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SUPPLY AND USE TABLES IN TRANSITIONAL COUNTRIES 1

ESTONIAN EXPERIENCE IN COMPILING SUPPLY AND USE TABLES

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Summary

This paper presents the results of work on compiling the first supply and use tables according to the concepts of the European System of Accounts (ESA95)[*]. The paper mainly focuses on the relations between the national accounts and the supply and use tables comparing the differences in the concepts, classifications, data sources and compilation methods used. The preliminary results for the year 1997 are also presented.

1. Introduction

In Estonia two measures of GDP for the 1997 based on different compilation methods have been produced. The national accounts estimates of GDP, which are compiled by production, expenditure and income approaches according to SNA93/ESA95 since 1993. The GDP compiled by three methods are balanced on the level of total aggregates. The final annual estimates of GDP are published fifteen months after the reference year.

In addition to the traditional national accounts estimates, the new calculations have been produced at the detailed product level within the supply and use framework. The supply and use tables have been completed after the annual national accounts data was published as final figures (about thirty months after the reference year).

Work on the compilation of the supply and use tables for 1997 started in 1996. It was decided from the beginning, that the supply and use tables would be produced independently from national accounts and integrated into the regular national accounts compilation process within the next few years leading to a revision of the national accounts.

In 1998 the Input-Output Tables Section with the 5 persons staff within the Macroeconomic Division of Statistical Office of Estonia (SOE) has been established.

The supply and use tables compiled for the base year cover full set of tables, including supply at basic prices, use table both at basic and at purchasers prices, valuation matrices (distribution margins, taxes and subsidies) and separate import matrix.

This paper covers the following areas. Section 2 describes the main differences in the concepts, classifications, data sources and estimation methods between the national accounts and supply and use tables. This section also provides a short description of the structure, data sources and the methodology used for the compilation of base year supply and use tables. In section 3, the preliminary results of GDP estimates based on different methods for the year 1997 are presented.

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[*] There is quit long tradition of compiling input-output tables in Estonia. The last input-output tables based on MPS methodology were compiled for the year 1987. At the beginning of nineties this work has been temporarily interrupted through the changes of the concepts, methodology and classifications.

2. Relations between the 1997 supply and use tables and national accounts

The main differences in the concepts, classifications, data sources and estimation methods used for reconciliation of GDP between the supply and use framework and national accounts are described below.

2.1. Concepts

In general there are no essential differences between the national accounts and supply and use tables from the conceptual point of view. The main differences concern the statistical units, treatment of production on a contract basis, non-deductible value added tax (VAT), measuring of output.

Compilation of the supply and use tables makes it possible to incorporate many of new specific concepts of the ESA95, such as income in kind, the valuation at basic prices. Some concepts as calculation of holding gains at the detailed product level are not yet integrated into supply and use framework.

It should be noted that most of the conceptual differences have no impact on the level of GDP, but are important from the methodological point of view. The large imbalances at the product level could be the result of conceptual problems.

Statistical units

The statistical units used in supply and use tables are based on enterprises. In Estonia statistical surveys collect information on both production and intermediate use from enterprises. In national accounts homogeneous branches are used.

Treatment of production on a contract basis

In supply and use tables total output and intermediate consumption are measured on a gross basis according to the ESA 95 recommendations, which differs from net recording in national accounts. Gross treatment means that total output and intermediate consumption of each activity engaged in contract processing are adjusted for the value of goods re-exported under processing and imported for contract processing. In order to avoid the double counting the value of fee received by sub-contractor is subtracted from output.

Non-deductible value added tax (VAT)

In national accounts total amount of VAT actually paid to the government budget is used. In supply and use tables value added tax is recorded according to the theoretical VAT.

Non-deductible VAT is calculated by categories of uses such as final consumption expenditures of household, intermediate consumption and gross fixed capital formation

of other non-market activities, expenditures of non-residents in Estonia as part of exports, applying the VAT rates to the relevant product groups. In use tables the difference between imputed and actually paid VAT is recorded as separate column.

Measuring of output

The gross or net measuring of the output of some activities, for instance, in construction due to large amount of sub-contractors differs from the estimates of national accounts.

2.2. Classifications

Activity classification

The activity classification used is based on EMTAK, which is consistent with NACE Rev.1 at the 4-digit level. In the supply and use tables 91 activity are distinguished. The level of details for activities depends on basic statistics, which provide data in general at the 2-digit or 3-digit level of NACE Rev.1.

In supply and use tables all activities are broken down by type of producers: market (73), other non-market (13) and for own final use (5). Non-financial enterprises, financial corporations and unincorporated enterprises of households are classified as market producers. Government budgetary institutions are other non-market producers. Households are mainly producers for own final use (housing services produced by owner-occupiers, agricultural, fishing and forestry production for own final use, own-account construction of dwellings).

In national accounts government budgetary institutions are classified by functions according to the COFOG classification. For the purpose of supply and use tables, all government units have been also classified by activity at the 2-digit level of NACE. An essential difference compared with the supply and use is that in national accounts the direct classification from COFOG to NACE is used (for instance, Education affairs and services COFOG 04 is directly classified as Education NACE 80). This difference has impact on the activity structure of value added.

Product classification

The product classification used in the compilation of supply and use tables is based on the Classification of Products by Activity (CPA).

Total number of product groups defined for supply and use tables is 119. The product details are mainly 3-digit level and partly 4-digit level of CPA. Few products are specified at 5-digit level.

Classification of Individual Consumption by Purpose (COICOP) is used in national accounts to break down the final consumption expenditure of private households. To

integrate into supply and use tables the private consumption expenditure data have been re-classified to CPA classification.

2.3. Data sources

With regard to the data sources, the supply and use tables are mainly based on the same statistical and administrative sources of information as used in national accounts. However, data at more detailed product level were used. Most of data sources are available on a regular annual or quarterly basis.

The financial survey of enterprises conducted by Statistical Office of Estonia (SOE) is one of the main sources for estimation of the gross output, intermediate consumption, value added of non-financial corporations used in the national accounts and the supply and use tables. Financial survey provides with following information: total sales without breakdown by products, total cost with breakdown on goods for re-sale, raw materials and semi-finished goods, electricity, fuel and energy, purchased services and other operating expenses, opening and closing inventories by type of inventories.

For the compilation of the supply and use tables, to estimate output by product and by activity the various productions surveys, such as industry and energy statistics, construction statistics, trade, transport and service statistics have been used.

For financial corporations, the main sources are data from the accounting statements of banks gathered and compiled by the Bank of Estonia. For insurance companies the data are available from the annual bulletins of Estonian Insurance Authority. For other financial units data are collected by Government Finance Statistics Section of the SOE.

In general government sector the data are based on state, local budget and extra-budgetary funds' accounts gathered by the Ministry of Finance. The main source to calculate output of NPISH is annual survey of non-profit institutions serving households gathered by Government Finance Statistics Section of the SOE.

The main data sources for unincorporated enterprises are information obtained from Tax Authority.

The data sources used to estimate imports and exports by products are foreign trade statistics, balance of payments statistics, statistical survey of enterprises and foreign visitor's survey. The data of foreign trade statistics is used to estimate imports and exports of goods. Foreign trade statistics are based on customs declarations, which are collected by National Customs Board. For imports and exports not covered by customs statistics such as natural gas and electricity the information are based on reports of importing enterprises. Imports and exports of services are obtained from the balance of payments compiled by the Bank of Estonia. The tourist expenditures are based on the results of the special foreign visitor's survey, which is carried out by the Estonian Tourist Board, SOE and Bank of Estonia.

For the needs of supply and use tables a special cost survey of non-financial enterprises, financial corporations and budgetary institutions for the year 1997 was carried out by Input-Output Tables Section of SOE. The data of this survey have not been used in national accounts. The special cost survey provides detailed information on inputs of raw materials, fuels and services for about 100 groups of products.

The special cost survey covered the non-financial enterprises in all activities by sample. All state, municipal enterprises and private enterprises with more than 50 employees were observed completely. Small private enterprises were observed by sample. To obtain the structure of intermediate consumption the financial corporations (banks, insurance companies and financial auxiliaries) and budgetary institutions were also surveyed by sample. The budgetary institutions in public administration and defence, education, health and social assistance, recreational, cultural and sporting activities were covered.

It should be noted that in future the special cost surveys would be performed on a multi-annual basis every three or five year depending on activity.

For the calculation of the trade margins, the trade statistics data are used. To split the margins by product the wholesale and retail trade data on turnover by products groups are used. Also the information on turnover by 72 groups of products obtained from the annex of special cost survey (only for trade enterprises) are available. The calculations of transport margins are based on information from the transport statistics and also foreign trade statistics.

The various data sources, such as household budget survey, agriculture, retail trade, service statistics and others are used to prepare the initial estimates for household consumption.

Gross fixed capital formation is calculated by type of institutional sector and by activity. Gross fixed capital formation in non-financial and financial sectors is estimated on the basis of annual investment survey of enterprises and institutions, construction surveys of enterprises and foreign trade statistics. The investment survey provides information on the acquisitions of the following types of assets: new building and civil engineering works, existing buildings, motor vehicles, railway locomotives, ships, aircraft, computers, machinery and other equipment. Also the information on sales of existing buildings, machinery and transport equipment is collected. Acquisitions of fixed assets under financial leasing contracts are included.

State and local budget accounts provide the necessary information for the estimation of gross fixed capital formation in government sector. Gross fixed capital formation in the households sector is compiled on the basis of the data of household's budget survey. The administrative data sources as vehicle and construction register is also used.

Calculations of changes in inventories are based on the following surveys. Information on the value of the opening and closing stocks by types and by activities comes from annual

financial survey of enterprises. A product breakdown of the inventories of raw materials and other supplies was obtained from the special cost survey of enterprises for the year 1997.

Main sources used to calculate wages and salaries and employers' social contributions are annual financial survey of enterprises, state and local budget accounts. Information from the Bank of Estonia and from Estonian Insurance Authority is used to calculate compensation of employees for financial corporations. The estimation of wages and salaries in kind is based on information from the labour costs pilot survey for the year 1997 and households' budget survey.

2.4. Compilation methods

As mentioned before, the supply and use tables for the 1997 have been produced independently from national accounts. The compilation of the supply and use tables for the base year was split into three major stages:
− preparation of initial estimates of each items of supply and use
− integration and balancing the supply and use tables at purchasers prices
− transformation of the use tables at purchasers prices into basic prices and compilation of imports matrix

Preparation of initial estimates for aggregates of supply and use

The different methods have been used to prepare all information needed for the supply and use tables.

For non-financial enterprises, the aggregates of each activity, such as output and intermediate consumption by product, value added components have been calculated directly from the basic statistics. Then two adjustments for non-observed and for processing have been made. The intermediate consumption has been distributed on products using the information of a special cost survey.

For unincorporated enterprises and activities for own final use, total output, intermediate consumption and value added have been obtained from the annual national accounts. Intermediate consumption by products of unincorporated enterprises is estimated by using the average structure of intermediate consumption of the non-financial enterprises in the same activity.

For other non-market activities, output is calculated as total output less revenue from sales of goods and services. Non-market output is classified in CPA product according to the activity. Market output is treated as secondary product produced by government units and allocated to CPA product on the basis of the information provided by the state and local government budgets. For the government units the main secondary products are rental services, publications, hostels and canteens services, educational and medical

services, etc. Intermediate consumption by products of non-market activities is estimated by using information from budget accounts and cost survey of budgetary units.

Data on imports and exports of goods obtained at detailed level according to the Estonian Goods Nomenclature based on the Harmonised System (8-digit level of EKN) were transformed to CPA products before the integration into supply and use tables. The adjustments for illegal imports of fuel, alcohol and tobacco products to foreign trade figures made by Bank of Estonia were added to the original data.

Imports and exports of services by products are estimated at the level of detail provided by the balance of payments statistics. The major service groups are construction, transport, travel, post, communication, financial, insurance services, operational leasing, computer, business, government services, official business travel, health, cultural and sport services which are allocated to CPA products groups.

The results of special foreign visitor's survey were used to divide the expenditures of resident's abroad by groups of products. The survey provides data for about 10 groups of products. During the process of balancing these broad groups have been allocated to the detailed CPA products.

In supply and use tables, the final consumption expenditure of private households have been estimated according to the national concepts. It includes the expenditures of Estonian tourist's abroad and excludes the expenditure of foreign tourists in Estonia. Expenditures made in Estonia by foreign tourists are included in exports.

The expenditure on goods were mostly estimated on the basis of households budget survey, retail trade statistics. For certain goods, such as alcoholic beverages and tobacco the commodity flow method has been used. The expenditure on electricity, natural gas, heating and water were available from the main suppliers. The estimates of production for own final use by farmers and in private gardens, such as agricultural goods are based on the agricultural survey statistics. The expenditure on services is based on a wide variety of sources: transport and communication surveys, hotels, restaurants and other services statistics, budget accounts, etc. The rental value of owner-occupied dwellings is estimated from output approach.

To prepare the estimates of gross fixed capital formation by product both the expenditure and commodity flow methods were used. The investment expenditure on motor vehicles is based on administrative data from vehicle register. The estimates of investment in transport equipment (railway locomotives, ships and aircraft) are obtained directly from the investment survey.

For the machinery and equipment, first, total expenditure by activity has been estimated on the basis on investment survey. To split up the investment in machinery and equipment by product the commodity flow method is used. For construction, which includes non-residential buildings and civil engineering works, the annual construction and investment surveys were used.

Integration and balancing the supply and use tables at purchasers prices

At this stage, the estimates of supply at basic prices, including the trade and transport margins and net taxes on products, and use at purchasers prices have been incorporated into supply and use framework.

The preliminary analysis of the product balances for the total economy as well as on detailed product level was an important step before the real balancing process started.

The information integrated into supply and use framework provided us a basis for analyzing of inconsistencies and identifying the major problems with the data. Largest product discrepancies regarding the energy products, construction and real estate have been analyzed. A further analysis has shown that it was the result of, first, grossing up procedures of the special cost survey data, and secondly, misclassification problems. Because this was the first time supply and use table prepared for Estonia, the conceptual problems have been also identified at this step.

The balancing of supply and use tables has been done in two steps:
– manual balancing
– automatic balancing

The purpose of the manual balancing was to achieve balance at the macro level between total supply and total demand eliminating imbalances at the product level. The product discrepancies have been analyzed using all available information. In the balancing process the intermediate consumption, final consumption expenditures of household and changes in inventories have been mainly adjusted. It should be noted that totals of exports and imports have not been changed in the balancing process.

The automatic balancing method has been applied, when there was a macro balance between total supply and total demand already achieved, but there were still small imbalances at the level of the individual products. The product discrepancies between supply and demand before the automatic balancing has been applied are shown in Table 1.

At the final step, for the purpose of removing the last product discrepancies the RAS balancing method was used. The RAS method eliminates these product discrepancies by adjusting the intermediate consumption matrix to match supply.

The integrated Accounts System (IAS'96) software implemented on SOE in 1999 has been used for the compilation of the supply and use tables. The IAS'96 is an integration tool, so the basic data are generally processed outside the IAS'96 and then integrated into supply and use tables data set for balancing.

Table 1. Product imbalances (before the automatic balancing)

Code CPA	Description	Total Supply	Total Demand	Product imbalance, mln.kr.	Product imbalance, percent
1	2	3	4	5=4-3	6=5/3
A+B	Products of agriculture, forestry, fisheries	13595,5	13556,3	-39,2	-0,3%
C+D+E	Products from mining and quarrying, manufactured and energy products	119926,3	119660,9	-265,4	-0,2%
F	Construction work	11247,8	11256,4	8,6	+0,1%
G+H+I	Wholesale and retail trade, repair services, hotel and restaurant, transport and communication services	26333,1	26136,6	-196,5	-0,7%
J+K	Financial intermediation services, real estate, renting and business services	19951,1	20305,3	354,2	+1,8%
L to P	Other services	18363,0	18501,7	138,7	+0,8%

Transformation of the use tables at purchasers' prices into basic prices and compilation of imports matrix

The use table at basic prices has been constructed on a basis of the balanced supply and use tables at purchasers' prices. The separate matrices for each type of margin such as wholesale, retail, transport, taxes on products, subsidies on products have been calculated.

It should be noted that in practice the information from basic statistics to compile these matrices are not directly available, therefore the estimation process is quit complicated and based on a lot of assumptions.

The estimation of valuation matrices was carried out in following steps. First, the main categories of uses and products have been identified. For example, the wholesale margins have been split into margins on intermediate consumption, exports and gross fixed capital formation. It has been assumed that the entire turnover of retail trade is delivered to households. For intermediate and capital goods delivered directly from producers to users, the wholesale margins are not calculated. There are no margins on goods produced for own final use. Second, the margins by uses and by products have been calculated by applying the margin ratios to the relevant goods.

For taxes and subsidies, the information available from budget accounts is detailed enough to classify taxes and subsidies according to CPA product classification and to the main users. For example, excise tax on tobacco has been directly allocated to private

consumption of households. The excise tax on motor fuels has been proportionally distributed to intermediate and final uses.

To calculate the import matrix data from foreign trade statistics and balance of payments are used. For imported goods, the detailed information at enterprise level by product groups, by customs procedures are available from foreign trade statistics.

Import matrix is calculated by categories of uses: intermediate consumption, households' consumption and capital formation. The classification by Broad Economic Categories (BEC) is used to classify the imported goods into intermediate, consumption and capital goods.

The compilation of the import matrix on intermediate consumption involves the following steps. First, the importing enterprises of intermediate goods are identified. First group comprises non-trading enterprises, which imports goods mainly for the production process, and is the main uses of these products. Second group is wholesaling and retails traders that mainly import goods for re-sale. The value of products imported by traders is distributed proportionally to the all intermediate users.

To calculate the import matrix on final uses the information on imported consumption and capital goods are used. The imported consumption goods are allocated directly to the final consumption expenditure of households. The imported capital goods are the part of gross fixed capital formation.

The import of services is based on estimates, which are made by Bank of Estonia specially for supply and use tables. The data are available by activity and by products and not at the level of enterprises.

At further stage, the estimates of trade and transport margins, taxes and subsidies, imports of goods and services have been integrated into valuation supply and use tables data set. The use tables at basic prices, valuation matrices as well as import matrix have been balanced at the same time.

3. The results of the 1997 supply and use tables and national accounts estimates

In this section the preliminary results of GDP estimates by expenditure and output approach based on different methods for the year 1997 are presented.

Table 2 shows the results of GDP estimates by expenditure approach based on different compilation methods.

The actual difference for total GDP is relatively minor, plus 0,4 percent. Among the components of GDP from expenditure side, the changes in inventories and government consumption expenditures have been substantially revised. Government final consumption expenditure has been revised by 4,4 percent. This is the result of adjustment

on imports of government services made to government final consumption expenditure. The considerable difference for changes in inventories minus 12,6 percent is explained as the result of new sources and methods. As indicated above, totals of exports and imports have not been changed in the balancing process.

Table 2. Comparison of the GDP by expenditure approach, 1997
(Million kroons)

	National accounts estimates	Supply and use estimates	Difference in percent
Private consumption	37586,0	37171,9	-1,1%
Government consumption	14623,6	15263,7	+4,4%
Gross fixed capital formation	17962,4	18179,6	+1,2%
Changes in inventories	1574,7	1376,3	-12,6%
Exports	50238,1	50238,1	0,0%
Imports (-)	57661,1	57661,1	0,0%
GDP from expenditure	64323,7	64568,5	+0,4%

The results of estimates of GDP by output approach are presented in the table 3.

For output side estimate, the most substantial difference compared to the national accounts figures is accounted for VAT. The higher level of non-deductible VAT is explained by compilation methods. The changes in total output and intermediate consumption are mainly result of the different measuring of output (gross or net recording).

Table 3. Comparison of the GDP by output approach, 1997
(Million kroons)

	National accounts estimates	Supply and use estimates	Difference in percent
Output (at basic prices)	150115,8	149813,6	-0,2%
Intermediate consumption (at purchasers' prices)	93257,9	92896,7	-0,4%
Gross value added	56857,9	56916,9	+0,1%
FISIM (-)	1170,9	1170,9	0,0%
Net taxes on products (excluding VAT)	1950,5	1942,9	-0,4%
VAT	6686,2	6879,6[*]	+2,9%
GDP from output	64323,7	64568,5	+0,4%

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[*] Imputed VAT

Table 4 compares the structure of value added by activity, where for presentation market, other non-market and activities for own final use are grouped by NACE. The different structures between the national accounts and the supply and use tables estimates are the results of conceptual issues (statistical units), classification and balancing.

Table 4. Comparison of gross value added by activity, 1997
(Percent, %)

Code NACE		National accounts estimates	Supply and use estimates
A	Agriculture, hunting and forestry	6,5%	7,8%
B	Fishing	0,5%	0,6%
C	Mining and quarrying	1,5%	1,7%
D	Manufacturing	16,9%	19,2%
E	Electricity, gas and water supply	3,6%	3,7%
F	Construction	6,0%	7,1%
G	Wholesale and retail trade, repair of motor vehicles	17,5%	13,5%
H	Hotels and restaurants	1,2%	1,3%
I	Transport, storage and communication	12,4%	14,0%
J	Financial intermediation	5,0%	5,0%
K	Real estate, renting and business activities	10,0%	9,6%
L	Public administration and defense, compulsory social security	4,7%	6,1%
M	Education	5,5%	5,3%
N	Health and social work	3,9%	3,4%
O	Other community, social and personal service activities	7,0%	3,7%
	FISIM	-2,1%	-2,1%

Conclusion

In this paper we presented the results of work on the compiling the first supply and use tables for the 1997, which have been produced independently, but are not yet integrated in the national accounts.

The supply and use tables as tool for analyzing inconsistencies in data gave us opportunity to test the definitions, existing sources and compilation methods of national accounts. In addition, the results of the work on supply and use tables have been used for the analysis of exhaustiveness of the national accounts. The supply and use tables compiled for the base year gives us a picture of the requirements on basic information needed for national accounts. Compilation of the supply and use tables makes possible to

introduce the double deflation method within the framework of the supply and use tables for the constant price estimates.

The development of a supply and use framework for the integration and reconciliation of national accounts data is main aim in Estonia. The introduction of annual supply and use system will change the compilation methods and improve the quality of national accounts estimates.