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**Development of Input-Output Accounts within National Accounts:
Compilation and analysis of tax matrices within the input-output accounts
for Slovenia**

Abstract

In the compilation process of supply and use and input-output tables there is necessary to deal with different valuation concepts of product flows to be able to balance the supply and use tables and to produce symmetric input-output tables. It is necessary to produce different valuation layers of the tables which cover the transformation of data from the concept of purchasers' prices to the concept of basic prices and vice-versa. The transformation comprises calculation of trade and transport margins and taxes less subsidies matrices. These matrices are not only a necessary element in the compilation process, but are also a point of interest for analyses. In this paper, we concentrate on the part of the process which deals with the issues concerning the preparation of tax matrices and we present the tax characteristics for taxes on products seen from the supply and use tables for Slovenia.

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INTRODUCTION

In the compilation process of supply and use and input-output tables there is necessary to deal with different valuation concepts of product flows to be able to balance the supply and use tables and to produce symmetric input-output tables. There is necessary to produce different valuation layers of the tables which cover the transformation of data from the concept of purchasers' prices to the concept of basic prices and vice-versa. The transformation comprises calculation of trade and transport margins and taxes less subsidies matrices. These matrices are not only a necessary element in the compilation process, but are also a point of interest for analyses. In this paper, we will concentrate on the part of the process which deals with the issues concerning the preparation of tax matrices and we will present the tax characteristics and patterns of taxation for taxes on products seen from the supply and use tables for Slovenia.

1. CONNECTION OF DIFFERENT VALUATION CONCEPTS IN SUPPLY AND USE TABLES

1.1. Valuation concepts

According to ESA 1995 (as well as new proposed ESA 2010), there are two main valuation concepts for flows of goods and services in supply and use tables: purchasers' prices and basic prices. The type of valuation corresponds to the different nature of flows - uses are primarily observed at purchasers' prices, whereas supply data at basic prices. All transactions are valued at the actual market prices and for non-market transactions according to the costs of production or at market prices of similar products.

Purchaser' price is the price that purchaser pays for the product. It includes any taxes less subsidies on the product except deductible taxes (i.e. VAT). It also includes any transport charges paid separately by the purchaser. Basic price is the price receivable by the producer from the purchaser of a good or service produced, minus any tax payable on that product as a consequence of its production or sale (i.e. taxes on products), plus any subsidy receivable on that product as a consequence of its production or sale (i.e. subsidy on product). It excludes

any transport charges invoiced separately by the producer. The difference between these two price concepts is in trade and transport margins and taxes less subsidies on products.

In the former system of national accounts, the main valuation concept were producers' prices, which correspond to the amount receivable by the producer from the purchaser of the good or service, minus any VAT invoiced to the purchaser. They exclude any transport charges invoiced separately by the producer. The difference to the present concept of basic price is in taxes less subsidies on products (excluding non-deductible VAT). Valuation in producer prices may still be a stage in the compilation process, since some statistical sources can relate to this valuation.

Basic data which are used for the compilation of the tables are available at different valuations. Data on output are mostly valued at basic or producers' prices, data on intermediate and final uses at purchasers' prices. Data on imports are valued at CIF prices, which correspond to basic prices, and data on exports at FOB prices, which correspond to purchasers' prices. All data used for the compilation of the tables must be aligned in the first stage in the way that flows in supply table are compiled at basic prices and flows in use table at purchasers' prices. In the second stage it is necessary to bridge supply and use by bringing them to the same valuation, at basic or at purchasers' prices, to be able to balance them. The bridge is the columns of margins and of net taxes in the supply table which bring the supply data to the valuation at purchasers' prices. This bridge is not a straightforward and an easy task to perform, since data on margins and taxes by product groups are not readily available. They must be estimated, mainly from the use side, since they are connected to the uses of goods and services. The process involves therefore a production of use-side valuation matrices. This means that also use table have to be transformed to basic prices. Balancing is then best done simultaneously at purchases and at basic prices.

The transformation of use table to basic prices is not only necessary because of the needs of the balancing process. Valuation at basic prices is more homogeneous than at purchasers' prices and therefore more appropriate for economic analysis and also necessary for the transformation to symmetric input-output tables where all flows must be equally valued.

1.2. Valuation matrices

For the transition from the use table at purchasers' prices to the use table at basic prices there is necessary to elaborate use-side valuation matrices. They consist of trade and transport margin matrix and of taxes less subsidies matrix. Both matrices are to be deducted from the use table at purchaser's prices to come to the use table at basic prices.

Trade and transport margins matrix has the same dimensions as intermediate consumption and final uses part of use table at purchasers' prices. It shows the allocation of trade and transport margins, how much of them pertain to individual product groups and use categories.

Similarly, taxes less subsidies matrix has the same dimensions and it shows the allocation of taxes less subsidies to individual product groups and uses. Both matrices consist during the compilation process of different sub-matrices, referring to individual types of margins and taxes that have different characteristics and have to be separately assigned by products and users. In the following we will concentrate on the compilation of tax matrices for individual types of taxes for Slovenia.

2. COMPILATION OF TAX MATRICES FOR SLOVENIA

Tax matrices comprise data on taxes on products. According to ESA 1995 (as well as new proposed ESA 2010), taxes on production and imports (D.2) consist of taxes on products (D.21) and other taxes on production (D.29). In tax matrices only taxes on products are included which form the difference between purchasers' and basic prices. They are taxes that are payable per unit of a good or service produced or transacted. They can be imposed on the unit of quantity of a good or service or as a percentage of their value.

On the other hand, other taxes on production are taxes that enterprises incur as the result of engaging in production, independently on the quantity or value of goods or services produced or sold. They can be payable on land, fixed assets, labor employed or on other activities or transactions. They are not assigned to product flows, they are part of value added by activities.

Taxes on products consist of three categories: value added type taxes - VAT (D.211), taxes and duties on imports excluding VAT (D.212) and other taxes on products (D.214).

2.1. VAT matrix

VAT matrix is the most complex and laborious part of the compilation. It is the first stage in the compilation process of transformation from purchasers' prices, since VAT is imposed as the last item to the purchasers, after imposing of other taxes and trade and transport margins. VAT is according to ESA 1995 / ESA 2010 (and SNA 1993 / SNA 2008) treated net within the supply and use tables, this means that there is registered only non-deductible VAT, whereas deductible VAT on all purchases is not shown.

By calculating the VAT matrix it is necessary to take into account the prescribed tax rates upon the study and analysis of valid VAT legislation which is complex. In this process, it is firstly calculated theoretical VAT. Theoretical VAT is the amount of VAT which would have been received if all units in the economy had paid VAT according to the existing VAT legislation. The difference between theoretical and actually received VAT by the tax authority occurs because of deliberate or non-deliberate omissions of VAT payments and this is treated as VAT fraud.

The calculation of theoretical VAT for Slovenia is done in connection with the calculation of VAT own resources base for EU own resources, which is in Slovenia to a great extent done by the Statistical Office. VAT system was in Slovenia introduced in 1999. First elaboration of VAT matrix has been performed within the SUT for 2000. Then the calculation of VAT base for EU own resources and of theoretical VAT commenced with the data for 2002 on. The last year of calculation has been up to now for 2007.

For the calculation, it is necessary to define for every product group and user combination a prescribed tax rate and possible tax exemptions, depending on the type of product, type of activity, sector and size of producer. VAT is allocated to those goods and services for which buyers or consumers are not allowed to deduct it. They are final payers of VAT and they bear

the fiscal burden. Beside households as main final consumers, also all general government and non-profit institutions serving households (NPISH) units have in the VAT system the same status of final consumer. They produce exempted products on which VAT is not charged and they cannot reimburse VAT paid on their purchases. However, both general government and NPISH units can, as secondary activity, sell VAT products and are therefore allowed to refund input VAT from all purchases within this secondary activity. Therefore, to estimate total VAT payment on purchases of these units correctly, total VAT on purchases must be proportionally reduced for secondary activities. The same principles must be applied to all other VAT exempted sectors which as main activity produce and sell VAT exempted products. All these is solved by applying correction coefficients for each exempted sector/activity. Correction coefficients are calculated as percent of VAT products in the total output (turnover) of sector/activity and are then applied proportionally to all sector/activity inputs. The amounts of VAT products for each VAT exempted sector/activity are estimated by the use of VAT data of enterprises, reported to tax administration, to which Statistical Office has access.

The sectors and components in which non-deductible VAT is allocated are:

- households' final consumption expenditure by the domestic concept;
- general government intermediate consumption and gross fixed capital formation (GFCF), transfers in kind of market goods and services to households via market producers;
- NPISH intermediate consumption and GFCF;
- other VAT exempted activities and specific products:
 - intermediate consumption and GFCF in other exempted activities. Included are exempted activities of the business sector as primary or secondary activity. These activities are financial intermediation services except financial leasing activities, education, health and social services, business associations, public radio and TV broadcasting, gambling industry and housing services;
 - own-account construction activities of households;
 - intermediate consumption and GFCF of small units out of VAT system. These units do not charge VAT on their products.;
 - expenditures in the business sector for products for which VAT cannot be deducted according to VAT legislation: representation expenditure, i.e. hotel and restaurant services, purchases of food and beverages in retail trade, etc.;

– expenditure for passenger cars in the business sector: this category includes all costs regarding acquisition, disposal and maintenance of passenger cars as VAT non-deductible products by the business sector (purchases of new cars less disposals of existing cars, fuel, repair and maintenance costs together with operating and financial leasing expenditures for this purpose).

In other uses, i.e. main part of intermediate uses and capital formation of business sector and in exports, VAT is deductible or not applicable and therefore not allocated.

In Slovenia, two VAT rates are in use, a standard rate (20 %) and a reduced rate (8,5 %). They have to be applied in line with the legislation to the right product groups by CPA classification in the tables. Beside these, a third rate is calculated due to the existence of flat-rate system of VAT compensation for individual farmers in Slovenia. These farmers are compensated for their input VAT at the time of their sales to VAT units. Derived VAT rate according to paid VAT on their inputs must be calculated for their products and then applied by the uses of these products.

The calculation of theoretical VAT is necessary in national accounts also in order to provide a check on the exhaustiveness and completeness of GDP calculations. Calculated lower amount of theoretical VAT than the amount of actually collected accrual VAT for the country would mean underestimated GDP.

As stated, the calculated difference between theoretical and actually received VAT by the tax authority represents VAT fraud. By the calculation of VAT fraud it is important to distinguish between VAT fraud without complicity and VAT fraud with complicity. VAT fraud without complicity occurs when the buyer is not aware that the seller does not report the transaction to the tax authorities. Thus, VAT is paid by the buyer but not paid on to the tax authorities and the seller benefits from higher profits. By VAT fraud with complicity the seller and the buyer agree not to charge any VAT on a transaction. By this the buyer benefits from lower prices and the seller from not paying any taxes as the transaction is not included in his reported turnover.

The amount of VAT which is paid by the buyer but not remitted by the enterprise to the tax authorities (without complicity) is to be included in the purchasers' prices of the goods and services as well as explicitly in output calculation and thus in operating surplus or mixed income of the seller. VAT evaded in fraud with complicity is not paid and thus not recorded in the accounts. VAT fraud without complicity we estimate within the process of calculation of GDP by production approach by the estimation of exhaustiveness adjustment in activities with predominantly cash payments. VAT frauds with complicity are then achieved as the difference between theoretical and accrual VAT and tax frauds without complicity.

The results of the calculation of theoretical VAT and VAT gap for Slovenia:

	2002	2003	2004	2005	2006	2007
	%					
A THEORETICAL VAT	102,6	102,7	102,4	102,9	103,5	104,7
1. Final household consumption	63,2	64,6	66,0	67,2	65,9	66,4
2. General government	16,2	15,7	15,7	15,8	16,9	17,2
2.1 Intermediate consumption	9,6	8,4	8,1	8,6	8,7	7,9
2.2 Transfers in kind of products	1,2	1,3	1,3	1,3	1,2	1,1
2.3 Gross fixed capital formation	5,4	6,0	6,4	6,0	7,0	8,1
3. NPISH	1,6	1,4	1,3	1,0	1,0	1,0
3.1 Intermediate consumption	1,4	1,2	1,1	0,8	0,8	0,8
3.2 Gross fixed capital formation	0,2	0,2	0,2	0,2	0,2	0,2
4. Other VAT exempted activities and products	18,6	17,9	16,6	15,6	16,1	16,4
4.1 Intermediate consumption	10,8	9,6	8,7	8,2	8,7	8,7
4.2 Gross fixed capital formation	7,8	8,3	7,9	7,5	7,3	7,7
5. Expenditures for cars in the business sector	3,1	3,0	2,8	3,3	3,6	3,8
B VAT fraud without complicity	1,2	1,3	1,3	1,6	1,6	1,6
C VAT fraud with complicity	1,4	1,4	1,1	1,3	1,9	3,1
out of this						
UNRECOVERABLE VAT	0,7	0,7	0,7	0,7	0,7	0,9
D ACTUALLY PAID ACCRUAL VAT (A – B - C)	100,0	100,0	100,0	100,0	100,0	100,0

In the last years, we have in national accounts begun also to calculate the value of taxes which are unrecoverable (due to insolvency of firms or other reasons) and will not be paid to the government budget. They present the additional difference between the theoretical and actually paid accrual VAT.

The calculation of VAT matrix within SUT is done at the same level of industries and products as there is the balancing level of products in SUT, i.e. 206 industries and 264 products. VAT is re-calculated simultaneously by balancing the tables (with the use of computer software), since by balancing, the amounts of VAT are constantly changing, by every change of use VAT matrix should be changed.

Finally, the calculated theoretical VAT is in VAT matrix adjusted to the figure of accrual VAT which is registered in national accounts, taking into account identified activities where frauds are occurring.

2.2. Taxes and duties on imports excluding VAT matrix

This category comprises compulsory payments levied on goods in order to admit them to free circulation to the economic territory, and on services provided to resident units by non-residents units. It includes import duties (custom duties and similar charges, payable according to customs tariff schedules) and other taxes on imports (levies on imported agricultural products, excise duties and similar taxes on imports, etc.).

Data on these taxes are received from customs declarations, together with the data on the value of imports, detailed by products and by the registered activity of the importer. Calculation of matrix for taxes on imports is done during the process of the preparation of import matrix and aligned with it, where these taxes are allocated to appropriate products and use categories related to the import flows. For the analysis, excise duties paid by imports are deducted and added to other taxes on products where there are present all other excise duties. (In average, around 1 % of excise duties is paid by imports.)

2.3. Other taxes on products matrix

This category relates to all other taxes on products except VAT and import taxes. They become payable as a result of the production, export, sale, transfer, leasing or delivery of those goods or services, or as a result of their use for own consumption or own capital formation. They include excise duties and consumption taxes, taxes on the sale of specific products, taxes on financial and capital transactions, taxes on motor vehicles, taxes on lottery and gambling, taxes on insurance premiums and taxes on other specific services (e.g. lodging).

Data on total accrual values of these taxes are calculated within national accounts from data on collected taxes received from tax administration. In this evidences there are not available data on the end payers of taxes. Since these taxes are related to specific products, end payers can be defined by the flows in the use table. The greatest part of these taxes relates to final consumption of households, among them the most important are excise duties on fuels, tobacco products and alcohol. But some of them relate also to other uses, among them the largest are excise duties on fuels, for which final payers are also in intermediate consumption. For the allocation of these taxes in tax matrix, for each type of tax the taxation base in legislation is considered and then the values are distributed across appropriate products and uses according to the detailed use table.

In our work process of preparing SUT and all tax matrices we use specialized computer software SNA-NT which is simultaneously calculating tax matrices and by every change in use recalculating them, as already described by VAT calculation. For the calculation, data on tax rates for VAT applicable to individual product flows and users and values of other taxes on products pertaining to particular products and uses must be defined. The applicable rates for VAT are calculated considering legislative rates and shares of deductible taxes for each industry/activity and type of use. By this calculation it is important that products and users in SUT are so detailed that correspond to the needs of calculation, otherwise additional divisions of product flows are necessary to employ.

3. REVIEW OF TAXES ON PRODUCTS DATA BY USES AND PRODUCT GROUPS FOR SLOVENIA

Upon summing individual tax matrices we achieve a total tax matrix in which the distribution of taxes on products across all final payers and products is shown and analysis can be done of the distribution of tax burden of individual groupings. We have analyzed data from individual tax matrices in SUT for the time span from 2003 to 2007, for the latter year there is last finally estimated SUT. Year 2003 is before the entrance of Slovenia to EU which has been in the middle of 2004. This fact has the most direct effect on the taxes and duties on imports.

Shares of types of taxes in total tax revenue, %:

	Value added tax (VAT)	Taxes and duties on imports excluding VAT and excise duties	Other taxes on products	Total taxes on products
2003	64.5	4.3	31.2	100.0
2005	66.9	0.9	32.2	100.0
2007	66.1	1.9	32.0	100.0

From the data above we see that VAT represents the greatest part of taxes on products collected in Slovenia, around 2/3. Almost all of residual taxes, i.e. 1/3, are other taxes on products, whereas taxes and duties on imports (without VAT and excise duties) represent a low share, from 1 to 4 %. Next table shows the distribution of taxes collected in different uses comparing to the shares of consumption.

Shares of all taxes on products paid in separate uses and shares of value of consumption, %:

	Intermed. consumption	Final consump. expendit. by households	Final consump. expendit. by NPISH	Final consump. expendit. by governm.	Gross fixed capital formation and valuables	Changes in inventories	Exports f.o.b.	Total final use	Total use
Shares of all taxes on products:									
2003	26.3	62.9	0.0	1.0	9.8	0.0	0.0	73.7	100.0
2005	25.6	64.8	0.0	1.0	8.5	0.0	0.0	74.4	100.0
2007	25.8	62.8	0.0	1.0	10.4	0.0	0.0	74.3	100.0

	Intermed. consumption	Final consump. expendit. by households	Final consump. expendit. by NPISH	Final consump. expendit. by governm.	Gross fixed capital formation and valuables	Changes in inventories	Exports f.o.b.	Total final use	Total use
Shares of consumption at purchasers' prices:									
2003	42,0	21,6	0,5	7,4	8,8	0,5	19,3	58,0	100,0
2005	40,5	20,8	0,4	7,0	9,1	0,7	21,5	59,5	100,0
2007	40,9	19,0	0,3	6,0	9,6	1,4	22,8	59,1	100,0

Since taxes on products are mainly imposed for final uses, payments in these uses represent the biggest part, around 74 %. Out of them taxes paid in final consumption of households represent between 62 and 65 %. In intermediate consumption, around 25 % of taxes are paid. For gross fixed capital formation the share is around 10 %. Other uses have negligible share. The pattern is relatively stable for the observed years. In the continuation there are data of the shares for two important groups of taxes, VAT and other taxes on products.

Shares of each type of taxes on products paid in separate uses, %:

	Intermed. consumption	Final consump. expendit. by households	Final consump. expendit. by NPISH	Final consump. expendit. by governm.	Gross fixed capital formation and valuables	Changes in inventories	Exports f.o.b.	Total final use	Total use
Shares of value added tax (VAT):									
2003	22,2	63,7	0,0	1,4	12,7	0,0	0,0	77,8	100,0
2005	22,7	65,6	0,0	1,4	10,3	0,0	0,0	77,3	100,0
2007	22,3	63,6	0,0	1,6	12,5	0,0	0,0	77,7	100,0
Shares of other taxes on products:									
2003	35,1	59,4	0,0	0,0	4,1	0,0	0,0	63,5	100,0
2005	31,4	63,8	0,0	0,0	4,8	0,0	0,0	68,6	100,0
2007	32,5	61,5	0,0	0,0	6,0	0,0	0,0	67,5	100,0

What regards other taxes on products, the share paid in intermediate consumption is higher than for all taxes and it amounts to between 31 and 35 %. It is predominantly due to excise duties for fuels which are used in intermediate consumption. On the contrary, the share of taxes on products paid in gross fixed capital formation is lower than for all taxes on products. In the next tables there are showed data on product groups on which most taxes are collected. There are shown product groups with the largest share of taxes and shares of consumption (intermediate and final) for these product groups.

Shares of all taxes on products by product groups and shares of value of consumption, %:

CPA 2002 products	DF petroleum products	DA tobacco products	DA food and bever.	DM transport equipm.	F construction	K business services	I transport, telecommunication	Other products and services	A-DN products	E-O services
Shares of all taxes on products:										
2003	23.6	7.5	9.1	8.3	7.5	4.8	3.7	35.5	71.0	29.0
2005	25.9	8.7	6.6	7.4	6.4	4.9	4.9	35.2	69.2	30.8
2007	25.3	8.8	5.8	8.6	7.4	5.0	4.7	34.4	68.5	31.5
Shares of consumption at purchasers' prices:										
2003	2.8	0.6	6.1	5.7	7.4	9.7	5.4	62.3	58.7	41.3
2005	3.2	0.6	4.6	6.6	7.8	10.2	6.0	61.0	57.9	42.1
2007	3.1	0.5	4.3	7.1	9.4	10.1	6.1	59.4	57.7	42.3

The greatest shares of taxes are collected on the sale of petroleum products, around 25 %. They are followed by tobacco and food, transport equipment and construction services, where importance of each product group is slightly changing over the years observed. In average, around 70 % of taxes are imposed on products, whereas around 30 % on services. Compared to the shares of consumption it can be estimated how much the uses of particular product groups are effectively taxed. This can be in detail estimated for each product group within the detailed SUT. From the table we see that petroleum and tobacco products bear a great share of taxes which is highly greater than their share in total consumption.

In the next tables product groups with the largest shares of VAT paid are shown, first in total and finally in households' final consumption where the biggest share of VAT is paid.

Shares of VAT by product groups, %

CPA 2002 products	DF petroleum products	DM transport equipm.	F construction	I transport, telecommunication	DA food and bever.	K business services	DB textile and products	Other products and services	A-DN products	E-O services
2003	8.1	10.5	10.2	5.8	9.0	7.5	6.2	42.7	60.7	39.3
2005	11.4	8.9	8.0	7.3	7.3	7.3	5.5	44.3	60.4	39.6
2007	11.5	9.2	9.2	7.1	6.5	7.5	5.2	43.8	59.2	40.8

Product groups with major share of collected VAT are almost the same as by total taxes on products, but their shares are more equal. Here, the share of tax imposed on products is lower, around 60 %, whereas around 40 % of VAT is imposed on services.

Shares of VAT by product groups in final consumption of households and shares of value of consumption, %:

CPA 2002 products	DF petrole- um products	DM transport equipm.	DA food and bever.	I transport, telecomu- nication	DB textile and products	H hotels and rest- aurant.	DN furniture, other man. goods.	Other products and services	A-DN products	E-O services
Shares of VAT:										
2003	10.5	11.2	12.7	7.3	8.9	5.2	5.0	39.2	72.8	27.2
2005	12.6	10.9	10.0	9.2	8.1	6.0	5.5	37.7	71.3	28.7
2007	12.8	11.7	9.0	9.4	7.9	5.4	4.9	38.9	71.0	29.0
Shares of final consumption of households at purchasers' prices:										
2003	6.2	6.5	15.5	5.0	5.2	6.8	2.9	51.9	55.5	44.5
2005	7.6	6.6	12.9	7.6	4.9	6.5	3.3	47.9	54.0	46.0
2007	7.5	6.9	12.3	7.6	4.7	6.8	3.2	48.2	53.6	46.4

As we see from the last table, products with highest VAT collected are for households' final consumption to some extent expectedly different, still petroleum products represent in the last years the largest category. For the reference there are shown also respective shares of consumption for these product groups. In the table there is shown category DA food and beverages, due to its important share. But if we look together product groups A and DA, which represent all food, processed and unprocessed, beverages and tobacco, the share of VAT paid for this category is for 2003 19.5 %, for 2005 18.6 % and for 2007 17.8 % . This then represents the biggest category of VAT paid in household consumption. The respective shares of consumption for this category are for 2003 22.2 %, for 2005 20.1 % and for 2007 19.7 %.

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