

Tourism and Economic Development in Romania: Input-Output Analysis Perspective

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A*bstract.* Tourism provides a lot of opportunities for sustainable economic development. At local level, by its triggering effect it could represent a factor of economic recovery, by putting to good use the local material and human potential. By its position of predominantly final-branch, tourism exercises to a large impact on national economy by the vector of final demand, for which the possible and/or desirable variant for the future is an economic-social demand that must be satisfied by variants of total output. Using the input-output model (IO model) a comparison was made of the matrix of direct technical coefficients (a_{ij}) and the one of the total requirement coefficients (b_{ij}) with the assistance of which the direct and propagated effects were determined for this activity by the indicators defining the dimensions of national economy.

Key words: tourism, economic impact, multipliers, input-output, Romania

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1. Introduction

The branch “tourism” represents par excellence a predominantly final branch (only 15% of production is allotted to intermediary consumption, the rest of 85% being allotted to final-consumption (public-private consumption, investments and exports-imports)).

Therefore, the development of a country’s tourism, in general, and of tourism at regional level in particular is best revealed by correlating tourism activities with the level of the gross value added (GVA), both statically and dynamically. In the specialised literature, it is considered that GVA is an important development factor of a country and of a region, showing not only the actual development level but also, *mutatis mutandis*, the level of incomes on which depends to a large extent the tourism potential both domestically and internationally. By its specific features – services, high consumption of labour, intelligence and creativity – the tourism participates in creating more value added as compared to the related branches from the viewpoint of the development level (Minciú, 2000), and by its triggering capacity creates demand in touristic destinations for complementary products and services – food industry, leisure/cultural consumption, health services, etc. developing specific markets. At the same time, it stimulates the development/modernisation of the support infrastructure – transports, etc., provides employment opportunities, supports the import/export activity for tourism products/services/technologies and feeds the incomes of local communities.

At world level (WTTC 2010), after a 4.8% contraction in 2009 the real GDP growth for the Travel & Tourism Economy is expected to be 0.5% in 2010, to an average of 4.4% per annum over the coming 10 years. The contribution of Travel & Tourism to GDP is expected to rise from 9.2% (US\$ 5,751 bn) in 2010 to 9.6% (US\$11,151 bn) by 2020 and to total employment from 8.1%, (235,758,000 jobs or 1 in every 12.3 jobs) to 9.2% (303,019,000 jobs, or 1 in every 10.9 jobs). Export earnings from international visitors are expected to generate 6.1% of total exports (US\$ 1,086 bn) in 2010, growing (in nominal terms) to US\$ 2,160 bn (5.2% of total) in 2020. Travel & Tourism investment is estimated at 9.2% of total investment (US\$ 1,241 bn), in 2010 and at 9.4% (US\$ 2,757 bn) in 2020.

In Romania, the contribution of the branch to economic development in the period of economic growth was relatively more modest than world values. The period 2000-2008, in our analysis, represents for Romania the stage in which economy recorded growths at relatively high rates of GDP, imports, exports and investments, even though they had, as primordial support, demand, imports and exports under

the conditions of unprecedented growth in the foreign indebtedness degree of Romania on short, medium and long term. Based on evaluating the share in the development of national economy, the following **characteristics of the tourism branch** in Romania may be highlighted (Annex 1):

- ✓ **Tourism share** in domestic market output was 3.1% in 2008 against 3.0% in 2000 and 2.2% and, 2.1% respectively in the total output of goods and services, which signifies a relatively important field for the sustainable economic growth of Romania, particularly if we take into account that this share is almost equal to, or exceeds the share of traditional sub-branches or of new ones of the manufacturing industry in Romania; it should be noted that this share was maintained quasi-constant for the analysed period, which supports the hypothesis of relative constancy in time of the technical coefficients of the input-output model;
- ✓ In total tourism output, the highest share is held by the “Restaurants” branch (51.7%) followed by “Hotels” (35.5%) in 2008, this hierarchy remaining unchanged against the year 2000; thus, tourism in relative terms brings more value added (1.45 times) by the contribution of “Restaurants” branch against the “Hotels” branch. This relationship is valid for the entire aggregate of the tourism branch for foreign tourists in Romania, the expenditures on hotels being still the most important factor for tourists’ decision marking;
- ✓ The share of tourism in **total intra-community** imports in 2008 represents about 3.1% against 0.0% in 2000, which highlights the impact of Romania’s accession to EU in the year 2007; the extra-community import of tourism recorded a higher share in total extra-community import, reaching 1.15%;
- ✓ Both intra- and extra-community imports in tourism had as original source the “Hotels” branch;
- ✓ with respect to the contribution of tourism to taxes (value added tax), for the analysed period, there is an increase of their share in total tax on product from 3.1% to 4.7% respectively which might signify also a relative increase in the taxation burden;
- ✓ The consumption of tourism resources in total resources represents about 2.3% in 2008, on slight increase against 2000;
- ✓ The Tourism branch allocates a share of about 82% to final consumption from its total production which determines us to regard it as a **preponderantly final branch**, as for intermediate consumption allotted to the branch and for the other branches it is only 18%. This feature is very

important because tourism represents a sector of the economy dependent on the development of demand of goods and services in infrastructure in a much larger proportion than intermediate consumption distributed to manufacturing and to other sectors of the national economy. Within final consumption, tourism has a share of about 5% from final consumption on total economy, a share on increase against the year 2000.

- ✓ The share of tourism in total exports of goods and services was of about 2.1% from total exports in 2009, on increase against 2000, exports originating in close shares between the “Hotels” and “Restaurants” branches, 54% and 46% respectively under the conditions in which intra-community exports of the Tourism branch hold about 74.7%, and the extra-community ones 25.3%.

2. Review of Literature

From the viewpoint of its contents and in correlation with the total national economy, tourism acts as a stimulating factor of the global economic system (Minciu, 2000). Tourism can be an engine of economic growth, and the creation of partnerships between the public and private sector is important in order to stimulate investments in the sector.

Tourism is not only a GDP generator, but it has also an important contribution to the realisation of value added (Minciu, 2000). This sector exerts influence on natural resources, on environment, on infrastructure from touristic destinations, as tourism is important both to tourists but also to the inhabitants of the destination areas.

In the literature, various papers deal with aspects related to analytical and predictive potential of the IO model. Zaman et al. (2010a) use the IO method to analyze effects of taxes within the Romanian economy, based on data provided by the National Institute of Statistics, with the help of IO statistical tables for 2000 and 2006. The main conclusion of testing the time-stability of technical coefficients (Zaman et al. 2010 b) is that the IO method can be used as a quantitative and qualitative instrument for analysis on short and medium term (not more than five years). Chen et al. (1986) explore, for example, the relationship between the stability of the allocation version of the IO model (Ghosh) and the conventional production version of the model (Leontief). The authors present a theoretical analysis of joint stability.

Other approaches aimed to investigate the time-stability of the technological coefficients and short-time prediction methods of their dynamics. De Mesnard (2000) presents methods for comparing two IO matrices at two different time periods. The survey methods allow the evaluation of the changes in the exchange structure between branches over time or of the differences between two exchange structures over space. Morillas et al. (2008) define the coefficients importance as a fuzzy concept, and the importance considering the absolute flows. Rueda-Cantuche et al. (2008) argue that the fixed industry sales structure model emerges as the best one to construct industry tables as compared with the fixed product sales structure model. The authors investigate the fixed product and fixed industry sales structure models. Oosterhaven (2002) analyzes why the key sector concept should be broadened including not only the size of its forward and backward linkages, but also a sector's ability to generate autonomous growth. Oosterhaven (2008) proposes to replace the traditional (gross) forward and backward linkages with net linkages that take into account the two-sidedness of each sector's interdependency with the rest of the economy. The author uses some examples for various countries. An alternative approach to measuring the diversity based on the technical coefficients matrix of an IO model is outlined and computed by Wagner et al. (1993). According to the authors, the empirical results suggest that higher diversification levels within the theoretical constructs of the IO model are associated with higher levels of stability. Surugiu et al. (2009) use the Input-Output Analysis to measure tourism contribution to the Romanian economy. The authors use backward and forward linkages to describe how the increase in the production of tourism sector generates an increase in the demand for inputs from other sectors in the economy and respectively in the supply to other economic sectors. Surugiu (2009) uses the input-output analysis for Romania to determine the importance of value added incomes and employment and analyzes the existing connection in the economy. The author focuses on tourism and the analysis is finished for the Hotels and Restaurants Sector.

From the brief presentation of the research literature focused on the IO analysis, we can see the need for analysing the complexity of the transaction between branches of an economy and also its importance for future adopted measures.

3. Theoretical-methodological framework

The input-output analysis is one method for measuring the spread effects of changes in the final demand for the product of an industry or sector, the main applications of this analysis being discussed in the literature by many researchers. The structure of each sectors' production activity is represented by

appropriate structural coefficients that describe in quantitative terms the relationships between the input it absorbs and the output it produces. The interdependence among the sectors can be described by a set of linear equations that express the balances between total input and output of each good and service produced (Eurostat, 2008).

The input-output analysis is concerned with the description and analysis of the production structure of an economy. Production processes in an economy are always interdependent. The products of one process are used in another while the product of that process may be used in many others. In a time of global markets with more competition and interdependent production, deeper division of labour and greater diversity and complexity of products, the exchange of intermediates becomes more important and, consequently, so does input-output analysis (Eurostat, 2008).

The input-output analysis starts by estimating the input-output coefficients also called technical coefficients, calculated by dividing each column of the transactions table by corresponding "total" column. If x_{ij} represents the amount of inputs of sector j purchased from the selling sector i , and X_j the total output of sector j , the technical coefficients are determined as flows:

$$a_{ij} = \frac{x_{ij}}{X_j} \quad (1)$$

In the case of sectors, the technical coefficient matrix (A) is constructed; it is known as direct requirements table or Leontief matrix. If I is the unit matrix, X is the vector of sectoral output and Y is the vector of final demand, a demand-driven input-output model of an economy can be described as following:

$$A \cdot X + Y = X, \quad (2)$$

From where it results that:

$$X = (I - A)^{-1} \cdot Y \quad (3)$$

where $(I - A)^{-1}$ is called **total requirements matrix** or **Leontief inverse matrix**.

If we denote Leontief inverse matrix by B , then the output multipliers (B_j) will be:

$$B_j = \sum_{i=1}^n b_{ij} \quad (4)$$

The Leontief inverse matrix represents the starting point in deriving other important multipliers (e.g. income, employment, value added and taxes). The output multiplier shows the change in the output of all branches from the line due to changes in final demand with one unit in the relevant branch.

The IO analysis offers two distinctive results for each analysed sector, namely **backward linkages** and **forward linkages**. First, the backward linkage is used to indicate the interconnection of a particular sector to other sectors from which it purchases inputs. Also, increased output of sector j indicates that additional amounts of products are available to be used as inputs by other sectors. Backward linkages are demand-oriented (Eurostat, 2008). Because of their property, backward linkages are also reported in the bibliography as **multipliers**.

If O is the Leontief inverse matrix, the derived backward linkage coefficients are determined as follows:

$$OBL = \sum_{i=1}^n O_{ij}, \quad IBL = \sum_{i=1}^n Ic_i O_{ij}, \quad VABL = \sum_{i=1}^n VA_i O_{ij} \quad (5)$$

where: OBL – output backward linkage coefficient, IBL – income backward linkage coefficient, VABL – value added backward linkage coefficient, Ic_i – matrix of income technical coefficients (c_{ij}) determined as household income divided by sectoral output, VA_i – matrix of value added technical coefficients determined as sectoral value added (va_{ij}) divided by sectoral output.

The forward linkage presents the intersectoral transactions, showing that an increase in total production of sector j increases its total supply to the rest of the economic sectors that are seeking for sector's j product as an input in their production process (Bonfiglio et al. 2006). According to Augustinovics (1970), the forward linkage coefficients reveal the intermediate consumption as a percentage of total sectoral sales including final demand. The term forward linkage is used to indicate this interconnection of a particular sector to those to which it sells its output. Forward linkages are supply oriented (Eurostat, 2008). The forward linkage coefficients are determined as follows:

$$OFL = \sum_{i=1}^n O_{ij}^T, \quad IFL = \sum_{i=1}^n Ic_i O_{ij}^T, \quad VAFL = \sum_{i=1}^n VA_i O_{ij}^T \quad (6)$$

where: OFL – output forward linkage coefficient, IFL - income forward linkage coefficient, VAFL – value added forward linkage coefficient, O_{ij}^T - are the transposed of Leontief inverse matrix.

Forward linkages depict changes in output, employment and income in the whole economy as a consequence of a change in added value within the chosen sector (Golemanova and Kuhar, 2007). Eurostat (2008) suggests that if linkages are used to identify key sectors with high multipliers in a particular economy, only domestic intermediates should be used to assess the forward and backward linkages in the national context.

Multipliers are another means of estimating the overall change in the economy due to changes in final demand. Among all the information provided by input-output, multipliers are one of the most frequently used.

The research pursued to highlight the macroeconomic contribution of the "tourism" branch based on the last available official data supplied by the National Institute of Statistics regarding the input-output tables with a nomenclature of 105 branches in current and constant prices. In the input-output tables "tourism" does not appear as a distinct branch, and that is why, as a rule, it is identified with the activity volume of the branches 85 "Hotels", 86 "Restaurants" and 93 "Activities of tourism agencies".

4. Tourism dependency on inputs supplied by other branches

One of the major advantages of the IO model is the one regarding the possibility of analysing the structure of production expenditures of a branch based on the "a_{ij}" technical coefficients, on the input column of the respective branch. The size of these coefficients indicate the extent to which the production activities of the respective branch depend on raw materials, semi-fabs and products and services delivered by other branches with which this branch is in direct relation regarding production. Therefore, a_{ij} coefficients are also called direct requirements coefficients for the production of goods and services.

The development in time of the a_{ij} coefficients depends on a multitude of interdependent factors but the most important of them is the scientific and technological progress which, by replacing old technologies with new, superior ones induces sensitive changes in the structure of the production costs of the branches.

Therefore, a special attention is paid to the evolution in time of the a_{ij} coefficients because the hypothesis of their constancy in time adopted by the Leontief model cannot have relevance but on short and medium term, that is for a period in which no changes of essence occur with respect to technologies.

In our research, we have used the data of the statistical input-output tables for the years 2000-2008 for analysing the structure of production expenditures of the "tourism" branch in the respective years based on the coefficients a_{ij} (inputs).

Based on the data from the input-output tables for the Romanian economy in the years 2000 and 2008 we have attempted to perform an analysis of the structure of the branch costs from quadrant I of the IO model, based on the technical coefficients a_{ij} (input) for highlighting in decreasing order the main branches supplying goods and services to the tourism activity (Annex 2).

In the year 2000, **the highest a_{ij} coefficients** (with sizes between 0.4 – 0.05) of the inputs of the "tourism" branch were from: Food, beverages, tobacco (0.39742); Hotels, restaurants, tourism agencies and touristic assistance (0.20546); Electric power, thermal power, gas and water (0.08704); Communications (0.07958); Textiles, clothing, leather, footwear (0.06817); Transports (0.06430); Financial services, banking, insurance (0.05768); Chemicals and synthetic fibres (0.05440).

In 2008, the important **a_{ij} technical coefficients** of tourism inputs originated from the following branches: Foods, beverages and tobacco (0.45412); Communications (0.11661); Agriculture, forestry, fishing and forestry exploitation (0.10219); Electric power, thermal power, water and gas (0.10208); Hotels, restaurants, tourism agencies (0.09299); Transports (0.06273); Financial services, banking and insurance (0.06273); Collective, social and personal services (0.05204); Constructions (0.05204).

Some conclusions with a generalising character are necessary from the comparative analysis of the structure, size and dynamics of the a_{ij} technical coefficients of the inputs of the "tourism" branch, respectively:

- a) Tourism is directly related with respect to its expenditures on the purchase of goods and services with 24 important branches of the national economy, which indicates not only the **complex character** of the activities in the field but also a certain hierarchy of the priorities with regard to expenditures and of their optimisation opportunities, including from the viewpoint of the sustainable development requirements;
- b) Among the main providers of inputs for tourism there are branches of the primary, secondary and tertiary sectors with an increasing trend in the complementary contribution of the tertiary sector as a result of tourism economy computerisation and digitalisation, but also due to increased importance of services for production, banking, financing and insurance;

- c) Anyway, **as a basis of tourism development the branches from the primary and secondary sectors** (agriculture, food industry, textiles and chemistry, etc.), so that any trend of rendering these branches peripheral to the exclusive favour of “pseudo-tertiary” represents in the best case a unilateral approach, if not a wrongly oriented one. This finding based on the data of the input-output model has an incontestable strategic importance, because it stipulates unequivocally the fact that without a corresponding material basis in tourism, ‘tertrialisation’ remains just a “nice” word.
- d) The hypothesis of constancy in time of the a_{ij} technical coefficients, the postulate of the input-output analysis is verified by the fact that their size, with certain exceptions, was maintained quasi-constant both in 2000 and 2008, which pleads for the use of the IO model as a valuable instrument both from the analytic and predictive viewpoint in justifying economic policies;
- e) As the complexity degree of the national economy and of the goods and services supply diversification increases, there is a **multiplication and intensification** the interdependencies between tourism and the other branches of the national economy among which transports, electric and thermal power, gas and water remain future *sine qua non* supports;
- f) “Self-consumption” of the “tourism” branch, even if it does not represent the most important input in the cost structure of the branch, by size it takes place 2, in 2000 and place 5 in 2008, which gives the branch a certain specificity for its intrinsic potential of growth.

5. “Tourism” branch as supplier of goods and services for the other branches of the national economy

Even though tourism represents a field of activity which supplies 4/5 of its production to final consumption, its function as a supplier of intermediary goods and services for the other branches should not be neglected, as well. In accordance with our computations, tourism as a branch and its components supply mainly the outputs to the following branches in decreasing order of the a_{ij} coefficients: hotels, restaurants, tourism agencies (self-consumption); machine building industry; pharmaceuticals; detergents; cosmetics and other chemical products; services to enterprises; transportation means; transports; cars and home appliances; electric and electronic products.

This quality of tourism as a supplier to other branches must be interpreted from the viewpoint of the branch character that develops not only activities of tourist

services but also of goods and services intermediation.

Of course, we consider that this activity of supplying some intermediary goods and services to other branches in size is relatively modest and does not constitute a decisive factor for triggering economic growth, comparable to its function as a supplier of goods and services for demand, the final consumption through which it exercises the most **intense capacity** of propagating some direct and indirect effects in the entire economy, both on the real and nominal side of it.

As mentioned in the beginning, the coefficients b_{ij} or multipliers of the IO model gain a first-rank analytical-predictive importance because, with their help, the propagated effect is quantified for each branch and type of good and/or services propagated by tourism as regards the goods and services supply and demand for the entire economy.

In Annex 3 we present in rows and columns the D_{ij} coefficients of the tourism branch as difference between coefficients b_{ij} and a_{ij} , that is:

$$D_{ij} = b_{ij} - a_{ij}$$

where:

D_{ij} represents the effects induced by tourism in all other branches with which they enter in production relations; the higher the value of D_{ij} the more the propagated effects is stronger on other branches.

In 2000, the **highest values** of D_{ij} were recorded in the branches: hotels, restaurants and travel agencies (indirect self-consumption); foods, beverages, tobacco; agriculture-forestry, fishery and forestry exploitation; electric and thermal power, gas and water; extracting industry; chemistry and synthetic fibres; textiles, clothing, leather, footwear; financial and banking services.

In 2008, the highest values of the D_{ij} coefficient were recorded in the branches: hotels, restaurants and tourism agencies (indirect self-consumption); extractive industry; agriculture-forestry, fishery, forestry exploitation; foods, beverages, tobacco; electric and thermal power, gas and water; services for enterprises; chemistry and synthetic fibres; rubber and plastic materials; glass; machine building industry.

One should note that, even though with respect to sectors in which tourism induces effects there were no major changes occurring, we still observe their change in hierarchy by the size of the indirect impact and a sectoral diversification where services, rubber and plastic materials and machine building

prevail (Annex 4).

We mention again that, despite the structural changes in Romania's transition economy, the hard core of inter-branch relationships is maintained, this being the outcome of the specific features of producing goods and services, but also of technologies used.

At the same time, the comparative analysis of the evolution of a_{ij} and b_{ij} coefficients in the years 2000 and 2008, based on the relationship between their size we can outline some aspects and conclusions regarding their constancy in time, useful for applying some updating techniques and procedures.

The more the size of the relationships $a_{ij\ 2008}/a_{ij\ 2000}$ and $b_{ij\ 2008}/b_{ij\ 2000}$ becomes more important, the more we have to deal with significant changes in the technical coefficients and, to the contrary, the less it is we shall find that these coefficients remain unchanged.

To this purpose, we determined size intervals for the respective relationships within which we framed various coefficients of the branches depending on:

- significant changes ($a_{ij\ 2008}/a_{ij\ 2000} < 0,98$);
- quasi-constant a_{ij} (0,98 și 1,09);
- significant change ($a_{ij\ 2008}/a_{ij\ 2000} > 1,09$).

The same variation intervals were determined also for b_{ij} (Table 1). From analysing the data, the conclusion might be drawn that significant changes occurred particularly in the case of inputs (14 branches) and, in the case of outputs the insignificant changes or the quasi-constancy of the coefficients a_{ij} și b_{ij} were predominant.

This specific features of the a_{ij} coefficient in time and multiplier change leads to the conclusion that the highest attention must be given to the aspects related to inputs of the tourism branch which are subject to higher and more numerous changes, as a result of the action of the "turbulent" technological progress which acts under the *Schumpeterian* imperative of "creative destruction".

Table 1. A. Coefficients grouping a(ij) depending on the intensity* of their changes in the period 2000-2008 for the tourism branch, aggregated (85+86+93=hotels, restaurants and travel agencies)

Coefficients (aij) – output distribution			Coefficients (aij) – branch input		
Size of coefficient change	Number	Branches	Size of coefficients' change	Number	Branches
Insignificant change (aij ₂₀₀₈ /aij ₂₀₀₀ <0,98)	16	A79-A82; A44-A47; A55-A59; A67-A71; A28-A31; A48-A54; A85-86,93, A07 - A17, A87-A92, A32; A77-A78; A72-76; A60-A65; A84; A98-A101; A83	Insignificant change (aij ₂₀₀₈ /aij ₂₀₀₀ <0,98)	9	A79-A82; A77-A78; A96; A41-A43; A28-A31; A85-86,93; A07 - A17, A32, A84
Quasi-constancy aij (intre 0,98 si 1,09)	3	A35 -A40; A41-A43; A18-A27	Quasi-constancy aij (intre 0,98 si 1,09)	-	-
Significant change (aij ₂₀₀₈ /aij ₂₀₀₀ >1,09)	6	A102-A105; A96; A01-A06; A97; A33 -A34; A94-A95	Significant change (aij ₂₀₀₈ /aij ₂₀₀₀ >1,09)	16	A01-A06; A98-A101; A60-A65; A48-A54; A67-A71; A44-A47; A94-A95; A72-76; A55-A59; A87-A92; A102-A105; A33 -A34; A83; A35 -A40; A18-A27; A97

B. Coefficients' grouping b(ij) depending on their change intensity* in the period 2000-2008 for the tourism branch, aggregated (85+86+93=hotels, restaurants and travel agencies)

Coefficients (bij) – output distribution			Coefficients (bij) – branch input		
Size of coefficient change	Number	Branches	Size of coefficient change	Number	Branches
Insignificant change (bij ₂₀₀₈ /bij ₂₀₀₀ <0,98)	19	A41-A43; A18-A27; A97; A79-A82; A55-A59; A44-A47; A67-A71; A28-A31; A35 -A40; A48-A54; A07 - A17; A77-A78; A84; A32; A60-A65; A87-A92; A72-76; A83; A98-A101	Insignificant change (bij ₂₀₀₈ /bij ₂₀₀₀ <0,98)	6	A77-A78; A41-A43; A96; A32; A28-A31; A84
Quasi-constancy bij (intre 0,98 si 1,09)	1	A85-86,93	Quasi-constancy bij (intre 0,98 si 1,09)	2	A79-A82; A85-86,93
Significant change (bij ₂₀₀₈ /bij ₂₀₀₀ >1,09)	5	A96; A102-A105; A01-A06; A33 -A34; A94-A95	Significant change (bij ₂₀₀₈ /bij ₂₀₀₀ >1,09)	17	A98-A101; A60-A65; A48-A54; A55-A59; A01-A06; A87-A92; A97; A44-A47; A83; A72-76; A07-A17; A94-A95; A67-A71; A102-A105; A33 -A34; A18-A27; A35 -A40

*Note: By change intensity we understand the size of the aij₂₀₀₈/aij₂₀₀₀ and bij₂₀₀₈/bij₂₀₀₀, respectively
Source: Own calculations based on NIS data.

6. Analysis of multipliers impact, Backward and forwards

The input-output model provides the possibility of researching the **backward** and **forward** effects generated by the interdependencies that are established within the branches of a national economic complex represented by a multi-sectoral sui-generis structure of the respective complex. In fact, by means of these multipliers we can determine the impact of changes in final demand on production, value added, wage earnings, etc., the logic of the IO model starting from the premise that planning or programming a certain **desirable vector of final demand** as representation of the growth objective of welfare, population consumption and ensuring the premises of economic-social sustainable development (by the investments vector as factor of self-sustained growth) represents, practically, the "social demand" that must be sustained by a certain programmable level of the goods and services production.

Based on the matrix of the total requirements coefficients (b_{ij}) we determined the backward and forward influences for the years 2000 and 2008 of the IO model multipliers on the branches with which tourism enters into production relationships from the viewpoint of production magnitude, GVA and wage earnings (Annex 5). According to the postulates of the IO model, the multipliers quantify the interdependencies which are created between the branches of the national economy depending on their size. In 2000, *the backward multiplier of the outcome/production/output* for the branch hotels, restaurants and tourism agencies was 2.093, which means that any change of one Leu in the final demand for products and services of the sector, generates a change in total output within economy by 2.093 Lei. This includes the initial change of 1 Leu in the demand for accommodation and food services, and of the tourism agencies (direct effect) and the change in the endogenous sector production for sustaining the initial 1 Leu change of the accommodation sector, that is the indirect effect (1.057). The remaining amount of 1.036 Lei originates from the endogenous sectors, respectively 0.247 Lei from the sector Food, beverages, tobacco; 0.108 Lei from the sector Agriculture, forestry, fishery, forestry exploitation; 0.1079 Lei from Electric and thermal power, water and gas; 0.079 Lei from the sector Extractive industry, and 0.055 Lei from the sector Chemistry and synthetic fibres.

The backward multiplier of wage earnings measures the propagated economic impact of the final demand change for a certain branch on the wage earnings in economy. Certain components of the labour income that cannot be spent are excluded (for instance, effective social contribution in the burden on employers) and, therefore, the value of the gains shall be smaller than the incomes from labour included in the IO table. A change in the final demand in the hotels, restaurants and tourism agencies branch by 1 Leu determines the change in wage earnings within economy by 0.209 Lei.

The backward multiplier of value added indicates how the value added is changed for a change by 1 Leu of final demand. In the case of the hotels,

restaurants and tourism agencies branch, VA is the lowest, that is 1.1398 indicating a potential of generating value added in economy as result of increasing the final demand within the sector.

The second category of multipliers, **forward multipliers**, indicate, as already mentioned in the previous chapter, the way the increase in total output of sector j determines the increase in total supply to all other sectors of the economy using the products of sector j as inputs in their production process.

The forward multiplier of the outcome/production/output indicate that a change by one unit in the final payments in the hotels, restaurants and tourism agencies branch trigger a change in output within economy by 1.414 units.

The forward multiplier of wage earnings indicates that an increase in final payments within the hospitality sector by 1 Leu triggers an increase in wage earnings within economy by 0.166 Lei.

The forward multiplier of value added is 0.724 for the tourism sector, which places the sector in a position **with diminished potential of generating value added** as a result of increasing final payments within the branch.

In 2008, *the backward multiplier of production* within tourism is 2.341, which means that any change in final demand for the products and services of the sector triggers a change in total output within the economy of 2.341 Lei. This includes the initial change by 1 Leu in the demand for accommodation and food services, and the tourism agencies (direct effect) and the change of the production of endogenous sectors for sustaining the initial change of 1 Leu in the production of the tourism sector, that is the indirect effect (1.035). The remaining amount of 1.306 Lei originates from the endogenous sectors, respectively 0.294 Lei from Foods, beverages, tobacco; 0.175 Lei from Agriculture, forestry, fishery, forestry exploitation; 0.115 Lei from Extractive industry; 0.111 Lei from Electric and thermal power, water, gas; 0.06 Lei from Chemistry and synthetic fibres. *The forward multiplier of the production* is 1.327, which indicates how much the output within economy changes, as a result of a one unit change in final payments in the tourism branch.

For the year 2008, *the backward multiplier of the value added* diminished and an increase by one unit in the demand in tourism generates an increase by 1.072 Lei in the value added within economy. The *forward multiplier of VA* is 0.598, stimulating VA only to a small extent within economy, generated by the increase in final payments in tourism.

With respect to the *backward multiplier of wage earnings*, the values indicate that the tourism branch has a low potential of increasing wage earnings at the level of national economy by only 0.308 Lei, as a result of increasing final demand for Hotels, restaurants, tourism agencies by 1 Leu. *The forward multiplier of wage earnings* indicates that an increase in final payments within the tourism sector by 1 Leu determines the increase in wage earnings within economy by 0.197 Lei.

Table 2. Share of GVA, wage earnings (wages and gross earnings) in total output of Romania

	2000					2008				
	GVA / OUTPUT	Employees remuneration / Output	Wage earnings / Output	Gross Operating Surplus / Output	Other taxes on production / Output	GVA / OUTPUT	Employees remuneration / Output	Wage earnings / Output	Gross Operating Surplus / Output	Other taxes on production / Output
A01-A06 Agriculture, forestry, fishery, forestry exploitation	0.515	0.08421	0.069	0.431	0.00205	0.466	0.14441	0.129	0.360	0.00240
A07 - A17 Extracting industry	0.447	0.28388	0.226	0.160	0.00326	0.377	0.37898	0.315	-0.006	0.00364
A18-A27 Food, beverages, tobacco	0.326	0.08176	0.065	0.234	0.01045	0.373	0.13608	0.121	0.235	0.00256
A28-A31 Textiles, clothing, leather and footwear	0.406	0.34025	0.252	0.059	0.00650	0.417	0.40902	0.342	0.004	0.00317
A32 Wood processing industry (excluding furniture industry)	0.403	0.17655	0.140	0.225	0.00110	0.411	0.25381	0.218	0.155	0.00304
A33 -A34 Pulp and paper, editing and printing house	0.367	0.15532	0.124	0.211	0.00093	0.425	0.15080	0.129	0.272	0.00223
A35 -A40 Chemistry and synthetic fibres	0.186	0.10967	0.087	0.107	0.00193	0.245	0.19445	0.171	0.047	0.00300
A41-A43 Drugs, detergents, cosmetics, other chemical products	0.412	0.15367	0.123	0.257	0.00163	0.389	0.24937	0.213	0.136	0.00344
A44-A47 Rubber and plastic materials, glass	0.360	0.20028	0.159	0.158	0.00126	0.384	0.16484	0.141	0.217	0.00241
A48-A54 Construction materials	0.359	0.20141	0.160	0.156	0.00139	0.334	0.18350	0.157	0.148	0.00219
A55-A59 Metal and steel industry	0.194	0.13572	0.108	0.058	0.00082	0.153	0.14372	0.121	0.006	0.00303
A60-A65 Machine-building	0.407	0.29101	0.232	0.113	0.00302	0.409	0.30463	0.259	0.103	0.00239
A67-A71 Household machines and appliances, electric and electronic products	0.421	0.18446	0.147	0.234	0.00247	0.419	0.24092	0.207	0.175	0.00235
A72-76 Transportation means	0.309	0.24596	0.195	0.060	0.00268	0.431	0.16702	0.142	0.262	0.00220
A77-A78 Furniture manufacturing and other industrial activities	0.478	0.24625	0.195	0.231	0.00122	0.436	0.33882	0.299	0.094	0.00265
A79-A82 Electric and thermal power, gas and water	0.249	0.13624	0.108	0.112	0.00108	0.203	0.12890	0.107	0.072	0.00217
A83 Constructions	0.428	0.19467	0.155	0.232	0.00153	0.466	0.14807	0.130	0.316	0.00247
A84 Wholesale and retail trade	0.645	0.30419	0.242	0.343	0.00082	0.595	0.23713	0.202	0.354	0.00464
A85 Hotels	0.707	0.11196	0.089	0.592	0.00285	0.648	0.18027	0.155	0.465	0.00282
A86 Restaurants	0.364	0.15407	0.123	0.210	0.00074	0.274	0.15819	0.139	0.114	0.00200
A87-A92 Transports	0.462	0.25745	0.202	0.220	0.00357	0.548	0.21928	0.191	0.343	0.00394
A93 Tourism and touristic assistance agencies' activities	0.630	0.06419	0.051	0.565	0.00125	0.655	0.05732	0.048	0.596	0.00182
A94-A95 Communications	0.680	0.22661	0.181	0.451	0.00225	0.641	0.26242	0.235	0.354	0.00521
A96 Financial services, banking and insurance	0.760	0.31328	0.268	0.428	0.01910	0.552	0.29408	0.247	0.208	0.04993
A97 Real estate transactions	0.613	0.01714	0.014	0.595	0.00134	0.581	0.03261	0.029	0.545	0.00318
A98-A101 Services for enterprises	0.614	0.22562	0.180	0.381	0.00707	0.458	0.18175	0.152	0.284	0.00234
A102-A105 Collective, social and personal services	0.567	0.44794	0.333	0.115	0.00476	0.596	0.48210	0.378	0.110	0.00419

Source: Based on NIS data.

In Table 2, on the basis of the b_{ij} coefficients we computed the share they held in the years 2000 and 2008 in total production of fundamental components of value added, remuneration, gross operating surplus, other taxes on production.

The data of this table provide for a multi-sectoral comparative framework which is extremely useful for decision maker with respect to the impact that various exogenous variants of final demand might have on the components of value added within a national economy by using the matrix of the technical coefficients and inversely. Thus, it can be noticed that the GVA share in total output in the nomenclature of aggregate branches used in the year 2008 varies between 0.655 (tourism agencies) and 0.153 (metal and steel industry), while the share of wage earnings varies between 0.03261 (real estate transactions) and 0.48210 (social, collective, personal services).

Table 3. Share of the tourism branch disaggregated by branches in total national output computed by means of backward output multipliers from 2008

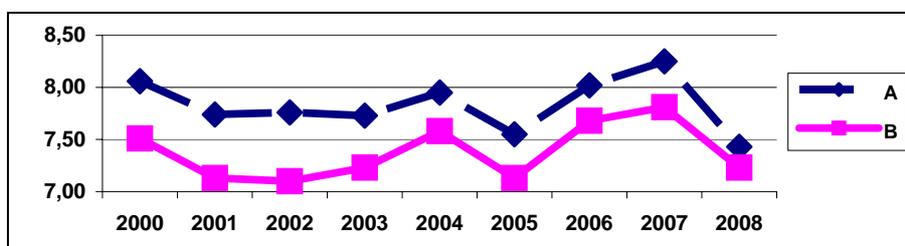
(billion lei)

TURNOVER	2000	2001	2002	2003	2004	2005	2006	2007	2008
Accommodation	2.62	3.96	5.16	6.48	9.76	9.45	12.22	15.04	18.86
Restaurant	2.03	2.67	4.07	5.72	7.56	8.30	12.50	14.99	20.55
Railway passenger transportation	1.97	2.29	3.07	3.80	4.87	3.71	3.81	4.23	2.33
Road passenger transportation	1.13	1.75	2.23	3.70	4.98	5.99	7.48	8.88	9.96
Water passenger transportation	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.09
Air passenger transportation	0.78	1.22	1.50	1.72	1.94	2.40	2.84	4.14	3.98
Tourism agencies	0.87	1.10	1.46	1.43	2.05	2.64	3.54	4.57	6.63
Transportation equipment rental	0.12	0.34	0.69	0.70	0.49	0.64	0.52	0.80	1.33
Cultural activities	0.06	0.14	0.14	0.15	0.38	0.41	0.50	0.60	0.55
Sports and leisure activities	1.19	1.36	1.16	1.94	3.07	3.95	6.04	8.07	6.27
TOTAL TOURISM	10.77	14.84	19.51	25.64	35.12	37.51	49.50	61.36	70.55
TOTAL ECONOMY	143.51	208.13	274.64	354.90	463.58	526.19	644.50	785.60	975.52
% TOURISM IN TOTAL ECONOMY	7.51	7.13	7.10	7.23	7.58	7.13	7.68	7.81	7.23

Source: Based on NIS data.

Table 3 presents the shares in the years 2000 and 2008 of the tourism branch, disaggregated by branches based on the IO model multipliers from 2000 and 2008. The computations highlight in the last three years, both in a multiplier variant and in the other one, a decreasing trend of the tourism share in total output of national economy, before the full outburst of the economic crisis in the year 2009. The total values of the tourism sector, as defined in the present paper, computed by means of the *backward* production multipliers vary at the level of 7-8%, with lower values for the determining based on the multiplier values for the year 2008.

Figure 1: Share of the tourism branch in total national output computed by using backward production multipliers from 2000 and 2008



A = Share of the tourism branch in total national output computed by using backward production multipliers from 2000.

B = Share of the tourism branch in total national output computed by using backward production multipliers from 2008.

Source: own calculations based on NIS data.

As a general conclusion of the IO model, we present the size of multipliers within the branch tourism that shows the highest level of the restaurants component, followed by transports and collective, social and personal services, both in 2000 and 2008.

Table 4. Backward production multipliers

	2000	2008
A85-86.93 HOTELS, RESTAURANTS, TOURISM AGENCIES	2.093	2.341
A85 Hotels	1.678	1.877
A86 Restaurants	2.545	2.814
A93 Activities of tourism agencies and travel agencies	1.816	1.796
A87-A92 Transports	2.347	2.089
A102-A105 Collective, social, personal services	2.057	2.002

Source: Own calculations based on NIS data.

The size of the multipliers underwent a slight growth in 2008 against 2000 which, unfortunately, was counteracted by the crisis in the years 2009 and 2010.

Some final remarks

The analysis of the economic-social contribution of tourism by its three components (hotels, restaurants, travel agencies) based on the IO model highlights, firstly, the complex character of this branch as a consumer of production from other branches and the production supplier to the other branches in the nomenclature of the IO model. The IO model represents an **analysis and forecasting tool** for the multisectorial structure of the national economy, in general, and for the macroeconomic contribution of this sector (branch), in particular, taking into account the total interdependencies between the branches of a national economy.

Under the terms of the Input-Output Analysis, a comparison was made for the matrix of technical coefficients (a_{ij}) and the one of the total requirements coefficients ($(E-A)^{-1}$ or b_{ij}) by means of which we determined the direct and propagated effects within the national economy. The "tourism" branch is *par excellence* a predominantly final branch (only 15% of the production is allocated to intermediate consumption, the rest of 85% being allotted to final consumption (public-private consumption, investments and export-import).

According to its position of predominantly final branch, tourism has a great impact on the national economy by the vector of final demand, the possible and/or desirable variants of which for the future represent, practically, an economic-social demand that must be satisfied by variants of total output.

Elements of the backward and forward multipliers are used in relation to value added components for determining the intensity of the influence that tourism has either directly or propagated on the VA elements by branches of the economy.

The issue of time constancy of the technical coefficients was studied by comparing these coefficients in row (output) and column (input), highlighting the groups of coefficients with insignificant changes with quasi-constant coefficients and strongly changed coefficients.

It is interesting to underline the fact that the change in the coefficient magnitude occurs mostly in columns, at the inputs of the "tourism" branch from other branches, the a_{ij} coefficients in the row showing a higher structural stability than the ones in column.

Tourism shows important influences in the economic-social life, developing constantly due to changes in society. At national level, it is required to adopt measures for stimulating tourism development, considering its potential to stimulate demand also for other economic branches.

Annex 1

**Macroeconomic indicators in tourism, disaggregated by sub-branches
and aggregated per total**

	85 Hotels		86 Restaurants		93 Activities of tourism and tourist assistance agencies		Total		85+86+93=Hotels, Restaurants and Travel agencies		Share of tourism branch (85+86+93=Hotels, Restaurants, Travel agencies) in total national-Romania %	
	2000	2008	2000	2008	2000	2008	2000	2008	2000	2008	2000	2008
Market output - total	1266	7808.5	1110.9	11362.6	272.7	2788	86830.5	706614.2	2649.6	21959.1	3.051	3.108
Goods and services production - total	1266	7808.5	1110.9	11362.6	0	0.4	113072	852350	2376.9	19171.5	2.102	2.249
Intra-community import of goods and services	0	834.7	0	584	272.7	2788.4	0	136993	272.7	4207.1	0.000	3.071
Extra-community import of goods and services	0	385	0	269.4	0	0	0	56892.8	0	654.4	0.000	1.150
Import of goods and services	153.7	1219.7	114.1	853.4	0	0	22796.8	193885.8	267.8	2073.1	1.175	1.069
Tax on product - total	46.8	647.1	72.1	888.9	43.1	144.6	6629.9	51620.4	162	1680.6	2.443	3.256
Tax on product – VAT	46.8	647.1	72.1	888.9	0	144.6	3790.5	35650.7	118.9	1680.6	3.137	4.714
Subventions per product	-0.9	0	0	0	0	0	-598.2	-1179.4	-0.9	0	0.150	0.000
Total resources per product	1465.6	9675.3	1297.1	13104.9	315.8	2933	141900.5	1096676.8	3078.5	25713.2	2.169	2.345
Intermediary consumption	348.7	1178	341	2855.2	23.1	77.3	62582.3	456212.7	712.8	4110.5	1.139	0.901

	85 Hotels		86 Restaurants		93 Activities of tourism and tourist assistance agencies		Total		85+86+93=Hotels, Restaurants and Travel agencies		Share of tourism branch (85+86+93=Hotels, Restaurants, Travel agencies) in total national-Romania %	
	2000	2008	2000	2008	2000	2008	2000	2008	2000	2008	2000	2008
Effective final consumption of households	1062.1	6977.6	908.5	8996.3	292.7	2855.7	39581.9	298007.1	2263.3	18829.6	5.718	6.319
Final total consumption	1062.1	6977.6	908.5	8996.3	292.7	2855.7	49752.7	374798.7	2263.3	18829.6	4.549	5.024
Intra-community export of goods and services	0	1151	0	920.5	0	0	0	95868.3	0	2071.5	0.000	2.161
Extra-community export of goods and services	0	368.7	0	332.9	0	0	0	36131.1	0	701.6	0.000	1.942
Export of goods and services	54.8	1519.7	47.6	1253.4	0	0	18933.5	131999.4	102.4	2773.1	0.541	2.101

Source: Own calculations based on NIS data.

Annex 2

Technical coefficients a_{ij} of the „Tourism” branch in column (inputs) in the years 2000 and 2008

2000			2008		
Ord. No.	Input supplying branch	a_{ij} Coefficient	Ord. No.	Input supplying branch	a_{ij} Coefficient
1	A18-A27 Foods, beverages, tobacco	0,39742	1	A18-A27 Foods, beverages, tobacco	0,45412
2	A85-86-93 – Hotels, restaurants, travel agencies	0,20546	2	A94-A95 – Communications	0,11661
3	A79-A82-Electric and thermal power, gas, water	0,08704	3	A01-A06 –Agriculture, forestry, fishery, forestry exploitation	0,10219
4	A94-A95 – Communications	0,07958	4	A79-A82- Electric and thermal power, gas, water	0,10208
5	A28-A31 –Textiles, clothing, leather, footwear	0,06817	5	A85-86-93 –Hotels, restaurants, travel agencies	0,09299
6	A87-A92 – Transports	0,06430	6	A87-A92 – Transports	0,06273
7	A96 – Financial services, banking and insurance	0,05768	7	A96 – Financial services, banking and insurance	0,06273
8	A35-A40 – Chemistry and synthetic fibres	0,05440	8	A101-A105 – Collective, social and personal services	0,05204
9	A83 – Constructions	0,04209	9	A83 – Constructions	0,05115
10	A101-A105 – Collective, social and personal services	0,03317	10	A28-A31 –Textiles, clothing, leather and footwear	0,04686
11	A97 – Real estate transactions	0,03064	11	A35-A40 – Chemistry and synthetic fibres	0,04646
12	A41-A43 –Drugs, detergents, cosmetics, other chemical products	0,03015	12	A44-A47 – Rubber, plastic materials and glass	0,04415
13	A01-A06 – Agriculture, forestry, fishery, forestry exploitation	0,02405	13	A97 – Real estate transactions	0,03952

2000			2008		
Ord. No.	Input supplying branch	aij Coefficient	Ord. No.	Input supplying branch	aij Coefficient
14	A44-A47 – Rubber, plastic materials and glass	0,02257	14	A98-A101 – Services for enterprises	0,02614
15	A77-A78 –Furniture manufacturing and other industrial activities	0,02050	15	A67-A71 –Household machinery and appliances, electric and electronic products	0,02223
16	A32 –Wood processing industry (excluding furniture manufacturing)	0,01820	16	A77-A78 –Furniture manufacturing and other industrial activities	0,02126
17	A67-A71 – Household machinery and appliance, electric and electronic products	0,01340	17	A41-A43 –Drugs, detergents, cosmetics, other chemical products	0,02084
18	A07-A17 – Extracting industry	0,01270	18	A48-A54 – Construction materials	0,01961
19	A33-A34 –Pulp, paper, editing, and printing house,	0,01079	19	A60-A65 – Machine building	0,01345
20	A48-A54 – Construction materials	0,00861	20	A33-A34 – Pulp, paper, editing, and printing house,	0,01265
21	A98-A101 – Enterprise services	0,00777	21	A72-A76 – Transport means	0,00815
22	A72-A76 – Transport means	0,00564	22	A32 –Wood processing industry (excluding furniture industry)	0,00788
23	A60-A65 – Machine building	0,00347	23	A07-A17 – Extracting industry	0,00496
24	A55-A59 – Metal and steel industry	0,00094	24	A55-A59 – Metal and steel industry	0,00140

Source: Own calculations based on data from NIS input-output tables.

Annex 3

Dij coefficients in the „Tourism” branch (85+86+93), in the years 2000 and 2008

A85-86,93 HOTELS, RESTAURANTS, TOURISM AGENCIES							
BRANCH	2000	BRANCH	2000	BRANCH	2008	BRANCH	2008
	bij-aij		bij-aij		bij-aij		
	ROW		COLUMN		ROW		COLUMN
A85-86,93	1.074483	A85-86,93	1.074483	A85-86,93	1.027550	A85-86,93	1.027550
A72-76	0.017692	A18-A27	0.340367	A55-A59	0.012465	A07 - A17	0.325377
A35 -A40	0.016844	A01-A06	0.294628	A41-A43	0.011839	A01-A06	0.308051
A55-A59	0.016804	A79-A82	0.251323	A79-A82	0.010875	A18-A27	0.281354
A41-A43	0.016274	A07 - A17	0.251144	A35 -A40	0.010713	A79-A82	0.228780
A60-A65	0.016153	A35 -A40	0.150148	A48-A54	0.009831	A98-A101	0.142616
A67-A71	0.014836	A28-A31	0.103973	A67-A71	0.009689	A35 -A40	0.123453
A79-A82	0.014793	A96	0.103708	A96	0.009627	A44-A47	0.094255
A48-A54	0.014298	A94-A95	0.090249	A44-A47	0.009407	A60-A65	0.090861
A44-A47	0.014270	A44-A47	0.078187	A60-A65	0.009207	A94-A95	0.086147
A87-A92	0.013566	A67-A71	0.075044	A33 -A34	0.009172	A55-A59	0.082302
A07 - A17	0.012907	A98-A101	0.071933	A07 - A17	0.009080	A67-A71	0.068933
A83	0.012680	A87-A92	0.058954	A72-76	0.008482	A87-A92	0.064887
A28-A31	0.012418	A55-A59	0.057450	A28-A31	0.008257	A96	0.058633
A33 -A34	0.011570	A102-A105	0.056262	A102-A105	0.007650	A102-A105	0.053317
A77-A78	0.010952	A60-A65	0.049551	A77-A78	0.007139	A33 -A34	0.044423
A98-A101	0.010407	A41-A43	0.046363	A18-A27	0.007015	A28-A31	0.042281
A32	0.009549	A33 -A34	0.044259	A98-A101	0.006310	A41-A43	0.038339

BRANCH	2000	BRANCH	2000	BRANCH	2008	BRANCH	2008
	bij-aij		bij-aij		bij-aij		bij-aij
	ROW		COLUMN		ROW		COLUMN
A84	0.006760	A97	0.019211	A94-A95	0.005362	A32	0.023446
A94-A95	0.006097	A72-76	0.017624	A97	0.004940	A72-76	0.018066
A01-A06	0.005302	A77-A78	0.013443	A01-A06	0.004933	A77-A78	0.011027
A96	0.004340	A84	0.000000	A84	0.004838	A84	0.000000

Source: Own calculations based on NIS data.

Annex 4

Evolution of the a(ij) and b(ij) coefficients relationship* in 2008 against the year 2000 for the tourism branch, aggregated (85+86+93=hotels, restaurants and travel agencies)

Branch	2008/2000	Branch	2008/2000	Branch	2008/2000	Branch	2008/2000
	Coefficients (aij) – output distribution		Coefficients (bij) –output distribution		Coefficients (aij) – branch input		Coefficients (bij) – branch input
A102-A105	3.56041	A96	3.28319	A01-A06	4.78253	A98-A101	2.44988
A96	3.55549	A102-A105	1.87487	A98-A101	3.67407	A60-A65	2.28780
A01-A06	2.98941	A01-A06	1.21035	A60-A65	3.49673	A48-A54	1.70026
A97	1.75590	A33 -A34	1.11291	A48-A54	1.99464	A55-A59	1.69839
A33 -A34	1.55392	A94-A95	1.10805	A67-A71	1.98448	A01-A06	1.61287
A94-A95	1.11860	A85-86,93	0.97902	A44-A47	1.81969	A87-A92	1.58325
A35 -A40	1.09339	A41-A43	0.95690	A94-A95	1.61669	A97	1.57191
A41-A43	1.00911	A18-A27	0.94188	A72-76	1.54286	A44-A47	1.52480
A18-A27	0.98314	A97	0.85022	A55-A59	1.45455	A83	1.47738
A79-A82	0.95537	A79-A82	0.84967	A87-A92	1.43125	A72-76	1.45008
A44-A47	0.92864	A55-A59	0.84667	A102-A105	1.33103	A07 - A17	1.44291
A55-A59	0.82866	A44-A47	0.82620	A33 -A34	1.31768	A94-A95	1.40307
A67-A71	0.82009	A67-A71	0.80271	A83	1.30988	A67-A71	1.23625
A28-A31	0.79868	A28-A31	0.80010	A35 -A40	1.23886	A102-A105	1.21426
A48-A54	0.66793	A35 -A40	0.76491	A18-A27	1.22093	A33 -A34	1.20913
A85-86,93	0.57155	A48-A54	0.76126	A97	1.19149	A18-A27	1.19228
A07 - A17	0.56385	A07 - A17	0.72531	A79-A82	0.96693	A35 -A40	1.10084
A87-A92	0.46836	A77-A78	0.63452	A77-A78	0.90127	A79-A82	1.03149

Branch	2008/2000	Branch	2008/2000	Branch	2008/2000	Branch	2008/2000
	Coefficients (aij) – output distribution		Coefficients (bij) –output distribution		Coefficients (aij) – branch input		Coefficients (bij) – branch input
A32	0.46322	A84	0.61144	A96	0.81101	A85-86,93	0.97902
A77-A78	0.44118	A32	0.61082	A41-A43	0.69643	A77-A78	0.96186
A72-76	0.40270	A60-A65	0.55003	A28-A31	0.64636	A41-A43	0.87412
A60-A65	0.39964	A87-A92	0.50987	A85-86,93	0.57155	A96	0.73923
A84	0.24720	A72-76	0.50455	A07 - A17	0.44561	A32	0.72464
A98-A101	0.16951	A83	0.42667	A32	0.40491	A28-A31	0.55724
A83	0.09467	A98-A101	0.41397	A84	0.00000	A84	0.00000

* Note: aij 2008/aij 2000 (bij 2008/bij 2000 respectively).

Source: Own calculations based on NIS data.

Annex 5

**Forward and backward multipliers for the tourism branch, aggregated
(85+86+93=hotels, restaurants and travel agencies)**

	2000						2008					
	Backward multipliers			Forward multipliers			Backward multipliers			Forward multipliers		
	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings
A01-A06 Agriculture, forestry, fishery, forestry exploitation	2.141	1.102	0.147	3.077	1.421	0.333	2.312	1.077	0.299	3.153	1.401	0.505
A07 - A17 Extracting industry	2.320	1.037	0.524	5.693	2.063	0.889	2.694	1.016	0.849	7.254	2.515	1.427
A18-A27 Food, beverages, tobacco	2.621	0.854	0.170	2.729	1.119	0.323	2.566	0.958	0.310	2.628	1.105	0.397
A28-A31 Textiles, clothing, leather and footwear	2.403	0.976	0.605	2.455	1.046	0.542	2.468	1.028	0.845	1.710	0.721	0.520
A32 Wood processing industry (excluding furniture industry)	2.391	0.964	0.336	1.708	0.712	0.255	2.448	1.007	0.535	1.718	0.723	0.380
A33 -A34 Pulp and paper, editing, printing	2.538	0.931	0.314	2.015	0.791	0.284	2.452	1.043	0.315	1.997	0.865	0.311
A35 -A40 Chemistry and synthetic fibres	3.030	0.564	0.264	3.470	1.161	0.456	3.085	0.755	0.528	3.117	1.093	0.572

	2000						2008					
	Backward multipliers			Forward multipliers			Backward multipliers			Forward multipliers		
	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings
A41-A43 Drugs, detergents, cosmetics, and other chemical products	2.504	1.032	0.307	1.859	0.768	0.252	2.615	1.016	0.556	1.878	0.749	0.390
A44-A47 Rubber and plastic materials, glass	2.672	0.962	0.426	2.535	0.976	0.408	2.634	1.012	0.370	2.749	1.105	0.458
A48-A54 Construction materials	2.626	0.942	0.421	1.654	0.625	0.261	2.843	0.950	0.447	1.849	0.663	0.298
A55-A59 Metal and steel industry	3.114	0.604	0.337	2.800	0.862	0.395	3.612	0.553	0.438	3.538	1.051	0.561
A60-A65 Machine building	2.531	1.030	0.586	2.252	0.900	0.438	2.667	1.090	0.691	3.084	1.229	0.663
A67-A71 Household machines and appliances, electric and electronic products	2.405	1.012	0.353	2.653	1.115	0.416	2.537	1.062	0.524	2.414	1.019	0.483
A72-76 Transportation means	2.770	0.856	0.541	1.373	0.457	0.261	2.574	1.110	0.365	1.418	0.606	0.219
A77-A78 Furniture manufacturing and other industrial activities	2.269	1.084	0.443	1.171	0.556	0.226	2.436	1.062	0.728	1.188	0.520	0.339

	2000						2008					
	Backward multipliers			Forward multipliers			Backward multipliers			Forward multipliers		
	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings	Production	VAT	Wage earnings
A79-A82 Electric and thermal power, gas and water	2.909	0.725	0.315	5.253	1.821	0.746	3.264	0.663	0.350	4.881	1.650	0.812
A83 Constructions	2.382	1.019	0.370	1.373	0.594	0.208	2.372	1.106	0.308	1.582	0.728	0.221
A84 Wholesale and retail trade	1.859	1.205	0.449	1.006	0.652	0.243	1.991	1.185	0.403	1.058	0.630	0.214
A85-86,93 HOTELS, RESTAURANTS, TRAVEL AGENCIES	2.093	1.140	0.209	1.414	0.724	0.166	2.341	1.072	0.308	1.327	0.598	0.197
A87-A92 Transports	2.344	1.082	0.474	1.754	0.783	0.330	2.088	1.143	0.398	2.108	1.016	0.405
A94-A95 Communicationsi	1.610	1.095	0.291	2.180	1.250	0.377	1.778	1.140	0.418	2.139	1.171	0.463
A96 Financial services, banking and insurance	1.451	1.104	0.389	2.745	1.490	0.553	2.042	1.128	0.505	1.889	0.943	0.425
A97 Real estate transactions	1.927	1.181	0.026	1.187	0.712	0.038	2.061	1.197	0.060	1.598	0.851	0.127
A98-A101 Services for enterprises	1.858	1.140	0.335	2.600	1.268	0.438	2.319	1.063	0.353	4.032	1.705	0.718
A102-A105 Collective, social and personal services	2.057	1.167	0.685	1.868	0.942	0.482	1.998	1.191	0.755	1.888	0.973	0.556

Source: Data processed by the authors after NIS.

Annex 6

**Share of tourism branch disaggregated by branches in total national output computed
by means of backward output multipliers from 2000**

(billion lei)

TURNOVER	2000	2001	2002	2003	2004	2005	2006	2007	2008
Accomodation	2.34	3.54	4.61	5.79	8.72	8.45	10.93	13.44	16.86
Restaurant	1.84	2.42	3.68	5.17	6.84	7.51	11.31	13.55	18.58
Railway passenger transportation	2.21	2.58	3.45	4.27	5.47	4.17	4.28	4.75	2.61
Road passenger transportation	1.27	1.96	2.51	4.16	5.60	6.72	8.40	9.98	11.19
Water passenger transportation	0.87	1.37	1.68	1.94	2.18	2.69	3.20	4.65	4.47
Air passenger transportation	0.87	1.37	1.68	1.94	2.18	2.69	3.20	4.65	4.47
Tourism agencies	0.75	0.95	1.27	1.24	1.78	2.29	3.08	3.97	5.77
Transportation equipment rental	0.14	0.38	0.78	0.78	0.55	0.72	0.59	0.90	1.50
Cultural activities	0.06	0.14	0.15	0.15	0.39	0.42	0.51	0.62	0.56
Sports and leisure activities	1.23	1.39	1.19	1.99	3.16	4.06	6.21	8.30	6.45
TOTAL TOURISM	11.57	16.11	21.00	27.42	36.86	39.73	51.70	64.81	72.46
TOTAL ECONOMY	143.51	208.13	274.64	354.90	463.58	526.19	644.50	785.60	975.52
% TOURISM IN TOTAL ECONOMY	8.06	7.74	7.65	7.73	7.95	7.55	8.02	8.25	7.43

Source: Based on NIS data.

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