

# Outline for Input-Output Tables of BiH

## Final Report

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## 1. Introduction

The main objectives of this project is to provide an outline for the new input-output tables at the state level for BiH after assessing the former input-output table, evaluating the best methodology to be used while taking into account data availability and gaps.

Given the tremendous structural challenges Bosnia and Herzegovina has been facing and the huge structural changes through which the country will undergo in the near future, it is of utmost importance for the policymakers and the economic agents to have a clear picture of the structure of the economy. The input-output framework is the core element of such an indispensable picture. The input-output tables, and in particular the supply and use tables, serve both statistical and analytical purposes.

Firstly, they provide a framework for checking the consistency of statistics on flows of goods and services obtained from quite different kinds of statistical sources (industrial surveys, household expenditure inquiries, investment surveys, foreign trade statistics and other statistics). The system serves as a co-ordinating framework for economic statistics, both conceptually for ensuring the consistency of definitions and classifications used and as an accounting framework for ensuring the numerical consistency of data drawn from different sources. The input-output framework is also appropriate for calculating much of the economic data contained in the national accounts and detecting weaknesses and inconsistencies of the basic data available. This is particularly important for the decomposition of the flows of goods and services into values, prices and volumes with the aim of calculating an integrated set of price and volume measures.

As an analytical tool, input-output data are conveniently integrated into macroeconomic models in order to analyse the links between demand and supply, in particular between final demand components and industrial output levels. Input-output analysis also serves a number of other analytical purposes by linking other major statistics (e.g. employment, capital, energy, and environment) to the system of national accounts.

There are therefore many reasons and advantages to have a good input-output framework. The statistical purposes are:

- to identify gaps and inconsistencies in statistics

- to promote the integrated calculation of economic variables at current and constant prices
- to assess residually calculated estimates
- to improve the balancing procedures
- to enhance the consistency of the accounting system in general
- to provide links with sector accounts

The analytical purposes are:

- to provide valuable information for economic analysis (traditional input-output analysis)
- to identify analyses that can be carried out on the basis of satellite systems or other extensions to the systems (e.g. capital, labour, energy, pollutants)

While supply and use tables are data-oriented in nature, the symmetric input-output tables are always constructed on the basis of certain analytical assumptions, usually from existing supply and use tables.

The supply and use tables and the symmetric input-output tables can be used as tools of economic analysis. Both types of tables have different merits. For calculating direct and indirect effects, the supply and use tables need to be accommodated with specific assumptions or extra statistical information. For calculating cumulative effects of economic shocks, these assumptions and extra data requirements are the strongest. In fact, the requirements for calculating cumulative effects with a supply and use table amount to constructing a symmetric input-output table. Therefore, for calculating cumulative effects, the symmetric input-output table is the preferable tool. However, for calculating direct effects and first-order effects, the supply and use tables adjusted with a selected amount of assumptions (or extra statistical information) is in general to be preferred, because:

- the calculation is less dependent on assumptions;
- the supply and use table provides more detail than the symmetric input-output table;
- the information in the supply and use table can be better linked to other types of statistical data.

These features are also helpful when the supply and use tables are integrated in a macro-economic model: the resulting overall model is more close to real statistics, can show a lot of detail and can relatively easily be linked to areas on which other statistical data are available, e.g. on the labour market or the environment.

The supply and use tables and symmetric input-output tables can be used to calculate:

- effects of changes in prices or tax rates on the values of supply or use;
- effects of changes in volumes on the values of supply or use;
- effects of changes in prices of supply on prices of use;
- effects of changes in the volume of use on the volume of supply;
- effects of changes in the volume of supply on the volume of use.

The calculations can show indirect as well as direct effects.

## 2. Need for input-output tables

Input-output analysis is at the core of many types of quantitative economic analysis. Input-output analysis is indeed the main tool of applied equilibrium analysis. Input-output models, social accounting matrices, and general equilibrium models help us to examine questions such as: Which industries are competitive? What are the multiplier effects of an investment program? How do environmental restrictions impact on prices? What are the sectoral impacts of trade liberalisation? What would be the effects of EU enlargement on BiH? What would be the impacts of a tax reform? What would be the sectoral and regional impacts of EU accession?

Input-output analysis is the main tool to help us answer three key questions that pertain to the economy as a whole. What is the performance of an economy, in terms of efficiency and productivity growth? What is the comparative advantage of an economy vis-à-vis the rest of the world? How are these measures affected when environmental constraints are taken into account? Of course, many other interesting questions can be posed. The focus on the economy as a whole gives input-output analysis a macroeconomic flavour, but its foundation and techniques are more microeconomic, including a rigorous grounding in production and consumption.

Some people argue that it is at the interface of the two and define it as the study of industries or sectors of the economy. The name mesoeconomics has been coined for this. Input-output analysis may be considered a rather mechanical tool, not be easily applicable to free market economies with competitive valuations. It offers a unified, simultaneous treatment of the so-called “quantity and value systems.” The main framework is the United Nations’ System of National Accounts (SNA) and Eurostat’s ESA95 system, ingenious devices to provide a coherent snapshot of all the sectors of an economy.

Input-output tables are the core elements of widely used quantitative models, such as social accounting matrices and general equilibrium models. There is an increasing demand for quantitative economic analysis in a large number of areas: agriculture, industry, public finance, labour market issues, environment, trade, energy, sectoral issues, economic restructuring, economic forecasting, etc.

Both on the domestic and on the world markets, economic environment has been changing rapidly, marked by intense competition, uncertainties, innovation, far-reaching disruptions, crisis, technological changes, and new institutional arrangements. These metamorphosis and challenges will be even more critical in the coming years both on the domestic and on the international markets. The dramatic transformation of the world economy will continue with the rising role of China and India, the impacts of the EU enlargement and several bilateral and multilateral trade agreements, new technological breakthroughs, and the forthcoming changes on the energy markets.

In such a dynamic, uncertain, and complex environment, policymakers and the business community need to monitor very closely the economic developments not only at the macro level, but also at the sectoral and state levels in order to define, adjust and implement their vision and strategies.

Input-output and general equilibrium modelling offer powerful tools that can be used in all these areas to provide rigorous analysis and advice to the policymakers. They are powerful tools for the analysis of structural issues and are flexible enough to incorporate micro and macro elements and highly disaggregated features of the economy at the country, regional, urban, sectoral, household, and government levels. These models can take into account the extremely complex and dynamic social, economic, and financial framework in which factor

and product markets, as well as domestic and foreign markets interact, and how governments intervene.

General equilibrium models are based on microeconomic theories. They are designed to measure the direct, indirect and induced economic and environmental impacts of policy changes on an economy in the short, medium and long run. The input-output core enables the model to trace the extent and the channels of changes in policy and international environment. The resulting price changes affect the demand for the sectoral outputs and alter the resource allocation of factors. The simulations explore the effects of external shocks (such as changes in the international prices, the fluctuations in the real exchange rate, foreign demand, etc) and domestic policy changes. Model simulations provide results regarding the impacts on the:

- GDP
- sectoral production,
- sectoral value added
- sectoral trade flows,
- employment,
- investment,
- macroeconomic variables,
- prices,
- wages
- income,
- public finance outcomes,
- energy use,
- etc.

Input-output and general equilibrium (CGE) models use input-output tables and simulate the workings of an economy and are unique in their ability to analyze the impacts of economic policy decisions, especially when the policy has macro, and sectoral resource allocation repercussions. They are explicitly designed to capture all structural impacts including changes in relative prices, demand composition, and sectoral output and employment.

The main premise of the input-output and CGE models is that "structure" matters and they explicitly consider the workings of a multi-sectoral, multi-market, general equilibrium system undergoing structural adjustment, i.e. these models simulate the transactions in an economy. They capture the interaction of various actors in the economy including: households, (as consumers, workers and savers); firms, (as producers, consumers of intermediate goods, and investors); government, (as consumer and transfer agent); and the rest of the world, (as consumers of exports, producers of imports and providers or recipients of international capital flows). Consistent with microeconomic theory, all agents are assumed to optimize within budget constraints as well as the constraints imposed by regulatory frameworks. Input-output and CGE models are unique in their ability to present the trade-offs of a given policy decision, especially when the policy has economy-wide repercussions as in the case of corporate, sales and individual income taxes. Even the sign of an affected variable may change when an analysis is extended from partial to general equilibrium.

One of the most desirable properties of these models is their ability to trace economy-wide implications of several policy changes simultaneously, taking into account both the interactions between these policy changes as well as the policy changes and existing distortions.

The use of detailed inter-industry flow information allows the modelling of the interaction between industries that can result from the change in relative prices of specific commodities or the level of demand.

### 3. The 1983 input-output table for BiH

The first input-out table for Bosnia and Herzegovina was built in 1978, and the second and the last one, in 1983. In this report we focus on the 1983 input-output table. However, in the last part of this section a short comparison between the 1978 and 1983 input-output tables is undertaken.

The 1983 input-output table was built by the Economic Institute of Sarajevo. The authors are Dr Stiepo Andrijić and Dr Stanko Stanić. In their report, “*Medjusektorski Model Privrede SR Bosne i Hercegovine*”<sup>1</sup>, the authors have highlighted that the major problem in building 1983 input-output table was the collection of the data, its adjustment, harmonisation and transformation, but also the adaptation of the suitable methodology.

All the figures that are presented in this section steam from the report of Economic Institute of Sarajevo (1988).

### 3.1. Main concepts in the 1983 input-output table

Quantitative values of all the elements of production system and the magnitude connecting the production system with the economic environment are depicted in the input-output table. The scheme of the Bosnian 1983 input-output table is presented in Table 1. All the elements of the system are expressed in monetary terms.

The main elements of the input-output table are the following:

- $X_{ij}^{ir}$  value of the output of sector  $i$  which is supplied to the sector  $j$  for intermediate consumption;
- $X_j (X_i)$  total production of sector  $j$  ( $i$ );
- $X_j^{sr}$  value of the production that sector  $j$  imports from the other former Yugoslav republics for the intermediate consumption;
- $X_j^{ur}$  value of imports from the rest of the world of the sector  $j$  for the intermediate consumption;
- $D_j$  domestic product of the sector  $j$ ;
- $A_j$  consumption of fixed capital of sector  $j$ ;

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<sup>1</sup> Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo.

$P_j$	compensation of employees by sector j;
$V_j$	net operating surplus of sector j;
$B_i$	gross fixed capital formation and valuables of sector i;
$L_i$	part of the production of sector i allocated to the final consumption expenditure of households;
$O_i$	part of the production of sector i allocated to the final general consumption;
$\Delta Z_i$	changes in inventories of sector i;
$R_i$	part of the production of sector i exported to the other former Yugoslav republics;
$E_i$	exports to the rest of the world of sector i;
$F_i$	final use of domestic output of sector i.

The Bosnian 1983 input-output table had the same structure as the other table for former Yugoslavia. The main difference between the two is that in the Bosnian input-output table the intermediate and final consumption of the economy is more detailed.

In the 1980s, the system of the national accounts of Bosnia was based on the concept of “material production”. Therefore, the same concept has been used for building the input-output table, and it represents one of its main characteristics.

In accordance to this concept, the following production sectors have been presented in the input-output table: industry and mining, agriculture, forestry, water supply and production, construction, craft industry, catering, municipal activities and the other productive activities, but also transport which has been seen as the continuation of the production process, and trade. All the other activities, i.e. education or social security, not creating an income were included in the final consumption of the input-output table.

The 1983 input-output table displays all the stages of the production process, and is composed of three quadrants.

The first quadrant includes the central part of the table, and contains the structure of the intermediate consumption of production sectors.

The second quadrant includes main sources of the total available resources of production sectors, composed of the production of the production sectors, changes of inventories, imports from the rest of the world and imports from the other former Yugoslav republics. The value of the production of Bosnian economy is given by the elements of its structure. In the other words, it is given by the value of the total expenditure for the raw materials and materials, to which the value of the domestic product is added with its categories of the primary distribution to: the consumption of the fixed capital, compensation of employees, taxes, contributions, etc. This part of the table is directly related to the first quadrant, and has for the same sectors same columns. When these two quadrants are taken into account together, they represent the detailed structure of the production (gross domestic product) of some specific sectors of Bosnian economy, but also the structure of the total available resources.

**Table 1: Scheme of Bosnian 1983 input-output table**

Sectors	1	2	.	.	.	.	n	$\sum_j X_{ij}$	$B_i$	$L_i$	$O_i$	$\Delta Z_i$	$R_i$	$E_i$	$F_i$	$X_i$	
1								$\sum_j X_{1j}^{rr}$	$B_1$	$L_1$	$O_1$	$\Delta Z_1$	$R_1$	$E_1$	$F_1$	$X_1$	
2								$\sum_j X_{2j}^{rr}$	$B_2$	$L_2$	$O_2$	$\Delta Z_2$	$R_2$	$E_2$	$F_2$	$X_2$	
.								.	.	.	.	.	.	.	.	.	
.								.	.	.	.	.	.	.	.	.	
.								.	.	.	.	.	.	.	.	.	
.								.	.	.	.	.	.	.	.	.	
n								$\sum_j X_{nj}^{rr}$	$B_n$	$L_n$	$O_n$	$\Delta Z_n$	$R_n$	$E_n$	$F_n$	$X_n$	
$\sum_i X_{ij}$	$\sum_i X_{i21}^{rr}$	$\sum_i X_{i22}^{rr}$	.	.	.	.	.	$\sum_i X_{in}^{rr}$	$\sum_i \sum_j X_{ij}^{rr}$	$\sum_i B_i$	$\sum_i L_i$	$\sum_i O_i$	$\sum_i \Delta Z_i$	$\sum_i R_i$	$\sum_i E_i$	$\sum_i F_i$	$\sum_i X_i$
$A_j$	$A_1$	$A_2$	.	.	.	.	$A_n$	$\sum_j A_j$									
$P_j$	$P_1$	$P_2$	.	.	.	.	$P_n$	$\sum_j P_j$									
$V_j$	$V_1$	$V_2$	.	.	.	.	$V_n$	$\sum_j V_j$									
$X_j^{sr}$	$X_1^{sr}$	$X_2^{sr}$	.	.	.	.	$X_n^{sr}$	$\sum_j X_j^{sr}$									
$X_j^{ur}$	$X_1^{ur}$	$X_2^{ur}$	.	.	.	.	$X_n^{ur}$	$\sum_j X_j^{ur}$									
$X_j$	$X_1$	$X_2$	.	.	.	.	$X_n$	$\sum_j X_j$									

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.9.

The third quadrant includes the upper right part of the table. It shows the final distribution of the total available resources. This part is also linked to the first quadrant, and once considered together they represent the distribution, or in the other words, the use of total available resources in intermediate consumption (by production sectors), in final consumption, in exports to the rest of the world and in exports to the other former Yugoslav republics.

The balance between the total available resources and the total expenditures, for each sector but also for the total value, can be formulated as it follows<sup>2</sup>:

$$P + \Delta Z^r + X^{sr} + X^{ur} = X^{tr} + \Delta Z + B + L + O + E + R \quad (1)$$

$$D + (X^{ur} - E) + (X^{sr} - R) = (\Delta Z - \Delta Z^r) + B + L + O \quad (2)$$

The equation (2) shows that the total final consumption equals domestic product which is corrected by the amount of exports and imports to and from the rest of the world, and by the amount of exports and imports to and from the other former Yugoslav republics.

The input-output table includes the trade flows between Bosnia and the other five republics of the former Yugoslavia. This means that each republic has been considered as a region when analysing six republics together.

For the choice of sectors to be included in the 1983 input-output table, the starting point was the use of common former Yugoslav classification of activities. But, each republic was allowed to introduce some changes in that classification. The changes should reflect the difference in the structure of economy of each former Yugoslav republic. Therefore, Bosnian input-output table includes 11 sectors which are common to the input-output tables of the five other former Yugoslav republics. Two of these eleven sectors, (1) industry and mining and (5) construction, were very important for the Bosnian economy and were therefore disaggregated at the lower level. The former is disaggregated at 33 sub-sectors, and the latter at 3 sub-sectors.

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<sup>2</sup> For the notation please see pages 9-10.

This rule of having 11 identical sectors in the input-output, in each of 6 former Yugoslav republics, was imposed in order to be able to have a consistent comparison of figures among six.

The list that follows includes the 11 main sectors, but also the disaggregation of two important sectors for Bosnian economy. The detailed input-output table includes 45 sectors.

### **List of 45 sectors included in the Bosnian 1983 input-output table**

- (1.1) Electricity supply and production
- (1.2) Coal production
- (1.3) Coal processing
- (1.4) Production of petroleum products
- (1.5) Production of mineral, iron
- (1.6) Ferrous metallurgy
- (1.7) Production of minerals, coloured metals
- (1.8) Production of coloured metals
- (1.9) Processing of coloured metals
- (1.10) Production of non metals
- (1.11) Processing of non metals
- (1.12) Metal processing activity
- (1.13) Engineering
- (1.14) Production of transport equipment
- (1.15) Production of electric machines and instruments
- (1.16) Production of chemical products
- (1.17) Processing of chemical products
- (1.18) Production of stones and sand

- (1.19) Production of construction materials
- (1.20) Production of cut material and panels
- (1.21) Production of final wood products
- (1.22) Production and processing of paper
- (1.23) Production of yarn and fabrics
- (1.24) Production of final textile products
- (1.25) Production of leather and fells
- (1.26) Production of leather footwear
- (1.27) Processing of rubber
- (1.28) Production of food products
- (1.29) Production of drinks
- (1.30) Production of provender
- (1.31) Production and processing of tobacco
- (1.32) Graphical activity
- (1.33) Production of miscellaneous products
- (2) Agriculture and fishing
- (3) Forestry
- (4) Water supply and production
  - (5.1) Construction - buildings, business centres, etc
  - (5.2) Construction - civil engineering and hydraulic construction
  - (5.3) Installation and final proceedings in construction
- (6) Transport and communications
- (7) Trade

- (8) Catering and tourism
- (9) Craft industry and reparations
- (10) Municipal activities
- (11) Other productive activities

### 3.2. Data used in the 1983 IO table

The authors underline that one of the main problems in building the 1983 input-output table was the collection of the data, its adjustment, harmonisation and transformation but also the adaptation of the suitable methodology.

The largest portions of the data used for building the 1983 input-output table was from:

- The statistical research PB-11 report, “Izvjestaja OUR-a u privredi o reprodukcijama potrošnje, zalihama, nabavci i prodaji” for the year 1983. Some transformation of data was needed, in order to prepare the data for its use in the input-output table;
- Complex annual report, KGI-01, presenting regularly published statistical publications.

In addition to these two main sources, the authors used the officially published data regarding:

- foreign trade;
- imports and exports that were elaborated by national bank;
- calculations of the income of private sector, agriculture, craft industry, catering and transport; These calculations were the main source for the estimation of the value and the structure of production of private sector;
- wholesale and retail trade;
- investments;
- un-produced consumption.

### 3.3. Methodology used in building the 1983 input-output table

The Bosnian 1983 input-output table shows very clearly how the different sectors of the economy are linked to each other, but also how these sectors interact with the sectors of the other former Yugoslav republics. The transactions with the rest of the world were also taken into account.

Given that the statistical empirical research could not provide all the necessary information for building the 1983 input-output table, the authors also used analytical methods, such as:

- a) arrangement of data according to the general scheme (presented above);
- b) checking if the data in the input-output table by assumption can keep their place (cell) at the final stage;
- c) final verification and correction of data that has created imbalances among the rows and columns.

The main assumption that has been used in their analytical approach is the establishment of the macroeconomic balance. The input-output table is a part of the national accounts, and therefore the main economic indicators in this table and in national accounts were defined in the same way.

In the Bosnian system of national accounts, in the year 1983, the balance between total available resources and total expenditures, was given by the following scheme:

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1. Gross domestic product
Intermediate consumption
Domestic product
- consumption of fixed capital
- compensation of employees
- operating surplus, net
2. Imports from other former Yugoslav republics
3. Imports from the rest of the world

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4. Output (1+2+3)
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1. Intermediate consumption
2. Changes in inventories
3. Gross fixed capital formation and valuables
4. Consumption expenditure of households
5. General consumption
6. Exports to the other former Yugoslav republics
7. Exports to the rest of the world

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8. Total expenditures
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*Source:* Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.54.

The national accounts that were used for building the balance of total available and consumed resources were elaborated by the office for statistics of Bosnia and Herzegovina.

At the beginning of the process of building the 1983 input-output table, the values in the table were expressed in purchasing prices. This means that the values included the transport costs and the margins of trade (taxes on the turnover). Although, for the analysis of interdependence of sectors the values expressed in purchasing prices are not very reliable, as the quantity of that relationship does not depend on the value of transport costs or on margins of trade. In order to have reliable structural analysis, the input-output table in producer prices had to be built. To get the latter table, the authors had to build the matrix of turnover costs (transport costs plus margins).

The biggest part of the data that could be used directly was used for building the second quadrant (described above) of the input-output table. Less of it was used for the third quadrant, and unfortunately none of that data could be used directly for building the first quadrant. The non reliability of data was the main reason for this constraint.

The construction of the 1983 input-output table was done in three phases:

- 1) In the first stage, the second quadrant of the 1983 input-output table was built. For its building a few data adjustments were necessary, as an important part of data could be used directly. Therefore, it was concluded that the second quadrant of the table is very reliable and as such it may be a good starting point for the further statistical development.
- 2) In the second stage, the third quadrant of the input-output table was built (final consumption). This stage is characterised by the more intensive adjustment of the raw data. However, a degree of direct use of the data is still very high.
- 3) The data which resulted from the point one and two was used as a starting point for building the first quadrant. At this stage, the use of the direct data is very low, and the use of specific methods and techniques for the adjustment of data is very high.

#### **Building of the second quadrant (domestic output and imports)**

In the next paragraphs we will shortly describe the way the data was used and adjusted for building the second quadrant.

The data regarding the changes in the inventories of raw materials, materials used in the production, semi-products and final products was directly taken from Table 7 and 8 of PB-11 report. To get the changes, they subtracted the values of inventories on the 31.12.1983 from the value of inventories on the 31.12.1982. If the result of the subtraction was negative, they imported a positive value in the input-output table, as it represented an additional import to the production process.

Export data was directly imported from the Table 7, PB-11 report.

The data concerning consumption of fixed capital, compensation of employees and the net operating surplus was extracted from Table 9, PB-11 report. The same data source has provided the data concerning the imports of each sector of Bosnian economy from the other former Yugoslav republics.

The main result of this phase of the process was the calculation of the aggregate values of imports of each sector of Bosnian economy from the other sectors of the economy.

### **Building of the third quadrant (final consumption)**

The third quadrant shows the distribution of goods from production sectors to the other Bosnian users. These other users are composed of consumers that consume the available goods, but exclude the production sectors as their consumption is included in the first quadrant.

Data regarding the changes of inventories of raw materials, materials, trade products, retail inventories, packaging, final products and unfinished production was taken from Table 7 and 8 of PB-11 report. As it was the case for the calculation of the second quadrant, the changes were obtained by subtracting the values of inventories on the 31.12.1983 from the value of inventories on the 31.12.1982. If the result of the subtraction was negative, they imported a positive value in the input-output table as such a change of inventories represents an additional output.

The gross fixed capital formation and valuables data was extracted from Table 10 of PB-11 report. The data that is presented in that table is shown as a total delivery of investment goods to some production and other sectors of the former Yugoslavia. Therefore, they had to extract from the values of investment deliveries to the production sectors of the former Yugoslavia the values that were related to the deliveries to Bosnian economy. The separation has been done as it follows. The authors calculated the proportional part of gross investments by sector. They have used “the share of total deliveries to the Bosnian economy in the total deliveries to the former Yugoslavia” as a key for this separation.

Data concerning the exports to the other former Yugoslav republics, and to the rest of the world was extracted from Table 3 of PB-11 report.

Once the previously described values were obtained, the authors were able to start the calculations of the final values of total intermediate deliveries of production sectors. In the same time, they paid attention on the previously obtained results for the total intermediate procurement. Using this method, they obtained the aggregate values of exports and imports of Bosnian economy.

The households' and general consumption, as a part of final consumption, were estimated independently from the PM-11 report.

Once the authors set up the third quadrant, they were able to compare the values of its elements to the values of the elements of the second quadrant, and thereby calculate the residuals.

### **Building of the first quadrant (intermediate consumption)**

After building the matrix of domestic products and imports, and the matrix of final consumption, the next step was to build the matrix of the intermediate consumption. The construction of this matrix was more complex than the one of the two previous, as there was a significant lack of data regarding it.

The starting point for building the matrix of intermediate consumption was Table 3 from PB-11 report. This table contains the data regarding the total consumption of raw materials, materials, services and trade goods by the groups of products and services. The same table contains the data regarding the total imports from the other former Yugoslav republics and the total imports from the rest of the world. The difference between the total supply and the supply to the other former Yugoslav republics and imports represents the total supply to the country. This method allowed the authors to calculate the value of the inputs each sector bought from the other ones. However, for building the matrix of intermediate consumption they also needed data on consumption. As mentioned above, Table 3 contained the data regarding the total consumption of raw materials, materials, services and trade goods but it did not contain the origins of these goods. This means that from that data the authors could not find out how much of that consumption was used in Bosnia, how much in the other former Yugoslav republics and how much in the rest of the world.

Disaggregation of the total consumption among these three uses was done by using three groups of coefficients. The first group showed the supply of the other former Yugoslav republics in the total supply, the second the supply of the rest of the world, and the third the supply from Bosnian economy in the total supply. By using this method the authors could derive an estimation of the matrix of the intermediate consumption.

As they knew the total values of supply of intermediate goods of the Bosnian economy by sector, but also the total delivery of each sector to all the other sectors, they were able to verify the results. They noticed a difference between the rows and columns for all sectors of the matrix of intermediate consumption. However, these differences were greater than 5% only for 2 sectors, and less than 1% for the 75% of differences. The scale of differences was

acceptable. For each sector for which the difference was less than 1% the corresponding residuals were corrected, and for the sectors for which the difference was greater than 5% there was a specific analytical analysis in order to correct that difference.

Regarding the residuals, these are not presented in the 1983 input-output table. This decision of the authors is acceptable as for none of the sectors that compose the Bosnian economy the residuals were greater than 2.5%. Therefore, the authors have distributed the value of residuals among the elements of the input-output table.

### 3.4. Analysis of the structure of Bosnia and Herzegovina's economy following the 1983 IO table

There were four areas regarding the productive system that were analysed in the 1988 report of Economic Institute of Sarajevo.

- 1) Analysis of the direct and total interdependence between industries;
- 2) Analysis of the direct and total link of the industries with the final consumption;
- 3) Analysis of the domestic product;
- 4) Analysis of the Bosnian economy's dependence on foreign trade (including exports and imports to and from the other former Yugoslav republics).

In what follows, the main conclusions regarding the structural analysis of these four areas are presented.

#### **Analysis of interdependence of sectors in the Bosnian economy**

The linkage between the production sectors of the Bosnian economy, in 1983, is shown in a clear way in the matrix of technical coefficients and the matrix of realisation coefficients. The two matrices illustrate the density but also the intensity of economic linkage between the production sectors. The matrix of technical coefficients ( $A = [a_{ij}]$ ) shows the production relationship from the point of view of sectors that consume, and the matrix of realisation coefficients ( $S = [s_{ij}]$ ) from the point of view of sectors that supply. These two matrices of Bosnian 1983 economy are presented in Tables 2 and 3.

For the sector  $j$ , consumer of intermediate goods, the supply sectors that have higher elements  $a_{ij}$  in the matrix are more significant for it. The sum of all elements of the column  $j$  of matrix  $A$  represents the measure of the direct integration of the sector  $j$  in production system in Bosnia and Herzegovina, from the point of view of consumption of the intermediate goods.

**Table 2: Matrix of technical coefficients**

Sector	1	2	3	4	5	6	7	8	9	10	11
1	0.3486	0.1325	0.0789	0.2306	0.1865	0.1733	0.0386	0.2823	0.2054	0.4493	0.0840
2	0.0279	0.0814	0.0077	0.0000	0.0007	0.0002	0.0067	0.3700	0.0030	0.0006	0.0000
3	0.0125	0.0002	0.0258	0.0018	0.0016	0.0005	0.0001	0.0004	0.0001	0.0004	0.0001
4	0.0002	0.0003	0.0002	0.0176	0.0006	0.0006	0.0002	0.0017	0.0007	0.0062	0.0002
5	0.0045	0.0006	0.0137	0.0717	0.1327	0.0113	0.0006	0.0078	0.0030	0.0202	0.0351
6	0.0199	0.0103	0.0536	0.0330	0.0348	0.0442	0.0183	0.0205	0.0161	0.0194	0.1093
7	0.0392	0.0155	0.0218	0.0556	0.0544	0.0332	0.0043	0.0519	0.0390	0.0553	0.0063
8	0.0011	0.0003	0.0070	0.0007	0.0026	0.0049	0.0008	0.0687	0.0008	0.0011	0.0017
9	0.0087	0.0184	0.0108	0.0168	0.0265	0.0081	0.0035	0.0123	0.0179	0.0061	0.0084
10	0.0216	0.0044	0.0020	0.0031	0.0081	0.0155	0.0109	0.0581	0.0220	0.0760	0.0246
11	0.0157	0.0039	0.0098	0.0095	0.0059	0.0215	0.0041	0.0164	0.0135	0.0900	0.0434

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, after p.65, Table 3.6.2.

**Table 3: Matrix of realisation coefficients**

Sector	1	2	3	4	5	6	7	8	9	10	11
1	0.3486	0.0211	0.0014	0.0005	0.0309	0.0131	0.0062	0.0094	0.0076	0.0180	0.0040
2	0.1745	0.0814	0.0008	0.0000	0.0007	0.0001	0.0067	0.0077	0.0001	0.0002	0.0000
3	0.7123	0.0018	0.0258	0.0002	0.0148	0.0020	0.0012	0.0007	0.0003	0.0008	0.0002
4	0.0871	0.0221	0.0020	0.0176	0.0528	0.0226	0.0190	0.0278	0.0136	0.1260	0.0049
5	0.0274	0.0005	0.0014	0.0009	0.1327	0.0052	0.0006	0.0016	0.0007	0.0049	0.0101
6	0.2638	0.0218	0.0124	0.0009	0.0763	0.0442	0.0387	0.0090	0.0079	0.0103	0.0693
7	0.2451	0.0155	0.0024	0.0007	0.0564	0.0157	0.0043	0.0108	0.0091	0.0139	0.0019
8	0.0331	0.0012	0.0037	0.0000	0.0131	0.0111	0.0040	0.0687	0.0009	0.0013	0.0025
9	0.2349	0.0788	0.0051	0.0009	0.1181	0.0164	0.0149	0.0109	0.0179	0.0066	0.0108
10	0.5392	0.0173	0.0009	0.0002	0.0335	0.0293	0.0433	0.0481	0.0204	0.0760	0.0294
11	0.3275	0.0129	0.0036	0.0004	0.0203	0.0339	0.0138	0.0114	0.0105	0.0753	0.0434

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.9., after p.65, Table 3.6.3.

According to this criterion, the following sectors were highly integrated in the production system: production of iron (82.5% of total production was produced with goods supplied by Bosnian production sectors); metallurgy (80.09%), municipal activities (72.46%), production of coloured metals (70.57%), and 11 other sectors that had more than 50% of their total production being produced with goods supplied by the Bosnian enterprises.

On the other hand, some sectors, such as production of miscellaneous products (24.79%) or forestry (23.13%), used very few goods in their production that are supplied by the other sectors of Bosnian economy.

For the sector  $i$ , supplier of intermediate goods, the consumer sectors that have higher elements  $s_{ij}$  in the matrix are more significant for it. The sum of all these elements represents the proportion of the production of the sector  $i$  that is delivered to the other sectors of Bosnian economy for the intermediate consumption, and it also represents the measure of integration of the sector  $i$  in the production system of Bosnian economy, from the point of view of supply of the intermediate goods.

According to this criterion, the following sectors supplied more than 50% of their production for the intermediate consumption: production of provender (89.61%), coal processing (87.77%), municipal activities (83.79%) and 12 other sectors. All the other sectors beam the biggest part of their available production to some categories of final consumption.

In addition to the matrix of technical coefficients and the matrix of realisation coefficients, which show the interdependency between two sectors, the matrix of sectoral multipliers was also presented. This matrix shows how the total effects are spread on the production system and this as the consequence of increase of final consumption of the sector  $j$ . The matrix of sectoral multipliers for the 1983 is presented in Table 4.

Final consumption of the product of the sector  $j$  conditions the corresponding value of production of the economy. The amount of that production is given by the sum of  $r_{ij}$ . This sum represents the total direct and indirect effects that the unit of production of the sector  $j$  (dedicated to the final consumption) has on the production of all sectors.

It is the unit of final production of the following sectors that had the greatest effect on the production of all sectors: the ferrous metallurgy (288.01%), municipal activities (228.79%), production of iron (226.4%) and 5 other sectors that have more than 200%.

The authors have highlighted that in order to understand the complete link between some sectors, it was very important to understand indirect effects that the unit of the product of sector  $j$  (aimed for the final consumption) had on the production through the specific links between some sectors. In addition, they have introduced the notion of “averaged synthetic measure of integration”. This measure was calculated by summing the sum of  $a_{ij}$  and the sum of  $s_{ij}$ , and it showed how the analysed sector was linked with the other sectors from the point of view of direct consumption and the supply of intermediate goods. The closer is this value to one; the greater is the linkage between the analysed sector and the other sectors of Bosnian economy. This also means that the sector has a higher degree of integration in the production system. The measure only covers direct production links.

**Table 4: Matrix of sectoral multipliers**

<b>Sector</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>
<b>1</b>	1.6053	0.2492	0.1692	0.4323	0.3863	0.3233	0.0819	0.5726	0.3678	0.8282	0.2183
<b>2</b>	0.0495	1.0964	0.0144	0.0140	0.0134	0.0107	0.0099	0.0615	0.0121	0.0269	0.0071
<b>3</b>	0.0206	0.0034	1.0287	0.0076	0.0069	0.0047	0.0012	0.0079	0.0049	0.0111	0.0030
<b>4</b>	0.0006	0.0005	0.0004	1.0182	0.0011	0.0009	0.0004	0.0026	0.0011	0.0073	0.0006
<b>5</b>	0.0117	0.0032	0.0191	0.0887	1.1575	0.0178	0.0022	0.0172	0.0079	0.0367	0.0466
<b>6</b>	0.0418	0.0198	0.0652	0.0528	0.0556	1.0597	0.0226	0.0450	0.0304	0.0584	0.1289
<b>7</b>	0.0697	0.0296	0.0343	0.0831	0.0837	0.0520	1.0098	0.0881	0.0585	0.1007	0.0250
<b>8</b>	0.0025	0.0008	0.0084	0.0020	0.0042	0.0061	0.0012	1.0750	0.0017	0.0031	0.0031
<b>9</b>	0.0169	0.0233	0.0145	0.0251	0.0361	0.0130	0.0049	0.0218	1.0229	0.0179	0.0138
<b>10</b>	0.0409	0.0126	0.0092	0.0176	0.0228	0.0278	0.0146	0.0848	0.0351	1.1081	0.0367
<b>11</b>	0.0322	0.0107	0.0163	0.0215	0.0179	0.0324	0.0078	0.0380	0.0249	0.1204	1.0560

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, after p.65, Table 3.6.4.

## Multiplier effects of the final consumption on the total production

The analysis of the final consumption is one of the most important aspects of the analysis of interdependence in the structure of economy, as the production of each sector is dependent on the final consumption (in the direct or indirect way). The third quadrant of the Bosnian 1983 input-output table shows the production by sector that is directly dedicated to some elements of the final consumption such as: gross capital formation ( $I^n$ ), households' consumption (L), general consumption (O), changes of inventories ( $\Delta Z$ ), exports to the other former Yugoslav republics (R), and exports to the rest of the world (E). In addition, the share of the production that was dedicated to the intermediate consumption is transformed in the goods that are used in the final consumption. The latter represents an indirect effect of the final consumption on the production. Thereby, each sector participates in the production of goods that are dedicated to the final consumption regardless if they are producers of final goods or not.

The total effects of the elements of final consumption on the production are defined by:

$$X = (I - A)^{-1} \cdot I^n + (I - A)^{-1} \cdot L + (I - A)^{-1} \cdot O + (I - A)^{-1} \cdot \Delta Z + (I - A)^{-1} \cdot R + (I - A)^{-1} \cdot E$$

where  $(I - A)^{-1}$  stands for the matrix of sectoral multipliers;

X stands for the vector of production.

Regarding the Bosnian economy in 1983, it can be noticed that 57.3% of the total production was directly dedicated to the final consumption, and the remaining 42.7% to the intermediate consumption.

More than 30% of the total production that was dedicated to the final consumption went to the households' consumption, and one third to exports to the other former Yugoslav republics.

As the total production is conditioned by the consumption (direct or indirect) it was important to calculate the shares of GDP that are conditioned by the components of the final consumption. These shares are shown in Table 5. The same table also shows the indirect effects of the components of final consumption on GDP. It can be noticed that it is the households' consumption (30.73%) and exports to the other former Yugoslav republics (31.90%) that conditioned the most GDP. Concerning the indirect effects, once again, it is the households' consumption (11.87%) and exports to the former Yugoslav republics (14.63%) that had the greatest impact.

**Table 5: Miscellaneous effects of the final consumption on GDP (in %)**

	Share of GDP conditioned by components of final consump.	Indirect effects of the components of final consumption on GDP
Gross capital formation	13.81	4.82
Households' consumption	30.73	11.87
General consumption	5.99	2.64
Changes of inventories	5.58	2.60
Exports to the other former Yugoslav republics	31.90	14.63
Exports to the rest of the world	11.95	5.67
Total	100.00	42.23

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.80 and personal analysis.

It is also interesting to look at the shares of each of eleven sectors of the 1983 input-output table in GDP:

1) Industry and mining	57.53%
2) Agriculture and fishing	9.18%
3) Forestry	1.01%
4) Water supply and production	0.11%
5) Construction	9.53%
6) Transport and communications	4.35%
7) Trade	9.19%
8) Catering and tourism	1.91%
9) Craft industry and reparations	2.14%
10) Municipal activities	2.31%
11) Other productive activities	2.76%

The sectors that have the highest share in GDP are: industry and mining (57.53%), construction (9.53%), trade (9.19%) and agriculture and fishing (9.18%). These four sectors almost represent the Bosnian economy as they account for more than 85% of the total production.

## **Analysis of Bosnian economy's import dependence and its relationship with the other former Yugoslav republics**

The analysis of imports and the structure of imports is very important, as the imports have to be covered by the real goods, exports. This analysis also allows one to find out if it is possible to substitute some imports by the domestic production.

The import dependence may be seen as direct or indirect dependence. Direct dependence concerns the value of imports of intermediate goods that the production sectors use. Although, intermediate goods with domestic origins used by the production sectors contain a certain amount of imports that are conditioned by import dependence of supply sector. The latter represents indirect dependence. The sum of direct and indirect dependence represents the total dependence.

The figures from Table 6 show that the production of petroleum products has a high degree of total dependence on imports (83.4%) from the rest of the world. There are some other sectors that are less dependant than the former, but are still represent a high dependence, such as: production of transport equipment (34.8%), production of coloured metals (31%) or processing of non metals (29.9%).

Regarding the imports from the other former Yugoslav republics, the following sectors have high degree of dependence (measured by total coefficient): production of provender (55.7%), production of leather footwear (49.4%), production of food products (44.6%) and fourteen other sectors that have coefficients higher than 30%.

The authors have highlighted that they had some methodological problems regarding the data, and that they were unable to solve them. Therefore, they suggested analysing the two types of imports (imports from the rest of the world and imports from the other former Yugoslav republics) as a one single flow.

**Table 6: Direct and total coefficients of imports from the rest of the world and from the other former Yugoslav republics (in %)**

SECTOR	IMPORTS			Imports from the other former Yugoslav rep.		
	Direct coeff.	Total coeff.	Ratio	Direct coeff.	Total coeff.	Ratio
Electricity supply and production	1.7	5.9	3.47	6.2	12.8	2.06
Coal production	5.0	8.9	1.78	12.8	19.4	1.52
Coal processing	16.3	<b>22.7</b>	1.39	19.0	<b>30.4</b>	1.60
Production of petroleum products	79.7	<b>83.4</b>	1.05	5.3	5.5	1.04
Production of mineral, iron	3.2	<b>21.7</b>	6.78	1.4	18.5	13.20
Ferrous metallurgy	5.2	19.2	3.69	4.0	21.2	5.30
Production of minerals, coloured metals	6.3	11.4	1.81	18.3	23.3	1.27
Production of coloured metals	16.1	<b>31.0</b>	1.93	8.4	22.6	2.69
Processing of coloured metals	10.2	<b>25.1</b>	2.46	17.8	29.1	1.63
Production of non metals	0.2	4.2	21.00	23.1	28.8	1.25
Processing of non metals	25.3	<b>29.9</b>	1.18	31.9	<b>38.9</b>	1.22
Metal processing activity	3.9	11.4	2.92	18.4	28.3	1.54
Engineering	8.7	12.8	1.47	22.7	29.6	1.30
Production of transport equipment	27.9	<b>34.8</b>	1.25	18.1	25.7	1.42
Production of electric machines and instruments	10.4	15.3	1.47	25.2	<b>32.9</b>	1.31
Production of chemical products	8.7	16.4	1.89	15.1	28.0	1.85
Processing of chemical products	8.0	12.8	1.60	34.2	<b>42.3</b>	1.24
Production of stones and sand	0.0	7.9	-	15.1	24.0	1.59
Production of construction materials	2.0	15.9	7.95	19.5	26.8	1.37
Production of cutted material and panels	4.0	9.0	2.25	7.8	17.7	2.27
Production of final wood products	4.2	10.1	2.40	11.4	23.1	2.03
Production and processing of paper	15.5	<b>21.7</b>	1.40	17.2	27.5	1.59
Production of yarn and fabrics	10.3	15.0	1.46	22.5	<b>32.2</b>	1.43
Production of final textile products	8.5	12.0	1.41	32.6	<b>39.1</b>	1.20
Production of leader and fell	17.5	20.9	1.19	33.7	<b>44.1</b>	1.31
Production of leader footwear	4.8	10.0	2.08	38.1	<b>49.4</b>	1.30
Processing of caoutchouc	16.2	19.1	1.18	31.1	<b>35.1</b>	1.13
Production of food products	4.0	8.9	2.23	24.4	<b>44.6</b>	1.83
Production of drinks	1.8	8.7	4.83	28.5	<b>40.9</b>	1.44
Production of provender	1.9	3.9	2.05	39.7	<b>55.7</b>	1.40
Production and processing of tobacco	5.8	10.2	1.76	21.7	<b>38.0</b>	1.75
Graphical activity	1.9	8.1	4.26	29.3	<b>39.0</b>	1.33
Production of miscellaneous products	1.2	4.8	4.00	33.1	<b>38.4</b>	1.16
Agriculture and fishing	0.4	2.6	6.50	22.9	<b>32.3</b>	1.41
Forestry	1.0	4.5	4.50	6.7	11.1	1.66
Water supply and production	0.0	8.2	-	4.7	13.4	2.85
Construction - buildings, business centres, etc	0.4	4.9	12.25	13.0	22.8	1.75
Construction - civil engineering and hydraulic construction	1.5	8.8	5.87	20.0	28.5	1.43
Installation and final proceedings in construction	0.2	5.6	28.00	16.5	28.1	1.70
Transport and communications	1.0	7.8	7.80	6.3	12.4	1.97
Trade	0.0	1.1	-	0.0	2.1	-
Catering and tourism	0.0	5.5	-	7.2	22.6	3.14
Craft industry and reparations	2.0	7.7	3.85	24.6	<b>31.6</b>	1.28
Municipal activities	1.7	11.5	6.76	8.1	22.2	2.74
Other productive activities	14.5	17.9	1.23	22.7	29.4	1.30

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, pp.98-99.

Following that approach, the production of the following sectors was highly dependant on imports: production of petroleum products (88.9%), processing of non metals (68.8%), production of leather and fell (65%), production of transport equipment (60.5%) and twenty-two other sectors that have percentages higher than 40%.

Twenty-six production sectors of the Bosnian economy are characterized by a high dependence on imports of intermediate inputs, as more than 40% of their intermediate consumption originates from imports. These figures clearly indicate country's high dependence on imports. The analysis also shows that these 26 production sectors are the part of industry and mining, and other productive activities.

### **Analysis of structural changes of the Bosnian economy between the 1978 and 1983**

The authors observe six significant changes in the economic structure between 1978 and 1983.

Firstly, the gross domestic product of Bosnia and Herzegovina's economy in 1983 was 3.9 times higher compared to 1978.

Secondly, it was noticed that the majority of economic activities of Bosnia had much more intensive production links, from the point of view of imports of intermediate goods, among them in 1983 than in 1978. In addition, the links among the production sectors, from the point of view of delivery of the goods necessary for intermediate consumption, were much more intensive in 1983 compared to 1978.

Thirdly, for the two years considered here, 1978 and 1983, the value of the production delivered to the final consumption did not change much. However, there are significant changes in the structure of the final consumption. This is shown by the data on the components of the final consumption in the total production of the Bosnian economy, presented in Table 7.

**Table 7: Structure of the final consumption of the Bosnian economy in 1978 and 1983 (in %)**

Elements of the final consumption	1978		1983	
	Direct	Total	Direct	Total
Gross fixed capital formation and valuables	3.68	6.37	8.99	13.53
Final consumption of households	17.68	33.01	18.86	30.05
General final consumption	6.35	10.71	3.34	5.79
Changes in inventories	0.21	0.33	2.98	5.46
Exports to the other former Yugoslav republics	23.91	39.4	17.27	31.22
Exports	6.19	10.18	6.28	13.95
(Consumption used for the reproduction)	(41.98)	-	(42.27)	-
(Total)	(100)	100	(100)	100

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.104.

From the point of view of allocation of available production to the final consumption, it can be noticed that in 1983 some elements of the final consumption have increased and some decreased, when compared to 1978. The elements of the final consumption that have increased are: gross fixed capital formation and valuables, changes in inventories, and exports. On the other hand, final consumption of households, general final consumption and exports to the other former Yugoslav republics have increased.

Fourthly, the results of the 1978 input-output table show that the value of imports was 5.54% times higher than the value of total production. However, this percentage has increased to 7.12% in 1983. In addition, it has also been noticed that the share of exports in the total allocated production has been higher in 1983 with respect to the 1978. *These results have led to the conclusion that links between the Bosnian production sectors and the rest of the world have increased.*

Five, the imports from the other republics of the former Yugoslavia were 20.45% of the total production in 1978, and 14.62% in 1983. This figure shows a decrease of links between Bosnian production sectors and the production sectors of the other former Yugoslav republics.

And finally, the figures of Table 8 show that there were significant changes in the structure of the Bosnian economy in the year 1983 with respect to the year 1978.

**Table 8: Structure of GDP, in 1978 and 1983 (in %)**

Elements of the GDP	1978	1983
Imports of goods from Bosnia used in production	41.98	42.77
Imports of goods from other former Yugoslav rep. used in production	20.45	14.62
Imports of goods	5.54	7.12
Consumption of fixed capital	3.19	5.56
Personal income of employees	11.2	18.49
Operating surplus, net	15.97	11.44
<i>Gross Domestic Product (GDP)</i>	98.33 <sup>3</sup>	100

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.106.

The significant changes in the structure of the Bosnian economy can also be seen in the Table 9, depicting the structure of the economy by sector.

**Table 9: Structure of total production of Bosnian economy by sector, in 1978 and 1983 (in %)**

	Sector	1978	1983
1	Industry and mining	45.50	57.53
2	Agriculture and fishing	2.31	9.18
3	Forestry	1.20	1.07
4	Water supply and production	0.12	0.11
5	Construction	8.94	9.53
6	Transport and communications	4.07	4.35
7	Trade	29.67	9.12
8	Catering and tourism	1.62	1.91
9	Craft industry and reparations	1.80	2.14
10	Municipal activities	1.71	2.31
11	Other productive activities	3.06	2.70
	Total	100	100

Source: Andrijić, S. and Stanić, S. (1988), *Medjusektorski Model Privrede SR Bosne i Hercegovine*, Economic Institute of Sarajevo, p.106.

Table 9 shows that in 1983, 57.53% of the Bosnian production steam from industry and mining sector and the remaining 42.47% of the total production was produced by the other 10 sectors. However, that domination of industry and mining sector did not exist in 1978. It is

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<sup>3</sup> The difference from 100% is residuals.

from the year 1979 that the larger part of the total production belonged to the industry and mining sector.

## **Conclusion**

Even if the 1983 input-output table gives some useful information, it is no more relevant and cannot be used in economic analysis if the current situation. It is too old and the structure of the economy has changed considerably since 1983. On the other hand, the concepts in establishing the 1983 input-output tables are not the ones currently used in the European System of Accounts 1995 (ESA95). The new input-output tables of BiH need to comply with the latest methodology and international standards being used in the field.

## 4. ESA95 methodology

The 1995 European System of Accounts (ESA 95) includes an integrated set of supply and use tables as well as sym-metric input-output tables. Both types of data sets, together with tables linking the supply and use tables to the sector accounts, form the input-output framework as described in Chapter 9 of the ESA 95. For these tables the same concepts and definitions apply as they do elsewhere in the system.

The tables in the input-output system provide a consistent framework for balancing supply and demand at current and constant prices and offer a more detailed basis for disaggregated economic analysis. With this programme, the input-output system of supply and use tables and symmetric input-output tables has become central to the compilation of national accounts. They represent a key feature of the European System of National Accounts and are part of the transmission programme of national accounts data to be supplied to Euro stat on a regular basis.

A short overview of data transmission is given below:

### *a) Annually (beginning with reference year 1995)*

- Supply table at basic prices, including a transformation into purchasers prices, at current and constant prices, A60 x P60
- Use table at purchasers prices, at current and constant prices, A60 x P60

### *b) Every five years (beginning with reference year 1995)*

- Symmetric input-output table at basic prices, current and constant prices, P60 x P60
- Symmetric input-output table for domestic output at basic prices, current and constant prices, P60 x P60
- Symmetric input-output table for imports at basic prices, current and constant prices, P60 x P60

*c) Every five years (beginning with reference year 2000)*

- Cross classification of production accounts and by sector, current prices, A60 x five sectors (Non-financial corporations, Financial corporations, General government, Households, Non-profit institutions serving households)
- Cross classification of fixed assets by industry and by product, current prices, A31 x Pi3
- Cross classification of gross fixed capital formation by industry and by product, current prices, A31 x P60

All these data sets have to be provided with a delay of  $t + 36$  months. During the transition period derogations from the base program have been accepted for certain member states concerning the details and form of transmission. Certain exemptions were made for the submission of tables and single variables and individual branches. Some flexibility for the transmission of the symmetric input-output tables product by product (as requested in the transmission program) or industry by industry was also allowed, depending on the statistical units used in the countries for compiling the tables.

### **Input-output framework in ESA95**

In the ESA95 system, the input-output framework consists of three types of tables:

1. supply and use tables;
2. tables linking the supply and use tables to the sector accounts;
3. symmetric input-output tables.

Supply and use tables are matrices by industry and product describing the domestic production processes and the transactions in products of the national economy in great detail. These tables show:

- the structure of the costs of production and the income generated in the production process;
- the flows of goods and services produced within the national economy;
- the flows of goods and services with the Rest of the World.

A supply table shows the supply of goods and services by product and by type of supplier, distinguishing output by domestic industries and imports.

A use table shows the use of goods and services by product and by type of use, i.e. as intermediate consumption (by industry), final consumption, gross capital formation or exports. Furthermore, the table shows the components of gross value added, i.e. compensation of employees, other taxes less subsidies on production, net mixed income, net operating surplus and consumption of fixed capital.

Between the supply and use tables, two types of identities hold good:

1. The identity by industry:

$$\text{Output} = \text{Intermediate consumption} + \text{Value added};$$

2. The identity by product:

$$\text{Output} + \text{Imports} = \text{Intermediate consumption} + \text{Exports} + \text{Final consumption expenditure} + \text{Gross capital formation}.$$

These identities by industry and product can be used to check and improve the consistency and completeness of the data.

Supply and use tables are also the central framework for all tables by industry, e.g. those on employment, gross fixed capital formation and capital stock.

The supply and use tables contain all the flows in the following accounts:

- a) the goods and services account;
- b) the production account;
- c) the generation of income account.

A symmetric input-output table is a product by product or industry by industry matrix describing the domestic production processes and the transactions in products of the national economy in great detail. A symmetric input-output table rearranges both supply and use in a single table. There is one major conceptual difference between a symmetric input-output table and a combined supply and use table: in the supply and use table, the statistics relate products to industries, while in the symmetric input-output table the statistics relate products to products or industries to industries. So, in a symmetric input-output table either a product or an industry classification is employed for both rows and columns.

Most statistical information that can be obtained from producer units indicates what type of products they have produced/sold and, usually less detailed, what type of products they have bought/used. The format of the supply and use tables is designed to fit in with this type of statistical information (i.e. industry by product). By contrast, information of a product by product or industry by industry nature as required by the symmetric input-output table is not often available. For example, surveys of industries usually provide information about the type of products used and about the products produced. However, information on the inputs in terms of products and value added components for each product produced is usually not collectable. Ideally, the administration of an enterprise should show all costs allocated to the various types of output and, simultaneously, show the composition of intermediate consumption by type of product. In practice, information arranged in the form of supply and use tables is therefore a practical starting point for constructing the more analytic information in the symmetric input-output tables. The industry by product information in the supply and use tables can be converted into product by product or industry by industry, statistics by adding extra statistical information on the input structures, or by assuming constant input structures by product or by industry.

The methodological advantages of supply and use tables as an integral part of national accounts are:

- Integration of GDP calculation

- Consistency of detailed commodity level
- Efficient confrontation of different primary sources
- Identification of gaps in primary sources
- Ideal framework for different value concepts (basic prices, purchaser prices)
- Best framework for calculation of variables at constant prices

The practical advantages of supply and use tables as an integral part of national accounts are:

- Extreme exploitation of information in primary sources
- Open for incorporation of any other basic statistics
- Good foundation for making reliable estimates (supply equals use)
- Possible to use ‘common sense’ more efficiently
- Linkage to symmetric input-output tables
- Linkage to preliminary and quarterly accounts systems
- Linkage with satellite systems

The methodology of building supply and use tables, as well as input-output tables is explained in details (almost 400 pages) in the ESA 95 Input-Output Manual<sup>4</sup> currently being developed by the Euro stat. It is therefore superfluous (and impossible within the limited space of this report) to enter into the details of this methodology. The draft version of the Manual is available from the Eurostat.

As an overview, we provide below the table of contents of the Manual.

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<sup>4</sup> The ESA 95 Input-Output Manual – Compilation and Analysis, August 2002 (Draft version).

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## 5. Data availability

Even if the detailed data needed for building the supply and use tables, as well as the symmetric input-output tables are not yet *all* available, the Agency for Statistics of BiH has been working intensively to develop the statistical array and the relevant data in the country, in spite of very limited resources and difficult institutional arrangements. These data can be used to develop a *preliminary* version of the new input-output table. The current situation regarding the data is as follows:

- Detailed data on foreign trade are available
- The preliminary results of industry statistics (PRODCOM 2003, 2004, and 2005 have already been published)
- Classification of activities in conformity of Nace Rev 1.1 published
- National accounts following the ESA95 standards are being developed and some data are already available
- Data on informal economy in preparation (OECD project)
- Data on investment have already published been published for 2004 and 2005
- Tax statistics are under development (agreement with the Indirect Tax Administration)
- Some data on prices area available. The CPI project is at its final phase.
- Household budget surveys (preliminary are already available and the 2007 HBS has started)
- Labour force survey (the preliminary results of LFS 2006 are already available)
- There is also some data available on agriculture (some data have already been published for 2004 and 2005).

In spite of the progress, there are important gaps for constructing the SUT and IO table, especially in the field of business statistics, business registry, industry surveys, intermediate consumption, price indices, production and capital accounts of the sectors.

## 6. Conclusions and recommendations

As a result of our research, fact-finding missions, and interviews, we arrived to the following conclusions, actions and approach:

- The input-output tables, and in particular the supply and use tables, are indispensable statistical and analytical tools.
  - Firstly, they provide a framework for checking the consistency of statistics on flows of goods and services obtained from quite different kinds of statistical sources (industrial surveys, household expenditure inquiries, investment surveys, foreign trade statistics and other statistics). The system serves as a co-ordinating framework for economic statistics, both conceptually for ensuring the consistency of definitions and classifications used and as an accounting framework for ensuring the numerical consistency of data drawn from different sources. The input-output framework is also appropriate for calculating much of the economic data contained in the national accounts and detecting weaknesses and inconsistencies of the basic data available.
  - As an analytical tool, input-output data are integrated into macroeconomic models in order to analyse the links between demand and supply, in particular between final demand components and industrial output levels.
  - Input-output analysis also serves a number of other analytical purposes by linking other major statistics (e.g. employment, capital, energy, and environment) to the system of national accounts.
- The most recent available input-output tables are too old. They are no more relevant to the current economic and institutional context and should not be used.
- The new input-output tables should be built in compliance with the ESA95 standards and requirements. This means that not only an input-output table, but above all supply and use tables should be constructed in line with the ESA95 standards and methodology.

- In order to build these tables, data gaps in relation to the business sector, production and capital accounts, and various price indices should rapidly be filled up.
- Given the lack of human resources and experience in the field of supply and use matrices, as well as input-output tables, a twinning project with one of the statistical agencies of the EU member states is indispensable.
- The new EU member states from Central and Eastern Europe have already implemented a program of SUT and IOT development. Given that the statistical institutes of these countries had to face similar challenges, we recommend a close cooperation with them, especially with the statistical office of Slovenia.
- Relevant software (such as ERETES, IAS96, and SNA-NT) should be used to accelerate the SUT and IOT construction process. This would make the whole process much easier and reliable. Software can be used for compiling the annual integrated economic accounts for institutional sectors, the supply and use tables, the input-output tables, and also for the balance of payments. The objective of the available software is to construct a precisely defined and efficient set-up with respect to routines for compiling annual national accounts, based on the guidelines of ESA95.
- Filling up all the data gaps and building the full-fledged SUT and IOT might take some time. Policymakers and their advisors (such as EPPU) cannot wait for all the data become available. We suggest that a preliminary, aggregate (about 20 industries), and unofficial input-output table and a preliminary social accounting matrix be built by an external consultant. These tables are indeed indispensable for structural general equilibrium and multi-sector macro econometric models. There is an urgent need for such tools in the policymaking process in Bosnia and Herzegovina.