Chapter 19

Processing

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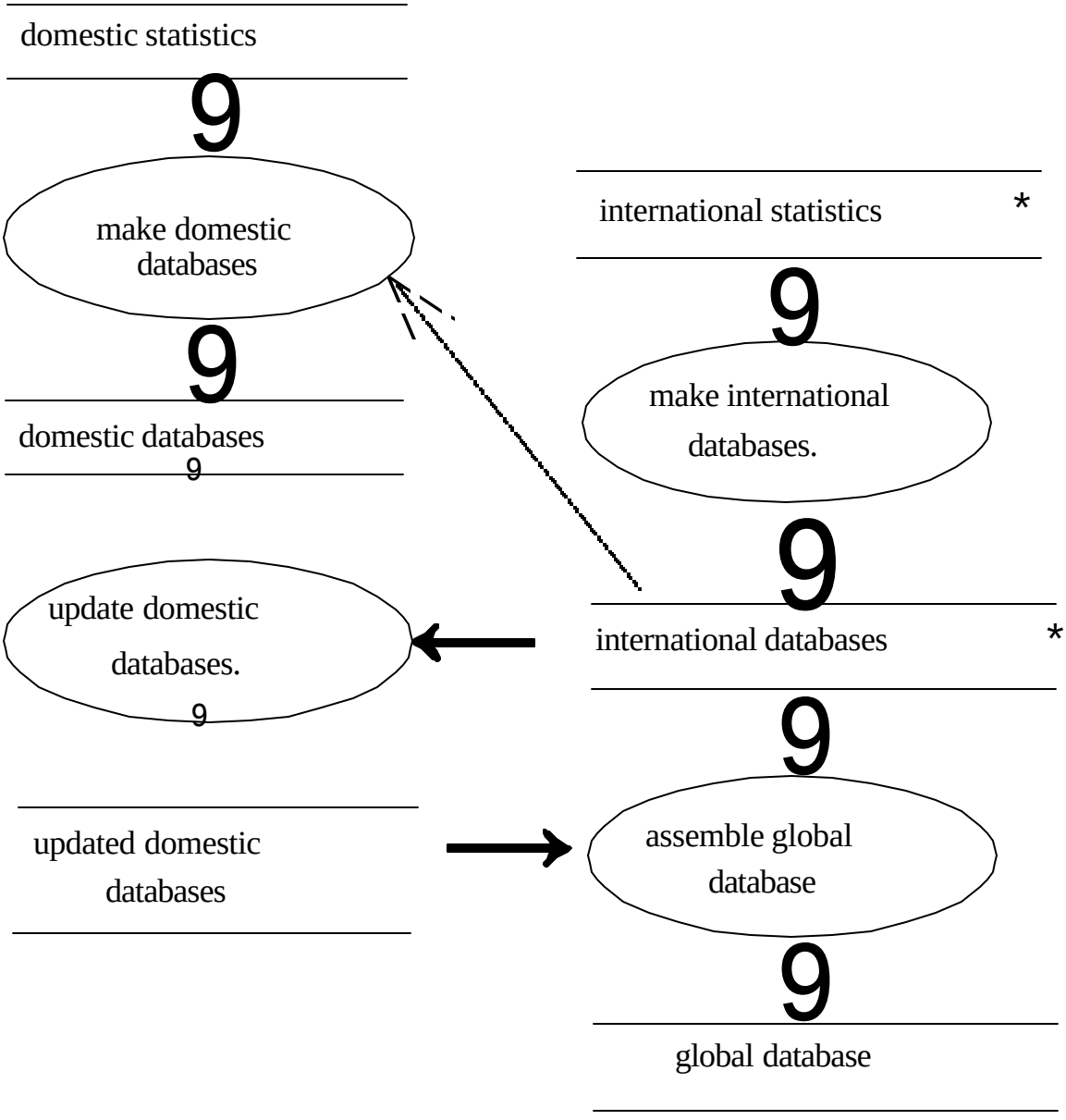
19.1 Overview of Data Base Processing

Figure 19.1 provides an overview of the data base construction procedures. There are five basic steps. First we assemble an international data base, with bilateral trade, protection and macroeconomic data for all of the GTAP regions. The inputs to this international data base have been described in chapters 11-15 and 17. Simultaneously, we assemble a set of domestic data bases building on the primary input-output data described in chapter 16. These domestic data bases must be supplemented by constructing a set of composite region data bases for those regions not covered by the primary domestic data. This is done by combining macroeconomic information from the international data base and original source data for those countries reported in chapter 16. We then update all of the regional data bases to match the trade, protection and macroeconomic data for the base year. Finally, the global data base is assembled and checked for accuracy and balance.

Figure 19.1 Overview of data base processing



* trade, protection, macroeconomic data

19.2 Assembling the International Data Base

The final version 3 data base must conform to a set of prespecified international data on trade, protection and macroeconomic totals. In principle, this is a trivial practice, given the work which has been documented in chapters 11-15 and 17. However, in practice there are a few subtleties which must be considered. In particular, in the case of the protection data base, we sometimes have two pieces of information on the same distortion and a decision must be made as to which should be used. This occurs quite frequently in the case of agricultural import protection. Here, Ulrich Reincke's data base (chapter 13) provides aggregated protection rates based on MFN tariffs. In addition, we have Merlinda Ingco's agricultural data base (chapter 14) which is intended to capture both tariff and non-tariff barriers. Finally, we also have a certain amount of protection information from the source IO tables. Because of the prevalence of non-tariff barriers in agriculture, and the more comprehensive nature of the price-comparisons offered by the latter data base, we have tended to use Merlinda Ingco's protection data in those cases where it is available. However, coverage in this labor-intensive data base is incomplete, and sometimes those estimates were actually below those based on applied tariffs (e.g., due to incomplete coverage of an aggregated commodity grouping). Thus in the end a combination of protection information from all three sources was used. Finally, it should be noted that antidumping duties are also included as a separate component of import protection.

On the export side, we have multiple interventions. We have data for export subsidy equivalent rates for food and agriculture. We also have data for three special interventions similar in effect to export taxes: the Multi-Fiber Arrangement, other voluntary export restraints, and price undertakings (voluntary undertakings on export prices, made to avert the threat of anti-dumping action).

We calculate a total export subsidy including four terms: ordinary export subsidies, and the three kinds of special intervention. For agricultural commodities we set the ordinary export subsidy rate equal to the agricultural export subsidy, where this is known; otherwise we use the rate from the input-output table. For non-agricultural commodities we always take the rate from the input-output table. We then factor in the special instruments (VERs, MFA, and price undertakings), assuming that they are not covered in the ordinary export subsidy estimates.

19.3 Representative IO tables for Composite Regions

The construction of a global data base presents a major challenge, since we still do not have IO tables for many of the regions of the world. This section discusses how to deal with this problem. Specifically, it outlines our strategy for creating IO tables for the regions for which we do not have original IO tables. It has the virtue of building on known information from the data base using a very simple and transparent set of assumptions. This assures consistency in applying accounting concepts and sectoral definitions. We mention some of its limitations at the end of this section.

The version 3 GTAP data base contains a complete and consistent accounting of domestic economic activity in 23 of the 30 regions. We use these data bases to construct domestic accounts for the remaining 6 composite regions: Rest of Latin America, Central America and the Caribbean, Sub-Saharan Africa, Middle East and North Africa, Rest of South Asia, and Regions not Classified Elsewhere (ROW). We do so based on the assumption that the average patterns of production, consumption, and savings in any individual country in these 7 composite regions can be approximated by patterns observed in one of the countries for which we have IO information. In particular, we associate a known GTAP region with each of the member countries in a composite region using a per capita income criterion and a secondary criterion based on the overall structure of production in the economy.

The logic behind the choice of per capita income as a primary criterion is rather simple. Consider, for example, the aggregate private household's budget share spent on food. Gains in per capita income generally increase food demand less than proportionately. Thus, a country with low per capita income is likely to spend a higher portion of income on food. In contrast, a country with high per capita income will spend a much smaller portion of its household income on food. For this reason, we expect countries with similar per capita incomes to have relatively similar budget shares for food. Further refinements could take account of relative food prices in the country, but this requires a very large amount of added information. Demand in nonfood sectors is simply expected to follow patterns based on per capita income levels. We believe that rather than investing a great deal of energy in refining this method, it is preferable to reduce the size of the approximation errors by expanding the individual-country coverage in GTAP.

Implementation: We start by establishing correspondences among the countries in each of the six composite regions with known GTAP regions according to per capita GDP, with production structure as a secondary criterion. We then associate each of the known IO tables with a weight, representing the shares of regional GDP generated in economies with comparable income levels.

These weights sum to one, and thereby provide the vehicle for creating a composite IO table for the entire region.

Table 19.1 reports the weights assigned to members of the set of known IO tables (see also Table 16.1), for the 7 composite regions. We have also included the Central European Associates in this table, since we only have four original IO tables for this grouping of 7 countries. The IO coefficients in the three remaining countries in CEA (Bulgaria, Slovakia, and Slovenia) are represented either by known CEA countries or by Argentina. In the end, the composite CEA table is most heavily influenced by the IO table of Poland (weight = .4588), followed by Hungary and then Romania. The weights in Table 19 are used to compute the IO parameters for each region. Intuitively, what we do is to calculate the weighted means assigned to the parameters of each composite region. For example, the average propensity to save in each composite region is computed as:

$$s = \sum_r w_r s_r^{(}, = 1, \ddot{y}, 24,$$

where w_r is the weight assigned to the rth GTAP region, and s_r is the savings propensity computed for the rth GTAP region. Of course $\sum_r w_r = 1$.

Strengths and Limitations of the Approach: An important strength of this approach is the ease with which we generate new IO tables for the rest of the world (ROW) using existing programs. It also permits us to generate tables that are inherently consistent with the rest of the data base. Of course, this approach can be refined in many ways. It might be worth trying to establish mappings between GTAP countries and countries in a composite region using other criteria in addition to per capita GDP and its distribution over the three main sectors of an economy. However, any such approach is necessarily arbitrary and there is merit in the simplicity and transparency of the per capita approach. Ultimately the best way to reduce the approximation error in these composite regions is to add more individual countries to the GTAP data base. In this way we reduce the size of the composite regions while simultaneously enhancing the portfolio of countries with which to approximate the remaining countries' unknown IO structures.

19.4 Updating the Regional Data Bases

This section discusses procedures for updating the IO information to 1992, based on the trade data in chapters 11 and 12, the protection data in chapters 13-15, and the macroeconomic data in Chapter 17. The vehicle for accomplishing this update is the FIT software developed at the Australian Industry Commission (James and McDougall 1993). FIT is an economic model of a regional economy that allows targeting of economic magnitudes to match conditions in a particular year. These target variables are shocked, and changes in all other variables of the model are computed in response to

these shocks. FIT maintains market clearing and zero profit conditions, while fixing primary factor prices and permitting value-added, as well as the intensity of input usage to adjust, subject to a prespecified penalty function. Eight exogenous variables were targeted for the update in each region: (1) exports by commodity, (2)

Table 19.1 Composite IO Tables

Region Name & Number	Original IO Table	Per Capita[a] GDP	Subregional Weight	Subregional GDP
Rest of South Asia (14)	India	275	0.4296	37,150
	China	359	0.5682	49,130
	Philippines	835	0.0022	192
	Total		1.0000	86,472
Central America and the Caribbean (18)	India	275	0.0299	2,376
	China	359	0.0302	2,394
	Indonesia	695	0.0544	4,316
	Philippines	835	0.3144	24,946
	Thailand	1,953	0.1659	13,168
	Brazil	2,663	0.2227	17,673
	Mexico	3,797	0.0996	7,906
	Argentina	6,869	0.0329	2,609
	New Zealand	11,869	0.0500	3,967
	Total		1.0000	79,354
Rest of South America (22)	China	359	0.0021	374
	Philippines	835	0.0688	12,113
	Thailand	1,953	0.5198	91,548
	Brazil	2,663	0.3430	60,423
	Mexico	3,797	0.0663	11,677
	Total		1.0000	176,134
EFTA (25)	EU12	20,377	0.5417	292,576
	Japan	29,498	0.4583	247,556
	Total		1.0000	540,132
Central European Associates (26)	Romania	1,097	0.1709	35,465
	Poland	2,207	0.4588	95,215
	Czech Rep.	2,663	0.1348	27,980
	Hungary	3,559	0.1760	36,532
	Argentina	6,869	0.0595	12,348
	Total		1.0000	207,540

Table 19.1 Composite IO Tables (Continued)

Region Name & Number	Original IO Table	Per Capita[a] GDP	Subregional Weight	Subregional GDP
Middle East and North Africa (28)	China	359	0.0090	5,356
	Indonesia	695	0.0681	40,746
	Thailand	1,953	0.4085	244,245
	Argentina	6,869	0.2549	152,436
	Korea, Rep.	7,045	0.0083	4,989
	Taiwan	9,932	0.0360	21,554
	New Zealand	11,869	0.1337	79,946
	Australia	17,087	0.0814	48,676
	Total		1.0000	597,948
Sub Saharan Africa (29)	India	275	0.2500	76,110
	China	359	0.1295	39,442
	Indonesia	695	0.0053	1,622
	Philippines	835	0.1035	31,504
	Thailand	1,953	0.0242	7,383
	Brazil	2,663	0.0249	7,575
	Malaysia	3,123	0.4406	134,153
	Argentina	6,869	0.0220	6,701
	Total		1.0000	304,491
Rest of the World (30)	India	275	0.0564	17,596
	China	359	0.0046	1,431
	Indonesia	695	0.0010	309
	Philippines	835	0.1938	60,430
	Thailand	1,953	0.0495	15,424
	Brazil	2,663	0.6553	204,352
	Korea, Rep.	7,045	0.0113	3,513
	New Zealand	11,869	0.0282	8,804
	Total		1.0000	311,859

[a] *Source:* 1992 Bank Economic and Social Data Base, IEC Department, The World Bank

imports by commodity, (3) aggregate household consumption expenditures, (4) aggregate government spending, (5) aggregate expenditures for gross capital formation, (6) import tariffs, (7) export subsidies, (8) production subsidies/taxes, and (9) selected import prices (specifically petroleum). Also import prices (the oil price shock). The updated data represent an internally consistent IO table that can be incorporated into the GTAP data base.

19.5 Assembling the Global Data Base

Having updated the individual-region IO tables to conform with 1992 macroeconomic, trade, and policy control totals, we are now in a position to bring all the individual IO tables together to construct a global data base. We check accounting relationships to determine if the data are globally consistent. This is the point where the supplementary information on primary factor splits in agriculture (Chapter 17.3) is brought in. Capital stock and depreciation values (Chapter 17.2) are also incorporated into the data base. Finally, the bilateral detail from the trade matrix (Chapters 11 and 12) is brought in, also bilateral detail from the protection data sets, along with the international trade and transport margins that account for the difference between *cif* and *fob* values. This completes development of the global data base.

References

James, M., and McDougall, R. (1993) "FIT: An Input-Output Data Update Facility for SALTER," SALTER Working Paper No. 17, Canberra, Australia: Australian Industry Commission.