Chapter 16

Disaggregation of input-output tables

Jing Liu and Robert McDougall

16.1 Introduction

The Global Trade Analysis Project (GTAP) version 4 data base substantially expanded its sectoral and regional coverage compared to version 3. A critical data source to build the data base is the Input-Output (I/O) tables from regions represented in GTAP. However, not all the contributed I/O tables have fully disaggregated sectors as required in the GTAP version 4 specification (See chapter 14.1, table 14.1), and not all GTAP regions have an updated contributed I/O tables. For those regions without updated I/O tables, we simply used the existing I/O tables from version 3 with 37 sectors. The problem remains as to how to estimate the fully disaggregated I/O tables for all regions.

Given the situation described above, we need to estimate the incomplete I/O tables using maximum entropy method. Common approaches are to use estimates of production shares to disaggregate the necessary sectors proportionally, or to use I/O coefficients from another I/O table to benchmark the shares. The clear advantage of these approaches is their simplicity. However, their usefulness depends entirely upon whether the disaggregated sectors can be approximated by the same production structure, or in the case of the second approach, how representative the benchmarked I/O table is (Jacobsen, 1996). In addition, these approaches are unable to handle more complicated cases where various information (directly and indirectly relevant) is available, but is incompatible.

The basic idea of our approach is to try to best utilize all the available information and to obtain certain estimates which are least in conflict with the given information. Aggregated I/O tables are available for all regions and part of the disaggregated I/O structure are known for some regions. In general, the information directly relevant to this job is very limited and piecemeal. In short, all the data directly related to I/O tables are not sufficient for us to estimate the more disaggregated tables. We need some additional information which is based on assumption or some prior knowledge. Therefore, we use a special I/O table called "representative table" to provide a reference I/O pattern. This special representative table measures the average level of I/O coefficients worldwide.

The data from various sources related to I/O tables are almost always in conflict and data pooling is thus necessary to ensure consistency of all inputs. We use GEMPACK programs (Harrison and Pearson, 1994) to do the data pooling. In the process of estimation, the highest priority goes to contributed I/O tables in order to guarantee the so-called re-aggregation property, that is the estimated fully disaggregated I/O table should reproduce an identical contributed I/O table once it is re-aggregated based on the original sector mapping. For this reason, we also call the original I/O table a constraint table. The second highest priority is given to the information directly related to the contributed I/O table, for instance, the binding sum vector for each disaggregated sector for a particular region. Finally, the lowest priority is given to the representative I/O table, which is referred to as the reference table.

16.2 Available information

For GTAP 4 we have 36 contributed I/O tables, 34 corresponding to GTAP regions, and 2 (Peru, European Union) being used in preparing composite regions (see further chapter 14 section 1). According to the degree of information completeness of the I/O tables, we classified all 36 tables into five categories. Among them, twelve tables have fully disaggregated I/O tables; two tables have agriculture sectors fully disaggregated; fourteen regions do not have fully disaggregated agriculture sectors but detailed agriculture disaggregation information is available; and eight regions do not have fully disaggregated agriculture sectors and only rough agriculture disaggregation information is available.

To disaggregate each I/O table, as described below (section 16.3), we require two kinds of information besides the table to be disaggregated. We require a reference I/O table, to provide initial estimates of the cost structure for each disaggregated sector. And we require total costs and total sales estimates for each disaggregated sector, to provide target row and column totals for the disaggregated matrix.

For category 3 tables, we have reference I/O tables provided as part of Everett Peterson's agricultural I/O data set (chapter 15). Table 16.2 below displays the Argentina table as an example.

These tables, adjusted for consistency with the tables to be disaggregated, also furnish us with target sales and cost totals.

For category 4 tables, the agricultural I/O data set does not provide reference I/O tables, but does provide commodity summary totals, from which we can calculate total costs and sales (chapter 15 section 3). Table 16.3 below shows the summary data for Germany by way of example. We revise these values for commodities for which the source data underlying the I/O data set do not provide a good coverage, and adjust them for consistency with the tables to be disaggregated. For the reference I/O table, we use the representative table.

For disaggregating sectors outside agriculture and food processing, we again use the representative table as the reference table. We estimate disaggregated sector row and column totals using the table to be disaggregated, and the cost structures from the representative table.

16.3 Disaggregation mechanism

In order to understand the disaggregation procedure, a brief introduction to the disggregation programs may be helpful.

Suppose we have an initial I/O table in matrix form for disaggregation and a set mapping file that links this initial I/O to the more disaggregated target I/O. The initial I/O table represents certain constraints that the target I/O needs to meet, namely, the reaggregation condition mentioned above. However, there would be an infinite number of solutions that meet the reaggregation condition without further constraints. Now suppose that a fully disaggregated I/O table (we call it a reference matrix) is available for another region and that such a region is regarded as having similar sector structure as the region in question. We take such fully disaggregated I/O as the starting point and scale its elements according to the sector mapping so as to meet the reaggregation condition. The solution is unique in this case. Take a second case and suppose that we also know column sums and row sums of the target I/O. These sum vectors normally measure the consumption or the production shares of target sectors. In this case, a simple scaling operation based on mapping is not enough. The results generally will not satisfy the sector share constraint.

Roughly speaking, for any reference matrix, constraint matrix, target row sum vector, and target column sum vector, there is a unique set of block scaling factors, row scaling factors, and column scaling factors, which when applied to the reference matrix will yield a new matrix that satisfies the reaggregation, row sum, and column sum conditions. This new matrix is the disaggregated matrix that we seek.

This broad statement is subject to several qualifications. First, the set of scaling factors that generates the solution is not strictly unique. Given one such set of scaling factors one can generate another different set by, for example, doubling all the row scaling factors and halving all the column scaling factors. This new set of scaling factors, however, yields the same solution matrix as the original set. Second, there is no solution at all, unless the constraint matrix, row scaling factors, and column scaling factors are mutually consistent. For example, the sum of the elements of the constraint matrix, of the row target vector, and of the column target vector must all be equal; since the sum of the elements of the solution matrix must be equal to each. Third, even if the targets are mutually consistent, there may be no solution, if the reference matrix is ill-chosen — for example, if it contains too many zero elements.

We solve for the disaggregated matrix using a TABLO-generated program. The program solves a model that includes equations corresponding to the reaggregation, row total, and column total conditions. The initial data base for the model includes the reference matrix. The model contains variables representing the block, row, and column targets. To find the solution matrix we apply shocks to these variables, taking them from the actual totals in the reference matrix to the target totals.

16.4 Disaggregation procedure

This section briefly describes the procedure used to disaggregate non-fully disaggregated I/O tables into GTAP 50-sector I/O tables. We have four groups of regional I/O tables that need disaggregation (categories 2 through 5 in table 16.1). Regional I/O tables of category 1 have fully disaggregated sectors and no further work need to be done. To proceed, we begin with the disaggregation of agriculture sectors since most relevant information is directly concerned with agriculture, and most of the new sectors in the version 4 compared to the version 3 are in agriculture. Once agriculture sectors for all five categories are fully disaggregated, we then proceed to disaggregate non-agriculture sectors.

In the first stage of agriculture disaggregation, no work is needed for category 2 since the contributed I/O tables from this category all have agriculture sectors. Category 3 has detailed agriculture information that provides a useful disaggregation pattern for the agriculture sectors, which serves as a starting point. Category 4 has only total target information for agriculture sectors at a disaggregated level. We have to use a representative agricultural disaggregation pattern as supporting information and treat target information as a constraint in the GEMPACK disaggregation program. Please note that the final I/O tables will further be adjusted according to macro, trade, and protection data. It is expected that the estimation for category 2 is better than category 3, and category 3 is better than category 4.

Once agriculture sectors are fully disaggregated for all regions, the next step is quite straightforward. The procedure is the same as the agriculture disaggregation. Overall, the disaggregation quality depends on two factors. Firstly, *ceteris paribus*, the more disaggregated sectors the contributed I/O table has, the more accurate the estimates are. Secondly, the more disaggregated the agriculture sectors in the referenced table are, the better the estimates.

Now let us see in more detail how the GEMPACK disaggregation program integrates all information and produces a more disaggregated estimated I/O table. Figure 16.1 gives the flowchart of the various steps followed. When dealing with category 3, we first “squeeze” or aggregate the contributed I/O table according to the sector specification of table 16.2. The result should satisfy three conditions: a) no two sectors in the “squeezed” I/O can match to any single sector in table 16.2, b) the “squeezed” I/O has the maximum number of aggregated sectors both column-wise and row-wise, and c) any sector in table 16.2 could map to exactly one sector in the “squeezed” I/O. It is not too difficult to prove that the way to squeeze contributed I/O is unique and the “squeezed” I/O is more disaggregated compared to table 16.2. For the disaggregation program to work, we take “squeezed” I/O table (referred to as “transitory I/O 1”) as a constraint table, and the corresponding table similar to table 16.2 as the reference table. We then proceed to the standard disaggregation procedure described in the last section. The resulting matrix (referred to as “transitory I/O 2”) has agriculture sectors fully disaggregated.

We then concatenate the original contributed I/O table with the newly obtained matrix to get the most disaggregated matrix possible. The target matrix should be consistent with the contributed I/O table and each of its sectors should match with either the contributed I/O or the reference table (similar to table 16.2), whichever is more disaggregated. The mechanism is quite simple. For example, if we need to fill all cells of the more disaggregated matrix, we have two matrices, then the row and column sectors of the more disaggregated matrix are the unions of the corresponding sectors of two referenced matrices. There are two different types of cells in the more disaggregated matrix. The first type of cell (Type 1) has both row and column sectors directly corresponding to one of the referenced matrix. The second type (Type 2) has row and column sectors mapped to different referenced matrices. Since these two referenced matrices are consistent, we can simply plug the values from one of the referenced matrix into the Type 1 cells. We use the row sum shares or column sum shares of the referenced matrices to estimate the values of Type 2 cells.

The procedure to deal with category 4 regions differs from category 3 regions in that we use the aggregated representative matrix as the starting point. The constraint matrix is still the contributed I/O and table 16.3 is used only to estimate the row and column sum shares of the target matrix which is more disaggregated. The GEMPACK disaggregation program in this case will find it much more difficult to converge and the results are less reliable than results for category 3 regions; otherwise, the procedures for the two categories are quite similar.

We call the disaggregation procedures for categories 3 and 4 described above as “agriculture disaggregation”. After that, we treat the results for categories 3 and 4 the same as category 2. For category 2 regions, we treat the contributed I/O table as a constraint matrix, and we treat the representative I/O table as a reference matrix. The column and row sum vectors are obtained based on contributed I/O table but refer to the sum vectors of the representative I/O. Nevertheless, all data need to be adjusted according to reliable macro and trade data in the fitting procedure described in chapter 20.

References

Lars-Bo Jacobsen. 1996. "The Danish contribution to the GTAP data base: Methodologic and Practical Issues"

Harrison, W.J. and K.R. Pearson. 1994. "Computing Solutions for Large General Equilibrium Models Using Gempack," Impact Project Preliminary Working Paper No. IP-64.

Figure 16.1 Disaggregation procedure for category 3 I/O tables

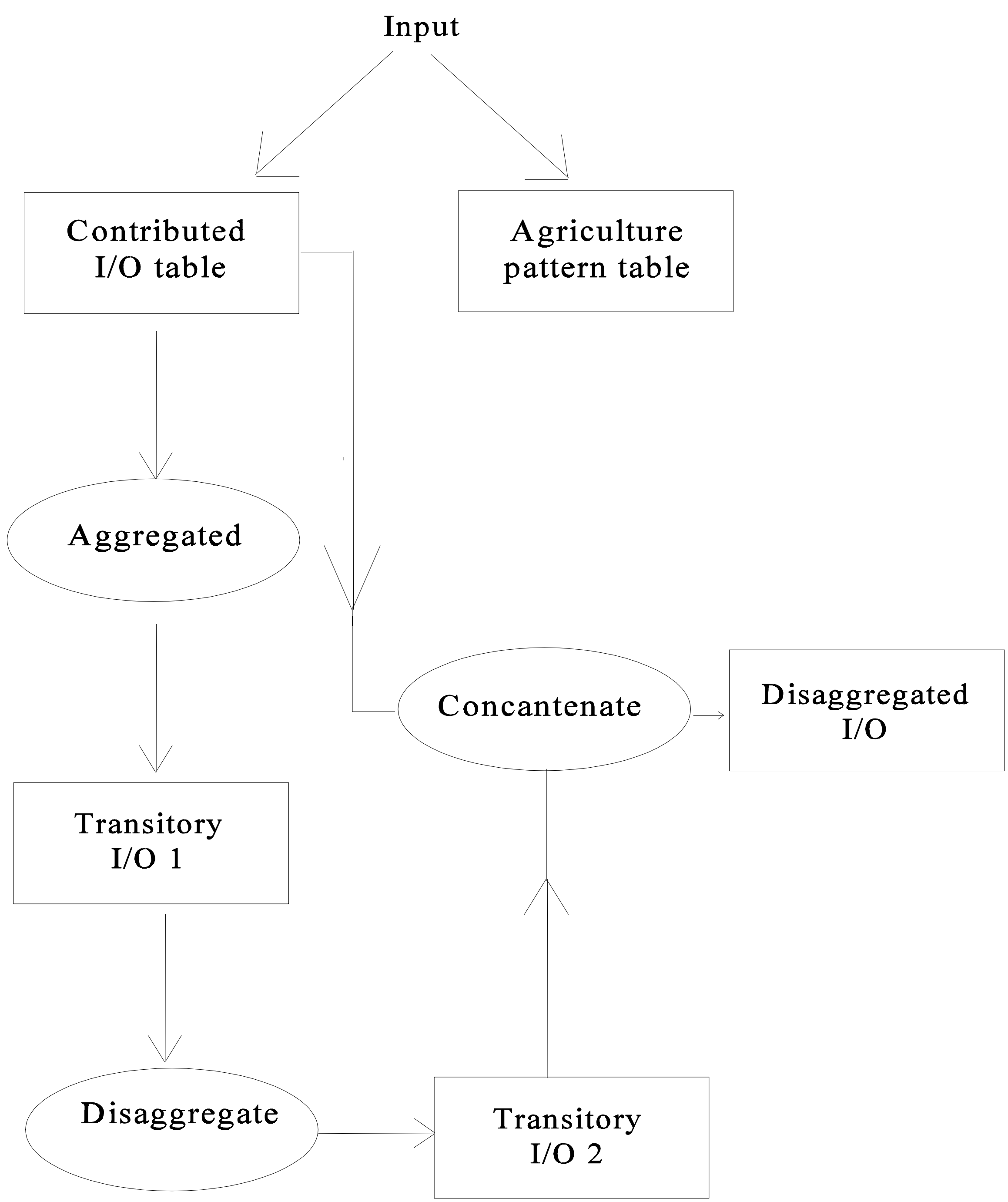

Table 16.1 Summary of information available for I/O tables

No.	Category	Region
1	I/O with complete sectoral classification	AUS, IDN, THA, TWN, IDI, USA, VEN, COL, PER, URY, GBR, DNK
2	I/O with agriculture fully disaggregated	NZL, EUN
3	I/O with detailed agriculture disaggregation info available	JPN, KOR, MYS, PHL, SGP, CHN, HKG, CAN, MEX, ARG, BRA, CHL, CEA, FSU
4	I/O with only rough agriculture disaggregation info available	VNM, LKA, DEU, SWE, FIN, TUR, MAR, SAF

Note: For a complete description of the GTAP regions, refer to the glossary at the front of the document.

Table 16. 2 Agriculture information for Argentina

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	wol
pdr	19.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1
wht	0.0	374.5	0.0	0.1	0.1	0.0	0.0	0.0	0.1
gro	0.0	0.1	309.8	0.2	0.2	0.0	0.0	0.1	0.1
v_f	0.0	0.1	0.2	278.8	0.0	0.0	0.0	0.0	0.0
osd	0.0	0.1	0.2	0.0	281.8	0.0	0.0	0.0	0.0
c_b	0.0	0.0	0.0	0.0	0.0	42.2	0.0	0.0	0.0
pfb	0.0	0.0	0.0	0.0	0.0	0.0	36.5	0.0	0.0
ocr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.5	0.0
wol	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1
ctl	0.0	0.2	0.4	1.3	1.3	0.2	0.1	0.3	0.1
oap	0.0	0.1	0.1	0.4	0.4	0.1	0.0	0.1	0.0
rmk	0.0	0.1	0.2	0.7	0.7	0.1	0.1	0.2	0.0
pcr	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
cmt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
omt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
mil	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
vol	0.0	0.4	0.3	0.5	0.4	0.1	0.1	0.1	0.0
sgr	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
ofd	0.0	1.8	1.2	1.9	1.8	0.3	0.2	0.5	0.1
b_t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
else	84.3	829.5	585.2	854.1	844.3	126.3	90.3	214.3	17.7
I_pdr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_wht	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_gro	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.0
I_v_f	0.0	0.0	0.0	9.1	0.0	0.0	0.0	0.0	0.0
I_osd	0.0	0.0	0.0	0.0	9.2	0.0	0.0	0.0	0.0
I_c_b	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
I_pfb	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0
I_ocr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0
I_wol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_ctl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_oap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

contd

Table 16.2 Agriculture information for Argentina (continued)

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	wol
I_rmk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_pcr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_cmt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_omt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_mil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_vol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_sgr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_ofd	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
I_b_t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_else	0.1	41.0	25.8	10.4	10.3	1.5	1.1	2.6	0.0
vad	179.4	2922.9	4503.2	4835.6	4779.8	714.8	510.9	1213.2	769.8
ITX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pdr	1.4	0.3	0.2	224.3	0.1	0.0	0.0	0.1	0.0
wht	148.5	31.0	24.5	0.0	1.9	0.3	0.9	27.0	1.1
gro	633.1	132.2	104.3	0.0	0.6	0.1	0.6	13.2	0.5
v_f	0.0	0.0	0.0	0.0	8.6	2.1	3.6	0.0	0.0
osd	0.0	0.0	0.0	0.0	8.3	2.0	3.5	4203.4	0.0
c_b	0.0	0.0	0.0	0.0	1.5	0.4	0.6	0.0	846.2
pfb	0.0	0.0	0.0	0.0	0.8	0.2	0.3	0.0	0.0
ocr	3.9	0.8	0.6	0.0	2.0	0.5	0.8	0.0	0.0
wol	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
ctl	921.2	0.0	0.0	0.0	8896.4	0.0	0.0	0.0	0.0
oap	0.0	234.7	0.0	0.0	0.0	2267.4	0.0	0.0	0.0
rmk	0.0	0.0	417.2	0.0	0.0	0.0	1627.6	0.0	0.0
pcr	2.3	0.5	0.4	0.1	0.1	0.0	0.1	0.1	0.0
cmt	0.1	0.0	0.0	0.0	1359.0	0.0	1.1	50.3	0.0
omt	0.0	0.0	0.0	0.0	0.0	331.1	0.3	0.0	0.0
mil	0.3	0.1	0.0	0.0	0.0	0.0	469.0	0.0	0.0
vol	0.0	0.0	0.0	0.5	9.7	2.4	24.0	149.9	0.0
sgr	0.0	0.0	0.0	0.1	1.2	0.3	2.9	0.0	35.0

contd

Table 16.2 Agriculture information for Argentina (continued)

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	wol
ofd	56.1	577.1	420.3	1.8	40.0	9.7	98.5	0.0	0.0
b_t	0.1	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0
else	601.3	125.5	99.1	75.7	947.1	127.1	886.8	117.5	4.7
I_pdr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_wht	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
I_gro	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
I_v_f	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
I_osd	0.0	0.0	0.0	0.0	0.1	0.0	0.0	240.3	0.0
I_c_b	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.4
I_pfb	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_ocr	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_wol	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
I_ctl	1.2	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0
I_oap	0.0	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0
I_rmk	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
I_pcr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_cmt	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.1	0.0
I_omt	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
I_mil	0.0	0.0	0.0	0.0	0.2	0.1	27.9	0.0	0.0
I_vol	0.0	0.0	0.0	0.0	0.1	0.0	0.5	5.2	0.0
I_sgr	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.2
I_ofd	0.2	2.0	1.4	0.0	0.5	0.1	2.1	0.0	0.0
I_b_t	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_else	2.5	0.5	0.4	0.1	21.4	2.9	3.0	2.5	0.1
vad	8505.9	1775.7	1401.7	269.7	2730.3	663.9	1951.7	2131.7	382.3
ITX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
pdr	3.6	1.0	0.0	0.0	0.3	1.7	0.0	-30.8	61.0
wht	1051.1	0.5	0.1	0.0	0.4	4.2	0.0	-760.5	3266.1
gro	512.6	92.3	0.1	0.0	0.5	29.6	0.0	431.2	3171.6
v_f	602.5	564.3	0.0	0.0	21.4	4023.7	11.5	-56.3	533.0
osd	0.0	0.0	0.0	0.0	20.7	674.5	11.1	-54.4	779.6
c_b	0.0	0.0	0.0	0.0	3.7	0.0	2.0	-9.7	0.0

contd

Table 16.2 Agriculture information for Argentina (continued)

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	wol
pfb	0.0	0.0	498.3	0.1	1.9	0.0	1.0	-5.0	106.4
ocr	0.0	558.4	0.0	0.0	5.0	604.0	2.7	-13.0	268.1
wol	0.0	0.0	259.7	0.0	7.6	0.1	0.0	-75.8	596.0
ctl	0.0	0.3	1.0	0.1	139.8	428.9	546.3	-121.9	62.4
oap	114.6	0.1	0.3	0.0	41.3	89.2	161.5	-36.0	6.4
rmk	0.0	0.2	0.5	0.1	73.2	125.6	286.2	-63.8	2.0
pcr	3.3	1.5	0.0	0.0	2.5	421.2	1.2	-62.3	200.8
cmt	285.1	0.0	1.2	0.0	1403.7	5202.2	55.3	4418.5	1260.0
omt	84.5	0.0	0.3	0.0	353.4	1396.5	13.9	1112.4	119.7
mil	120.5	0.2	0.0	0.0	60.9	4372.9	12.3	25.9	44.0
vol	838.5	0.0	0.7	0.0	180.8	2135.3	9.9	-116.0	3703.7
sgr	302.9	132.7	0.1	0.0	22.1	795.2	1.2	-14.2	39.8
ofd	1831.4	583.3	2.9	0.0	743.7	12053.8	40.8	-477.2	2450.1
b_t	24.1	1011.5	0.0	0.0	643.6	7740.2	27.2	-138.0	87.6
else	4665.2	2001.7	7831.9	3703.9	126623.0	129199.0	48424.5	73029.9	7305.9
I_pdr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_wht	3.2	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
I_gro	1.6	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0
I_v_f	34.5	9.5	0.0	0.0	68.3	38.2	0.0	0.0	0.0
I_osd	0.0	0.0	0.0	0.0	66.0	6.4	0.0	0.0	0.0
I_c_b	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	0.0
I_pfb	0.0	0.0	2.3	0.0	6.1	0.0	0.0	0.0	0.0
I_ocr	0.0	9.4	0.0	0.0	15.8	5.7	0.0	0.0	0.0
I_wol	0.0	0.0	1.4	0.2	0.0	0.2	0.0	0.0	0.0
I_ctl	0.0	0.0	0.2	0.0	3.7	0.1	0.1	4.3	0.0
I_oap	0.1	0.0	0.1	0.0	1.1	0.0	0.0	1.3	0.0
I_rmk	0.0	0.0	0.1	0.0	1.9	0.0	0.1	2.2	0.0
I_pcr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I_cmt	0.3	0.0	0.0	0.0	3.4	2.4	0.0	0.0	0.0
I_omt	0.1	0.0	0.0	0.0	0.8	0.6	0.0	0.0	0.0
I_mil	0.1	0.0	0.0	0.0	10.6	1.1	0.0	0.0	0.0
I_vol	29.0	0.0	0.3	0.0	13.3	3.1	0.0	0.0	0.0

contd

Table 16.2 Agriculture information for Argentina (continued)

	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	wol
I_sgr	10.5	2.0	0.0	0.0	1.6	1.2	0.0	0.0	0.0
I_ofd	63.4	8.7	1.4	0.0	54.7	17.7	0.1	0.0	0.0
I_b_t	0.0	22.2	0.0	0.0	0.5	15.5	0.4	0.0	0.0
I_else	99.0	115.6	542.1	37.3	12735.8	496.4	2104.2	250.3	0.0
vad	7759.1	4281.2	253183.0	0.0	0.0	0.0	0.0	0.0	0.0
ITX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: Hh = household consumption; Inv_gh = investment and government consumption; Stkch = change of stock.
Expt = exports. Other regions of category 3 in table 16.1 have similar agriculture information.

Table 16.3 Agriculture information for Germany

GTAP v.4 Commodity	Production	Imports	Exports
Paddy rice	0.00	0.00	0.00
Wheat	2346.79	268.54	931.86
Cereal grains, n.e.c.	1821.39	272.75	487.23
Vegetables, fruits, nuts	4664.58	5780.36	869.24
Oilseeds	613.62	1029.68	185.49
Sugar cane and beet	1221.74	0.04	2.13
Plant-based fibers	0.00	308.65	38.23
Crops, n.e.c.	31.59	3267.57	995.66
Bovine cattle, sheep and goats	2740.68	778.76	987.22
Animal products, n.e.c.	4241.99	1373.63	245.19
Raw milk	7005.50	107.96	650.07
Wool, silk-worms	8.47	82.32	13.49
Bovine cattle meat	4078.92	1172.06	1480.04
Meat products, n.e.c.	6163.19	1967.80	535.81
Vegetable oils	2537.65	1778.35	1339.69
Dairy products	8363.44	2052.27	1984.88
Processed rice	0.00	76.39	16.58
Sugar	1198.43	311.83	404.24

Note 1: Other regions of category 4 in table 16.1 have similar agriculture information.
Note 2: Units in this table are measured as Million of US dollar.