Chapter 8.A

Food and Agricultural Data Base

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One of the main features of the GTAP Data Base is a detailed sectoral classification of agricultural and food products. Twelve sectors within agriculture and eight sectors within the area of food, beverages, and tobacco are identified. This however creates a problem in data collection since not all countries' input-output (I-O) statistics provide such fine sectoral detail.

To address this problem, the I-O data contributors for some countries undertook the agricultural and food disaggregation themselves. Table 8.A.1 lists the 22 countries/regions for which I-O tables are available at the full GTAP 8 sectoral classifications for food and agriculture and 87 regions that require this disaggregation[1]. For the remaining countries/regions, the disaggregation was undertaken centrally. To support this centralized disaggregation process, the present author created a new multi-country agriculture and food products dataset. This chapter documents that dataset.

The agricultural and food products dataset consists of two components. The first component consists of information on the quantities produced, imported, and exported, plus information on producer prices for a broad set of agricultural commodities for a variety of countries. This information is then used to determine the value of production and trade, at producer prices, for as many GTAP agricultural and food commodities as possible. The second component uses the above information, along with I-O tables supplied for earlier GTAP data releases to develop an initial I-O table focused on the GTAP agricultural and food commodities for each country/region listed in table 8.A.1 that lack this detail. These initial I-O tables are then used as the starting point for the centralized disaggregation process.

8.A.1 Production, Trade and Price Data

In the absence of an I-O table available at the GTAP 8 level of aggregation, supplemental data are needed to provide guidance on how to disaggregate the agricultural and food commodities in the existing I-O table into the GTAP 8 commodities. A first step in the disaggregation process is to determine the relative magnitude of total sales of the GTAP commodities (for domestic uses and exports) produced in the region in question and the relative magnitude of total imports of the GTAP commodities into that region. In terms of an I-O table, one can think of these values as row sum targets. Only relative magnitudes are required because the existing I-O table contains the appropriate absolute magnitudes of agricultural and food sales and imports for the region in question. The goal of the disaggregation process is to determine how to allocate these values reported in the existing I-O table to the GTAP commodities. Assuming no changes in the stocks of agricultural and food commodities, total sales of a GTAP commodity produced within a given

[1] In GTAP 8.1 Data Base, we had a few more IO tables needing disaggregation in agricultural sectors. They are: Benin, Burkina Faso, Guinea, Togo, Rwanda, Malawi, Mozambique, Tanzania and Zambia.

region are equal to the value of domestic production. By subtracting the value of exports, one can obtain the value of commodity sales for domestic uses.

Because information on value of production and trade is needed across many regions, the supplemental data should come from a data base with consistent commodity definitions across regions, rather than data for individual countries. Fortunately, the Food and Agricultural Organization (FAO) of the United Nations provides data bases on commodity balances and producer prices that meet these criteria. The FAO commodity balance data base provides information on the quantity of a commodity produced, imported, and exported for a given country.[2] Unfortunately, the FAO producer price data base does not contain prices for all processed food products. Thus, prices for various vegetable oil and meal products, sugar, other sweeteners, cotton, dairy products, and meat by-products were obtained from a variety of other sources, which are documented in table 8.A.2.

The dollar values of production, imports, and exports at producer prices are then calculated by multiplying the appropriate quantity, producer price, and exchange rate together. For some countries, producer prices are not available for all FAO commodities. For example, a producer price of wheat is not available for Vietnam. In these instances, a production quantity weighted average price, computed using prices from all countries with a reported producer price, is used to compute the value of production, imports, or exports.

The commodity balance data for livestock only reports quantities of meat products produced and traded. Because of a lack of data on live weight or farm-level quantities, the value of production for livestock products are computed using the dressed (wholesale level) weight multiplied by a farm-level price (defined as “biological” in the FAO producer price data). As such, the value of production of livestock products will be underestimated at the farm-level. However, the relative value of production shares for livestock commodities, which are most important when disaggregating existing I-O tables, are not affected. This underestimation will only be a problem if the existing I-O table does not identify a total value of livestock production.

Because the FAO commodity balance data base is focused more on agricultural commodities than processed food products, it is not possible to compute the value of production, imports, and exports for the GTAP 8 commodities food products, n.e.c. (ofd) and beverages and tobacco products (b_t). For some of the processed food products contained in the GTAP food products, n.e.c., such as grain milling products (i.e., flour, breakfast cereals), bakery products (bread), and sugar confectionery, the FAO commodity balance data base has converted production of these processed food products into their agricultural commodity primary equivalence. The same is true for tobacco. In other cases, such as alcoholic beverages (i.e., wine, beer, distilled alcoholic beverages), there are available data. But this leaves a gap of all non-alcoholic beverages, such as soft drinks, which likely constituents a significant portion of production and trade for the GTAP commodity beverage and tobacco products in many regions. As documented in the next section, the values of production, imports, and exports for the GTAP commodities food products, n.e.c. and beverages and tobacco products are estimated econometrically using available data from the FAO data bases and gross domestic product (GDP).

The FAO commodity balance data base does not contain information for two of the GTAP 8 regions: China and Singapore. For China, production, import, and export data are obtained from

[2] The commodities in the FAO data bases are more disaggregate than the GTAP 7 commodity definitions. A concordance between the FAO commodities and GTAP 7 commodities is given in tables 8.2, 8.3, and 8.4.

the USDA Economics and Statistics System Service, which has compiled time-series data on Chinese agriculture from a variety of sources. The FAO producer price data base does contain producer price information for China and is used to compute value of productions of the GTAP commodities for China. The agricultural trade data for China are reported in dollar values. No data are available on agricultural production in Singapore. Fortunately, the I-O table for Singapore used in the GTAP 8 Data Base does not require sectoral disaggregation.

8.A.2 Developing Initial Agricultural and Food I-O Tables

The agricultural and food I-O table consists of two tables: uses of domestically produced agricultural and food commodities and uses of imported agricultural and food commodities. Using the values of production and imports identified from the FAO data as row totals, the next step is to determine how to allocate the row totals across the elements in each row of the agricultural and food I-O tables. This process requires identification of where the non-zero elements will occur within each row and the magnitude of each non-zero element. In the domestic use table, the non-zero elements represent intermediate uses such as inputs to processed food products, sales to consumers, and exports. In the import use table, the non-zero elements represent intermediate use of imports by domestic firms and purchases of imported agricultural and food products by domestic households.

8.A.2.1 Identification of Key Non-zero Elements

The identification of the key non-zero elements in the domestic and import use tables is based on observed patterns in regional I-O tables supplied for earlier versions of GTAP Data Bases. The regions utilized include Australia, New Zealand, Indonesia, Japan, Korea, Thailand, Taiwan, Bangladesh, India, United States, Venezuela, Colombia, Uruguay, United Kingdom, Denmark, Austria, Switzerland, Germany, Spain, Finland, France, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Sweden, Greece, Albania, Bulgaria, Croatia, Czech Republic, Malta, Romania, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Russian Federation, Cyprus, Botswana, Mozambique, Malawi, Tanzania, Uganda, Zambia, and Zimbabwe. The non-zero elements are identified in four major blocks (or sub-matrices) within the domestic use table: sales of agricultural and food commodities within the agricultural sector, sales of agricultural commodities to the food processors and textiles, sales of processed food commodities within the food processing sector, and consumption and exports.

Table 8.A.3 shows the location of the non-zero elements within the agricultural sector. There are two main types of entries in the table. First is the own-use of each GTAP agricultural commodity by firms that produce that commodity. For the crop commodities, this could represent the withholding of some production for seed usage in the next growing season or, for livestock commodities, the need to withhold some livestock as replacements for the breeding herd. Having non-zero own-use entries are typical in most existing I-O tables. The second type of non-zero elements is the sale of crop commodities to the livestock industries. This may be thought of as representing feed usage. Since all grains and oilseeds have the potential of being feed for livestock, non-zero entries are allowed for these commodities. Because the GTAP commodity crops, n.e.c. (ocr) contains forages and straw (for bedding), the potential for positive sales to the livestock industries is also allowed. Also note that sales from the GTAP commodity food products, n.e.c. (ofd) to the GTAP livestock industries are allowed to account for prepared animal feed sales.

Table 8.A.4 identifies the key sales of agricultural commodities to food processors and textiles. Paddy rice (pdr) is sold to rice processors (pcr) and to beverages and tobacco (b_t) to account for its potential use in beverages such as beer. Wheat (wht) and cereal grain, n.e.c. (gro) are sold to food products, n.e.c. (ofd), whose firms perform all grain milling activities, and to beverages and tobacco (b_t) to account for grain use in beverages such as beer or distilled alcoholic beverages. Vegetables, fruit, nuts (v_f) are also sold to food products, n.e.c. (ofd), whose firms produce prepared and preserved vegetables, fruits, and nuts, as well fruit and vegetable juices, and to beverages and tobacco (b_t) to account for vegetables use (e.g., grapes) in beverages (e.g., wine). Oilseeds (osd) are sold to firms that produce vegetable oils and fats (vol) and to firms that produce animal feeds (e.g. ofd). Sugar cane and sugar beets (c_b) are sold to sugar processors (sgr). Plant-based fibers (pfb) and wool (wol) are sold to textile manufacturers (tex). Sales of crops, n.e.c. (ocr) to beverages and tobacco (b_t) represents the sales of tobacco leaf and beverage and spice crops to be processed into cigarettes (or other manufactured tobacco products) and beverages. Based on the GTAP commodity definitions, bovine cattle, sheep and goat, horses (ctl) are sold to bovine cattle, sheep and goat, horse meat products (cmt), and animals products, n.e.c. (oap) are sold to meat products, n.e.c. (omt). Finally, the only processing use of raw milk (rmk) is in the manufacture of dairy products (mil).

The key sales of processed food products to food processing and other manufacturing firms are listed in table 8.A.5. All food processors are assumed to use some of their own product as an intermediate input. The same is true for beverage and tobacco firms. The food products, n.e.c. (ofd) industry uses all other processed food products as intermediate inputs (e.g., processed meats are used in frozen entrees, vegetable oils and sugar are used in the preparation of processed foods, and rice and dairy products, such as cheese, are used in prepared entrees). Animal hides from meat processing (cmt and omt) are used to produce leather products (lea). Also, animal fats and vegetable oils may be refined into chemicals or plastics. Thus, potential sales from meat processors (cmt and omt) and vegetable oils and fats (vol) to chemical, rubber, and plastic products (crp) are also allowed. Firms that produce beverages and tobacco products purchase intermediate inputs from processed rice (for use in beverages such as beer), sugar (for use in a variety of beverages such as soft drinks), and food products, n.e.c.(ofd) (e.g. grain mill products, such as malted barley, for use in beer or distilled alcoholic beverages). Finally, most of the existing I-O tables have food products, n.e.c. (ofd) sales to all other food processing industries.

The last groups of non-zero row elements are purchases by the domestic household (e.g., consumption) and exports. While all agricultural and food products may be purchased by the household, expenditures on paddy rice, sugar cane and sugar beets, plant-based fibers, and livestock products should be small in most regions. Exports of paddy rice, sugar cane and sugar beets, and raw milk as assumed to be zero for all regions because of their relatively low value when compared to transportation costs. With the exception of livestock commodities, export data from the FAO commodity balance data base determines whether a region exports the remaining GTAP agricultural or food commodities. Because the FAO commodity balance data base reports only exports of meat products, whether a region exports livestock is based on predicted livestock export values, which are discussed in more detail below.

The non-zero elements in the import use table are assumed to be the same as the domestic use table, with the following exception. Because paddy rice, sugar cane and sugar beets, and raw milk are assumed to be non-traded, there are no intermediate uses or purchases of these commodities by the domestic household.

8.A.2.2 Determining the Magnitude of Non-zero Elements

The magnitude of sales for each non-zero element identified in the previous section is predicted using data from the existing I-O tables with full GTAP food and agricultural sector disaggregation and per capita GDP. Per capita sales values in the existing I-O tables for each non-zero element are related to per capita total sales (or value of production), computed as the sum of the value of all domestic uses and exports in the existing I-O table, of the GTAP commodities and per capita GDP using a linear (or log-linear) model:

$$Sales_{ij} = \beta_0 + \sum_{k=1}^{m} \beta_k FSales_{ik} + \delta PGDP_i + e_{ij} \qquad (1)$$

where $Sales_{ij}$ is the values of per capita sales from the ith region for the jth non-zero element in the domestic use or import use table, $FSales_{ik}$ is per capita total sales of the kth GTAP commodity in the ith region, $PGDP$ is the per capita GDP for the ith region, e_{ij} is an error term corresponding to the ith region and jth non-zero element, and β_o, β_k and σ are unknown parameters to be estimated. Equation (1) is estimated on a per capita basis to control for differences in country size. Total sales are obtained by multiplying the predicted per capita sales obtained from equation (1) by population.

The choice of independent variables in equation (1) is dictated by the information that will be available for all regions that do not have an existing I-O table with full GTAP agricultural and food disaggregation. In the most aggregated case, there will be only a single row and column for agricultural and food processing. Thus, the only data available for all regions are the value of production, imports, and exports from the FAO data base and per capita GDP. Note that the value of the index m is allowed to vary across non-zero elements.

Because the per capita sales value in the existing I-O tables can and do take on a value of zero for some regions, equation (1) is estimated using a Tobit estimation procedure. Using a Tobit procedure avoids possible sample selection bias in the parameter estimates. If all per capita sales values are positive in the sample, then the Tobit procedure yields the same parameter estimates as Ordinary Least Squares (OLS).

The maximum sample size used to estimate equation (1) is 49. However, in many instances, the sample size is smaller than 49. Whenever the value of total sales of an agricultural or food commodity is less than $1 million, that region is excluded from the sample. For example, Botswana, Mozambique, Malawi, and Uganda have wheat sales of less than $1 million and these regions are not included in any of the samples used to predict the non-zero elements in the wheat (wht) row of the domestic use table. The rationale for this exclusion is that only the regions that have a "significant" industry should be included in the sample used to predict the magnitudes of the non-zero values. A threshold value of $1 million is chosen based on the data in the existing I-O tables. In most instances, regions with less than $1 million in total sales have different sales patterns than those regions with more that $1 million in total sales.

To provide a specific example of the econometric model utilized, consider the own-use of agricultural and food commodities. The magnitude of per capita own-use of each GTAP agricultural and food commodity is posited to be a linear function of total per capita sales of the

commodity in question and per capita GDP. In general, one would expect a positive relationship between own-use and total sales. Because production practices may differ between wealthy and poorer regions, GDP is included in the model to attempt to control for differences in the own-use of agricultural and food commodities across regions. Table 8.A.6 lists the Tobit estimates of equation (1) for the own-use of agricultural and food commodities. Per capita total sales are positively and significantly related to the own-use for all agricultural commodities with the exception of oap. Per capita GDP has a significant negative impact on the own-use of gro, osd, oap, cmt, pcr, and b_t.

The econometric models used to predict the value of non-zero elements for the import use table are essentially the same as the models used to predict the non-zero elements in the domestic use table. There are two differences. First, the value of per capita imports is substituted for per capita sales of the commodity in question in the econometric model. For example, the per capita own-use of imported agricultural commodities is specified as a linear function of the total per capita imports of that commodity and per capita GDP. The rationale for the substitution is that the total per capita import value represents its availability for intermediate use or consumption. As such, its role in the estimated equations is the same as the role of per capita sales in determining domestic uses. Second, the models used to predict the level of per capita imports of ctl, oap, ofd, and b_t differ from the models used to predict per capita exports of these commodities. The level of per capita ctl imports is posited as a linear function of own-use domestic sales of ctl and cmt, per capita imports of cmt, and per capita GDP. Similarly, the level of per capita imports of oap is posited as a linear function of per capita domestic sales of oap and omt, per capita imports of omt, and per capita GDP. Higher levels of domestic livestock and meat production are expected to increase livestock imports because larger livestock and meat industries will likely have larger absolute levels of intermediate import usage. Also, an increase meat imports may be associated with higher livestock imports, which may be used to increase domestic livestock production or domestic meat production. Imports of ofd and b_t are posited to be linear functions of the per capita sales of the respective industries and per capita GDP.

8.A.2.3 Determining the Magnitude of Value-Added

Table 8.A.7 provides a partial listing of the parameter estimates used to predict the magnitudes of land, skilled labor, unskilled labor, and capital factor payments for the agricultural and food I-O tables. For each of the primary factors, factor payments are posited as a log-linear function of total per capita sales of each commodity and per capita GDP. Because the data in the existing I-O tables indicated positive factor payments for all GTAP agricultural and food commodities in all regions, an OLS estimation procedure is utilized. Also, the sample size is smaller than that used to estimate domestic and import use because the I-O tables for the Eastern European countries aggregated land and capital together.

Total per capita commodity sales, which measure the relative size of the industry, is positively related to the land, unskilled labor, labor, and capital factor payments. Thus, as an industry gets larger in size, the magnitude of factor payments also increases. Per capita GDP has its largest effects on land and skilled labor factor payments. For half of the agricultural commodities (pdr, gro, v_f, osd, pfb, and ctl), an increase in per capita GDP leads to lower land factor payments. There is no statistically significant relationship between per capita GDP and land payments for the other agricultural commodities. Per capita GDP is positively related to skilled factor payments for twelve of the twenty GTAP agricultural and food commodities (pdr, wht, v_f, osd, c_b, ctl, oap,

cmt, vol, mil, sgr, and b_t) and not related to skilled factor payments for the remaining eight GTAP commodities. The relationship between per capita GDP and unskilled labor and capital are mixed. In agriculture, per capita GDP is negatively related to unskilled labor factor payments for five commodities (pdr, gro, v_f, osd, and pfb) and negatively related to capital factor payments for two commodities (pfb and ocr). In food and tobacco processing, per capita GDP is positively related to unskilled labor factor payments in cmt and vol and negatively related to capital factor payments in pcr. However, per capita GDP is positively related to capital factor payments in sugar processing (sgr).

8.A.2.4 Balancing the Initial I-O Table

All previously identified non-zero elements in the domestic use and import use table are predicted using the parameter estimates, along with estimates of the value of production (or total sales), exports, and imports from the FAO data bases plus estimates of per capita GDP. This is done for all regions listed in the bottom half of table 8.A.1.

The initial agricultural and food I-O table for each region is then balanced using the following procedure. First, for each commodity, the predicted row sum in the domestic use table, plus predicted household purchases, plus the value of exports from the FAO data base is compared with the estimated value of production from the FAO data base. Adjustments are made in individual row elements in the domestic use table and in household purchases in order to equate the predicted value of production with the estimate from the FAO data. Second, the predicted row sum of the import use table plus predicted household purchases of imports is compared with the estimated value of imports from the FAO data. Again, adjustments are made in the individual row elements in the import use table or in household purchases such that the predicted value of imports equals the target value for each commodity. Finally, for each commodity, the column sum in the domestic use table, plus the sum of all factor payments, plus the column sum of the import use table is compared with the target value of production (or total sales). This ensures that all receipts are exhausted on intermediate inputs and primary factors.

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Appendix

Table 8.A.1 Regions With and Without Full Agricultural and Food Sectoral I-O Data

a) Regions requiring Agricultural Disaggregation:	Pakistan	Switzerland	Saudi Arabia
China	Sri Lanka	Norway	United Arab Emirates
Hong Kong	Canada	Armenia	Turkey
Mongolia	Bolivia	Belarus	Egypt
Japan	Brazil	Kazakhstan	Morocco
South Korea	Chile	Kyrgyzstan	Tunisia
Indonesia	Colombia	Georgia	Cote d'Ivoire
Laos People's Democratic	Ecuador	Azerbaijan	Ghana
Republic	Paraguay	Russia	Nigeria
Malaysia	Peru	Ukraine	Senegal
Philippines	Venezuela	Bahrain	Ethiopia
Singapore	Costa Rica	Iran	Kenya
Thailand	Honduras	Israel	Mauritius
Vietnam	Nicaragua	Kuwait	Uganda
India	Panama	Oman	South Africa
	EU27 member countries	Qatar	
b) Regions with 57 Sectors	Albania	c) Regions with all agricultural sectors, but require disaggregation of other sectors:	
Australia	Bulgaria	Argentina	
New Zealand	Cameroon	Guatemala	
Taiwan	Croatia		
Cambodia	Botswana		
Bangladesh	Malawi		
Nepal	Mozambique		
United States	Tanzania		
Mexico	Zambia		
Uruguay	Zimbabwe		
Madagascar			

Editor's note: For a detailed exposition of the sectoral disaggregation of I-O tables in version 7 cycle, please refer to Chapter 8.D.

Table 8.A.2 Non-FAO Producer Prices Utilized and Their Source

FAO Commodity	Price ($/mt)[a]	Source	Description
Soybean Oil	591	USDA, Oil Crops Yearbook	Crude, tank cars, *f.o.b.* Decatur
Groundnut Oil	916	USDA, Oil Crops Yearbook	Peanut Oil, crude, tank cars, *f.o.b.* Southeastern mills
Sunflowerseed Oil	604	USDA, Oil Crops Yearbook	Crude, Minneapolis
Rape & Mustard Oil	1145	USDA, Oil Crops Yearbook	Refined, denatured, tanks, N.Y.
Cottonseed Oil	625	USDA, Oil Crops Yearbook	PBSY, Greenwood, MS
Palm Kernel Oil	695	FAO, Value of Exports[b]	
Palm Oil	728	USDA, Oil Crops Yearbook	Refined, *c.i.f.*, bulk, U.S. ports
Coconut Oil	750	USDA, Oil Crops Yearbook	Crude, tank cars, N.Y.
Sesameseed Oil	2385	FAO, Value of Exports	
Olive Oil	2425	USDA, Oil Crops Yearbook	
Rice Bran Oil	755	FAO, Value of Exports	
Corn Oil	588	USDA, Oil Crops Yearbook	Crude, tank cars, Chicago
Other Oil[c]	1100		
Castor Oil	992	USDA, Oil Crops Yearbook	No. 1, Brazilian tanks, N.Y.
Safflower Oil		USDA, Oil Crops Yearbook	Tanks, N.Y.
Linseed Oil		USDA, Oil Crops Yearbook	Raw, tank cars, Minneapolis
Tung Oil		USDA, Oil Crops Yearbook	Imported, drums, *f.o.b.*, N.Y.
Soybean Cake	192	USDA, Oil Crops Yearbook	49% Protein, Decatur
Groundnut Cake	142	USDA, Oil Crops Outlook	Peanut Meal, 50% Protein SE Mills
Sunflower Cake	80	USDA, Oil Crops Yearbook	28% Protein
Rape & Mustard Cake	125	FAO, Value of Exports	
Cottonseed Cake	136	USDA, Oil Crops Yearbook	41% protein, solvent, Memphis
Palm Kernel Cake	90	FAO, Value of Exports	
Copra Cake	100	FAO, Value of Exports	
Sesameseed Cake	490	FAO, Value of Exports	
Other Oilseed Cake	125		
Sugar, non-centrifugal	100		
Refined Sugar	397	USDA, Sugar & Sweetener Yearbook	Contract No. 5, London Daily Price, *f.o.b.* Europe, spot.
Other Sweeteners[d]	330		
Glucsose Syrup	319	USDA, Sugar & Sweetener Yearbook	U.S. Wholesale list price, Midwest, dry
HFCS-42	345	USDA, Sugar & Sweetener Yearbook	U.S. spot price, Midwest, dry
Cotton	1887	USDA, Cotton and Wool Yearbook	Average price of U.S. cotton, *c.i.f.* Northern Europe
Milled Rice[e]	330		
Thailand	341	USDA, Rice Yearbook	100% Grade B, *f.o.b.*, Bangkok
SW Louisiana	320	USDA, Rice Yearbook	Long grain, U.S. No. 2
Houston, Texan	324	USDA, Rice Yearbook	Long grain, U.S. No. 2
Sunflower Cake	80	USDA, Oil Crops Yearbook	28% Protein
Raw animal fats	510	FAO, Value of Exports	
Edible Offals	1390	FAO, Value of Exports	Value of fresh, edible offals
Meat Meal	295	FAO, Value of Exports	

Continued

Table 8.A.2 Non-FAO Producer Prices Utilized and Their Source (Continued)

FAO Commodity	Price ($/mt)[a]	Source	Description
Soft-fibers, Other	265	FAO, Value of Exports	Export value of Jute
Hard-fibers, Other	560	FAO, Value of Exports	Value of sisal and other agaves
Whole milk	550	FAO, Value of Exports	Value of fresh milk
Butter, Ghee	2900	FAO, Value of Exports	Value of butter
Cheese	4150	FAO, Value of Exports	Value of cheese & curd
Whey	790	FAO, Value of Exports	Value of dry whey
Cream	1960	FAO, Value of Exports	Value of fresh cream

[a] All prices are for 1995 to match time periods with the FAO producer prices.
[b] World value of exports divided by world quantity of exports, FAO Agriculture and Food Trade data base.
[c] The price of other oil is an average of the price of castor oil, safflower oil, linseed oil, and tung oil.
[d] The price of other sweeteners is an average of the price of glucose syrup and high fructose corn syrup, on a dry weight basis.
[e] The price of milled rice is an average of the prices of rice in the U.S. and Thailand.

Table 8.A.3 Sales of GTAP Agricultural and Food Commodities within GTAP Agricultural Sector

GTAP Commodity	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	ctl	oap	rmk	wol
pdr	OU[a]	0	0	0	0	0	0	0	FEED[b]	FEED	FEED	FEED
wht	0	OU	0	0	0	0	0	0	FEED	FEED	FEED	FEED
gro	0	0	OU	0	0	0	0	0	FEED	FEED	FEED	FEED
v_f	0	0	0	OU	0	0	0	0	FEED	FEED	FEED	FEED
osd	0	0	0	0	OU	0	0	0	FEED	FEED	FEED	FEED
c_b	0	0	0	0	0	OU	0	0	0	0	0	0
pfb	0	0	0	0	0	0	OU	0	0	0	0	0
ocr	0	0	0	0	0	0	0	OU	FEED	FEED	FEED	FEED
ctl	0	0	0	0	0	0	0	0	OU	0	0	0
oap	0	0	0	0	0	0	0	0	0	OU	0	0
rmk	0	0	0	0	0	0	0	0	0	0	OU	0
wol	0	0	0	0	0	0	0	0	0	0	0	OU
cmt	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
vol	0	0	0	0	0	0	0	0	0	0	0	0
mil	0	0	0	0	0	0	0	0	0	0	0	0
pcr	0	0	0	0	0	0	0	0	0	0	0	0
sgr	0	0	0	0	0	0	0	0	0	0	0	0
ofd	0	0	0	0	0	0	0	0	FEED	FEED	FEED	FEED
b_t	0	0	0	0	0	0	0	0	0	0	0	0

[a]Own-use of agricultural commodity.
[b]Feed use of crop commodities for livestock production.

Table 8.A.4 Sales of GTAP Agricultural Commodities to GTAP Food Processing Industries and Textiles

GTAP Commodity	cmt	omt	vol	mil	pcr	sgr	ofd	b_t	tex
pdr	0	0	0	0	NZ	0	0	NZ	0
wht	0	0	0	0	0	0	NZ	NZ	0
gro	0	0	0	0	0	0	NZ	NZ	0
v_f	0	0	0	0	0	0	NZ	NZ	0
osd	0	0	NZ	0	0	0	NZ	0	0
c_b	0	0	0	0	0	NZ	0	0	0
pfb	0	0	0	0	0	0	0	0	NZ
ocr	0	0	0	0	0	0	0	NZ	0
ctl	NZ[a]	0	0	0	0	0	0	0	0
oap	0	NZ	0	0	0	0	0	0	0
rmk	0	0	0	NZ	0	0	0	0	0
wol	0	0	0	0	0	0	0	0	NZ

[a] Represents a non-zero element in matrix.

Table 8.A.5 Sales of GTAP Processed Food Commodities to GTAP Food Processing Industries and Other Manufacturers

GTAP Commodity	cmt	omt	vol	mil	pcr	sgr	ofd	b_t	lea	crp
cmt	OU[a]	0	0	0	0	0	NZ[b]	0	NZ	NZ
omt	0	OU	0	0	0	0	NZ	0	NZ	NZ
vol	0	0	OU	0	0	0	NZ	0	0	NZ
mil	0	0	0	OU	0	0	NZ	0	0	0
pcr	0	0	0	0	OU	0	NZ	NZ	0	0
sgr	0	0	0	0	0	OU	NZ	NZ	0	0
ofd	NZ	NZ	NZ	NZ	NZ	NZ	OU	NZ	0	0
b_t	0	0	0	0	0	0	0	OU	0	0

[a] Own-use of GTAP commodity.
[b] Represents a non-zero element in matrix.

Table 8.A.6 Parameter Estimates used to Predict Magnitude of Per capita Own-Use of Agricultural and Food Commodities

Independent Variables	GTAP Commodities									
	pdr	wht	gro	v_f	osd	c_b	pfb	ocr	ctl	oap
Intercept	0.081	-1.88	-0.14	0.68	-0.27	-0.68	-4.78	-0.69	6.17	2.89
	(0.75)[b]	(0.17)	(0.93)	(0.77)	(0.58)	(0.23)	(0.0001)	(0.80)	(0.11)	(0.01)
Per capita GDP	0.00000	-0.00011	-0.00019	-0.00010	-0.00005	-0.00004	0.00005	-0.00017	-0.00018	-0.00015
	(0.96)	(0.14)	(0.03)	(0.33)	(0.03)	(0.23)	(0.50)	(0.22)	(0.46)	(0.02)
Per capita sales[a]	0.011	0.15	0.13	0.051	0.048	0.069	0.36	0.071	0.10	0.0022
	(0.0008)	(0.0001)	(0.0001)	(0.0004)	(0.03)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(0.72)
Number of observations	37	45	49	49	43	49	39	49	49	49
Number of left censored	9	6	4	4	21	17	18	7	15	12
Log-likelihood	-40.91	-122.58	-151.18	-160.89	-52.12	-79.80	-66.18	-162.32	-151.98	-116.37

Continued

Table 8.A.6 Parameter Estimates used to Predict Magnitude of Per capita Own-Use of Agricultural and Food Commodities (Continued)

Independent Variables	GTAP Commodities									
	rmk	wol	cmt	omt	vol	mil	per	sgr	ofd	b_t
	(0.31)[b]	(0.02)	(0.035)	(0.36)	(0.37)	(0.48)	(0.74)	(0.78)	(0.25)	(0.20)
Per capita GDP	-0.00015	0.00001	-0.00028	-0.00031	0.00003	-0.00020	-0.00010	-0.00008	-0.00053	-0.00125
	(0.35)	(0.74)	(0.08)	(0.21)	(0.66)	(0.58)	(0.0070)	(0.31)	(0.16)	(0.083)
Per capita Sales[a]	0.064	0.041	0.15	0.086	0.082	0.13	0.016	0.091	0.090	0.21
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	0.0095	(0.0001)	(0.0001)	(0.0001)
Number of observations	46	41	49	49	48	49	41	48	49	49
Number of left censored	10	24	9	8	7	7	23	8	0	4
Log-likelihood	-140.87	-43.45	-156.74	-178.24	-123.27	-196.00	-49.68	-131.36	-231.33	-243.65

[a] Per capita sales refer to per capita value of domestic production.

[b] Values in parentheses are *p*-values.

Table 8.A.7 Parameter Estimates used to Predict Primary Factor Payments for GTAP Agricultural and Food Commodities

Independent Variables	GTAP Commodities					
	pdr	wht	gro	v_f	osd	c_b
Land						
Intercept	0.033	-2.26	-0.52	0.070	0.068	-1.69
	(0.97)[c]	(0.089)	(0.54)	(0.92)	(0.93)	(0.081)
Per capita GDP	-0.34	-0.21	-0.23	-0.33	-0.35	-0.027
	(0.0007)	(0.27)	(0.065)	(0.055)	(0.0063)	(0.84)
Per capita sales[b]	1.23	1.50	1.016	1.12	1.20	0.78
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0009)
F Value	126.38	39.86	16.67	25.30	33.21	11.44
Adjusted R^2	0.869	0.696	0.452	0.561	0.629	0.387
Skilled Labor						
Intercept	-8.54	-11.36	-9.31	-8.40	-8.78	-11.07
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Per capita GDP	0.53	0.73	0.20	0.45	0.38	0.78
	(0.0001)	(0.0002)	(0.24)	(0.054)	(0.043)	(0.0001)
Per capita sales	0.55	1.024	1.74	0.90	1.10	0.65
	(0.0002)	(0.0002)	(0.0001)	(0.0094)	(0.0003)	(0.0061)
F Value	28.87	60.38	30.59	59.00	31.96	59.51
Adjusted R^2	0.666	0.793	0.615	0.753	0.632	0.785
Unskilled Labor						
Intercept	0.32	-2.38	-0.19	0.31	0.12	-1.69
	(0.62)	(0.12)	(0.79)	(0.53)	(0.87)	(0.0091)
Per capita GDP	-0.23	-0.079	-0.20	-0.22	-0.20	0.080
	(0.0044)	(0.71)	(0.059)	(0.082)	(0.075)	(0.35)
Per capita sales	1.12	1.50	1.17	1.089	1.079	0.83
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
F Value	147.71	37.18	32.71	61.75	40.72	84.14
Adjusted R^2	0.891	0.674	0.625	0.762	0.676	0.826
Capital						
Intercept	-1.20	-3.44	-1.56	-1.56	-1.28	-3.25
	(0.14)	(0.049)	(0.063)	(0.014)	(0.14)	(0.0001)
Per capita GDP	-0.15	-0.11	-0.19	0.086	-0.16	0.17
	(0.12)	(0.65)	(0.12)	(0.56)	(0.22)	(0.11)
Per capita sales	1.028	1.64	1.26	0.69	1.092	0.75
	(0.0001)	(0.0001)	(0.0001)	(0.0025)	(0.0001)	(0.0001)
F Value	63.86	32.03	29.82	39.68	33.45	50.39
Adjusted R^2	0.782	0.646	0.603	0.671	0.631	0.744

[a] All independent variables are in natural logarithms.
[b] Total per capita sales of GTAP commodity.
[c] Values in parentheses are *p*-values.