Decomposition of the ESA2010 Eurostat net tax matrices and the transformation to GTAP format

Revesz, Tamas.[b], Rueda-Cantuche, J. M.[a], Saveyn, B.[a] Amores, Antonio F.[a], and Mraz, M.[a]

[a]European Commission, Joint Research Centre,
Institute for Prospective Technological Studies

[b]Corvinus University of Budapest

Abstract

To paper describes the so called EU-GTAP conversion/estimation method developed by the European Commission's DG JRC IPTS to produce a set of 'Taxes less subsidies on products' matrices in GTAP format (TLSMG) for the 28 EU Member States for reference year 2010 by using the 2010 EUROSTAT Supply, Use and IO Tables (SUIOTs) and 'Taxes less subsidies on products' (TLS) matrices and a large set of auxiliary statistical data. These SUIOTs and TLS matrices were compiled under the new European System of Accounts methodology (ESA2010, complying with UN SNA2008), therefore the estimated TLSMGs are also in compliance with this methodology.

One of the activities of this exercise is the decomposition of each TLS matrix (originally available in product by industry break-down) to its VAT, excise tax, custom duty, 'other taxes on products' and subsidy components. This decomposition into multiple components goes beyond what is usually required for a GTAP data update. Nevertheless as taxation and pricing is one of the most important policy instruments, a higher degree of detail may make the EU data not only more suitable for tax policy analysis with multi-sectoral models, but also for energy, climate, agriculture and many other policy areas.

The estimation process consists of the following main phases:

1. Estimating the *row-totals* (totals by products) for the component matrices (TLS layers),
2. Estimating satisfactory *initial matrices* (priors) for each TLS layers,
3. Elaborating an *entropy-model* to simultaneously and consistently estimate the TLS layers.

In order to make them consistent with the GTAP9 database format, the estimated TLS layers and the corresponding commodity flows (the IOTs at basic prices or the 'Use tables') have been transformed. The transformation included the conversion from the 64 IOT sectors (based on the NACE Rev.2/ISIC Rev.4 classification) to the rather different 57 GTAP sectors. This required the elaboration of an intermediate classification (IMC) for which neither the IOT<->IMC nor the IMC<->GTAP mappings contain many-to-many correspondences.

To meet the requirements of the GTAP submission the estimated ("transformed") TLS layers are split to domestic- and import-uses related components by considering the scope of these taxes/subsidies and using reasonable assumptions about the tax rates.

To reconcile the so transformed TLS tables with additional statistics and information on the tax system (tax rates, exemptions, etc.) an other entropy model could be used.

The paper presents the Hungarian case in details for which we found many additional data sources and since its special tax system required also special estimating method of its TLS layers.

Keywords: GTAP Data Base; Input-Output Tables; Taxes and subsidies on products; European Union

1. Background

To provide the basis for the revision of the GTAP9 data for the EU for 2011 the European Commission's DG JRC IPTS undertook the task of updating the GTAP database's Input-Output tables for the 28 EU Member States using/transforming the 2010 EUROSTAT Supply, Use and IO Tables (SUIOTs) and 'Taxes less subsidies on products' (TLS) matrices and auxiliary data. Since the reference year of the most recent Input-Output tables is 2010 the same year was chosen. This ongoing work is organised in the frame of the so called EU-GTAP project. Of this project and about the transformation/estimation of the 2010 IOTs in GTAP format see a related paper (Rueda et al., 2016) also to be presented at the '19th Annual Conference on Global Economic Analysis'.

In our paper we deal with the transformation/estimation of the 2010 TLS matrices to TLSMGs. Despite of the common SNA2008 methodological framework (which however, in the details allows for alternative accounting methods) and the Eurostat template table for submitting the SUIOTs and TLS matrices, it revealed that the available data were rather heterogenous methodologically. Naturally, this applies especially to the auxiliary statistical data. Therefore first we tried to develop a pilot model for one country and only later we tried – mutatis mutandis – adapt this to the other Member States (MSs).

Hungary was chosen for this pilot study not only because in Hungary the share of the 'other indirect taxes' are far the highest in the EU, but mainly because for Hungary we found many additional data sources and because its special tax system required a rather sophisticated method for estimating its TLS layers. These additional data notably included the subsidy matrix, which rendered possible the testing of the estimating method of the subsidy matrix and by which we could reduce the decomposition task to that of the gross tax matrix only (i.e. only to the non-negative components of the net taxes).

Then we developed similar pilot models for Germany and Poland where we also could test the accuracy of the decomposition method with the available official TLS layers (compiled according to the earlier ESA95 methodology). Having achieved also satisfactory results (good fit to the official TLS layers) for the biggest West- and East-European economies, we could continue with the decomposition of the TLS matrices (compiled already according to the ESA2010 methodology) of 14 MSs, for which countries all further necessary data were already.

2. The general method to create the TLSMGs

2.1. Decomposition of the TLS matrices

One of the activities of this exercise is the decomposition of the TLS matrix (originally available in product by industry break-down) to its VAT, excise tax, custom duty, 'other taxes on products' and subsidy components. This decomposition into multiple components goes beyond what is usually required for a GTAP data update. Nevertheless as taxation and pricing is one of the most important policy instruments, a higher degree of detail may make the EU data not only more suitable for tax policy analysis with multi-sectoral models, but also for energy, climate, agriculture and many other policy areas.

The decomposition of the TLS matrix makes it more explicit that these different taxes usually affect a selected number of users or products. For example, VAT is paid mostly by the household sector and the budgetary institutions. The excise tax matrix includes only the quantity based 'EU-harmonized' excises taxes on alcoholic beverages, tobacco products and motor fuels. The custom duties concentrate on the manufacturing products, notably on textile, chemical and food products. Finally, even the seemingly rather mixed group of 'other taxes on products' category affects only a few products in most of the EU countries, although the scope of the tax may vary across countries. Taxes such as e.g. the 'general turnover tax' which affected many products are only observed in a limited number of countries. Similarly the subsidy matrix proved to be also rather sparse; (explicit) indirect subsidies are provided by the governments only to a limited products and uses. This feature we exploited fully in our estimation process.

The decomposition drew on a large set of auxiliary data beyond the SUIOTs and TLS matrices.

The estimation process consists of the following main phases:

1. Estimating the *row-totals* (totals by products) for the component matrices (TLS layers),
2. Estimating satisfactory *initial matrices* (priors) for each TLS layers,
3. Elaborating an *entropy-model* to simultaneously and consistently estimate the TLS layers.

The above phases consisted of the following detailed steps:

2.1.1. Estimating the row-totals of each TLS layers

In estimating *the row-totals* of each TLS layers we could mostly use the 'Excise Revenue Tables' and 'National Tax List' data (NTL) of DG TAXUD, the Eurostat's national accounts database and various publications of the national statistical offices, in particular their sometimes more detailed Supply and Use tables and occasionally available tax/subsidy matrices.

Fortunately, in most MSs the '*other product taxes*' are not too significant and in most MSs there are only a few such tax categories. These are listed in the NTLs. For each country each such tax category had to be allocated to products. In most cases (gambling tax, insurance tax, coffee excise tax, fees on entry tickets, etc.) this was straightforward. However, many of other types of taxes (notably stamp duties, general sales taxes, environmental taxes, the Romanian "special fees", or the Spanish "duty on specific means of transport" and "excise duty on certain imported products") needs further studies to refine our assumptions about the affected products. For Hungary the allocation (matching) was based on many data sources which will be presented in the following sections of this paper.

Unfortunately, apparently the statistical offices of the member states are also somewhat puzzled about the affected products (especially if they are expected to allocate even the second-hand products related product taxes to the use of the current sources – production and imports – of products). Since it has become obvious that even in the case of similar taxes the MSs allocate them to different products and users (e.g. the German Statistical office allocates the duties on acquisition of property to the L69 coded "legal services,…", while the Hungarian Statistical Office allocates it partly to construction, partly to the motor vehicles) we have to take into account these accounting differences in the estimation method by allocating them directly to the corresponding cell of the (other product-tax) matrix.

2.1.2. Estimating the prior matrices for the TLS layers

The construction of the initial subsidy- and *VAT-matrices* required much attention. In the case of the VAT-matrices we first estimated the *VAT-base* matrix. This can be formalised as follows:

Let u_{ij} be the components of the Use Table at basic prices where u_{ij} represents the intermediate consumption of the industries (i.e. commodity in rows i and industries in column j) and the column vector of the final consumption (commodities in rows *i and a final consumption in column j).* In addition let X_i and Xn_i be the total output and the non-market output of the commodity *i* and X_j and Xn_j be the same for industry *j*. Data on non-market output can be found in the Eurostat Supply Tables by industry (see reference below). Here we use the X_j/Xn_j shares as proxy for the unknown X_i/Xn_i shares. Let m_i be the total import of commodity *i*.

The table for demand liable to VAT (i.e. the tax base upon which the VAT rates must be applied), B, can therefore be written as:

$$j = \text{industries} \quad \rightarrow \quad b_{ij} = \left(1 - \frac{Xn_i}{X_i + m_i}\right) u_{ij} \left(\frac{Xn_j}{X_j}\right)$$

$$j = \text{final consumption} \quad \rightarrow \quad b_{ij} = \left(1 - \frac{Xn_i}{X_i + m_i}\right) u_{ij}$$

For the investments the VAT-bases are estimated in a similar way as for the final consumption but then these are adjusted proportionately by country and product (investment good) specific adjustment factors representing the share of VAT-exempt investors in the demand for the investment goods.

In addition, the estimation of the effective VAT-base took into account the share of the black economy, the various thresholds, exemptions, discounts, user-specific VAT-rates, and other facts such as whether VAT is accounted on the inventory changes and the exports.

In the case of the *subsidies* even the totals by products are normally missing from the official statistics so that to distribute the total subsidies among the elements of the subsidy matrix prior an EU-average subsidy matrix may be used. In addition we made sure that elements of the subsidy matrix should be at least as big in absolute value as the negative elements of the net tax matrix.

The not directly allocated (see the accounting conventions) *other indirect taxes* by branches could be allocated to the individual *use(r)s* proportionately to the corresponding rows of the Use (or IO) table.

Similarly, to distribute the gas and coal related harmonized *excise taxes* (and the electricity related excise taxes) we use the proportions of the row of the mining sector in the Use (or IO) table. Distributing the alcohol-, tobacco- and refinery-products related excise taxes among use(r)s will be a more

complicated procedure. First by using available data for reference countries (Czech Republic, Hungary) we computed the user-specific alcohol- and tobacco excise tax *shares* in the total expenditure on the 'Food, alcohol, tobacco' (CPA10-12) products and the user-specific motor-fuel excise-tax liable *shares* in the total expenditure on the refinery products. Then these shares were *scaled-up* by the corresponding consumption levels. Finally, these rough or 'would be" excise tax estimates were *adjusted proportionately* to the corresponding (alcohol-, tobacco- or motor fuel-related) total excise tax revenues.

Naturally, based on available direct information on the structure of the tax revenues, it was necessary to enforce certain *caps* on the (user-specific) other product taxes and excise tax estimates, but since these "other taxes on products" are more complex and their mechanisms are less clear, it was more difficult to identify a proper tax base to compute the reasonable lower and upper bound of the implicit tax rates.

2.1.3. Elaborating an entropy-model to re-estimate the TLS layers

The constraints on the individual matrix elements of the entropy model was based on the (usually scarcely) available data such as TLS layers available in official statistics. The adding-up, balancing and inequality constraints of the entropy model served as consistency checks to guarantee that the estimated TLS layers are fully consistent with the available statistics, accounting methods and known tax rules (e.g. the implicit effective VAT-rates should be less than the standard rate).

The objective function (or penalty-function) to be minimized was a quadratic relative distance. When computing the ratios of the estimated variables and their priors in the objective function, we added to both the numerator and the denominator a small value (e.g. 0.1), which allows 0 prior-values to turn to positive if necessary.

Since data availability, accounting methods and the tax system are heterogeneous across the EU Member States, the general entropy model had to take into account country-specific constraints and adjustments in order to be applied to all countries.

Despite the above-mentioned difficulties the entropy model seems to produce reasonable results (even for the subsidy matrix). Investigation of this revealed that this is due to large extent to the fact that in most cells (one cell representing the use of a given product by a given user) the available 'net tax' figure contains only one or two types of taxes (the other TLS layers are zero), therefore the minimization of the relative distance (objective) function pulls the distributable tax/subsidy amounts to the right cells (position) of the relevant TLS layer matrices, even without being informed about the precise tax mechanisms.

2.2. Transformation of the TLS matrices

The TLS tables need to be transformed so as to match the GTAP submission requirements. These require the submission of the domestic and import products related TLS tables in GTAP-sector break-down only but not the TLS layers. However, to be able to estimate the TLS tables in GTAP-sector break-down reliably we had to transform its components (layers) separately. The necessary steps of the process can be summarized in the following subsections:

2.2.1. GTAP-profile cleaning of the TLS layers

Since the sector break-down of the IOTs and TLS matrices are rather different from that of the GTAP, the transformation should include the conversion from the 64 IOT sectors (based on the NACE 2/CPA 2008 classification) to the 57 GTAP sectors. However, at this (usually 2-digits) (dis)aggregation level the correspondence between these IOT sectors and the GTAP sectors is not straightforward. While the 'one-to-many' and 'many-to-one' type correspondences could be dealt with by (dis)aggregation, one has to eliminate the 'many-to-many' type correspondences by a procedure called 'GTAP profile-cleaning' of the IOT sectors. This means the use of an intermediate classification (IMC) for which neither the IOT<->IMC nor the IMC<->GTAP mappings contain many-to-many correspondences.

For the GTAP profile cleaning of the TLS layers (which practically means the reallocation of certain subsectors to others) we used the output value-shares, while for the import taxes the HS foreign trade statistics-based import shares, assuming that the reallocable (usually not too great) components have the same tax rate as the remaining part of their respective sector (preliminary review of the list of these reallocable subsectors suggest that usually this is the case).

2.2.2. Transformation of the GTAP-profile cleaned TLS layers

To transform the GTAP-profile cleaned TLS layers to GTAP branch break-down we used – also as a default - the category-, country- and use(r)-specific *transformation coefficient/share matrices* which were computed by integrating various statistics, like the HS-foreign trade statistics, the Structural Business Statistics (both downloadable from the Eurostat online statistical database) and the earlier GTAP databases, which were used for the similar transformation of the domestic and import IOTs (see more about this in Rueda et al., 2016).

However, in each case – in particular in the case of the alcohol and tobacco-related excise taxes - it was considered how different the tax/subsidy rates were across the components (GTAP-sectors) of the given IOT sectors.

2.3. Reconciliation of the transformed TLS layers

After estimating priors for each transformed TLS layers an entropy model was elaborated and applied again which reconciled the transformed TLS layers with the aggregate TLS matrix and other external indirect tax data and which imposed all balance requirements and other constraints (implicit tax rates, proportions, etc.) on the model estimates of the TLS layers in GTAP-sector break-down.

To test the prospects of refining the method and results, a partly different pilot-entropy model for Hungary was elaborated in order to take into account the very specific characteristics of its tax system.

2.4. Split of the TLS layers into domestic and imported uses-related components

Finally, to meet the requirements of the GTAP submission we split the entropy-model estimated (“transformed”) TLS layers into domestic and imported uses-related components. For this we considered the following:

1. Import duties are rather small and only levied on Ex-EU imports of material products.
2. Other taxes on product (without the excises and the import duties) are also rather little in almost all MSs. From the NTLs we know what type of taxes are behind these figures, therefore it is not too difficult to find out whether they are related to domestic products only or to the imports or both (note, that in the NTL most MSs also filled in the cells for the "other taxes on imports"!).
3. Subsidies, which are also relatively small and concentrated to a few products and user, are related (almost exclusively, with energy products may be the most important exception) to domestic products.
4. As a consequence of the above facts it is feasible to separate the exclusively import- and domestic- products related taxes, while the rest is levied on both (irrespective of their origin, or in modelling terms the composite good is taxed – outstanding examples are the VAT and the excises).

Therefore, the remaining challenge was to distribute the 'origin-indifferent' taxes (i.e. which are levied both on the domestic and import products) between import and domestic uses. This could be done in each cell of the given TLS layer-matrix proportionately to the shares of the corresponding domestic and import uses.

3. The case of Hungary

3.1. Overview

We have carried through this exercise for Hungary, where both all the mentioned official statistics were available for 2010 and from where we could receive considerable methodological information and further unpublished data to be able to estimate plausible 'prior' VAT- and other indirect tax matrices even before reconciling them with the official gross indirect tax matrix. Altogether 38 data sources were used.

We had to reconcile the independently estimated excise tax-, VAT- and other indirect tax-matrices with this gross indirect tax matrix. For this an entropy-model was used which after imposing certain accounting identities, ceilings (for the commodity specific implicit VAT-rates) and shares (e.g the households and investment's share in total VAT-revenues) minimized the squared deviations of the estimated figures from the initial ones.

The estimated figures mostly seem reasonable and the entropy-model made the balancing so that did not modify the initial values too much.

Note, that the staff of the Hungarian Statistical Office compiles similar 'initial' matrices for the main components of the indirect taxes but they do the balancing only for their sum (the aggregate gross or net indirect tax matrix) and do not compute separate 'final' (i.e. consistent with the others) VAT-, excise-, etc. matrices. In any case, they do not disseminate these 'initial' tax matrices, which is understandable not only by imagining their possible weaknesses, but more importantly because official statisticians – unlike researchers - cannot take responsibility for such 'soft' figures. Moreover, these 'initial' tax matrices are compiled partly from casual pieces of 'insider' information and ad-hoc assumptions which they are not too willing to disclose.

In any case, it would be useful to have access to these 'official' 'initial' tax matrices to check and refine our method, but our primary goal was not to compute the statistically most accurate tax matrices only for Hungary, but instead to elaborate a method as general (and as independent of these casual individual data) as possible which can be used for other countries and years. We also wanted to identify the underlying mechanisms (primarily those which are theoretically sound) as much as possible, so that they can be built into the GEM-E3 and other multisectoral models.

3.2. Data

To estimate the TLS layers for Hungary the following main data sources were used:

[1] The **Net Tax matrix** for 2010 in HUF (HU Addit tables_10s.xlsx file, '1630' sheet) compiled by the Hungarian Central Statistical Office (HCSO)
[2] The **Subsidy matrix** for 2010 in HUF (HU Addit tables_10s.xlsx file, '1634' sheet,) compiled by the Hungarian Central Statistical Office
[3] **Supply- Use- and Input-Output tables** for 2010 in Euro (Suiot10HU.xlsx file)
[4] **Use table** at basic prices (HU Addit tables_10s.xlsx file's '1610' sheet)
[5] **GTAP9** pre-release (basedata.hrx file converted to basedata.gdx file by Bert Saveyn)
[6] **2011 exchange rates** against the USD (pa.nus.fcrf_Indicator_en_excel_v2.xls, part of the World Bank Development Indicators)
[7] **2010 exchange rates** against the Euro (AMECO13.xlsx file)
[8] European Commisssion: **Excise Duty Tables – Tax receipts** (Energy products and Electricity, Alcoholic beverages, Tobacco) – publication of the EC Directorate General Taxation and Customs Union (TAXUD) in July 2012 (excise_duties_energy_products_en.pdf, excise_duties_alcohol_en.pdf, excise_duties_tobacco_en.pdf), Ref 1.035
[9] European Commisssion: **Excise Duty Tables – Part II – Energy products and Electricity** – publication of the EC Directorate General Taxation and Customs Union (TAXUD) in January 2010 (excise_duties-part_II_energy_products-en-2010.pdf), Ref 1.030
[10] **National Accounts Data** 2010-2012 (non-financial accounts, 'nasa_nf_tr') of the Eurostat Downloadable Statistical database (nasa_nf_tr_2010-Euro.xls file; in national currency: nasa_nf_tr_2010-Nac.xls)
[11] **Investment by institutional sectors** data of the Eurostat Downloadable Statistical database (INV-EU-nasa.xls file)
[12] **Environmentally Related Taxes**, Fees and Charges - Revenues raised by environmentally related taxes for selected countries – Data of the OECD database (http://www2.oecd.org/ecoinst/queries/Query_2.aspx?QryCtx=2) (EnvTaxHu.xlsx file)
[13] **Consumption expenditure by COICOP-categories** of the Eurostat Downloadable Statistical database (nama_co3_c_eur.xls file)
[14] **Main national accounts tax aggregates** [gov_a_tax_ag] of the Eurostat Downloadable Statistical database (gov_a_tax_ag-Euro.xls file)

[15] **Detailed list of taxes and social contributions** according to national classification –Excel file (EU-TaxRev-ntl_release_20120510.xls file containing country specific sheets) downloaded from the http://ec.europa.eu/taxation_customs/taxation/gen_info/economic_analysis/tax_structures/article_5985_en.htm homepage of TAXUD

[16] CASE (Center for Social and Economic Research) [2014]: '2012 Update Report to the Study to quantify and analyse the **VAT Gap** in the EU-27 Member States' - report commissioned by the European Commission (DG TAXUD) and published in Warsaw, September 2014 (TAXUD/2013/DE/321, FWC No. TAXUD/2010/CC/104 EC VAT-gap) (vat_gap2012.pdf)

[17] European Commisssion [2012]: **'VAT Rates** Applied in the Member States of the European Community – Situation at 1st July 2010' - Taxud.c.1(2010)477911 – EN publication of the EC Taxation and Customs Union (vat_rates_en-2010.pdf)

[18] European Commisssion [2004]: TAXATION PAPERS – **'VAT indicators'** - working paper (No. 2/2004, DOC TAXUD/2004/2004–EN) – publication of the EC Directorate General Taxation and Customs Union (vat_indicators.pdf)

[19] Reckon [2009]: **Study to quantify and analyse the VAT gap** in the EU-25 Member States, study report written for the DG Taxation and Customs Union (TAXUD)(VAT-reckon_report_sep2009.pdf)

[20] Schneider: **The Shadow Economy in Europe**, 2010, Johannes Kepler University of Linz, publication of the A.T. Kearney consulting firm

[21] Magyarország Nemzeti Számlái – **National Accounts Hungary 2009–2011**, Hungarian Central Statistical Office, 2012 (monsz0911.pdf)(see tables 2.7.2., 4.1 and 8.1.2. on the non-market outputs by branches and institutional sectors, on the output of government sector and on the investment by types of investment goods and institutional sector)

[22] '2011. évi CXXXIII. törvény A Magyar Köztársaság 2010. évi költségvetésének végrehajtásáról' (=Law No. 133. on the **execution of the 2010 Hungarian State Budget**), Magyar Közlöny, 121. szám (Zárszám10-mk11121.pdf), 2011 october 19. (see page 30506 on the environment protection product charges)

[23] **2nd Supplement for the Government Budget Report of Hungary for 2010** (Zárszámadás2010-42mell.pdf) (see the break-down of the VAT to housing investments and other expenditures)

[24] **'Tax expenditures' Supplement** of the Government Budget Report of Hungary for 2012 (Zárszámadás2012-adokedvezmenyek.pdf) (see the excise tax refunds)

[25] Állami Számvevőszék [2011]: 'Jelentés a Magyar Köztársaság 2010. évi költségvetése végrehajtásának ellenőrzéséről' (National Audit Office: **Report on the supervision of the execution of the 2010 Hungarian State Budget**) 1117 T/3927/1 2011 August, (Ász-Kv10.pdf) (see page 77 on the excise tax refunds)

[26] **MOL Éves Beszámoló** 2010 (MOL eves jelentes hu.pdf) (see pages 68, 70 and 71)

[27] **MOL-CSOPORT Éves Jelentés** 2010 (MOL-ÉvesJelentés2010.pdf) (see page 144)

[28] NAV Évkönyv 2011 (=**2011 Yearbook of the National Tax Authority**) (NAV_Evkonyv_2011.pdf), Budapest 2012 (see page73 for the break-down of the surtaxes payable by certain industries)

[29] 'Kisadókból származó bevételek alakulása 2010. évben' (=**Revenues from small taxes in 2010**) - Adóvilág , Vol. XV., No. 11. (2011 October) (see page 36 for the innovation tax)
[30] 'Az egyszerüsített vállalkozói adó alanyok gazdasági teljesítményének jellemzöi a 2008. évi bevallások tapasztalatai alapján' (=Business characteristics of the enterprises falling under the **simplified corporation tax** based on the **2008 year's tax returns**) - Adóvilág , Vol. XIII., No. 11. (2009 October) (see page 38 for the simplified corporation tax)
[31] 'A 2010. évi SZJA-bevallások teljes körének átfogó értékelése' (=Comprehensive analysis of the **2010 year's PIT returns**) – Adóvilág, Vol. XV, No. 12 (2011 November), (see page 38 for the real estate rent income)
[32] 'Energiagazdálkodási Statisztikai Évkönyv 2008' (**Yearbook of Energy Statistics 2008**) Energia Központ Nonprofit Kft. Energia Információs Igazgatóság, Budapest, 2009 november (Evkonyv08.pdf)
[33] **Company tax returns by industries**, data delivered by the National Tax Authority in Excel (built into the TASA sheet of the AddRAS10teaor08.xlsm file)
[34] MVM Csoport Konszolidált Éves Beszámoló 2010 (=**MVM Group consolidated financial report for 2010**) (mvm_konsz_jel_2010.pdf)
[35] Magyarország nemzeti számlái, 1995–2013 (=**National Accounts Hungary, 1995-2013**), published by the Hungarian Statistical Office on 17th November, 2014

Further methodological and numerical information was obtained from the staff of the HCSO's Input-Output Department (in particular on the VAT, 'duties on acquisition of property', import duties, environment protection fees and sector specific taxes).

In addition we used various methodological sources regarding the mechanisms of the individual taxes. These we will list in the references section at the end of the paper.

3.3. Estimating the excise tax matrix

Since only a few products are liable to excise taxes it was reasonable to start the estimates of the individual tax matrices with this. In fact, there may be many less significant excise tax-like (not refundable quantity based) taxes, but we decided to include into the excise tax matrix only the so called 'EU-harmonised' excises, i.e. the excise taxes on alcohol, tobacco and fuels. For these harmonised excise taxes the TAXUD publishes both the rates (see e.g. [9]) and the generated revenues (see [8] and [15] which however, occasionally slightly differ, probably due to different stage of revision). These TAXUD publications, however, only display the total revenue of the given taxes without showing their break-down by users.

In the pre-release of the GTAP9 [5] one of the GTAP sectors is the 'beverages and tobacco' which exclude most of the soft drinks (juices are in the other food products' sector) and thereby can be regarded to be a good proxy for distributing the alcohol and tobacco excises[1].

[1] Note, that in many EU-countries wine is excise tax exempt, which on the other hand weakens he correlation of the deliveries of this sector and the excise tax paid by the users.

Based on these initial considerations we elaborated different methods for distributing among users the excise tax revenues for the various fuels and the beverages and tobacco. These are summarised in the following subsections:

3.3.1. Motor fuel excise tax revenues

Fortunately, for Hungary we now have the 'Use table' at *basic* prices compiled for the TIMESUT project [4]. This was the basis of estimating the excise tax base by users, which has been done by the following steps:

In the first step we extracted the figures (row) of the 'Use table' at *basic* prices' [4] for the deliveries of the 'Coke and refined petroleum products' to the various users[2]. Then using [32] we corrected these figures by the likely share of the consumption of the excise tax liable liquid fuels. In other words, since heavy fuel oil, kerosene (petroleum), bitumen (used for road construction) coke, LPG and the non-transportation use of the refinery products are not liable to the excise tax, therefore we removed a proportionate amount of the deliveries of the 'Coke and refined petroleum products'. By doing this we computed a proxy to distribute the *gross* excise tax revenue, which we define as the sum of the actual revenues and the refunds (tax expenditures). Data on the excise tax refunds were found in [24].

In the next step we distributed the gross (or augmented) liquid fuel excise tax revenues across users (industries and final uses). Finally, in the case of the affected industries (agriculture, rail and water transport) we subtracted the excise tax refunds from these estimated gross liquid fuel excise tax revenue figures.

The resulting figures seem to be plausible, after comparing them with other data sources. For example, and most notably, we know[3] that the excise tax content of the motor fuel price is about 1/3. Comparing this with our implicit 34 % estimate for the household consumption (which is the ratio of the estimated 1100 M euro tax and the 3209 fuel consumption at users prices, as found in the Use table [3]) one can see the unexpected accuracy of our fuel excise distribution method.

3.3.2. Other fuel related excise tax revenues

Since in Hungary both electricity and natural gas is liable to the harmonised excise tax [8] although the tax rate is low, we distributed the related excise tax revenues among users separately for the electricity and the gas. For this we used the figures of the corresponding rows of the GTAP9 commodity flow matrices (valuated at 'market prices') as proxies, since only in this database the gas production and distribution is separated from the crude oil production and electricity and heat generation[4].

Then we transformed the estimated data from GTAP to IOT (Nace 2) sector break-down by the transformation coefficient matrix we elaborated for this purpose. In the resulting excise tax matrix in Nace2 break-down the gas-related excise taxes appear in the row of the 'Mining and quarrying' branch

[2] for the road transport sector we took into account only the deliveries of the domestically produced part, since the import in this case is the 'bunker fuel', i.e. which is brought into the country in the tanks of the vehicles, therefore are not taxed in Hungary

[3] for example from the http://topceg.info/tartalom/az-uzemanyagok-afaja-es-jovedeki-adoja-hazankban-es-az-eu-ban website

[4] Although the implicit structure of the deliveries of the latter does not seem to be reliable (98% shows up in the household consumption)

together with the excise tax on coal, which was estimated in a similar way (distributing the mere 15 M euro excise tax revenue proportionately to the GTAP data on coal consumption, and then transforming it to Nace2 break-down).

3.3.3. Tobacco and alcohol related excise tax revenues

Only in the GTAP database the 'alcoholic beverages and tobacco' appear as a separate branch, while both in the Nace 1 and Nace 2 classification based Eurostat IOTs these commodities are included in the 'Food products, beverages and tobacco products' branch. Therefore, similarly to what we did in the case of the 'other fuels' we distributed the related excise tax revenues across users proportionately to the GTAP9 data.

Although we eventually decided to use the GTAP9 data, we found some odd figures among the data on the deliveries of the 'alcoholic beverages and tobacco' branch. In particular, the 'other animal products' ('oap') allegedly used 142 M $ of 'alcoholic beverages and tobacco' products. This 142 M $ figure, amounts to more than 5 % of the gross output.

Therefore we just discarded the 142 M $ figure from the proxy tax base of the alcohol and tobacco excise taxes.

After distributing the alcohol and tobacco related excise taxes to GTAP branches and final demand categories we transformed the results to IOT/Nace2 break-down by the standard GTAP9->Nace2 transformation coefficient matrix. However, as an exception (from the use of the shares of this matrix) in the case of the distribution of the estimated alcohol and tobacco related excise tax paid by the 'trade' sector, we assumed that 80 % was paid by the 'accommodation and food services', while the rest was paid by the 'retail trade services'.

Note, that eventually we estimated that more than ¾ (932 M of the total 1204 M euro) of the alcohol and tobacco related excise tax is paid by the households. Should we get a more accurate figure for this share, we could modify our estimate accordingly.

3.4. Estimating the VAT matrix

The method of estimating the VAT-matrix was pretty similar to the one used for estimating the 2004 and 2007 VAT for the EU-countries and which is described in Revesz [2013]. For 2010 we mostly started from the Use table's figures ([4] in the case of the 'bottom-up' approach and [5] in the case of the 'top-down' approach) to estimate the VAT-base for the individual products and users. VAT-rates were taken from TAXUD [17] and carefully allocated (matched) with the 64 Nace2 branches of the SUIOTs.

When applying the method of Revesz [2013] for 2010 and concretely for Hungary, certain modifications were also necessary/possible.

The main differences in the two approaches can be summarized as follows:

1. We took into account the estimated share of the black economy (only which is imputed into the national accounts and SUIOT figures) the output of which does not pay the VAT, and after the input of which the VAT can't be claimed back.
2. We took into account that the own-consumption of the government services (i.e. the government sector produced market or non-market services used as inputs in the non-market services or delivered to the government consumption) are not taxed (e.g the output of the national TV channels)
3. We took into account that the VAT-rate may differ across users (e.g. a lower rate applies the pharmaceutical products delivered to government consumption than the average VAT-rate of the branch as a whole; within the 'electricity-, gas- and heat supply' the households consumed district heat has only 5 % VAT-rate).
4. We took into account that the exempt part of the deliveries concentrate in special uses (e.g. social housing, social care, actual housing rentals paid by the households, 'travel agency, tour operator and other reservation services and related services')
5. We took into account the under-threshold enterprises do not pay VAT (e.g. in the 'other personal services')
6. The estimation method of the fixed capital investment related VAT was completely revised so that for each investment good the share of the VAT-liable part was estimated separately based on the above considerations and in particular the share of households and the government in the demand for them.

As far as the housing investment is concerned, in [23] we found data on the related VAT. In the case of the vehicles delivered for investment we assumed that – in value - half of them are passenger cars after which the VAT cannot be claimed back even if companies bought them.

The deliveries of the agriculture branch to investment was assumed to be VAT-exempt, since presumably they were mostly own-account investment (i.e. increase of livestock and plantations) - see the method of the Reckon study [19] (page 80, section 256-257). In any case, the 'output for own final use' of the agriculture was about 159 M euro [21] while in the Use table [3] 194 M euro is accounted as the sectors delivery for investment.

In the case of the 'Computer, electronic and optical products' delivered for investment, the share of the enterprises (i.e. the VAT-exempt share) was estimated by the share of the enterprises within the 'investment of computer softwares' category [21].

In the case of the household consumption, where according to the Supply table the trade margin has a high share (electronic goods, food, furniture, etc.) we estimated the VAT-base starting from the purchasers price. Correspondingly, for the wholesale and retail trade branches we set the VAT-content of the trade margin to 0 by setting the VAT-rate to 0.

In the case of the intermediate consumption of various branches (e.g. Scientific research and development, Other personal service activities) we had to realise that the VAT-exempt and VAT-liable parts of the branch have characteristically different input-intensity and input-structure. Therefore we had to estimate the related non-refundable VAT by taking this into account, although in a rough way, by adjusting the 'market-share' of the output suitably.

For example, in the case of the ' Other personal service activities' a higher market share is assumed by assuming that households and NPISHs part is less intermediate input intensive (more labour and capital intensive), thereby leaving a larger share of input-VAT refundable.

3.5. Estimating the matrix of the 'other indirect taxes'

Since 2010 many new type of taxes (although some resemble the medieval taxes) were introduced in Hungary. Many of these mostly branch-specific (or even company specific) taxes count as income or production taxes in the SNA, but quite a few are classified as indirect taxes. Together with the hitherto existed other indirect taxes (most notably the local industry sales tax) in 2010 these indirect taxes made 4.2 % of the GDP. The peculiarity of this (in the EU) extraordinarily high share is that it has increased continuously: from the 3.9 % level in 2009 to the 4.7 % share in 2013. Note that in 2010 in the EU these taxes in average made 1.6 % of the GDP[5] so that Italy came second with its 3.1 % share but still lagging far behind the Hungarian figure. Also note that within these other indirect taxes (which by using their SNA codes can be defined as the D214-D214AA difference) in Hungary the D214I coded so called 'General sales or turnover taxes' is so overwhelming, that it alone made up 3.3 % of the GDP. It is worth adding that this tax is almost unknown in the rest of the EU, since of the 4017 M euro total revenue of these 'General sales or turnover taxes' 3147 was collected by the Hungarian state, while the others received only 870 M euro [14].

Based on the above facts we may reasonably expect that if we manage to find out the mechanisms of these 'General sales or turnover taxes' in Hungary, and succeed in estimating the matrix of the 'other indirect taxes', the elaborated method can be successfully applied – mutatis mutandis – for other EU-countries, where presumably the indirect tax system is much less intricate.

To highlight the problem in the following table we present the components of these 'other indirect taxes' in Hungary for 2010:

Table 1. The components of the other indirect taxes in Hungary in 2010

Name	SNA code	in M HUF	in M €
Company sales tax	D214IA	443093	1608
Simplified corporation tax (without its VAT part)	D213IBb+ D213IBc	71843	261
Duties on acquisition of property	D214CA	77618	282
Innovation contribution	D214IC	22405	81
Import duty	D2121	33420	121
Environment protection fee (on imports 2039 M HUF)	D214AB+D2122CB	17274	63
Sector specific other taxes	D214IE	340344	1235
Of which:Car registration taxes	*D214D*	*30039*	*109*

[5] See my calculations in the AI141:BK143 range in the 'Tables' sheet of the VATmod10HU.xlsx file) based on [10] and [14].

Taxes on entertainment (Cultural contribution)	*D214E*	*1096*	*4*
Taxes on lotteries, gambling and betting	*D214F*	*62718*	*228*
Tax on public financed medicial products	*D214ID*	*28104*	*102*
Surtaxes payable by certain industries	*D214IE*	*191304*	*694*
Alcohol production duty	*D214LA*	*3021*	*11*
Forestry fund tax	*D214LB*	*284*	*1*
Nuclear contribution	*D214LE*	*23128*	*84*
Sugar duties (levy)	*D214LG*	*650*	*2*
Other indirect tax, total		**1005997**	**3652**

Source: [21], 'OthIndTax' sheet of the VATmod10HU.xlsx file, SNA codes are from [15]

We have already mentioned the biggest component, the local tax on company sales revenue, which makes almost half of the total. The second largest component, the 'sector specific other taxes', however, is a rather heterogenous category, therefore we displayed its subcategories. Of these subcategories, the 'surtaxes payable by certain industries', which still make 19 % of the total 'other indirect taxes', is still quite heterogenous, as one could guess it from its name. Unfortunately, the standard national accounts publications ([10], [[14], [15], [21]) do not show the further details of this subcategory.

By consulting additional sources we identified the following sub-subcategories:

Table 2. Components of the 'surtaxes payable by certain industries' in 2010

Name	Source	in M HUF	in M €
Surtax on financial institutions	[21]	39611	144
Surtax on retail trade	[28]	28942	105
Surtax on telecommunication companies	[28]	58576	213
Surtax on energy suppliers	[28]	64175	233
Of which on: Electricity and heat supply	*Computed residually*		*121*
Gas supply	*Own estimate (with 1,05% tax rate)*		*66*
Refinery industry	*Own estimate (with 1,05% tax rate)*		*46*
Other energy suppliers			*?*
Surtaxes payable by certain industries, total		**191304**	**694**

Source: 'OthIndTax' sheet of the VATmod10HU.xlsx file

We also learnt that of the 39611 M HUF surtax on financial institutions 38000 was paid by the insurance companies[6]. As far as the surtax on energy suppliers is concerned it was impossible to find

[6] http://www.biztositasiszemle.hu/cikk/elemzesek/drasztikusan_csokkent_a_hazai_biztositok_jovedelmezosege.177.html

consistent data on its break-down by energy industries. To separate out the gas- and refinery supply related components of the 'surtax on energy suppliers' we multiplied by their respective sales revenues (approximated by the total supply at basic prices in the Supply table[7] [3]) by the 1.05% official tax rate (see Leitner [2013], p. 13.). The resulting 66 and 46 M euro figures correspond to 18.1 and 12.7 Bln HUF, which is fairly consistent with the 19.4 Bln HUF paid by the MOL alone for its both profile.

Similarly it was impossible to find direct data on the 'electricity and heat supply' related component of the surtax. Therefore we computed the 'electricity and heat supply' related surtax residually.

3.5.1. Allocation of the 'other indirect taxes' to branches

Since the dimension of the tax matrices are commodity by agent (industry and final use/r/s) we had to estimate an 'other indirect taxes' matrix of the same dimension. The row-totals of this matrix represent the commodity break-down of the 'other indirect taxes' related to the supply of the given commodity. In the following subsections we present the method of the allocation of the individual components of the 'other indirect taxes' to such defined (i.e. by commodity groups) branches. The results can be seen in the following table:

Table 3. Allocation of the 'other indirect taxes' to IOT branches

[7] Note that unfortunately, but allegedly according to the Eurostat methodology, in the Input-Output table compiled in industry-break-down the imported gas is shifted to the industry of its main domestic producer, i.e. to the refinery industry / C19/ or to less extent to the gas distribution /D35/)

PRODUCTS (CPA*64)	code	Other indirect tax by commodity, total, computed as sum of components	Company sales tax	Simplified corporation tax	Duties on acquisition of property	Innovation contribution	Import duty	Environment protection fee (on imports 2039 M HUF)	Sector specific other taxes
		components of the other taxes (se also in EU-TaxRev-ntl_release_2012.xls)							
\ in Bln Na.c.->		1005997	443093	71843	77618	22405	33420	17274	340344
\ Million € ->		3652	1608	261	282	81	121	63	1235
Products of agriculture, hunting and related services	A01	20	17	0			2		
Products of forestry, logging and related services	A02	7	3	2			0		1
Fish and other fishing products; aquaculture products;	A03	0	0	0			0		
Mining and quarrying	B05	81	15	0		1	0		66
Food products, beverages and tobacco products	C10	77	57	1		2	3		13
Textiles, wearing apparel and leather products	C13	21	10	1		0	9		
Wood and of products of wood and cork, except furnit	C16	6	4	1		0	1		
Paper and paper products	C17	19	6	0		0	1	11	
Printing and recording services	C18	13	7	0		0	0	5	
Coke and refined petroleum products	C19	90	14	0		1	10	19	46
Chemicals and chemical products	C20	29	16	0		1	12		
Basic pharmaceutical products and pharmaceutical pr	C21	134	25	0		1	7		102
Rubber and plastics products	C22	44	23	1		1	7	13	
Other non-metallic mineral products	C23	17	13	1		0	2		
Basic metals	C24	17	12	0		1	4		
Fabricated metal products, except machinery and equ	C25	46	36	3		1	5		
Computer, electronic and optical products	C26	58	31	0		4	22		
Electrical equipment	C27	56	13	0		1	24	18	
Machinery and equipment n.e.c.	C28	45	43	0		2	0		
Motor vehicles, trailers and semi-trailers	C29	229	57	0	54	3	5		109
Other transport equipment	C30	4	3	0		0	1		
Furniture; other manufactured goods	C31	12	8	2		0	2		
Repair and installation services of machinery and equi	C33	16	13	3		0	0		
Electricity, gas, steam and air-conditioning	D35	306	92			6	3		205
Natural water; water treatment and supply services	E36	11	11			0	0		
Sewerage; waste collection, treatment and disposal a	E37	17	16			1	0		
Constructions and construction works	F41	399	157	9	227	5	0		
Wholesale and retail trade and repair services of moto	G45	37	25	1		11	0		
Wholesale trade services, except of motor vehicles an	G46	139	137	1		0	0		
Retail trade services, except of motor vehicles and mo	G47	168	52	12		0	0		105
Land transport services and transport services via pipe	H49	45	41	0		4	0		
Water transport services	H50	0	0	0		0	0		

PRODUCTS (CPA*64)	code	Other indirect tax by commodity, total, computed as sum of components	Company sales tax	Simplified corporation tax	Duties on acquisition of property	Innovation contribution	Import duty	Environment protection fee (on imports 2039 M HUF)	Sector specific other taxes
		components of the other taxes (se also in EU-TaxRev-ntl_release_2012.xls)							
\ in Bln Na.c.->		1005997	443093	71843	77618	22405	33420	17274	340344
\ Million € ->		3652	1608	261	282	81	121	63	1235
Air transport services	H51	2	2	0		1	0		
Warehousing and support services for transportation	H52	84	**82**	1		2	0		
Postal and courier services	H53	15	14	0		0	0		
Accommodation and food services	I55	20	17	1		2	0		
Publishing services	J58	12	12	0		0	0		
Motion picture, video and television programme produc	J59	10	8	0		1	0		
Telecommunications services	J61	272	58	0		1	0		213
Computer programming, consultancy and related serv	J62	45	41	2		1	0		
Financial services, except insurance and pension fund	K64	*70*	54	0		10	0		6
Insurance, reinsurance and pension funding services,	K65	153	13	0		3	0		138
Services auxiliary to financial services and insurance s	K66	25	17	6		2	0		
Real estate services (exluding imputed rent)	L68	**83**	65	16		2	0		
Imputed rents of owner-occupied dwellings	LIR	0	0	0			0		
Legal and accounting services; services of head office	M69	150	43	105		1	0		
Architectural and engineering services; technical testi	M71	59	33	25		1	0		
Scientific research and development services	M72	5	4	0		0	0		
Advertising and market research services	M73	31	28	3		0	0		
Other professional, scientific and technical services; v	M74	18	7	11		0	0		
Rental and leasing services	N77	24	22	1		1	0		
Employment services	N78	11	11	0		0	0		
Travel agency, tour operator and other reservation serv	N79	15	14	1		0	0		
Security and investigation services; services to buildin	N80	73	55	16		2	0		
Public administration and defence services; compulso	O84	0	0				0		
Education services	P85	13	5	8			0		
Human health services	Q86	16	16	0			0		
Social work services	Q87	**14**	0	13			0		
Creative, arts and entertainment services; library, arch	R90	255	20	2		1	0		232
Sporting services and amusement and recreation serv	R93	3	1	1		1	0		
Services furnished by membership organisations	S94	0	0	0		0	0		
Repair services of computers and personal and house	S95	3	2	1		0	0		
Other personal services	S96	14	4	9		1	0		
Services of households as employers; undifferentiated	T97	0	0				0		

Source: 'OthIndTax' sheet of the VATmod10HU.xlsx file

3.5.2. Company sales tax

The tax is payable after the adjusted net sales revenue. Adjustment essentially means the subtraction of the following costs: cost of purchased goods for sale, cost of materials, cost of distributed services. Data for these we obtained from the National Tax Authority [33]. Since this is a local tax, the HCSO does not have any details of it which would render possible the computation of its branch break-down. We could find branch-level data only for the refinery industry (as discussed before) and the banking sector

(CPA code K64). According to the March 3 2014 announcement of Levente Kovacs, the chief secretary of the Association of Banks the sector pays annually 20-30 Bln HUF such tax (see http://privatbankar.hu/penzugyek/smink-nelkul-tovabbra-is-szamottevo-a-bankszektor-vesztesege-266537). Allowing for growth and inflation for 2010 we assumed that the lower figure applied.

As far as the other branches are concerned we distributed the remaining tax revenue proportionately to the above mentioned adjusted sales revenues. The results seem plausible with the exception of only a few branches. The estimate for the 'warehousing and support services for transportation' and 'real estate services' seem to be too high, which suggest that in these (in accounting terms) special branches there could be certain exemptions and/or further deductions from the tax base.

3.5.3. Simplified corporate tax

Small companies may opt for this tax, which replace the VAT, the PIT and the corporate income tax. In [15] their respective share is shown as 60.8, 28.4 and 11.1 per cent. It means that of the total amount of 181880 M HUF 110037 had to be shifted the VAT-matrix (clearly when we estimate the VAT-matrix using the commodity specific rates we do not consider whether the seller is registered as a 'simplified corporate tax' payer or not). Therefore we had to distribute here only the remaining 71843 M HUF revenue among branches. To do this the best we could use was an article of the journal of the National tax Authority [30] which presented the 2008 revenues by 12 branches, of which the manufacturing industry was only one. Only for the 'Legal and accounting services; services of head offices; management consulting services' we could get a quote for its share in the total from the HCSO experts (so that this branch pays almost 60 % of the total), which we duly built into our Excel-table as far as it could fit into the figure for the total indirect tax on that service shown by the gross tax matrix [1],[2]. Apart from this individual case, we distributed the tax revenues within these 12 aggregate branches proportionately to the national accounts' data on the mixed income of the households [21]. According to the experts of the HCSO, however, only 30 % of the 'simplified corporate tax' paying companies belong to the household sector. Although it may qualify the reliability of this proxy used for the distribution, we think that the branch-structure of the remaining 70 % of the 'simplified corporate tax' paying companies cannot be too different from those which formally belong to the household sector. Indeed, many households establish corporations (more than one owner companies) to minimise tax and personal responsibility, but they operate in a similar way (low scale, etc.) as their counterparts which belong to the household sector.

In any case, the total amount of this tax is not too big, therefore for the time being it was not worth trying to refine our distribution method.

3.5.4. Duties on acquisition of property

The distribution of this tax among branches raised a quite challenging methodological problem: Since these duties are partly related to goods which were not produced at all or at least not in the given year, in theory, they should have been omitted from the allocation procedure. However, for some reason – probably partly because the statistical authorities do not have precise data on their share and partly because the tax implications are estimated in a long run, the HCSO experts allocated these duties partly to motor vehicles, partly to construction (which represent the dwellings acquired in the given year). Of the

total 77618 M HUF, they claim that about 15 Bln HUF was allocated to the vehicles while about 62 Bln HUF for construction.

3.5.5. Innovation contribution

Although the 22405 M HUF revenue in 2010 was not too significant it is a fast growing item of the Hungarian tax system: In 2013 it reached at 62 Bln HUF due to the elimination of many exemptions. Similarly to the simplified corporation tax we could find some statistics to distribute the total revenues among branches only in an other article of the journal of the National tax Authority [29] which presented the 2010 revenues by 11 branches, of which the manufacturing industry was again only one. Without having any better proxy, we distributed the innovation tax revenues within these 11 aggregate branches proportionately to the national accounts' data on the gross output (market output) of the firms [3],[21] by assuming that the agriculture is not liable to this tax either.

3.5.6. Import duties

The experts of the HCSO provided concrete figures about how much they accounted for the individual branches. These directly quoted data are displayed by red in Table 3 in the column of the import duties. We also assumed that the imported mining products (essentially crude oil and natural gas) and the machinery and equipment are exempt from the custom duty since they are energy and investment goods. Therefore the rest of the custom duties (the red figures subtracted from the total) was distributed among the other branches proportionately to the corresponding value of the 'import products from non-EU regions' as found in the Input-Output table[8] [3].

3.5.7. Environment protection fee

Even if we add together the import and domestic product related fees, the total 17274 M HUF fee (in other words 'environmental protection product charge'), which is 63 M euro, is not too significant. In the government budget report [22] we found its break-down by commodity groups. With the exception of the 'packing materials' we could allocate them to branches relatively easily, while we distributed the 'packing materials' related product charges proportionately to its likely producing branches.

3.5.8. Sector specific other indirect taxes

Having figured out the components of this tax in great detail it was relatively easy to allocate them to branches. However, this allocation inherited the uncertainties about the amount of the individual types of these taxes mentioned in the beginning of this section.

3.5.9. Distributing the ‘other indirect taxes’ among users

By adding together the above components by branches we get the estimate the total ‘other indirect taxes’ by branches too. This can be seen in the first column of Table 3.

Then for each branches we distributed the related total ‘other indirect tax’ among users proportionately to a proxy ‘tax base’. Since for most branches the dominant component of the ‘other indirect taxes’ is a tax which applies only the domestic suppliers (concretely the company sales tax, the

simplified corporation tax, the innovation contribution and many of the sector specific other taxes) for them we choose the deliveries of the domestic goods (output) to the various industries and final uses (as shown by the domestic component of the Use table at basic prices in [3]) as this proxy tax base.

For those few branches where apparently the dominant component of the other indirect taxes are the custom duty or taxes which are levied on both the domestic and imported commodities (duties on acquisition of vehicles, environment protection fee, or similar sector specific taxes (e.g. the vehicle registration tax or the surtax on energy suppliers) we choose the Use table at basic prices [3] as the proxy tax base. These branches were the mining (B05), the chemical products (C20), the computers, electronic and optical goods (C26), the electrical goods (C27), the motor vehicles (C29) and the electricity-gas-heat supply (D35)[9]. However, most likely the duties on acquisition of property and registration tax falls (disproportionately) on household consumption and investment. Therefore in the distribution of the other indirect taxes on motor vehicles we omitted the uses of the same industry of these products, assuming these are only parts of vehicles not liable to these stamp duties. Similarly, we omitted the exports of motor vehicles, which certainly are not subject to such stamp duties either.

Having done these distributions among users we got the initial matrix for the 'other indirect taxes'.

3.6. Reconciliation of the initial tax matrices with the gross tax matrix

Naturally, the above compiled initial excise-, VAT- and other indirect tax matrices are not fully consistent with the gross indirect tax matrix: the figures of the corresponding cells (i.e. the use of a given commodity by a given user) do not add-up. Therefore we developed an entropy-model which could eliminate the gaps between the gross matrix and the sum of its components. The model is programmed in GAMS.

The equations/inequalities (denoted below by their GAMS names) of the model do roughly the following:

EVATtot : Prescribes, that the total estimated VAT should be equal to what is in the national accounts augmented by the VAT component of the Simplified Corporate Tax.

EVATHCon: Prescribes that the share of the total household consumption related VAT should be equal to what was computed by the TAXUD/2013/DE/321 study as shares in VTTL (VAT total liability)

EVATAccu: Prescribes that the share of the total capital accumulation related estimated VAT should be equal to what was computed by the TAXUD/2013/DE/321 study as shares in VTTL

EExciTot: Prescribes that the estimated excise tax totals by commodities should be equal to the original ones (the row-totals of the excise tax matrix should not change)

ETaxId10 and ETaxFd10: For each elements of the estimated tax matrices (intermediate block and final demand block alike) the corresponding elements should add-up to the official totals (gross indirect tax matrix)

[8] But bear in mind the problem mentioned in the previous footnote on page 16 !

[9] We omitted the refinery products (C19) of this group, because the related custom duty might be exaggerated and more importantly because the surtax on energy suppliers probably does not apply to those imported refinery products which are used as input by the refinery and chemical industries. In general this surtax applies only the final energy products.

EOInTCGDS: Only the capital accumulation components of the estimated 'other indirect taxes' can be negative (taking into account the possibly negative elements of the stock accumulation). In addition it is earlier prescribed that all elements of the estimated VAT- and excise-tax matrix should be non-negative.

EVATmaxId, EVATmaxFd: The implicit VAT-rates (estimated VAT/value of the related goods at producer price) should not be higher than the standard VAT-rate or 120% of the initially estimated effective branch-specific rate.

Eobj: The total error (entropy) is computed as the sum of the squared relative errors of the elements.

Finally the SOLVE statement instructs the computer to find a feasible solution of the model which minimizes this aggregate error.

Note, that although it is not explicitly prescribed, the total amount of the 'other indirect taxes' will automatically - residually - be equal to the required national accounts figure minus the VAT content of the Simplified Corporate Tax.

3.7. Overview of the results

In table 4 we present the main results (the row- and column-totals of the estimated TLS layers) and in table 5 the ratios of these entropy-model estimated values to the initial ones (prior values). As one can see, the estimated figures mostly seem reasonable and the entropy-model made the balancing so that did not modify the initial values too much.

Finally, to illustrate the results of the transformation of the TLS layers to GTAP sectors, in tables 6 and 7 we present the GTAP-sector- and tax-type- specific implicit tax shares in the household- and intermediate- consumption respectively. Naturally, the intermediate consumption related tax shares are the average of the individual production activities. Therefore, from table 6 – which refer to a single user, the households – one can see more clearly the strengths and weaknesses of the transformation method. In particular: while the rates are quite reasonable/plausible (e.g. the excise tax- and VAT-rates are much lower in the intermediate consumption) and this suggests that the decomposition – which took place in the IOT (Nace 2) sector break-down – was quite successful, splitting the IOT sectors related results to corresponding GTAP sectors used proportionately assumptions, leading to uniform tax rates (but only for a given tax type!) across the GTAP-sectors corresponding to the same IOT sector. However, it is true only for those taxes which apply both the domestic and imported products, while the differences of the subsidy rates are due to the different share of the domestic products (which were assumed to have been subsidized) within the total use. However, we can modify the results provided we get more GTAP-sector specific data on the taxes and subsidies.

4. Conclusion

In the framework of the EU-GTAP project our research team carried through the transformation/estimation of the Eurostat collected and provided set of the 2010 ‘Taxes less subsidy’

matrices and Input-Output tables for the 28 EU countries into GTAP format (in GTAP sector break-down and final demand categories, and according to the GTAP methodology for valuations). This considerably novel process can be called 'transformation' since we did not modify/override these Eurostat tables (not least because their change would have required a comprehensive rebalancing of these tables) even if we detected several problems in these original tables and reported the most important of them back to the Eurostat. Therefore, all other, 'auxiliary' data used in the process were reconciled with these Eurostat tables (IOTs and TLS matrices) mostly by adjusting them to the corresponding IOT figure(s). In this way we use the auxiliary data only indirectly, so that if the transformation process/entropy model reveals implausibility or inconsistency of the direct input-data, we can consider to what extent the original data and to what extent our reconciliation-assumptions are responsible for that.

Eventually, of the well organised input data and using the purposefully developed software we could start mass-producing numerical results. However, these output tables are so big and numerous that even for one country (in our case for Hungary) and the most important figures it was impossible to present them in satisfactory details. Nevertheless, we hope that soon all users of the next update of the GTAP database will have access to our numerical results in the form of the EU countries related block of the GTAP database.

The decomposition and transformation of the 'taxes less subsidies" matrices for the EU-countries proved to be an extremely fruitful activity not only in terms of its resulting tables (the main and side products of the estimating process) and the invaluable lessons what the whole process provided for statisticians, mathematicians, economists (notably tax experts and economic modellers) and even for tax policy makers. Although the research team of the EU-GTAP project did its best to address the many interdisciplinary aspects of the problem, the bulk of the benefits can be realised only by sharing the acquired much information with the scientific community and by receiving feedbacks of those modellers who will use this new dataset.

5. References

Huff, K., McDougall, R. and Walmsley, T. [2000] "Contributing Input-Output Tables to the GTAP Data Base", GTAP Technical Paper, No.1. Release 4.2

Leitner [2013]: 'Különadók szerepe az adózásban tanulmány' (=The role of the surtaxes payable by certain industries) – Report of the Leitner + Leitner Adótanácsadó Kft (Tax consulting company), 2013 július 2. (kulonadok_tanulmany.pdf)

Révész, T. [2013]: Estimating VAT-rates on household consumption for the GEM-E3 model, IPTS manuscript

Révész, T. [2014] Decomposing the 2010 Eurostat product tax matrices - The case of Hungary, IPTS manuscript.

Rueda, J. et al. [2016]: The EU28 GTAP Input-Output Tables, paper to be presented at the '19th Annual Conference on Global Economic Analysis'

WTO-ITC (2007) World Tariff Profiles – 2006. World Trade Organization (WTO) and International Trade Centre (UNCTAD/WTO). Geneva.

Table 4. Main results of the balancing of the Hungarian TLS layers (in million €)

Branches	codes	Enthropy-model estimates					Enthropy-model estimates				
		Indirect tax	Excise	VAT	Other indirect tax	Discrepancy	Indirect tax	Excise	VAT	Other indirect tax	Discrepancy
		by users					by commodity				
Products of agriculture, hunting and related services	A01	169	88	47	34	0	256	0	205	51	0
Products of forestry, logging and related services	A02	9	3	1	5	0	36	0	27	9	0
Fish and other fishing products; aquaculture products; support services to fishing	A03	1	1	0	0	0	5	0	5	0	0
Mining and quarrying	B05	5	2	0	3	0	371	15	343	14	0
Food products, beverages and tobacco products	C10	122	29	3	90	0	3205	1204	1922	80	0
Textiles, wearing apparel and leather products	C13	8	1	0	7	0	346	0	310	36	0
Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	C16	9	2	0	7	0	40	0	31	10	0
Paper and paper products	C17	11	1	0	9	0	93	0	71	22	0
Printing and recording services	C18	7	1	0	6	0	43	0	33	10	0
Coke and refined petroleum products	C19	32	5	6	21	0	2597	1951	533	113	0
Chemicals and chemical products	C20	50	3	4	43	0	206	0	166	40	0
Basic pharmaceutical products and pharmaceutical preparations	C21	14	2	4	8	0	278	0	204	74	0
Rubber and plastics products	C22	29	3	2	24	0	103	0	57	47	0
Other non-metallic mineral products	C23	26	6	4	15	0	92	0	65	27	0
Basic metals	C24	22	2	1	18	0	28	0	8	20	0
Fabricated metal products, except machinery and equipment	C25	29	3	1	25	0	123	0	71	53	0
Computer, electronic and optical products	C26	54	2	3	49	0	286	0	186	100	0
Electrical equipment	C27	23	3	2	18	0	192	0	142	50	0
Machinery and equipment n.e.c.	C28	30	5	4	21	0	123	0	40	83	0
Motor vehicles, trailers and semi-trailers	C29	62	5	6	51	0	582	0	380	203	0
Other transport equipment	C30	3	1	0	2	0	32	0	26	6	0
Furniture; other manufactured goods	C31	15	2	1	13	0	340	0	314	27	0
Repair and installation services of machinery and equipment	C33	7	1	1	5	0	22	0	7	16	0
Electricity, gas, steam and air-conditioning	D35	91	4	11	77	0	872	112	511	249	0
Natural water; water treatment and supply services	E36	18	5	3	9	0	85	0	74	11	0
Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	E37	45	20	16	10	0	164	0	144	19	0
Constructions and construction works	F41	186	28	95	63	0	1087	0	847	240	0
Wholesale and retail trade and repair services of motor vehicles and motorcycles	G45	44	16	10	19	0	76	0	55	20	0
Wholesale trade services, except of motor vehicles and motorcycles	G46	198	74	49	74	0	1	0	0	1	0
Retail trade services, except of motor vehicles and motorcycles	G47	174	65	45	64	0	0	0	0	0	0
Land transport services and transport services via pipelines	H49	304	238	26	40	0	250	0	143	108	0
Water transport services	H50	4	4	0	0	0	2	0	1	1	0
Air transport services	H51	3	0	0	3	0	11	0	0	11	0
Warehousing and support services for transportation	H52	60	13	20	27	0	145	0	88	57	0
Postal and courier services	H53	35	5	25	5	0	21	0	0	21	0
Accommodation and food services	I55	152	90	33	28	0	590	0	566	24	0

Table 4. (continued)

Branches	codes	Enthropy-model estimates					Enthropy-model estimates				
		Indirect tax	Excise	VAT	Other indirect tax	Discrepancy	Indirect tax	Excise	VAT	Other indirect tax	Discrepancy
		by users					by commodity				
Publishing services	J58	11	1	1	9	0	80	0	64	16	0
Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services	J59	28	1	17	10	0	53	0	38	16	0
Telecommunications services	J61	39	2	11	26	0	726	0	252	474	0
Computer programming, consultancy and related services; information services	J62	33	3	15	14	0	217	0	156	60	0
Financial services, except insurance and pension funding	K64	228	11	171	45	0	70	0	0	70	0
Insurance, reinsurance and pension funding services, except compulsory social security	K65	50	0	35	14	0	151	0	0	151	0
Services auxiliary to financial services and insurance services	K66	28	2	19	7	0	22	0	6	16	0
Real estate services (exluding imputed rent)	L68	92	16	27	49	0	168	0	89	78	0
Imputed rents of owner-occupied dwellings	LIR	144	0	105	39	0	0	0	0	0	0
Legal and accounting services; services of head offices; management consulting services	M69	54	10	20	25	0	311	0	140	171	0
Architectural and engineering services; technical testing and analysis services	M71	36	8	12	15	0	122	0	54	68	0
Scientific research and development services	M72	21	1	14	6	0	19	0	13	6	0
Advertising and market research services	M73	14	3	5	6	0	39	0	17	22	0
Other professional, scientific and technical services; veterinary services	M74	20	4	7	8	0	56	0	30	26	0
Rental and leasing services	N77	12	7	2	3	0	71	0	50	21	0
Employment services	N78	3	1	1	2	0	24	0	14	10	0
Travel agency, tour operator and other reservation services and related services	N79	3	1	1	1	0	23	0	14	9	0
Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	N80	60	17	23	20	0	187	0	124	62	0
Public administration and defence services; compulsory social security services	O84	402	24	309	69	0	0	0	0	0	0
Education services	P85	153	8	120	25	0	46	0	22	24	0
Human health services	Q86	216	13	175	28	0	57	0	14	43	0
Social work services	Q87	72	5	60	7	0	9	0	2	7	0
Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	R90	85	3	65	18	0	317	0	30	287	0
Sporting services and amusement and recreation services	R93	35	2	24	8	0	51	0	49	2	0
Services furnished by membership organisations	S94	47	2	36	9	0	2	0	0	2	0
Repair services of computers and personal and household goods	S95	5	2	0	3	0	41	0	37	4	0
Other personal services	S96	33	8	19	5	0	66	0	51	15	0
Services of households as employers; undifferentiated goods and services produced by households for own use	T97	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0
Subtotal:		*3973*	*887*	*1722*	1364	0	15633	3282	8841	3509	0
Household consumtion		9376	2395	5947	1033	0	4306.5	904.0	2463.6	*938.8*	
Government consumption+NPISHs		239	0	143	96	0					
Gross fixed capital formation		1295	0	1029	266	0					
Changes in valuables		0				0					
Changes in stocks		0				0					
Export		750	0	0	750	0					
Total:		15633	3282	8841	3509	0					

Table 5. Ratios of the Hungarian TLS layers' estimated and initial row- and column-totals

Branches	codes	Ratio of Enthropy-model estimates to original								
		Indirect tax	Excise	VAT	Other indirect tax		**Indirect tax**	Excise	VAT	Other indirect tax
		by users					**by commodity**			
Products of agriculture, hunting and related services	**A01**	**1.00**	0.91	0.78	0.85		**1.00**		0.81	2.60
Products of forestry, logging and related services	**A02**	**1.00**	0.85	1.23	1.35		**1.00**		1.53	1.36
Fish and other fishing products; aquaculture products; support services to fishing	**A03**	**1.00**	0.82	3.26	1.19		**1.00**		1.42	1.42
Mining and quarrying	**B05**	**1.00**	0.49	1.07	1.09		**1.00**	0.15	1.09	0.17
Food products, beverages and tobacco products	**C10**	**1.00**	0.21	1.38	1.52		**1.00**	1.00	1.03	1.04
Textiles, wearing apparel and leather products	**C13**	**1.00**	0.19	2.53	1.27		**1.00**		0.95	1.75
Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	**C16**	**1.00**	0.29	2.53	1.35		**1.00**		1.16	1.56
Paper and paper products	**C17**	**1.00**	0.41	1.50	1.19		**1.00**		1.18	1.19
Printing and recording services	**C18**	**1.00**	0.41	1.64	0.97		**1.00**		0.87	0.75
Coke and refined petroleum products	**C19**	**1.00**	0.24	0.39	0.38		**1.00**	1.00	0.98	1.26
Chemicals and chemical products	**C20**	**1.00**	0.39	0.97	1.09		**1.00**		1.07	1.37
Basic pharmaceutical products and pharmaceutical preparations	**C21**	**1.00**	0.21	0.51	0.83		**1.00**		1.67	0.55
Rubber and plastics products	**C22**	**1.00**	0.26	1.32	1.13		**1.00**		1.18	1.07
Other non-metallic mineral products	**C23**	**1.00**	0.17	0.84	0.97		**1.00**		1.23	1.59
Basic metals	**C24**	**1.00**	0.60	1.11	1.01		**1.00**		0.48	1.20
Fabricated metal products, except machinery and equipment	**C25**	**1.00**	0.36	1.17	1.18		**1.00**		1.05	1.16
Computer, electronic and optical products	**C26**	**1.00**	0.38	1.17	0.86		**1.00**		0.99	1.74
Electrical equipment	**C27**	**1.00**	0.48	1.73	1.08		**1.00**		1.17	0.90
Machinery and equipment n.e.c.	**C28**	**1.00**	0.34	1.69	1.09		**1.00**		0.40	1.84
Motor vehicles, trailers and semi-trailers	**C29**	**1.00**	0.27	1.57	1.58		**1.00**		1.21	0.89
Other transport equipment	**C30**	**1.00**	0.57	0.78	1.03		**1.00**		1.21	1.71
Furniture; other manufactured goods	**C31**	**1.00**	0.26	0.20	1.61		**1.00**		1.07	2.18
Repair and installation services of machinery and equipment	**C33**	**1.00**	0.49	1.32	1.17		**1.00**		0.53	0.99
Electricity, gas, steam and air-conditioning	**D35**	**1.00**	**0.09**	0.75	1.08		**1.00**	3.80	0.96	0.81
Natural water; water treatment and supply services	**E36**	**1.00**	0.88	0.98	1.01		**1.00**		0.93	1.00
Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	**E37**	**1.00**	0.84	1.13	0.88		**1.00**		1.06	1.16
Constructions and construction works	**F41**	**1.00**	1.03	0.97	0.83		**1.00**		1.18	0.60
Wholesale and retail trade and repair services of motor vehicles and motorcycles	**G45**	**1.00**	0.75	0.49	0.51		**1.00**		0.58	0.55
Wholesale trade services, except of motor vehicles and motorcycles	**G46**	**1.00**	0.97	0.59	0.87		**1.00**			0.00
Retail trade services, except of motor vehicles and motorcycles	**G47**	**1.00**	0.81	0.47	1.02		**0.00**			0.00
Land transport services and transport services via pipelines	**H49**	**1.00**	1.22	0.33	0.64		**1.00**		0.68	2.41
Water transport services	**H50**	**1.00**	0.26	0.76	0.95		**1.00**		0.44	1.66
Air transport services	**H51**	**1.00**	0.03		0.98		**1.00**			4.73
Warehousing and support services for transportation	**H52**	**1.00**	**0.33**	0.90	0.92		**1.00**		0.79	0.67
Postal and courier services	**H53**	**1.00**	1.09	0.70	1.32		**1.00**			1.47
Accommodation and food services	**I55**	**1.00**	1.27	0.55	0.90		**1.00**		1.04	1.20

Table 5. (continued)

Branches	codes	Ratio of Enthropy-model estimates to original								
		Indirect tax	Excise	VAT	Other indirect tax		**Indirect tax**	Excise	VAT	Other indirect tax
		by users					**by commodity**			
Publishing services	**J58**	**1.00**	0.43	1.05	0.80		**1.00**		0.87	1.25
Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services	**J59**	**1.00**	0.68	**1.01**	1.07		**1.00**		0.63	1.62
Telecommunications services	**J61**	**1.00**	0.91	1.00	1.08		**1.00**		0.54	1.74
Computer programming, consultancy and related services; information services	**J62**	**1.00**	0.94	0.74	0.89		**1.00**		0.96	1.34
Financial services, except insurance and pension funding	**K64**	**1.00**	1.22	1.00	1.20		**1.00**			1.00
Insurance, reinsurance and pension funding services, except compulsory social security	**K65**	**1.00**	1.25	1.18	0.79		**1.00**			0.99
Services auxiliary to financial services and insurance services	**K66**	**1.00**	1.25	1.24	0.98		**1.00**		0.82	0.64
Real estate services (exluding imputed rent)	**L68**	**1.00**	0.69	1.12	1.16		**1.00**		0.57	0.95
Imputed rents of owner-occupied dwellings	**LIR**	**1.00**	0.00	**1.05**	0.88		**0.00**			68.00
Legal and accounting services; services of head offices; management consulting services	**M69**	**1.00**	0.82	0.72	0.92		**1.00**		0.87	1.14
Architectural and engineering services; technical testing and analysis services	**M71**	**1.00**	0.84	0.86	1.12		**1.00**		0.80	1.16
Scientific research and development services	**M72**	**1.00**	0.59	**0.88**	1.08		**1.00**		0.76	1.14
Advertising and market research services	**M73**	**1.00**	0.77	0.59	0.87		**1.00**		0.68	0.69
Other professional, scientific and technical services; veterinary services	**M74**	**1.00**	0.87	0.96	1.14		**1.00**		1.01	1.45
Rental and leasing services	**N77**	**1.00**	0.96	0.33	0.84		**1.00**		0.75	0.89
Employment services	**N78**	**1.00**	0.68	0.48	0.75		**1.00**		1.06	0.86
Travel agency, tour operator and other reservation services and related services	**N79**	**1.00**	0.99	0.21	0.72		**1.00**		0.47	0.63
Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	**N80**	**1.00**	0.89	0.68	0.90		**1.00**		0.77	0.86
Public administration and defence services; compulsory social security services	**O84**	**1.00**	0.58	**0.93**	1.16		**0.00**			
Education services	**P85**	**1.00**	0.50	**0.93**	1.09		**1.00**		1.03	1.89
Human health services	**Q86**	**1.00**	0.85	1.06	1.01		**1.00**		0.60	2.62
Social work services	**Q87**	**1.00**	0.73	**0.85**	0.94		**1.00**		1.31	0.48
Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	**R90**	**1.00**	0.63	0.99	0.76		**1.00**		0.56	1.13
Sporting services and amusement and recreation services	**R93**	**1.00**	0.55	0.89	0.82		**1.00**		0.89	0.76
Services furnished by membership organisations	**S94**	**1.00**	0.75	**0.69**	1.01		**1.00**			4.73
Repair services of computers and personal and household goods	**S95**	**1.00**	0.78		1.88		**1.00**		0.96	1.19
Other personal services	**S96**	**1.00**	1.00	0.67	0.92		**1.00**		0.94	1.07
Services of households as employers; undifferentiated goods and services produced by households for own use	**T97**	**0.00**	0.00				**0.00**			
Subtotal:		***1.00***	*0.73*	*0.85*	0.98		**1.00**	**1.00**	**0.97**	**0.96**
Household consumtion		**1.00**	**1.16**	0.99	1.04					
Government consumption+NPISHs		**1.00**	0.00	**0.79**	0.94					
Gross fixed capital formation		**1.00**		1.06	0.60					
Changes in stocks										
Export		**1.00**			1.04					
Total:		**1.00**	**1.00**	**0.97**	**0.96**					

Table 6. Shares of Taxes and subsidies in the household consumption, %

GTAP sectors \ Tax categories		Subsidies	Excise taxes	VAT	Other indirect taxes	Net taxes total
Paddy rice	**pdr**	0,3	0,0	10,1	0,2	**10,0**
Wheat	**wht**	0,3	0,0	10,1	0,2	**9,9**
Cereal grains nec	**gro**	0,4	0,0	10,1	0,2	**9,8**
Vegetables fruit nuts	**v_f**	0,5	0,0	10,1	0,2	**9,7**
Oil seeds	**osd**	0,3	0,0	10,1	0,2	**9,9**
Sugar cane sugar beet	**c_b**	5,4	0,0	10,1	0,2	**4,8**
Plant-based fibers	**pfb**	0,0	0,0	10,1	0,2	**10,2**
Crops nec	**ocr**	0,6	0,0	10,1	0,2	**9,7**
Bovine cattle sheep and goats horses	**ctl**	0,2	0,0	10,1	0,2	**10,0**
Animal products nec	**oap**	0,8	0,0	10,1	0,2	**9,4**
Raw milk	**rmk**	1,7	0,0	10,1	0,2	**8,5**
Wool silk-worm cocoons	**wol**	0,0	0,0	10,1	0,2	**10,2**
Forestry	**frs**	0,0	0,0	17,8	0,9	**18,8**
Fishing	**fsh**	0,0	0,0	16,7	0,3	**17,0**
Coal	**coa**	0,0	6,4	12,8	0,9	**20,1**
Oil	**oil**	0,0	6,4	12,8	0,9	**20,1**
Gas	**gas**	0,0	6,4	12,8	0,9	**20,1**
Minerals nec	**omn**	0,0	6,4	12,8	0,9	**20,1**
Bovine meat products	**cmt**	0,0	0,0	17,5	0,3	**17,8**
Meat products nec	**omt**	0,0	0,0	17,5	0,3	**17,8**
Vegetable oils and fats	**vol**	0,0	0,0	17,5	0,3	**17,8**
Dairy products	**mil**	0,0	0,0	17,5	0,3	**17,8**
Processed rice	**pcr**	0,0	0,0	17,5	0,3	**17,8**
Sugar	**sgr**	0,0	0,0	17,5	0,3	**17,8**
Food products nec	**ofd**	0,0	0,0	17,5	0,3	**17,8**
Beverages and tobacco products	**b_t**	0,0	49,8	17,5	0,3	**67,6**
Textiles	**tex**	0,0	0,0	16,8	0,1	**16,9**
Wearing apparel	**wap**	0,0	0,0	16,8	0,1	**16,9**
Leather products	**lea**	0,0	0,0	16,8	0,1	**16,9**
Wood products	**lum**	0,0	0,0	15,0	0,2	**15,2**
Paper products publishing	**ppp**	0,0	0,0	11,0	0,6	**11,6**
Petroleum coal products	**p_c**	0,0	36,9	15,5	0,6	**53,0**
Chemical rubber plastic products	**crp**	0,0	0,0	11,6	0,5	**12,1**
Mineral products nec	**nmm**	0,0	0,0	16,7	0,1	**16,8**
Ferrous metals	**i_s**	0,0	0,0	0,0	0,0	**0,0**
Metals nec	**nfm**	0,0	0,0	0,0	0,0	**0,0**
Metal products	**fmp**	0,0	0,0	16,5	0,1	**16,6**

Motor vehicles and parts	**mvh**	0,0	0,0	18,2	7,7	**25,9**
Transport equipment nec	**otn**	0,0	0,0	19,6	0,1	**19,7**
Electronic equipment	**ele**	0,0	0,0	17,7	0,1	**17,8**
Machinery and equipment nec	**ome**	0,0	0,0	17,8	0,2	**18,1**
Manufactures nec	**omf**	0,0	0,0	16,9	0,2	**17,0**
Electricity	**ely**	0,1	0,5	15,8	5,1	**21,2**
Gas manufacture distribution	**gdt**	0,2	0,5	15,8	5,1	**21,2**
Water	**wtr**	0,0	0,0	18,0	1,7	**19,7**
Construction	**cns**	0,0	0,0	12,5	3,6	**16,1**
Trade	**trd**	0,0	0,0	14,2	0,7	**14,9**
Transport nec	**otp**	20,9	0,0	13,9	1,5	**-5,5**
Water transport	**wtp**	0,0	0,0	11,8	0,5	**12,3**
Air transport	**atp**	0,0	0,0	0,0	0,3	**0,3**
Communication	**cmn**	0,0	0,0	14,7	9,6	**24,3**
Financial services nec	**ofi**	0,0	0,0	0,0	0,7	**0,7**
Insurance	**isr**	0,0	0,0	0,0	10,2	**10,2**
Business services nec	**obs**	0,0	0,0	5,8	1,4	**7,2**
Recreational and other services	**ros**	0,5	0,0	4,6	9,1	**13,2**
Public Administration Defense Education Health	**osg**	0,0	0,0	4,1	1,9	**6,0**
Dwellings	**dwe**	0,0	0,0	0,0	0,0	**0,0**
Average of all sectors	**Total**	**0,5**	**4,6**	**11,4**	**2,0**	**17,5**

Table 7. Shares of Taxes and subsidies in the intermediate consumption, %

GTAP sectors \ Tax categories		Subsidies	Excise taxes	VAT	Other indirect taxes	Net taxes total
Paddy rice	**pdr**	0,7	0,0	0,7	0,5	**0,5**
Wheat	**wht**	1,7	0,0	1,1	0,4	**-0,2**
Cereal grains nec	**gro**	2,1	0,0	1,1	0,4	**-0,7**
Vegetables fruit nuts	**v_f**	3,5	0,0	0,6	0,6	**-2,3**
Oil seeds	**osd**	1,2	0,0	0,4	0,6	**-0,1**
Sugar cane sugar beet	**c_b**	3,9	0,0	0,1	0,8	**-3,1**
Plant-based fibers	**pfb**	0,0	0,0	0,5	0,5	**0,9**
Crops nec	**ocr**	2,6	0,0	0,9	0,5	**-1,3**
Bovine cattle sheep and goats horses	**ctl**	0,6	0,0	0,6	0,6	**0,6**
Animal products nec	**oap**	2,4	0,0	0,2	0,8	**-1,5**
Raw milk	**rmk**	3,2	0,0	0,2	0,8	**-2,2**
Wool silk-worm cocoons	**wol**	0,2	0,0	1,1	0,4	**1,3**
Forestry	**frs**	0,0	0,0	0,6	2,2	**2,8**
Fishing	**fsh**	0,0	0,0	0,7	0,9	**1,5**
Coal	**coa**	0,0	0,0	0,4	0,0	**0,4**
Oil	**oil**	0,0	0,0	0,0	0,0	**0,0**
Gas	**gas**	0,0	0,2	1,5	0,2	**1,9**
Minerals nec	**omn**	0,0	0,1	2,8	0,4	**3,4**
Bovine meat products	**cmt**	0,0	0,0	1,2	0,5	**1,7**
Meat products nec	**omt**	0,0	0,0	1,4	0,5	**1,9**
Vegetable oils and fats	**vol**	0,0	0,0	0,6	0,4	**1,0**
Dairy products	**mil**	0,0	0,0	0,7	0,5	**1,2**
Processed rice	**pcr**	0,0	0,0	0,9	0,5	**1,4**
Sugar	**sgr**	0,0	0,0	0,8	0,5	**1,2**
Food products nec	**ofd**	0,0	0,0	0,9	0,5	**1,4**
Beverages and tobacco products	**b_t**	0,0	16,9	1,2	0,5	**18,6**
Textiles	**tex**	0,0	0,0	1,2	0,4	**1,6**
Wearing apparel	**wap**	0,0	0,0	2,5	0,7	**3,2**
Leather products	**lea**	0,0	0,0	0,7	0,4	**1,2**
Wood products	**lum**	0,0	0,0	3,2	0,4	**3,6**
Paper products publishing	**ppp**	0,0	0,0	1,8	0,9	**2,6**
Petroleum coal products	**p_c**	0,0	15,3	0,9	0,9	**17,2**
Chemical rubber plastic products	**crp**	0,0	0,0	1,1	0,5	**1,6**
Mineral products nec	**nmm**	0,0	0,0	2,1	0,7	**2,8**
Ferrous metals	**i_s**	0,0	0,0	0,2	0,1	**0,4**
Metals nec	**nfm**	0,0	0,0	0,2	0,1	**0,3**
Metal products	**fmp**	0,0	0,0	0,8	0,9	**1,8**

Motor vehicles and parts	**mvh**	0,0	0,0	0,1	0,3	**0,4**
Transport equipment nec	**otn**	0,0	0,0	0,7	0,1	**0,7**
Electronic equipment	**ele**	0,0	0,0	0,3	0,2	**0,4**
Machinery and equipment nec	**ome**	0,0	0,0	0,3	0,2	**0,6**
Manufactures nec	**omf**	0,0	0,0	6,4	0,4	**6,8**
Electricity	**ely**	0,1	0,5	3,3	5,7	**9,4**
Gas manufacture distribution	**gdt**	0,2	0,5	1,7	6,1	**8,0**
Water	**wtr**	0,0	0,0	4,2	1,9	**6,1**
Construction	**cns**	0,0	0,0	5,4	3,1	**8,5**
Trade	**trd**	0,0	0,0	3,5	0,6	**4,1**
Transport nec	**otp**	3,1	0,0	1,6	1,0	**-0,5**
Water transport	**wtp**	0,0	0,0	0,2	0,1	**0,3**
Air transport	**atp**	0,0	0,0	0,0	0,3	**0,3**
Communication	**cmn**	0,0	0,0	4,2	6,8	**11,0**
Financial services nec	**ofi**	0,0	0,0	0,1	1,6	**1,7**
Insurance	**isr**	0,0	0,0	0,0	8,5	**8,5**
Business services nec	**obs**	0,0	0,0	2,8	2,1	**4,9**
Recreational and other services	**ros**	1,3	0,0	3,0	1,2	**3,0**
Public Administration Defense Education Health	**osg**	0,0	0,0	2,1	0,6	**2,7**
Dwellings	**dwe**	0,0	0,0	0,0	0,0	**0,0**
Average of all sectors	**Total**	**0,2**	**0,7**	**1,4**	**1,1**	**3,1**

Content