The construction of regional SAMs for the RHOMOLO model

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Abstract

RHOMOLO is a spatial CGE model used for ex-ante impact assessment of policy instruments such as the European Cohesion Policy. Since there is no external dataset available for the 267 regional Social Accounting Matrices (SAMs) for the calibration of the model, we have developed an in-house methodology for regionalising the SAMs. First, national SAMs consistent with the model have been constructed based on the Supply and Use Tables (as available from WIOD, base year 2007) and with Eurostat National Account data. Then, the different items of the SAMs have been regionalised in the model code following a cell-specific approach.

First, inter-regional trade flows were estimated that form the backbone of the regional SAMs. In a first step, the estimation is based on prior information derived from the dataset as developed by Thissen, Diodato and van Oort (2013), available for 25 of the 27 EU countries currently in RHOMOLO. For the two countries where no prior information was available, we first combined a gravity model of trade with available national import and export data as macro constraints. In a second step, the prior inter-regional trade flows were made consistent with other RHOMOLO data by solving an optimisation problem minimising the error of estimated and actual trade patterns, given the available national consumption and production constraints. As such, we obtain consistent regional data on supply, imports and exports.

For the remaining parts of the SAMs – and where no reliable additional information was available – cells of the national SAMs have been regionalised proportionally to GDP, assuming the same national technology for each region.

1 Introduction

RHOMOLO is a regional CGE model used for ex-ante impact assessment of policy instruments such as the European Cohesion Policy. It is currently being developed within the European Commission by DG JRC-IPTS on behalf of DG REGIO. The regional structure of the model covers 267[1] EU NUTS2 regions under the European Nomenclature of Territorial Units for Statistics (NUTS[2]).

In order to create consistent regional Social Accounting Matrices (SAMs), we first created SAMs at the country level using national Supply and Use Tables (SUTs) as provided by the World Input Output Database (WIOD[3]) and completed these with data from the National Accounts (available on EUROSTAT, such as social transfers and taxes). In a later stage, we regionalised these national SAMs on a cell-by-cell approach using constraints from regional accounts as available at EUROSTAT and – in some cases – national statistical offices. The result is a fully consistent database of 267 SAMs of the NUTS2 regions covered by RHOMOLO.

This paper describes in detail the method applied in the regionalisation process and is organised as follows. Section 2 provides a summarised technical description of RHOMOLO. Section 3 describes in detail the data that are used for the construction of the national SAMs and the sources for regionalisation. Section 4 describes the approaches that are taken for regionalising each entry in the SAM (from Section 4.1 to Section 4.5). Finally, Section 5 concludes and provides an overview of future steps foreseen to improve the regionalisation.

2 Description of RHOMOLO

This section provides a non-technical overview of the RHOMOLO model. For a more detailed and technical description of RHOMOLO, we refer to Brandsma *et al.* (2013, 2014). RHOMOLO is a spatial Computable General Equilibrium (CGE) model designed to work at the regional level. The model currently consists of 267 NUTS2 regions of the EU27 and covers 6 sectors (agriculture, manufacturing, construction, transport, financial services and

[1] The EU27 has 271 NUTS2 regions, but the four French overseas regions of Guadeloupe, Reúnion, French Guyana and Martinique are not covered by RHOMOLO. We are currently working on a new database for the EU28, including Croatia that joined the EU in on 1 July 2013. For this version, with base year 2007, Croatia was not a Member State and thus not covered by the model.
[2] See for more information http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction
[3] See www.wiod.org and

public services). Each region is inhabited by households that receive income from labour (in the form of wages), capital (profits and rents) and transfers (from national and regional governments). The income is split between savings, consumption and taxes.

Each region contains 6 sectors that produce goods that are consumed by households and the government or used as an input by firms (in the same sector or in the others). Transport costs for trade between and within regions are assumed to be of the iceberg type. Within each region they vary by sector, between regions they vary by sector and region pair. This implies a 267×267 asymmetric trade cost matrix derived from the transport model TRANSTOOLS (Petersen et al., 2009).

Domestically produced and imported varieties are combined using a CES function. Trade and transport margins are applied to imports from other NUTS2 regions and to domestic sales. A CET function defines the sectors' choice between sales on the domestic market and exports to other regions as function of relative prices on these markets. A Leontief function is employed to allocate consumer income between savings and consumption. It is also used to define complementarity between intermediate inputs, inventory changes, depreciation and the labour-capital aggregate of firms on the top level of the sectors' production functions. The lower level of the sector’s production function features the possibility of trade-offs between labour and capital services specified with a CES function. Intermediate inputs are assumed to be non-substitutable.

The national government levies taxes on the income of households, firms and production factors and pays social contributions to the households. Disposable income of regional governments is fully spent on their consumption of final goods and savings.

R&D expenditures at the regional level are linked to Total Factor Productivity (TFP) growth, which can be measured as the part of productivity increases that are not explained by the main inputs to the production process (in RHOMOLO: labour and capital). The main elements assumed to explain the growth in regional TFP levels are R&D expenditures, technology spillovers, distance from the technological frontier and non-R&D expenditures.

Due to its high dimensionality, the model is solved following a recursive static rather than a full dynamic approach. It contains a sequence of short-run equilibria that are related to each other through the build-up of physical and human capital stocks.

3 Data description

RHOMOLO is calibrated to the regionalised Social Accounting Matrices (SAMs) of the EU member states (these SAMs were constructed with the World Input-Output Database[4]). Regionalisation of the EU27 countries' SAMs is done by using the data of regional production by sector, exports and imports. Entropy was employed to balance the rest of SAMs' entries.[5]

Data on bilateral transport costs per sector are provided externally by TRANSTOOLS,[6] a model covering freight and passenger movements around Europe. The costs of different shipments are calculated in terms of share of the value shipped, based on the time needed to reach the destination using alternative modes of transport. Transport costs thus differ by type of good and depend on the distance between the regions and the variety and characteristics of modes of transport connecting them, which also means that they can be asymmetric. The transport costs are measured in Euros and cover the agriculture and manufacturing and energy sectors. In order to calculate regional transport margins, transport costs were divided by the value of bilateral regional trade flows.

Figure 1 provides an overview of the flows in the typical format of a SAM. Section 4 will deal with the regionalisation approach of each flow separately.

Figure 1 A simplified version of RHOMOLO's SAMs

	Commodities	**Industries**	**Value Added**	**Final Demand**	
Commodities		Intermediate Use		Final Use	Exports
Industries	Supply				
Value Added	Taxes less Subsidies on Products	Value Added and Taxes			
Final Demand	Imports		Sources of Value Added	Outgoing Transfers	Incoming Transfers
	Trade & Transport Margins				

[4] World Input-Output Database, http://www.wiod.org/
[5] See Conte and Potters (2013) for a more detailed description of the SAMs and the database used for RHOMOLO.
[6] See Burgess et al. (2008) or visit http://energy.jrc.ec.europa.eu/TRANS-TOOLS/TT_model.html

For the industry detail, data has been collected for 6 industries using the NACE Rev. 1.1 classification, as shown in Table 1.

Table 1: Six NACE Rev. 1.1 industries

CODE	SECTOR
AB	Agriculture, hunting and forestry
CDE	Mining and quarrying + Manufacturing + Electricity and Gas
F	Construction
GHI	Wholesale and retail trade; repair of motor vehicles, motorcycles
JK	Financial intermediation, real estate and business services
LMNOP	Non-Market Services

4 Regionalisation

Due to the high number of regions in RHOMOLO and limited availability of reliable regional data for all 267 regions, the regionalisation procedure is highly constrained. The main requirement for the first version of regionalised SAMs is the consistency of the data amongst all regions. Therefore we started with the variable for which most regional details were available: interregional trade.

4.1 Interregional Trade Flows (imports, exports and domestic supply)

For the regionalised SAMs, data on interregional imports and exports is required, but are not readily available for all 267 regions and for the 6 industries. WIOD provides us with data on the national level that serve as macro-constraints for constructing these interregional trade flows. These macro-constraints are combined with prior data on trade flows developed by Thissen, Diodato and Van Oort (2013). For this exercise, Thissen *et al.* use data from Eurostat for the year 2000 that are then adjusted to the base year of RHOMOLO (2007) by imposing the national macro-constraints. Data are available on (a) locally produced consumption per region, (b) total production in every region, (c) the total consumption in a region and (d) the total international exports and imports on the country level. As such, all regional trade between the regions can be determined. A parameter free transport model was used to determine export destinations, based on the probabilities of trade flows between different regions. These probabilities are derived from data on freight transport, collected from Eurostat micro data of their survey on carriage of goods by road.[7]

Before estimating inter-regional trade flows that are consistent with other parts of the RHOMOLO database, a preceding step is necessary for estimating the inter-regional trade flows for the missing countries in the Thissen *et al.* dataset – Bulgaria and Romania – by using a gravity model of trade and the available macro-constraints. This is described in Section 4.1.1. These trade flows for all 27 EU countries are then used as priors to estimate the trade flows updating the macro constraints from the Thissen et al. database to the RHOMOLO database by solving an optimisation problem minimising the error of estimated and actual trade given the available macro-constraints (Section 4.1.2).

4.1.1 Estimation of inter-regional trade priors for Bulgaria and Romania

4.1.1.1 Available macro constraints

The estimation of inter-regional trade priors for Bulgaria and Romania will be illustrated by a simple 2×3 example (for a formal discussion see Ivanova, Kancs and Stelder, 2009). The example consists of two countries, c1 and c2, each containing 3 regions, *i1*, *i2*, and *i3* (*c1*) and *i4*, *i5* and *i6* (*c2*), and the rest of the word (*RoW*). We have the following available data that serve as macro constraints:

- SAMs (country-level data, as available from the WIOD)
    - The value of goods produced and consumed in each country. In our example *c1* produces and consumes domestically 35, *c2* produces 25, and *RoW* produces 94 units.
    - The SAMs contain information also about transport and trade margins, trade and transport margin. In our example 6 for *c1*, 7 for *c2*, and 0 for *RoW*.
- International trade data (country-level data, as available from the WIOD)

[7] See http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/eu_road_freight_trans_survey

- The bilateral trade flows between countries. In our example *c1* exports 4 to *c2*, and 11 to RoW; *c2* exports 10 to *c1*, and 5 to *RoW*; *RoW* exports 5 to *c1*, and 11 to *c2*.
- The value of goods imported into each country. In our example 56 in *c1*, 47 in c2, and 110 in *RoW*.

- Regional production (regional data, as available from the Eurostat)
  - The regional production (value added). In our example 12 in i1, 15 in i2, 23 in i3, 8 in i4, 11 in i5, 21 in i6.

Table 2: Available macro-constraints

	j1	j2	j3	**c1**	j4	j5	j6	**c2**	**RoW**	**Tot FOB**
i1										12.0
i2										15.0
i3										23.0
c1				**35.0**				**4.0**	**11.0**	**50.0**
i4										8.0
i5										11.0
i6										21.0
c2				**10.0**				**25.0**	**5.0**	**40.0**
RoW				**5.0**				**11.0**	**94.0**	**110.0**
Tot FOB				**50.0**				**40.0**	**110.0**	**200.0**
TT marg				**6.0**				**7.0**	**0.0**	**13.0**
Tot CIF				**56.0**				**47.0**	**110.0**	**213.0**

Note: Regional data; Country data

4.1.1.2 Estimation of domestic exports (from region to country)

For each region, we assume that the share of regional production that is sold within the country and that is exported is the same as at the national level. This implies that *i1* is exporting the same share of its output to *c2* as regions *i2* and *i3* (and thus the same share as *c1* exports to *c2*). Multiplying these shares by the domestic production sold domestically and international trade flows yields domestic sales and exports from each region to each country. In our example *i1* sells 8.4 in *c1*, exports 1.0 to *c2*, and 2.6 to *RoW*.

Note that imposing this assumption amounts to imposing some structure to the data. However, this is necessary when little data is available and/or quality of the data is questionable, as in our case.

Generally, it is possible to skip this step and proceed directly with the estimation of gravity model of trade (Section 4.1.1.3). In such an unconstrained gravity model, all inter-regional trade flows would solely depend on regional characteristics. Yet, such an unconstrained gravity model would yield hardly explainable results, because many unobservable regional characteristics, such as differences in consumer preferences, language, culture, geo-political history, etc., are omitted from the simple gravity model (1). For example, according to the unconstrained gravity model, in relative terms a region in South UK would trade with Germany many times more than a region in North UK, because the South UK region has considerably lower trade costs to all German regions than North UK. Given that such results are not supported by the data, in the case of RHOMOLO it is highly recommended to impose a structure on the shares of regional production which are sold in the country of production and which are exported to each trading partner.

Table 3: Domestic sales/exports from region to country

	j1	j2	j3	**c1**	j4	j5	j6	**c2**	**RoW**	**Tot FOB**
i1				8.4				1.0	2.6	12.0
i2				10.5				1.2	3.3	15.0
i3				16.1				1.8	5.1	23.0
c1				**35.0**				**4.0**	**11.0**	**50.0**
i4				2.0				5.0	1.0	8.0
i5				2.8				6.9	1.4	11.0
i6				5.3				13.1	2.6	21.0
c2				**10.0**				**25.0**	**5.0**	**40.0**
RoW				**5.0**				**11.0**	**94.0**	**110.0**
Tot FOB				**50.0**				**40.0**	**110.0**	**200.0**
TT marg				**6.0**				**7.0**	**0.0**	**13.0**
Tot CIF				**56.0**				**47.0**	**110.0**	**213.0**

4.1.1.3 Estimating a gravity model of inter-regional trade

The third step consists of estimating a gravity model of inter-regional trade. According to Anderson and Van Wincoop (2003), if consumers have CES preferences with common elasticity of substitution σ among all goods, the gravity equation can be expressed as:

Original: (1)

(1) $$P_{ij} = \frac{X_i C_j}{Y_w} \left(\frac{t_{ij}}{\prod_i \prod_j} \right)^{1-\sigma}$$

$$\prod_j^{1-\sigma} = \sum_i \prod_i^{\sigma-1} y_i \, t_{ij}^{1-\sigma}$$

$$\prod_i^{1-\sigma} = \sum_j \prod_j^{\sigma-1} y_j \, t_{ji}^{1-\sigma}$$

where P_{ij} are the inter-regional trade priors we are interested in, X_i and C_j are production and consumption in origin region i and destination region j, respectively, y is the corresponding share, Y_w is total production of all trading partners, t_{ij} are trade costs between i and j, and $\prod_i$ and $\prod_j$ are price indices, which often are referred to as multilateral trade resistance.

Data on regional production and consumption, X_i and C_j, are available from the regional SAMs, inter-regional trade costs, and t_{ij}, are readily available from the TRANSTOOLS data base. Values for the elasticity of substitution, σ, are taken from the literature (Okagawa and Ban 2008)).

Table 4: The estimates of inter-regional trade priors

	j1	j2	j3	**c1**	j4	j5	j6	**c2**	**RoW**	**Tot FOB**
i1	2.8	2.9	2.7	8.4	0.3	0.3	0.3	1.0	2.6	12.0
i2	2.8	3.6	4.2	10.5	0.4	0.4	0.4	1.2	3.3	15.0
i3	5.9	6.3	3.9	16.1	0.7	0.6	0.5	1.8	5.1	23.0
c1	**11.5**	**12.8**	**10.7**	**35.0**	**1.5**	**1.3**	**1.2**	**4.0**	**11.0**	**50.0**
i4	0.7	0.7	0.5	2.0	2.2	1.5	1.3	5.0	1.0	8.0
i5	0.8	1.1	0.8	2.8	2.1	1.9	2.9	6.9	1.4	11.0
i6	1.8	1.8	1.7	5.3	3.5	5.8	3.9	13.1	2.6	21.0
c2	**3.3**	**3.6**	**3.0**	**10.0**	**7.8**	**9.2**	**8.1**	**25.0**	**5.0**	**40.0**
RoW				**5.0**				**11.0**	**94.0**	**110.0**
Tot FOB				**50.0**				**40.0**	**110.0**	**200.0**
TT marg				**6.0**				**7.0**	**0.0**	**13.0**
Tot CIF				**56.0**				**47.0**	**110.0**	**213.0**

According to the gravity model estimates, in our example *i1* sells 2.8 locally, exports 2.9 to *j2*, 2.7 to *j3*, 0.3 to *j4*, 0.3 to *j5*, and 0.3 to *j6* (see Table 4).[8]

[8] Note that in our one sector example expenditure is equal to output.

The above gravity model is only one among many potential gravity models that can be used to estimate inter-regional trade flows. This particular gravity model, however, is well founded theoretically and is widely used in the literature, which explains our choice.

4.1.1.4 Regionalising the trade margins and imports from RoW

The next step concerns the regionalisation of imports from *RoW* and splitting the international trade and transport margins (available from the national SAMs) by importing region.

In absence of regional specific data on trade margins, the most natural way to disaggregate imports from *RoW* is to assume the same regional import shares as of regional imports from other EU countries. According to Table 5, in our example *j1* imports $(\frac{3.3}{10} \times 5.0 =)$ 1.7, *j2* imports $(\frac{3.6}{10} \times 5.0 =)$ 1.8, and *j3* imports $(\frac{3.0}{10} \times 5.0 =)$ 1.5 from *RoW*.

Analogously, the most natural way to disaggregate the international trade and transport margins (from SAMs) by importing region is to attribute these proportionately to the total import shares. According to Table 5, in our example *j1* pays 2.0, *j2* pays 2.2, and *j3* pays 1.8 for transportation services of importing goods.

Table 5: Regionalising trade margins and imports from RoW

	j1	j2	j3	**c1**	j4	j5	j6	**c2**	**RoW**	**Tot FOB**
i1	2.8	2.9	2.7	8.4	0.3	0.3	0.3	1.0	2.6	12.0
i2	2.8	3.6	4.2	10.5	0.4	0.4	0.4	1.2	3.3	15.0
i3	5.9	6.3	3.9	16.1	0.7	0.6	0.5	1.8	5.1	23.0
c1	**11.5**	**12.8**	**10.7**	**35.0**	**1.5**	**1.3**	**1.2**	**4.0**	**11.0**	**50.0**
i4	0.7	0.7	0.5	2.0	2.2	1.5	1.3	5.0	1.0	8.0
i5	0.8	1.1	0.8	2.8	2.1	1.9	2.9	6.9	1.4	11.0
i6	1.8	1.8	1.7	5.3	3.5	5.8	3.9	13.1	2.6	21.0
c2	**3.3**	**3.6**	**3.0**	**10.0**	**7.8**	**9.2**	**8.1**	**25.0**	**5.0**	**40.0**
RoW	1.7	1.8	1.5	**5.0**	3.5	4.0	3.5	**11.0**	**94.0**	**110.0**
Tot FOB	**16.5**	**18.3**	**15.3**	**50.0**	**12.8**	**14.4**	**12.8**	**40.0**	**110.0**	**200.0**
TT marg	2.0	2.2	1.8	**6.0**	2.2	2.5	2.2	**7.0**	**0.0**	**13.0**
Tot CIF	**18.4**	**20.5**	**17.1**	**56.0**	**15.0**	**17.0**	**15.1**	**47.0**	**110.0**	**213.0**

Regional trade margins and regional imports from *RoW* were the last missing entries for completing the full inter-regional trade matrix. Having this information, one can estimate the total consumption and imports for each region in CIF prices. According to Table 5, in our example the total consumption of *j1* is 18.4, 20.5 of *j2*, and 17.1 of *j3*.

4.1.2 The estimation of inter-regional trade flows

4.1.2.1 The estimation problem

The prior information on inter-regional trade (P_{ij}), which is equal to the trade from region i to region j, is used for estimating the bilateral trade flows between the EU regions. First, we introduce the following two new priors that give the *relative* trade information such that the procedure takes possible differences in the overall totals of regional production and consumption into account. These relative priors Px_{ij} and Pc_{ij} are taken relative to the production and demand, respectively:

$$Px_{ij} = \frac{P_{ij}}{\sum_j P_{ij}}$$
$$Pc_{ij} = \frac{P_{ij}}{\sum_i P_{ij}} \qquad (1)$$

The objective function used to estimate the trade flows T_{ij} is given by the following equation:

$$minZ = \sum_{ij}\left[\left(Px_{ij} - \frac{T_{ij}}{X_i}\right)^2 + \left(Pc_{ij} - \frac{T_{ij}}{C_j}\right)^2\right] + \frac{1}{\left(\frac{\sum_i X_i}{\#i}\right)^2}\sum_{ij}\left(X_i Px_{ij} - T_{ij}\right)^2 + \frac{1}{\left(\frac{\sum_j C_i}{\#j}\right)^2}\sum_{ij}\left(C_j Pc_{ij} - T_{ij}\right)^2 \qquad (2)$$

where $\#i$ is the number of origin (exporting) regions and $\#j$ is the number of destination (importing) regions. This objective function consists of three parts. The first part describes the quadratic relative error of the final trade matrix in relation to the prior information. The second and third parts describe the absolute errors which are rescaled such that they have the same weight in the objective function as the relative errors. Note that these trade data include the diagonal and therefore take the cross-hauling of trade into account as well.

We have chosen a quadratic objective function, because it is convenient in solving very large optimisation problems. The quadratic function can be solved as either a conic or a quadratic program which are much faster to solve than the nonlinear logarithmic objective function. An entropy-based optimisation problem would involve changing the objective function into a logarithmic function. This is easy to change from a programming perspective, but cumbersome from a computational perspective.

In order to obtain the trade matrix consistent with the regional consumption and production figures, we add the following two constraints to the minimisation problem:

$$X_i = \sum_j T_{ij} \qquad (3)$$

$$C_j = \sum_i T_{ij} \qquad (4)$$

Note that one of these constraints can be omitted for one region because the system would otherwise be over-determined.

4.1.2.2 Additional constraints

Given the national SAMs, next we add additional constraints where data are available. For instance, we add the country constraints such that the regional trade adds up to the country trade T_{od}^c between origin country o and destination country d:

$$T_{od}^c = \sum_{i \in o} \sum_{j \in d} T_{ij} \qquad (5)$$

Note, however, that this also adds information on the national flows, which if not properly taken into account would result in a bias in the estimate. The estimate should also be on the national level if the international trade is taken as given. The complete optimisation problem together with constraint (5) changes to:

$$minZ = \sum_{ij}\left[\left(PxN_{ijn} - \frac{T_{ij,j\in n}}{X_{i,n}}\right)^2 + \left(PcN_{ijn} - \frac{T_{iji\in n}}{C_{n,j}}\right)^2\right] + \frac{1}{\left(\frac{\sum_i X_{i,n}}{\#i}\right)^2}\sum_{ij}\left(X_{i,n}PxN_{ijn} - T_{ij}\right)^2 + \frac{1}{\left(\frac{\sum_j C_{j,n}}{\#j}\right)^2}\sum_{ij}\left(C_jPcN_{ijn} - T_{ij}\right)^2 \quad (6)$$

where subscript n refers to the set of nations. Together with (6) we have the following set of additional constraints:

$$X_i = \sum_j T_{ij} \quad (7)$$

$$C_j = \sum_j T_{ij} \quad (8)$$

$$X_{i,n} = \sum_{j\in n} T_{ij} \quad (9)$$

$$C_{n,j} = \sum_{i\in n} T_{ij} \quad (10)$$

The relative probability priors Px_{ij} and Pc_{ij} are:

$$PxN_{ijn} = \frac{P_{ij}}{\sum_{j\in n} P_{ij}} \quad (11)$$

$$PcN_{ijn} = \frac{P_{ij}}{\sum_{i\in n} P_{ij}} \quad (12)$$

As a result, a fully completed, consistent and balanced inter-regional trade matrix is obtained, which can be readily used as data input in RHOMOLO. Note that this estimation procedure needs to be performed only once (not for each model run).

4.2 Supply and Use

We start by filling in the Supply columns of the regional SAMs with the regional output by industry and the regional intra- and extra-EU imports, all available from the interregional trade flows and consistent with our national SAMs, as described in Section 4.1. For the Taxes less Subsidies on Products, we apply the share of regional production over national production per industry.

4.3 IOZ+VA+Taxes

For regionalising the cells of Intermediate Use, first the ratio of national Intermediate Demand (by industry and commodity) over the total national Supply is calculated. This share is then applied to the regional total Supply.

For Value Added and Taxes, the share of each industry's regional supply over total regional supply has been applied to the regional total of the Value Added and Taxes (assuming national technology). For balancing regional [IOZ+VA] and regional Supply, entropy has been applied where industry imbalances in Intermediate Demand are redistributed.

4.4 Sources of Value Added and Transfers

The sources of Value Added (wages, taxes and operating surplus and depreciation) also follow the national technology assumption and are thus multiplied by the regional share in national output. Outgoing Transfers, such as Employees' Social Contributions for Households, Social Transfers for the Government are proportional to regional Supply of national Supply.

4.5 Final Demand

Intra-EU and extra-EU exports come from the consistent interregional trade flows. Final Demand (consumption of government, households, investments and inventories) is assumed to be in the same proportion per commodity as on the national level and is balanced with total income for each of the agents.

5 Conclusions and further steps

Currently, more regional detail is being introduced step-by-step in the present consistent regionalised SAMs. Regional data on employment and government consumption are becoming more and more available.

A challenging task will be to link the inter-regional trade cost matrices to trade and transport margins in the SAMs. Whereas bilateral trade costs from the TRANSTOOLS data are expressed as a share of transported goods value, the trade and transport margins in the SAMs use an inter-sectoral flow approach linking those sectors that produce transport services (GHI) to those sectors that purchase transport services (AB, CDE, F, JK, LMNOP). Note that in the SAMs, the transport services sales enter with negative sign, whereas the purchases enter with positive sign. A further complication arises from the fact that for many countries the trade and transport margins in the SAMs are zero, suggesting that trade costs are zero (or the respective goods are non-tradable). These issues need to be addressed conceptually, before the inter-regional trade cost data can be linked to trade and transport margins in the SAMs.

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Annex I: Detailed SAM

		p1	p2	p3	p4	p5	p6	a1	a2	a3	a4	a5	a6	Wages and salaries	Employers' social contribution	Employees' social contribution	Personal income tax	Corporate income tax	Operating surplus, net	Other net taxes on production	Taxes-subsidies on products	Households and NPISH	Government	SavingsInvestments	Changes in inventories	Other regions in EU	Outside EU
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
p1	1																					CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
p2	2																					CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
p3	3							IOZ(reg,sec,secc)														CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
p4	4																					CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
p5	5																					CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
p6	6																					CZ	CGZ	SIZ	SVZ	EEU27Zreg	EROWZ
a1	7	≈XDZ																									
a2	8		≈XDZ																								
a3	9			≈XDZ																							
a4	10				≈XDZ																						
a5	11					≈XDZ																					
a6	12						≈XDZ																				
Wages and salaries	13							LZ	LZ	LZ	LZ	LZ	LZ														
Employers' social contribution	14							EMPSCZ	EMPSCZ	EMPSCZ	EMPSCZ	EMPSCZ	EMPSCZ														
Employees' social contribution	15																					EMPLSCZ					
Personal income tax	16																					TRYZ					
Corporate income tax	17							TYKZ	TYKZ	TYKZ	TYKZ	TYKZ	TYKZ														
Operating surplus, net	18							OSurpl	OSurpl	OSurpl	OSurpl	OSurpl	OSurpl														
Other net taxes on production	19							TAXPZ	TAXPZ	TAXPZ	TAXPZ	TAXPZ	TAXPZ														
Taxes-subsidies on products	20	TAXCZ	TAXCZ	TAXCZ	TAXCZ	TAXCZ	TAXCZ																TaxGov	TaxInv	TaxChInv		
Households and NPISH	21													LTZ					TOsurpl				Gov2HH			EU2HH	ROW2HH
Government	22														22;14	EMPLSCZ		22;17			22;20	TRFZ				EU2Gov	ROW2Gov
SavingsInvestments	23							DEPRZ	DEPRZ	DEPRZ	DEPRZ	DEPRZ	DEPRZ									SHZ	SGZ	TDEPRZ		EU2InvZ	ROW2InvZ
Changes in inventories	24																							ColumnSVZ			ROW2SVZ
Other regions in EU	25	MEU27Zreg	MEU27Zreg	MEU27Zreg	MEU27Zreg	MEU27Zreg	MEU27Zreg															HH2EU	Gov2EU	Inv2EUZ			
Outside EU	26	MROWZ	MROWZ	MROWZ	MROWZ	MROWZ	MROWZ															HH2ROW	Gov2ROW	Inv2ROWZ	SVZ2ROW		
	27	TMTZ	TMTZ	TMTZ	TMTZ	TMTZ	TMTZ																				