16.2 EU-12[1]

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16.2.1 Introduction

This chapter documents the procedure for compiling a consolidated input-output table of the European Union (EU) for version 3 of the GTAP data base. The constructed input-output table of the EU 12 captures the economic activity in Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom. It therefore updates the EU 12 integrated input-output table originally elaborated for version 2 of the GTAP data base (Ryan, 1991). Although Austria, Finland and Sweden were going to access the European Union at the time this project was conducted, these new entrances are not included, but are documented in a separate "EU 3" input-output table (compare chapter $ of this documentation). This procedure was chosen to enable analysis of European integrational issues with GTAP.

The documentation is organized as follows. In the second section general characteristics of currently available input-output tables of the 12 EU member countries are described. Thereafter, the procedure to obtain an EU 12 consolidated input-output table disaggregated in accordance with the European System of Integrated National Accounts is discussed. Section 3 then shows how this EU 12 integrated input-output table is mapped to the GTAP concordance. In this regard the disaggregation of the agricultural sector constitutes a particular problem. Section 3 therefore also describes the SPEL data base as well as their usage to obtain the agricultural sector classification

1. This project is one of the results of my collaboration with the Global Trade Analysis Project during my sabbatical year in the department of agricultural Economics at Purdue University. I would especially like to thank Robert A. McDougall, Deputy Director of the Global Trade Analysis Project, Purdue University, USA, who provided considerable expertise and assistance in the construction of this data base. I am also grateful to Peter Ungar and Jos Heuschling (Eurostat, Luxembourg), Wolfgang Wolf (EUROCARE, Germany), Cornelia Nöth (Institute of Agricultural Economics, University of Gießen, Germany) and Karen M. Huff (Department of Agricultural Economics, Purdue University) for their very helpful support of this effort. In addition, I would like to thank the Deutsche Forschungsgemeinschaft, Bonn, Germany, who provided financial support for my sabbatic.

of GTAP. In the last section some specific problems and inconsistencies between the constructed EU 12 input-output tables and the GTAP data base are discussed.

16.2.2 Data source

General characteristics of the national input output tables

The starting point to update the EU 12 part of the GTAP data base includes the search for available information. First, input-output tables are issued by most of the national statistical offices. Depending on the classification used and their preliminary and definitive nature, the amount of information contained in these national tables varies from country to country. Another source for national input-output tables of the 12 EU member countries constitutes the input-output data base of Eurostat. Since the early 60's Eurostat in cooperation with the national statistical offices of the member states has been developing a five-yearly program to compile input-output tables harmonized in accordance with the European System of Integrated National Accounts (ESA). This sectoral classification is the Community version of the United Nations System of National Accounts (SNA) and includes either 59 sectors (designated as R59) or 44 sectors (designated as R44) depending upon the country in question.[2]

The national input-output tables of Eurostat are grouped commodity by commodity. According to this sectoring four different kinds of tables are available:

— Total uses and resources
— Domestic production
— Imports from EU member countries
— Imports from third countries

The table on total uses and resources is obtained by adding domestic production and imports from EU member countries and third countries. Intermediate and final demand therefore include domestic production, services and all imports. The second table - domestic production - reflects domestic goods and services as well as an aggregated row for the total import requirements of production and final use. The import tables represented as a matrices give a detailed sectoral

2. The increased number of sectors in the R59 sector classification is mainly achieved due to a more detailed disaggregation of several energy sectors like coal, lignite, crude oil, natural gas and petroleum products.

breakdown of intra-European trade with EU member states and trade with third countries (Eurostat, 1992c, p 9).

In table 16.2.1 national input-output tables for the recent available years are shown. Most of the input-output tables published by Eurostat are based on the input-output tables that are compiled in the national statistical office of the member states according to their national definitions and sector are time consuming and lead to a time lag between the publication of the harmonized input-output tables and the reported year.

For the year 1985, Eurostat supplies input-output tables for Denmark, France, Germany, Italy, Spain and the United Kingdom with a disaggregation of 59 sectors (R59). The base year of the input-output tables submitted by the Netherlands and Luxembourg is 1987, but they are still disaggregated in accordance with the R59 sector classification. In contrast to that, Ireland provides a harmonized input-output table with 44 sectors (R44) for the year 1985. Table 16.2.1 also shows that not all the 12 EU member countries supply input-output tables to Eurostat. For example, Greece does not report any information, while input-output tables for Belgium and Portugal are only available for 1980. These input-output tables cover 59 and 44 sectors respectively.

The flows in the national input-output tables are expressed in value terms using millions of national currency except in the case of Italy and Spain, where they are expressed in 1000 millions of national currency. Within the program of Eurostat European member states are requested to report data on intermediate demand evaluated at both basic and producer prices, while imports are requested to be evaluated at CIF prices and ex-customs prices. In contrast to that, final demand is evaluated at purchaser prices.[3] Yet, most of the EU member countries are not able to meet these requirements. Depending on the taxation system Belgium, Denmark, Germany, France, Ireland, Italy, the Netherlands and the United Kingdom provide input-output tables representing intermediate demand at producer prices. Denmark and Ireland additionally submit input-output tables at basic prices, while the values of intermediate demand in the input-output tables of Spain and Portugal are reported using producer prices including all net indirect taxes. Unfortunately, tax matrices to convert tables to a common valuation are not available, because in most cases they are considered confidential (Eurostat, 1995a, p 4).

Based on the national input-output tables, Eurostat also computes consolidated input-output tables for the EU 12 expressed in millions of ECU. These integrated EU 12 input-output tables are

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3. The basic price of domestic goods equals the cost for intermediate goods and factors used to produce the good as well as taxes linked to production. Equivalent to that, the CIF price of imported commodities covers the foreign producers price, foreign trade margins and the cost for insurance and transport from the place of production to the border of the importing country. The producer price (excustom price) therefore correspond to the basic price of domestic goods (CIF price of imported goods) plus net taxes on the product. Thus, producer prices are net of all deductible value added tax, but include non-deductible value added tax. The purchaser price correspond to the price paid by the consumer (EUROSTAT, 1992c, p 11).

available for the year 1985 and 1991, but reflect only 25 sectors (R25). Figure 16.2.1 displays the procedure used at Eurostat to compile these tables. In the first step, the available national input-output tables for the year 1985 of Denmark, Germany, Spain, France, Italy and the United Kingdom with a 59 sector classification and the input-output table of Ireland with a 44 sector classification are added to one integrated “Pre-EU-

Table 16.2.1 National input output tables of EU 12 published by Eurostat

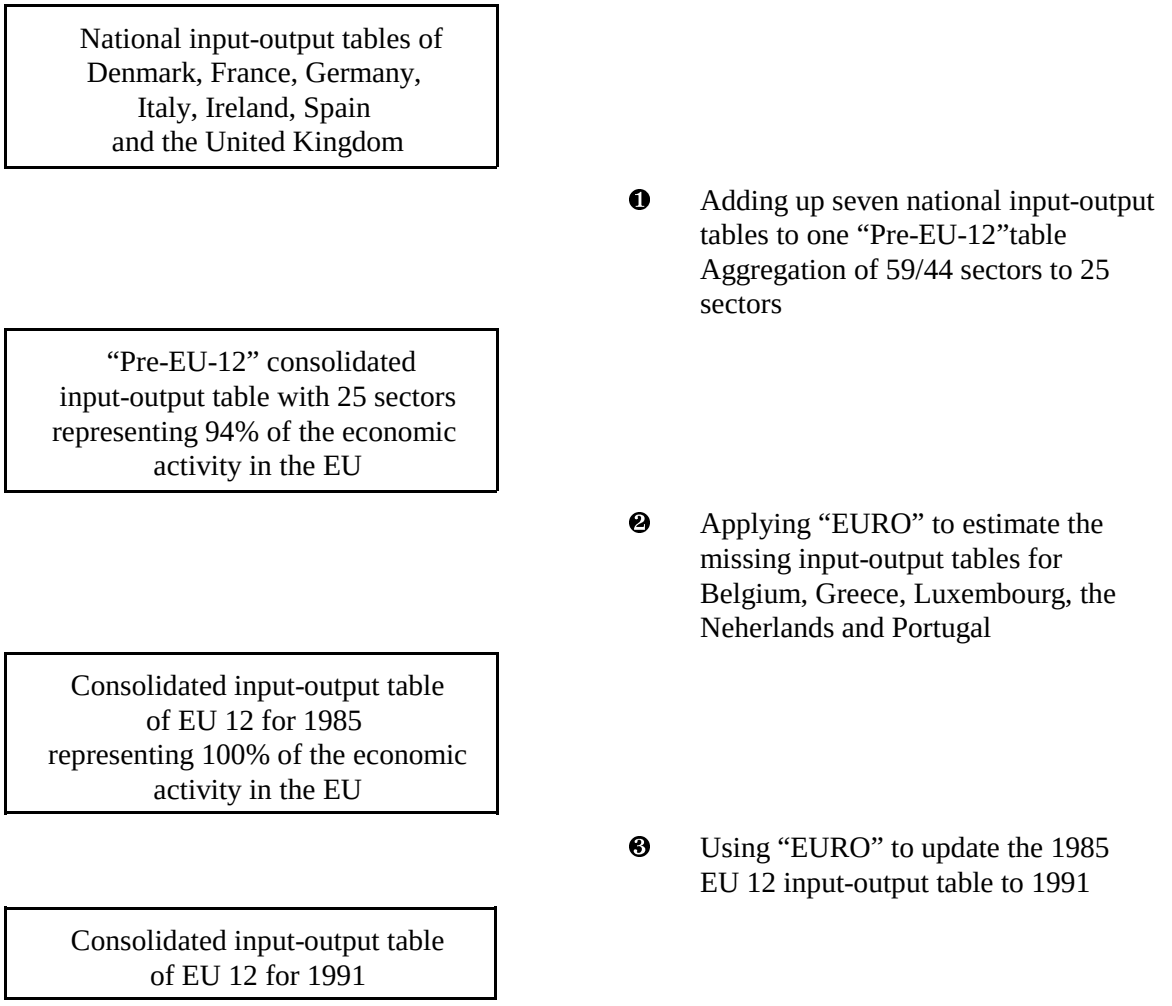
Country	1980	1985	1987	1991
Belgium	R59			
Denmark	R59	R59		
France	R59	R59		
Germany	R44	R59		
Greece				
Ireland		R44		
Italy	R59	R59		
Luxembourg			R59	
Netherlands	R59		R59	
Portugal	R44			
Spain	R44	R59		
United Kingdom	R59	R59		
EU 12		R25		R25

Source: In accordance with Eurostat, 1992c, p 7/8.

Secondly, the missing input-output tables of Belgium, Greece, Luxembourg, the Netherlands and Portugal for the year 1985 are estimated. For this purpose a new methodology has been developed at Eurostat which is called “EURO” The underlying idea of this method is to use official Eurostat statistics as macro targets for iteration, whereby the column and row vectors of intermediate use and final demand are derived as endogenous variables. The outcome of this procedure is a consolidated input-output table of EU 12 for the year 1985 which reflects 100 per cent of the economic activity in the EU 12.

In a third step, the consolidated EU 12 input-output table is finally updated from 1985 to 1991. For this purpose the iteration method “EURO” based on macro economic target variables of official Eurostat statistic is applied again. The resulting input-output table represents the economic activity of the EU 12 for 1991 (Eurostat, 1994a, p 1).

Figure 16.2.1 Development of the Eurostat's input-output table of EU 12 for 1991



Aggregation of National Input-Output Tables to the Consolidated Input-Output Table for the EU 12

Given the national input-output tables currently available, several alternative ways are conceivable to update the EU 12 portion of the GTAP data base. One includes the elaboration of 12 national input-

output tables disaggregated according to the GTAP sector classification. This procedure would certainly be preferable, since it provides the most detailed information about the 12 EU member countries. For this purpose input-output tables published by the national statistical offices could be

used as a starting point. However, because most of these input-output tables vary in their sectoral classification, it would call for 12 more or less different aggregation/disaggregation procedures to map the GTAP concordance. In contrast to that, only one aggregation/disaggregation procedure would be needed if the 6 harmonized national input-output tables issued by Eurostat were used, but the coverage would be incomplete. Accordingly, an additional method must be applied to estimate the input-output tables for the remaining countries, so that they could be represented as a composite region. However, given the time-scale of this project, both ways would not constitute a real alternative.

For this reason, we decided to compile a consolidated input-output table for the EU 12 to replace the former EU 12 portion of the GTAP data base. Comparing the 25 sectors of the EU 12 input-output table issued by Eurostat, it can be seen that this table is much too aggregated to map the GTAP concordance (compare table 1A in the appendix). Accordingly, additional information is needed to disaggregate this 25 sectors input-output table of the EU 12 again. In order to obtain this information, the harmonized input-output tables of the EU member countries are first added up to one “Pre-EU-12” input-output table. In so doing, we first had to decide whether the input-output table of Spain, which reflects a different tax regime, should be include in the “Pre-EU-12” input-output table or not. Since no tax matrix is available for Spain, the former case would incorporate a somewhat »imperfect« input-output table. In contrast to that, neglecting the input-output table of Spain means to disregard approximately 8.5 per cent of the economic activity in the EU 12. Furthermore, Spain is more labor intensive and comparatively lesser developed than the European average. A RAS of the consolidated “Pre-EU-12” input-output table by the Spanish sectoral output therefore does not seem to be suitable. Correspondingly, the six harmonized input-output tables of Denmark, France, Germany, Italy, Spain and the United Kingdom have been chosen to be included in the “Pre-EU-12” input-output table (compare figure 16.2.2). Since these harmonized input-output tables are expressed in national currency, they were converted to ECU using the exchange rates of 1985 shown in table 16.2.2.

Thereafter the tables of domestic production of these six countries are added to one input-output table (Eurostat, 1992a-f). An important issue to be considered in this regard is the treatment of the intra-European trade. Since the final consolidated EU-12 input-output table represents the economic activity in the whole EU, the imports from other EU member countries must also be considered as domestic production. Accordingly, the matrix of intra-European imports is merged with the value of domestic production. Subsequently, several adjustments must be conducted to balance the input-output table again. First of all, the row reflecting the intra-European imports is deleted. Since imports from EU member countries must on the other hand also be exports from EU member countries, the next thing to do would be to delete the column of exports to EU member countries in the final usage table. Unfortunately, the exports to EU member countries and to third countries are not identified separately in all national input-output tables (e.g. in the German input-output table), but combined in one column called “Exports of Goods and Services”. Hence, the convention adopted is that the row sum of the intra-European import matrix is subtracted from the

column of total exports. Due to re-trading, harmonization problems and the absence of Belgium, Greece, Ireland, Luxembourg, the Netherlands and Portugal, the intra-EU imports still does not equal the intra-EU exports. In order to ensure the balance of the table, the required adjustments have been incorporated in the “Change in

Figure 16.2.2 Development of the GTAP's input-output table of EU 12 for 1992

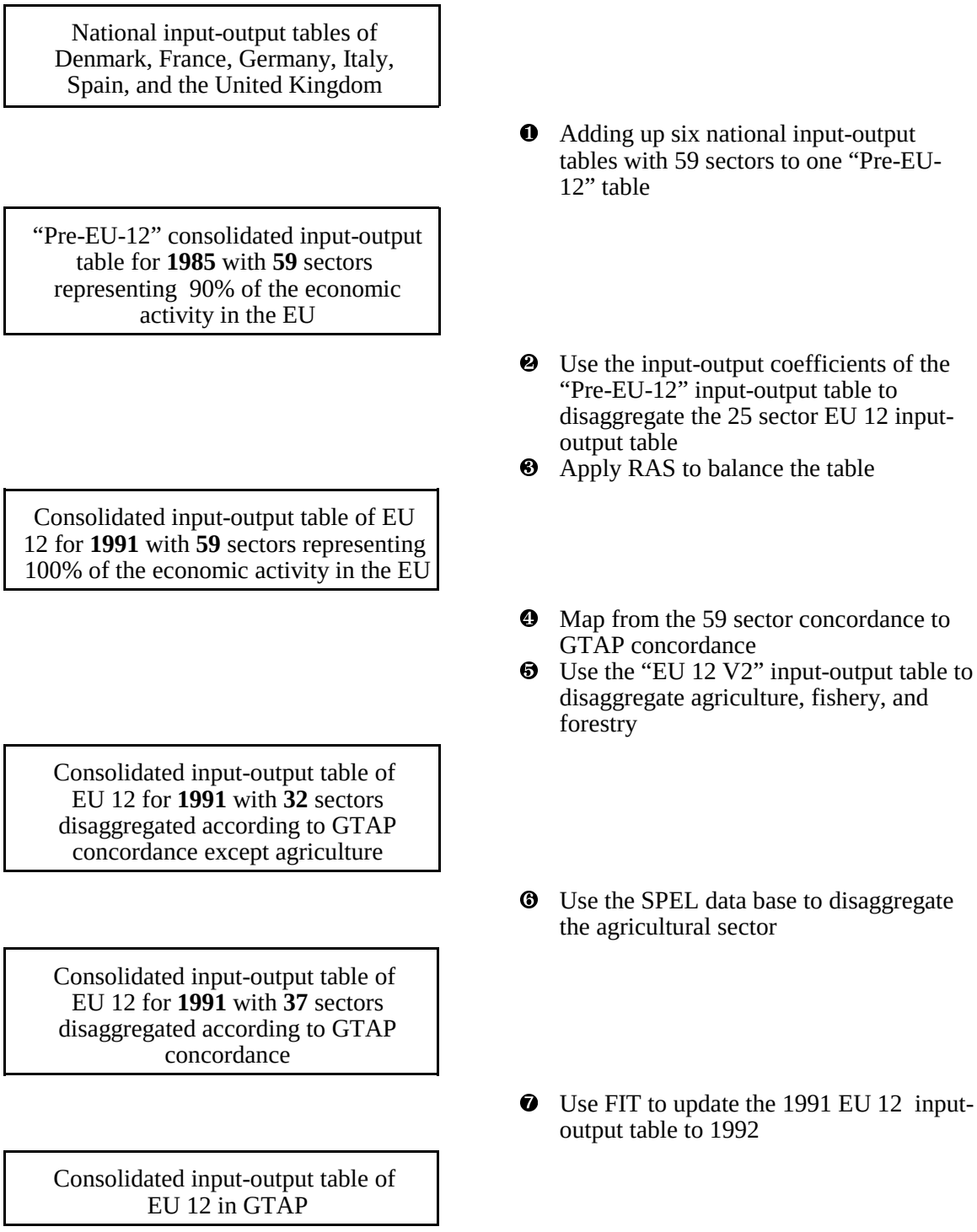


Table 16.2.2 Exchange rate between the national currency and the ECU

Country		Exchange Rate (1 ECU =)
Denmark	DKR	8.01900
France	FF	6.79500
Germany	DM	2.22631
Italy	LIT1	1447.98700
Spain	ESC	130.25150
United Kingdom	UKL	0.58900

Source: Eurostat, National Account ESA, Detailed Tables by Branch, 1994b, p 28

Stocks" column of the final use table. However, these adjustments are less than 1% of the total value for each sector in the "Change in Stocks" column. The resulting "Pre-EU-12" input-output table for 1985 presents a classification of 59 sectors and 90 per cent of the economic activity in the EU (figure 16.2.2).

In a second step the 59 columns of this "Pre-EU-12" input-output table are first aggregated according to the R25 sector classification (compare figure 16.2.2 and table 1A in the appendix). In so doing, a 59x25 sector "Pre-EU-12" input-output table for 1985 is obtained. The input coefficients of this 59x25 sector table are then applied to disaggregate the rows of the original 25 sector EU 12 table for 1991 published by Eurostat. This procedure gives a 59x25 sector EU 12 table for 1991. Finally, the new row sums and the 25 columns of the 59x25 sector table for 1991 are used as target column sums and target row sums to RAS the 59x59 sector "Pre-EU-12" table for 1985 (step 3 in figure 16.2.2). The resulting 59x59 input-output table for 1991 reflects 100 per cent of the economic activity in the EU 12.

16.2.3 Mapping between the Consolidated Input-Output Table of the European Union and the GTAP Concordance

Industrial Sector

The next step to carry out is the mapping between the R59 sector EAS classification and the appropriated GTAP category (step 4 in figure 16.2.2). Table 1A in the appendix shows how the GTAP concordance matches the R59 sector classification used by Eurostat. Since the R59 concordance is more disaggregated than the GTAP classification, it easily fulfills most of the requirements. However, there are two cases where one entry of the R59 classification falls under more than one GTAP category. These items are reported in table 16.2.3.

From table 16.2.3 it can be seen that the ESA category »410 Textile and clothing« groups together “Textiles” and “Wearing apparel”. Hence, this entry would need to be split between the GTAP categories “18 Textiles” and “19 Wearing apparel”. In this case a fifty-fifty split is imposed. Thereafter, a table of

Table 16.2.3 Required disaggregation of the ESA classification

ESA Sector Classification	GTAP Sector Classification
010 Agriculture, forestry and fishery products	1 Paddy rice
	2 Wheat
	3 Grains except wheat and rice
	4 Non grain crops
	5 Wool
	6 Other livestock products
	7 Forestry
	8 Fisheries
410 Textile and clothing	18 Textiles
	19 Wearing apparel

30x30 sectors is obtain where the GTAP categories 9 to 37 are matched, but agriculture, fishery and forestry is still combined in the ESA category “010 Agriculture, fishery and forestry”.

Agricultural Sector

The ESA category »010 Agriculture, fishery and forestry« constitutes a particular problem, because it includes six agricultural sectors (Paddy rice, Wheat, Grains except wheat and rice, Non grain crops, Wool, Other livestock products) and the sectors for forestry and fisheries classified by GTAP. In order to map the complete GTAP concordance, the ESA category »010 Agriculture, fishery and forestry« is first split between three sectors identifying data on agriculture, fishery and forestry (step 5 in figure 16.2.2). For this task information from the EU 12 input-output table contained in version 2 of the GTAP data base (in the following referred to as EU 12 V2) is employed. After aggregating the six original agricultural sectors of the EU 12 V2 input-output table into one sector the sales shares of agriculture, fishery and forestry are calculated and applied to the ESA category “010 Agriculture, fishery and forestry”. This procedure yields an input-output table of 32x30 sectors. Next, the cost shares of the EU 12 V2 tables are utilized to gain the cost structure of agriculture, fishery and forestry. Using the new row sums of agriculture, fishery and forestry as target column sums and the original ESA column “010 Agriculture, fishery and forestry” as target row sums in a RAS procedure, a balanced input-output table of 32x32 sectors is achieved.

In order to split the sector “agriculture” of this 32x32 input-output table between the first six GTAP sectors we employed the SPEL[4] data base published by Eurostat (step 6 in figure 16.2.2). SPEL is a very comprehensive data base including detailed supply and demand oriented accounting tables of the agricultural sector which covers the economic activity of all EU 12 member countries and the EU as a whole in the years 1974 to 1994 (Eurostat, 1994c, p. 11). Because the SPEL data base is designed with the intention to make maximum possible use of the Eurostat’s original data, consistency with the input-output table issued by Eurostat is ensured. The SPEL data base mainly identifies four different kinds of accounting tables:

— Output generation
— Output use
— Input generation
— Input use

The output generation table is grouped commodity by production activity. It reflects physical flows which are defined as quantity per unit of production activity. Therefore, these entries are called activity coefficients. According to the sectoring of the output generation table, it is possible to break down the agricultural production process into different production activities and to show the links within and between sectors. The physical components of the output use table show how the generated output is used within and outside the agricultural sector. Thus, the intrasectoral and intersectoral use table is grouped commodity by use activity including final demand, export and change in stocks. According to that, the input balance displays the input generation within the agricultural sector, the purchases of primary factors and intermediate inputs from other sectors and their use in agricultural production activities.

The SPEL data base also defines a production activity level vector which measures the land use of crop production (number of hectare per production activity) and the livestock of animal production (number of head per production activity). Furthermore, the producer and purchaser prices (defined as united values) as well as the physical components of imports and exports are reported.[5]

Given this information, the output value of a production activity can be computed by multiplying the activity coefficient by the production activity level and the producer price. Because

4. SPEL means Sektorales Produktions- und Einkommensmodell der Landwirtschaft (Sectoral Production and Income Model of Agriculture for the European Union). The concept for this data base was developed at the Institut für Agrarpolitik, Marktforschung und Wirtschaftssoziologie of the University of Bonn by W. Henrichmeyer, W. Wolf and H.-J. Greuel. SPEL not only covers a data base, but also a versatile modeling framework. For more information on the model structure compare Eurostat (1994) Spel System, Methodological Documentation, Volume 1: Basics, BS, SFSS and Volume 2: MFSS, Theme 5, Series E.

5. The SPEL data base includes several other components. This information is not used for the disaggregation of the agricultural sector and therefore not described here. For more information on the SPEL data base compare EUROSTAT, 1995b, 1994c and 1994d.

the SPEL data base takes the value flows within and between the production activities into account, an approximately realistic gross production value flow can be calculated. In contrast to that, the Economic Accounts for Agriculture (EAA) reflects only the intersectoral value flows or so-called net production values. However, if the gross production activity data of the production activities is aggregated, the resulting gross value added at market prices obtained from the SPEL data is identical with that of the EAA (Eurostat, 1994c, p. 16).

Tables 3A and 4A in the appendix show the mapping between the GTAP concordance and the commodities and production activities defined in the SPEL data base. Since the SPEL data base is very detailed, it is easy to match the GTAP classification. The only exception is straw feed, where a fifty-fifty split between the GTAP categories “2 Wheat” and “3 Grain except wheat and rice” is imposed. Using the output and input use table of the SPEL data base, it is possible to create a table which represents information about the intermediate demand within the agricultural sector. Unfortunately, the flows from agriculture to non-agricultural usage categories as well as the flows from non-agricultural sectors to the agricultural sectors can not exactly be identified, because these categories of SPEL database are more disaggregated (compare table 5A and 6A in the appendix). Furthermore, the input items 68 Seed inputs, 70 Fodder: cereals, 71 Fodder: rich protein, 72 Fodder: rich energy, 73 FMIL Fodder: milk and milk products, 74 Fodder: dried, 75 Fodder: fresh and ensilaged and 76 Fodder: other of the SPEL data base contain intrasectoral agricultural sales. Employing information from the output use table of the SPEL data, intersectoral and intrasectoral flows of the agricultural sector can be separated.

In order to gain the missing information, the 32x32 input-output table obtained in step 5 is first aggregated to map the finest aggregation outside agriculture of the table created from the SPEL data base. Utilizing the shares of the SPEL table, the row and columns representing the agricultural sector is split up between the six agricultural categories of GTAP. Next, RAS is applied to the six agricultural columns using the row sums and the aggregated agricultural column of the initial table as target column sums and target row sums respectively. The resulting balanced input-output table reflects full intermediate demand within the agricultural sector, but is more aggregated outside agriculture than GTAP.

The method adopted to disaggregate the categories outside agriculture according to GTAP employs information from the EU 12 V2 input-output table and the 32x32 input-output table obtained in step 5. First, shares of the EU 12 V2 input-output table are used to disaggregate the row representing agriculture in the 32x32 input-output table to the six agricultural sectors defined by GTAP. These initial values are then RASed by the column sums of each usage category defined in SPEL. Accordingly, each cost category defined in SPEL is first disaggregated using shares of the EU 12 V2 input-output table and then RASed by the column sum of the 32x32 input-output table. Thereafter, only the imports of agricultural goods are still combined in one row. In order to complete the final structure of agricultural sector, the coefficients of the domestic agricultural intermediate demand are applied to receive the import matrix.

Other deviations from the GTAP target structure

The data sources used for the construction of the EU 12 input-output table do not supply all information necessary to match the target structure of GTAP. First of all, the value added reported in the input-output table published at Eurostat only differentiates between returns to labor on one side and earnings of capital and land on the other side. In order to identify earning to land and capital separately, shares from a "representative table" (a weighted average of the input-output table for the GTAP data base version 2) is used.

Secondly, no information about commodity taxes and import duties are reported in the original data source. While the commodity taxes are set to zero, the import duties are estimated utilizing the import values from the constructed EU 12 input-output table and duty rates collected for the protection data set of the GTAP data base.

When all calculation had been carried out, the resulting EU 12 input-output table includes two elements (exports of gas and exports of meet) with negative sign. These entries are reset to zero. Thereafter, the EU 12 input-output table is updated using FIT (step 7 in figure 16.2.2) which completes the construction of the EU 12 input-output table for the GTAP data base.

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