49042	220999	22,2%		45184	5354274	0,8%
total agriculture and food		415	8675	4,8%		2735	421635	0,6%
total manufacturing		30824	136033	22,7%		31335	3798731	0,8%
total merchandise		38852	201174	19,3%		34870	4488357	0,8%

Data source: The GTAP data base version 8 pre-release. Notes: imports are valued at CIF prices.