

Estimating the economic impact of tourism industry through the MM approach

C. SOCCI¹, Y. ALI²
M. CIASCHINI³, R. PRETAROLI⁴, F. SEVERINI³

Abstract: *Tourism is one of the fastest growing industries in Italy and has proven to be a valuable source of economic prosperity. The main issue emerging when measuring the impact of tourism is that tourism is usually considered as a specific industry while in most applied situations it shows traits of a complex and structured economic activity characterized by a blend of different industries. We will identify the relationship among the various industries making up the complex economic activity usually referred as the “tourism industry”. This is done through the application of the multisectoral analysis to the Italian case. The evaluation of tourism in terms of economic policy is performed through the definition of an index of interaction among industries.*

Key-words: *Output changes, Input-Output Model, Key industry, Macro Multiplier approach*

1. Introduction and methodology

Tourism is suitable, under many ways, to bring economic advantages to operators in a country or a region. The World Travel and Tourism Council (WTTC) statistics suggests that tourism is the second largest industry in the world, which generates 200 million jobs worldwide and accounts for 10% of global GDP (WTTC, 2003).

However when measuring the impact of the tourism industry both on total output and GDP the main problem which arises is that a distinct tourism industry doesn't exist within list of industries in national accounts (NACE-CLIO) and the quantitative links between the “tourism industry” and the industry outputs and GDP of the economy have to be carefully reconstructed (Smeral, 2006). Tourism industry appears then as an economic activity that relies on outputs and services provided to tourists by the various industries that constitute the producing core of economy. For

¹Corresponding author: claudio.socci@unime.it, Department of Economics and Law, via Crescimbeni 14, 62100 Macerata – ITALY, phone number +3907332583263.

² Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Pakistan.

³ Department of Economics and Law, University of Macerata, Italy.

⁴ Department of Economics and Law, University of Macerata, Italy.

identifying the potential economic contribution of tourism to a country's economy the relationships of tourism data with data in the national accounts have to be put under scrutiny as to the consistency and reliability of the source of information on the economic dimensions of tourism. These reasons lead to consider the “tourism industry” as a cluster of industrial activities associated with tourism: the Tourism Cluster (Babalola, 2011).

Our study starts as an analysis of dispersion in an I-O model of the Italian economy based on an I-O table (*industry by industry*) for year 2010 with 64 industries a tool for analyzing tourism effects and quantifying the direct and indirect impacts of tourism as highlighted by (Henry and Deane, 1997; Fletcher, 1994; Archer and Fletcher, 1996; Tyrrell and Johnston, 2001; Gul, 2015). We then further deepen this analysis through the identification and quantitative determination of aggregated Macro Multipliers (MM) (Ciaschini and Soggi, 2006) that drive the magnitude of the economic interactions through the structure of macroeconomic variables (Ciaschini and Soggi, 2007). The reference to two indices: “target efficiency” and “control effectiveness” (Ali et al., 2015) will help the analysis extending the focus from the industries towards the policies, intended as those combinations of industries composing both the policy control variables and the policy target.

2. Tourism industry as a cluster of industries

Tourism is one of the fastest growing industries in Italy. It has proven as to be a valuable economic pillar of the Italian economy and we urgently need to determine what really falls under tourism as a complex process. According to (UNWTO) certain economic industries are defined as tourism industries (United Nations, 2008). However, the tourism industry is implicitly included in the I-O tables as part of the production of different industries such as “Accommodation services for visitors”, “Hotel and Restaurant”, “Food and beverage industry”, “Land transport”, “Water transport”, “Rail transport”, “Air transport”, “Supporting and auxiliary transport services, recreational, culture and sporting services”, “retailing industry and country specific tourism industry” (Maresca and Anzalone, 2011).

The tourism literature (UNWTO, 2007) covers a number of studies through a variety of methods, ranging from pure guess work to complex mathematical models. Many economists have emphasized the importance of more accurate quantification of the economic impacts of tourism: (Madsen and Zhang, 2010; Frechtling and Horvath, 1999) identified four different approaches to estimate the regional and local impacts of tourism based on national accounts and economic modelling; (Steenge and Steeg, 2010) discussed the importance of tourism by using input output table and tourism satellite accounts for a small Caribbean island; (Mantente, 1999; Manente and Zanette, 2010) conducted a study on the macroeconomic effects of a

VAT reduction in the Italian hotels and restaurants industry; (Tantirigama and Taniguchi, 2009) used an input output multiplier approach to measure the economic impacts of transport and tourism in New Zealand. According to Fletcher (1989) the I-O analysis has been used in measuring the impact of tourism on economies as it is more comprehensive in providing a holistic picture of economic structure. Fan and Ooasterhaven (2005) investigated the impact of international tourism on the Chinese economy.

The mixed structure and the consistency of 'complex' tourism industry strictly depend on the qualitative and quantitative elements emerging prevalently on the demand side. In this context tourism refers to the extent in which change in prices, competition, promotion, quality and quantity of facilities determine the change in the number of tourists in a given area. The demand approach, then, overcomes the difficulties in the industry approach by redirecting the focus towards tourists (Madsen and Zhang, 2010).

Usually tourism is associated with various motivations of visiting a place away from home. Different people have different ideas about the chemistry of tourism, although they may not all agree with the same definition. Henry and Deane (1997) describe tourism as follows: "Tourism is referred to as an industry, but that is a misnomer. From the perspective of the tourist, he or she demands an extraordinary range of goods and services during the course of a holiday, or a visit to another country. The needs of tourists are not met by accommodation, transport, dining, and one or two other basics alone, but extend to such diverse areas as banking, medical and dental care, security, manufacturing, telecommunications, sewerage and other such attributes. From the perspective of the supply side, some operators, such as hoteliers, see themselves as integral components of this industry. Others, such as a medical doctor or a mail carrier, of course would not think along those lines as they provide services to public with no special interest in the tourists. But, nevertheless, their services include meeting the needs of tourists which essentially make them part of the tourist industry".

The US Department of Commerce Office of Tourism Industries defines tourism as an industry made up of diverse groups of industries that supply goods and services purchased by business (Mak, 2004). However, in order to understand this definition, we need to determine "what really comprises the tourism industry". Answering this question is important because tourism industry cannot be reduced to a single industry nor can it be incorporated into the national account scheme. Since tourism should be regarded as being made up of many different industrial activities which in general are not related to tourism. For example, let us consider the air transport industry. Airplane can be used both by tourists and by non-tourists, including professional and business people, etc. In addition, some of the products related to tourism are intangible in which the output cannot be easily measured by volume or currency value. Therefore, we consider tourism industry as a cluster of industrial activities which relate directly or indirectly to tourists at various levels.

From the perspective of different analysts, it can be summed up that tourism refers to visiting a place away from home, the visitor should be someone who is travelling under certain conditions, for pleasures, education, medical treatment, business or other purposes (Steenge and Steeg, 2010). In this context, tourism is not only related to fun and pleasures but also means of fulfilling other purposes.

For a quantitative study of tourism, it is important to have both conceptual basis as well as empirical tools to measure the impact of tourism related activities. Equally important is to determine which industries relate to tourism industry, and what percentage of their total sales should be attributed to tourism industry, so that all these fractions can be composed into larger pieces without altering the national accounts structure.

Almost all industries of an economy directly and indirectly benefit from the tourism industry given that provides services across all sectors of the economy. Among the industries those which directly benefit from tourism include transportation i.e. land transport, water transport, air transport, which correspond to industries nr. 31, 32 and 33 in the NACE-CLIO classification of industries at 64 sectors. The cluster also includes industries as 36. "Accommodation and food service activities", 53. "Travel agency, tour operator reservation service and related activities", 59. "Creative, arts & entertainment activities; libraries, archives, museums, cultural activities" and 60. "Sports activities and amusement and recreation activities". In fact, more tourist-travelers mean more use of transportation, more food and beverages consumption, more credit flow to hotels and restaurants. These seven industries, nonetheless, define the Tourism Cluster (TC) that we utilize in our applied work.

Tourism affects the economy of a country through various means. Government and industries recognize the contribution of tourism to the economy in terms of employment, revenues, income generation, balance of payment and investment. Basically, tourism is a labour intensive industry and the greatest proportion of its value derives from wages and salaries paid to those employed in full time jobs. The industrial sectors, in which those jobs are based, either directly serve the needs of tourist or indirectly benefit from the tourists expenditures. In the economic perspectives, tourism is also important for the economy because it generates employment for locals and increases profit margins in various industrial sectors of a country.

A further contribution of the tourism industry is that it has a significant influence on a country's balance of payments. Foreign tourists buy tourist services in the destination countries and the payment for these services are considered as invisibles. The total value of international tourist receipts minus the total payments during a year represents a country balance of payments on the tourism account, which will include other services such as banking, insurance and transport (Holloway, 2006). According to the United Nation World Tourism Organization's report, global tourism exports represents about 6% of overall exports of goods and

services, while the contribution of tourism to economic activity worldwide is estimated at some 5%. This represents 6-7% of the overall number of jobs worldwide (UNWTO, 2010).

3. Tourism and Input-Output analysis

Information related to tourism, as models and data, must affect both the tourism activities as well as their relationship with other activities, within and outside the local and regional economic system. I-O analysis can provide a useful tool for the study of the complex tourism industry, since it spells out the model of interactions among industries composing the economy also with reference to the seven industries forming tourism industries set that we have defined above. Moreover, it offers a database strictly consistent with the definitions of intersectoral variables in the model for a reliable quantification of interindustry flows. It gives the possibility of quantifying the economic impacts, in terms of direct, indirect and induced impacts and deriving multipliers making use of the two matrices, supply and use, made available in national accounts. The main postulates and applications of I-O analysis have been discussed in (Ahlert, 2009; Miller and Blair, 2009; Leontief, 1986; EUROSTAT, 2008; Ten, 2005). Fletcher (Fletcher, 1989) discussed in details the use of I-O analysis in studying the economic impact of tourism. While (Archer, 1982) debated the use of I-O models for Tourism industry. He also analyzed different policy choices to compare each one for its implications on income, employment and wages, which would be valuable to policy makers and policy planners in the tourism industry.

In the I-O model the total output x of n industries is a function of the interdependencies among the industries, describe by the technical coefficient matrix A , and consumption of commodities in each industry, denoted by the final use vector c .

The original structure of the Leontief model is shown in the below equation.

$$x = Ax + c \quad (1)$$

Solving equation 1 to get the total output can be in the form

$$x = (I - A)^{-1} c \quad (2)$$

The equilibrium output vector can also be written as

$$x = L c \quad (3)$$

where $(I - A)^{-1} = L$ is the Leontief inverse.

Matrix L can be easily decomposed in a sum of n different matrices through the Singular Value Decomposition (SVD) (Lancaster and Tismenetsky, 1985). The MM approach is based on the Singular Value Decomposition (SVD) of the Leontief

inverse. The model can identify the most efficient structure that quantify the aggregate scale effects and the associated structures of the impact of a change in final demand on total output.

Through the MM approach key structure of the exogenous variable (final demand change) can be identified in order to obtain the expected total output change. Avoiding the main criticism associated with the traditional multiplier analysis which is affected by the unrealistic structure of the exogenous shock (Ciaschini et. al, 2009), the MM analysis overcomes this limit and identify the most convenient structure of the policy control (final demand for tourism industry) by which the shock on economy is modelled.

The SVD of the $n \times n$ matrix L can be written as the product of three matrices:

$$L = USVT \quad (4)$$

Matrices U and V are two unitary or orthonormal basis matrices of dimension $n \times n$. The columns of matrix U represent the structures of the objective variables (the total output) through which all the results are observed and evaluated. These structures are called the key structures of the policy objectives. The rows of unitary matrix V give the structures of the policy controls, these structures measure and establish the composition of all the possible control policies. Matrix S is an $n \times n$ diagonal matrix whose elements are positive scalars called singular values. The elements along the diagonal represent aggregate multipliers, which are all real positive and ordered according their magnitude as: $s_1 \geq s_2 \geq \dots \geq s_{1n} \geq 0$.

The SVD of the inverse matrix L can be express from equation (4) as a sum of n matrices:

$$L = s_1 u_1 v_1 + \dots + s_n u_n v_n = s_i u_i v_i \quad (5)$$

where u_i and v_i are the i th columns of matrix U and V and s_i is the i th singular value of matrix L . As the columns of matrix V are orthonormal therefore each operator $s_i u_i v_i^T$ acts as a filter.

The analysis proposed stresses then a change of view point from comparison between columns of the Leontief inverse to the relationship between the demand shock, considered as the policy control and the total output vector considered as the target variable, providing a tool for quantifying the effect of a change in the structure of the policy variable in terms of the total scale of the policy.

We can decompose the Leontief inverse and concentrate on the highest, dominating, macro multiplier for which:

$$L v_1 = s_1 u_1 \quad (6)$$

where vector v_1 corresponds to the most “effective” control key-structure among the set of all control key-structures, v_i , $i = 1, \dots, n$ and vector u_1 is the most “efficient” target key-structure since it is activated by the highest multiplier s_1 . With

these methodological bases in mind, we elaborated two indices of effectiveness and efficiency of the policy. These indices, which are still referred to each single industry, show the role of each industry inside the set of key-structures and quantify their relevance both in terms of what we defined “target efficiency” and “control effectiveness”. For the set of the target key-structures, given in the columns of matrix U , it is possible to define the following index of target efficiency of industry i on target j :

$$\mu_{ij} = \frac{\frac{|s_j u_{ij}|}{\frac{1}{n} \sum_{j=1}^n |s_j u_{ij}|}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^m |s_j u_{ij}|} \quad (7)$$

which quantifies the relevance of the i^{th} industry on the j^{th} unitary target structure weighted by the scale effect given by the j^{th} Macro multipliers that impacts on it. When this index takes a value lower than 1, $\mu_{ij} < 1$, the corresponding i^{th} industry is of low relevance within the j^{th} target key-structures.

It is also possible to define an index starting from the set of the control key-structures determined in columns of matrix V . We defined this index as policy effectiveness of industry i on control j and shows the relevance of the single sector component v_{ij} , within the structure of the j^{th} policy key-sector.

$$\gamma_{ij} = \frac{\frac{|v_{ij}|}{\frac{1}{n} \sum_{j=1}^m |v_{ij}|}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^m |v_{ij}|} \quad (8)$$

In particular, this index makes explicit the role played by the selected industry within the control key-structure which will cause the attainment of the j^{th} target structures u_j , activating corresponding Macro Multiplier s_j on the target. When this index takes a value lower than 1, $\gamma_{ij} < 1$, the corresponding i^{th} industry is of low relevance within the j^{th} control key-structures.

4. Dispersions analysis for Tourism industry

4.1. Power and sensitivity dispersion for Tourism industry

The Leontief inverse matrix, which is in fact the reduced form of the Leontief model, gives the possibility of quantifying the direct and indirect effects on multi industry outputs. This is possible imposing an exogenous shock either on final demand or on any other macroeconomic variable in the model. Starting from the

reduced form of the model, we can build two types of indices of dispersion that are able to evaluate quantitatively the role of any commodity produced in terms of power of dispersion and sensitivity of dispersion.

The first type of index stresses the relevance of a commodity in activating the production chain evaluating an increase of a unit final demand shock of the i^{th} good in terms of a change of the output of all other commodities. The second type of index evaluates the relevance of a commodity when a unit final demand shock on all commodities is imposed. These indices of dispersion determine those key commodities that play a significant role in particular in the industries of the tourism industries set and give a rank to all commodities in terms of power and sensitivity of dispersion. Results of the power of dispersion and sensitivity of dispersion indices are reported in the Figures 1 and 2 below. The TC industries are represented with histogram bars coloured white. These figures show the results based on the Leontief inverse for the period of 2010.

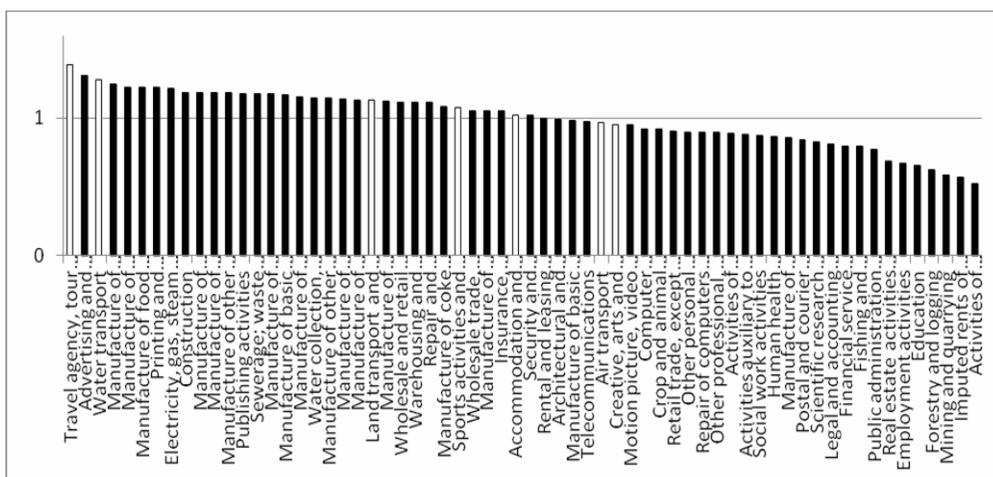


Fig. 1. *Power of Dispersion (PD): Tourism Relevance*

Using the dispersion analysis proposed by Rasmussen (Rasmussen, 1956), an industry is considered as a key industry if $PD_j > 1$ and $SD_i > 1$. In the second case if for an industry $PD_j < 1$ and $SD_i > 1$ then the industry is considered as a sensitivity of dispersion oriented industry. In the third case is if $PD_j > 1$ and $SD_j < 1$ then the industry is considered as power of dispersion oriented industry (Khanal, 2014; Soulie, 2014; Cai et al., 2006).

Table A2 in the appendix presents the full details of sensitivity of dispersion and of power of dispersion indices for each the 64 I-O industries included the 7 industries of the TC. Table A2 shows that 18 industries have strong sensitivity and power dispersion 31 "Land transport and transport via pipeline services" and

36. “Accommodation and food service activities” are also among these industries. The results for power of dispersion are shown in Figure 1. These results indicate for TC industries that 53. “Travel agency, tour operator reservation service and related activities” and 32. “Water transport and transport via pipelines” occupy two highest ranks within all industries. From Figure 1 we also observe that 34 industries out of 64 for which the value of index is greater than one. Five of the seven TC industries belong to this group.

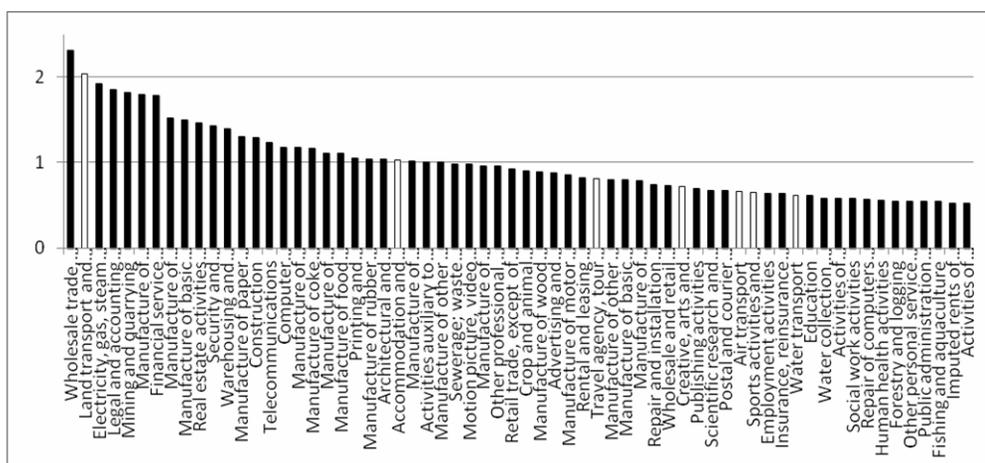


Fig. 2. *Sensitivity Dispersion (SD): Tourism Relevance*

Figure 2 shows the sensitivity dispersion index for the Italian economy. The results of the sensitivity of dispersion indicate that “Wholesale trade, except of motor vehicles and motorcycles” is the key and highest rank industry among the 27 industries out of 64. The second key industry is “Land transport and transport via pipelines”, an industry of the TC. The results support the importance of different industries in stimulating the economic growth of Italy tourism industry is involved in both the power and sensitivity dispersion effects

4.2. Policy target efficiency and policy control effectiveness

Matrix L also has the potential to reveal the role of each commodity and quantify its relevance in terms of both Target-Efficiency and Control Effectiveness of the policy shock. For this purpose, we will use two types of indices with respect to structures of both the target variable (Target Efficiency) and the control variable (Control Effectiveness). These indices determine those commodities whose role is relevant in the TC industries assigning a rank to all commodities both in terms of Policy target Efficiency and Policy Control effectiveness as defined in eq.(6) and (7). The

equation (6) reveals the role played by the selected commodity inside the target structures u_i when the corresponding Macro Multiplier s_i is activated. When the value of this index is lower than 1 (i.e. $\mu_{ij} < 1$) than the commodity has a low importance inside the target structure.

The results regarding the target structures are shown in Figure 3. We observe that 37 industries out of 64 for which the value of index is greater than 1; among these the TC industries whose bars are coloured in white. We notice that industry 46. “Legal and accounting activities; activities of head offices; management consultancy activities” get a high score among the 37 upper target structures. All the seven industries composing the tourism set are placed in the upper target structures.



Fig. 3. Policy Target Efficiency (PTE)

Table A3 in the appendix presents the full details of Policy target Efficiency and Policy Control effectiveness indices and the ranking for each of the tourism components within the 64 I-O industries. From this table we can see that 31. “Land transport and transport via pipeline” get a highest rank 6 among the entire TC industries.



Fig. 4. Policy Control Effectiveness (PCE)

The Policy Control Effectiveness is given in eq. (7), which quantifies the importance of the i^{th} good in all the n control structures. In particular, this index reveals the role played by the selected commodity inside the control structure (v_i). When the index assumes a value lower than 1 (i.e. $\gamma_{ij} < 1$) than the commodity has a low importance inside the control structure. Further, these indices identify the relevant structures of final demand in which the TC industries play a role in terms of tool of economic policy. From figure 4 we can identify 38 key structures of final demand that have an index greater or equal to one ($\gamma_{ij} \geq 1$). On the basis of these structures of final demand we can identify the commodities that get the major changes in terms of output.

From figure 4 we see that industry 46. “Land Legal and accounting activities; activities of head offices; management consultancy activities” plays a role within the upper 38 control structures. For what regards TC industries all the 7 industries are placed in the upper target structures. From table A3 in the appendix we can see that 53. “Travel agency, tour operator reservation service and related activities” get the highest rank, 5, among the entire tourism set industries. Another influential industry of the tourism set is 31. “Land transport and transport via pipelines” which is ranked 7.

5. Policy target and policy control structures

In this section, we will identify the demand control policies (policy control variable) that promote the Tourism Cluster within the realized total output (policy target variable). Using the Macro Multiplier approach, we identify the convenient final demand and output vectors, operating on all the structures. A specific structure of final demand, which has a positive effect on the growth of the Tourism Cluster as a

whole also impacts the remaining industries' outputs. We then determine a set of 64 MM, a set of 64 structures of demand control, rows of matrix VT, and a set of 64 structures of objective, the columns of matrix U. The structures identified by matrix VT and U together with matrix S determine all the possible behaviours of the economic system.

From the set of structures of the target variable, $s_i u_i$ ($i=1, \dots, 64$), it is possible to choose the most effective policies for the TC. Table 1 shows the most effective policies that give the highest push to at least one of the industries composing the tourism industry set. Policy structure 1 has a modulus multiplier s_1 , a demand control structure v_1 and an overall policy effect on the target, $s_1 u_1$, which is shown in the second column of table 1. We notice that the most relevant component is industry 31. "Land transport and transport via pipelines services".

Policy structure 18 is a convenient structure for industry 53. "Travel agency, tour operator reservation service and related activities". However, the impact is in opposite direction. Target policy structure 24 can be seen from the 4th column of table 1. This policy has a relevant impact on industry 59. "Creative, arts & entertainment activities". Target policy structure 49 has a relevant impact on industry 33. "Air transport sector". Target policy structure 50 can be seen in the 6th column of table 1. This policy has a relevant impact on industry 60. "Sports activities & amusement and recreation activities". Target policy structure 57 has a relevant impact on industry 36. "Accommodation and food service activities" and finally the relevant impact of target policy structure 60 is on industry 32. "Water transport services". Since policy 1 is a dominating policy, which means a specific demand driven policy that has the highest multiplier effect on outputs, the policy control gives a consistent expansive push to all industries. The policy control structure v_1 of all positive final demand changes generates a vector of all positive (target variable) total output changes $s_1 u_1$. The structure of policy target 1 is shown in figure 5.

Key Objective policy structures: 1, 18, 24, 49, 50,57,60								Key policies control Structures: 24, 49, 50, 55, 57, 60						
ID	S ₁ .U ₁	S ₁₈ .U ₁₈	S ₂₄ .U ₂₄	S ₄₉ .U ₄₉	S ₅₀ .U ₅₀	S ₅₇ .U ₅₇	S ₆₀ .U ₆₀	ID	V ₂₄	V ₄₉	V ₅₀	V ₅₅	V ₅₇	V ₆₀
x ₁	0.18	0.09	0.08	-0.02	-0.08	0.24	-0.11	f ₁	0.07	-0.02	-0.08	-0.04	0.26	-0.12
x ₂	0.03	-0.04	-0.03	-0.22	0.17	0.00	0.00	f ₂	-0.03	-0.21	0.17	0.01	0.00	0.00
x ₃	0.05	0.01	-0.01	0.03	-0.07	0.05	-0.01	f ₃	-0.01	0.03	-0.07	-0.06	0.05	-0.01
x ₄	0.47	0.03	0.02	-0.04	0.04	0.03	0.08	f ₄	0.02	-0.04	0.03	-0.04	0.04	0.09
x ₅	0.29	0.05	0.01	0.03	0.09	-0.25	0.18	f ₅	0.01	0.03	0.08	0.03	-0.28	0.23
x ₆	0.30	0.00	0.02	0.00	0.01	0.01	-0.01	f ₆	0.01	0.00	0.01	0.00	0.00	0.00
x ₇	0.22	0.04	-0.05	0.02	0.01	0.00	-0.01	f ₇	-0.05	0.01	0.01	-0.02	0.00	0.00
x ₈	0.42	0.20	-0.03	-0.02	-0.02	0.08	0.03	f ₈	-0.04	-0.02	-0.03	0.01	0.10	0.04
x ₉	0.30	-0.14	0.10	0.06	0.11	-0.29	-0.13	f ₉	0.09	0.05	0.11	-0.07	-0.32	-0.16
x ₁₀	0.33	0.11	0.05	-0.02	0.01	0.00	-0.01	f ₁₀	0.05	-0.04	0.03	0.00	0.02	0.05
x ₁₁	0.57	-0.08	0.04	-0.02	0.01	0.03	0.00	f ₁₁	0.04	-0.02	0.00	0.02	0.02	0.01
x ₁₂	0.14	0.07	0.03	0.00	0.01	0.03	-0.01	f ₁₂	0.02	0.00	0.00	-0.01	0.02	0.00
x ₁₃	0.31	-0.10	-0.03	0.04	0.02	-0.02	-0.02	f ₁₃	-0.02	0.04	0.02	-0.04	-0.02	-0.02
x ₁₄	0.29	0.05	0.07	0.02	0.02	0.01	-0.02	f ₁₄	0.07	0.02	0.02	-0.03	0.01	-0.02

	Key Objective policy structures: 1, 18, 24, 49, 50,57,60							Key policies control Structures: 24, 49, 50, 55, 57, 60						
X15	0.50	-0.16	-0.13	0.00	0.01	0.00	-0.01	f15	-0.13	0.00	0.00	0.00	0.00	-0.01
X16	0.47	-0.11	0.16	0.05	-0.03	-0.02	-0.02	f16	0.14	0.05	-0.03	0.03	-0.02	-0.02
X17	0.19	0.44	-0.20	0.02	0.00	0.03	-0.01	f17	-0.19	0.02	0.00	0.02	0.03	-0.01
X18	0.25	0.39	0.27	0.02	0.02	0.01	0.01	f18	0.24	0.02	0.01	0.00	0.01	0.01
X19	0.34	0.02	0.02	0.01	0.02	0.02	0.02	f19	0.03	0.02	0.01	-0.01	0.02	0.03
X20	0.19	0.15	-0.25	0.06	-0.05	0.09	0.00	f20	-0.22	0.07	-0.05	-0.02	0.10	0.00
X21	0.18	0.32	0.04	-0.06	0.04	0.06	0.09	f21	0.04	-0.07	0.04	-0.02	0.06	0.12
X22	0.18	-0.05	0.19	0.00	0.02	0.03	0.01	f22	0.17	0.00	0.02	-0.02	0.03	0.01
X23	0.17	0.03	0.02	-0.24	0.09	-0.05	0.03	f23	0.03	-0.23	0.09	-0.12	-0.05	0.03
X24	0.56	-0.24	-0.11	0.04	-0.02	-0.01	-0.02	f24	-0.10	0.05	-0.03	-0.02	0.00	-0.01
X25	0.14	-0.11	-0.08	0.08	-0.10	-0.02	0.01	f25	-0.08	-0.08	-0.10	0.06	-0.02	0.01
X26	0.26	0.40	0.01	-0.03	0.04	0.04	0.00	f26	0.01	-0.05	0.03	-0.02	0.04	0.00
X27	0.34	-0.06	-0.08	-0.02	0.00	0.00	0.01	f27	-0.07	-0.02	-0.01	0.04	0.00	0.01
X28	0.16	0.07	-0.19	-0.09	0.11	-0.17	-0.01	f28	-0.18	-0.09	0.11	-0.05	-0.16	-0.01
X29	0.67	-0.03	-0.17	0.00	-0.10	-0.21	0.04	f29	-0.15	0.00	-0.11	-0.12	-0.22	0.05
X30	0.19	-0.05	0.01	0.00	-0.04	-0.16	-0.04	f30	0.00	0.00	-0.04	0.31	-0.15	-0.04
X31	0.62	0.20	0.04	-0.05	-0.12	0.02	0.03	f31	0.04	-0.04	-0.13	0.47	0.02	0.04
X32	0.16	-0.11	-0.05	-0.29	0.18	-0.17	-0.56	f32	-0.05	-0.29	0.18	0.10	-0.18	-0.58
X33	0.12	-0.02	-0.03	0.52	-0.26	-0.10	-0.29	f33	-0.03	0.52	-0.26	-0.05	-0.11	-0.30
X34	0.41	0.05	0.07	0.11	0.05	0.06	0.08	f34	0.06	0.12	0.04	-0.42	0.07	0.10
X35	0.10	-0.03	0.00	-0.14	0.15	-0.05	-0.05	f35	0.00	-0.14	0.15	-0.40	-0.05	-0.05
X36	0.23	-0.17	-0.05	0.03	-0.02	0.48	-0.40	f36	-0.04	0.03	-0.02	-0.12	0.48	-0.42
X37	0.17	-0.03	-0.02	0.01	-0.04	0.43	0.04	f37	-0.01	0.01	-0.03	0.06	0.42	0.03
X38	0.20	0.18	-0.14	0.01	0.01	0.01	-0.04	f38	-0.09	0.01	0.01	-0.02	0.02	-0.04
X39	0.28	-0.12	0.09	0.07	0.11	-0.02	-0.06	f39	0.08	0.07	0.11	0.16	-0.02	-0.07
X40	0.24	-0.04	0.09	0.00	-0.06	-0.01	0.00	f40	0.08	0.00	-0.05	-0.02	-0.01	0.00
X41	0.38	0.01	-0.02	0.02	0.02	0.10	-0.01	f41	-0.01	0.02	0.02	0.11	0.12	-0.01
X42	0.10	0.04	-0.02	-0.02	-0.02	-0.02	0.01	f42	-0.02	-0.01	-0.02	0.00	-0.02	0.01
X43	0.16	0.08	-0.02	0.00	-0.03	-0.07	0.02	f43	-0.02	0.00	-0.02	-0.05	-0.06	0.01
X44	0.29	-0.12	0.06	0.02	0.01	0.10	0.08	f44	0.05	0.02	0.01	-0.27	0.11	0.09
X45	0.01	0.00	-0.01	-0.22	-0.17	-0.11	0.00	f45	0.00	-0.22	-0.17	-0.18	-0.11	0.00
X46	0.44	-0.09	0.04	-0.09	0.24	0.12	-0.06	f46	0.04	-0.09	0.24	0.21	0.14	-0.07
X47	0.22	0.01	-0.06	0.01	0.01	-0.02	0.01	f47	-0.05	0.01	0.01	-0.01	-0.01	0.00
X48	0.09	0.04	-0.02	-0.04	-0.05	-0.08	0.00	f48	-0.01	-0.04	-0.05	-0.04	-0.08	0.00
X49	0.23	0.16	-0.25	0.00	0.00	-0.01	0.02	f49	-0.25	0.00	0.00	-0.01	0.00	0.01
X50	0.18	-0.04	0.00	0.21	0.01	-0.09	0.02	f50	0.00	0.22	0.01	-0.05	-0.09	0.01
X51	0.17	-0.06	0.02	-0.04	0.19	0.07	0.17	f51	0.02	-0.03	0.19	0.09	0.08	0.20
X52	0.06	-0.02	-0.01	-0.27	-0.13	-0.03	0.00	f52	-0.01	-0.27	-0.13	0.06	-0.02	-0.01
X53	0.23	-0.45	-0.10	-0.02	-0.02	0.16	0.41	f53	-0.10	-0.01	-0.03	0.07	0.16	0.43
X54	0.34	-0.10	0.17	-0.12	-0.34	-0.14	0.00	f54	0.15	-0.13	-0.35	-0.08	-0.14	-0.01
X55	0.05	0.00	0.01	0.03	0.33	-0.06	0.01	f55	0.01	0.03	0.33	-0.03	-0.06	0.01
X56	0.05	-0.02	-0.02	0.03	0.01	0.02	0.00	f56	-0.02	0.03	0.01	-0.09	0.02	0.00
X57	0.06	-0.03	0.00	0.03	0.08	0.01	0.01	f57	0.00	0.02	0.07	0.00	0.01	0.01
X58	0.06	-0.12	-0.48	-0.01	-0.03	-0.07	0.04	f58	-0.44	-0.01	-0.03	-0.02	-0.06	0.03
X59	0.11	-0.05	0.51	0.11	0.33	-0.02	0.02	f59	0.46	0.11	0.34	-0.02	-0.02	0.02
X60	0.11	-0.05	0.39	-0.17	-0.48	-0.04	0.01	f60	0.36	-0.17	-0.47	0.02	-0.04	0.01
X61	0.08	0.01	0.03	0.45	0.09	-0.12	0.02	f61	0.03	0.45	0.09	0.08	-0.12	0.02
X62	0.07	0.03	-0.01	-0.12	-0.07	-0.05	0.01	f62	-0.01	-0.12	-0.07	-0.09	-0.05	0.01
X63	0.07	-0.12	-0.02	-0.07	0.04	-0.04	-0.01	f63	-0.02	-0.06	0.03	0.14	-0.04	-0.01
X64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	f64	0.00	0.00	0.00	0.00	0.00	0.00

Table 1. *Key Policies structure*

Among the 64 industries, a hierarchy of industries to be stimulated can be established in order to get the result of policy 1. From figure 6 we see that seven industries are stimulated at a very high degree, i.e. 8. “Manufacture of paper and paper products”, 11. “Manufacture of chemicals and chemical products”, 15. “Manufacture of basic metal”, 16. “Manufacture of fabricated metal products, except machinery and equipment”, 24. “Electricity, gas, steam and air conditioning supply”, 29. “Wholesale trade, except of motor vehicles and motorcycles” and 31. “Land transport and transport via pipelines”. Ten industries are part of a second set highly stimulated i.e. 5. “Manufacture of food products, beverages and tobacco products”, 6. “Manufacture of textiles, wearing apparel and leather products”, 9. “Printing and reproduction of recorded media”, 10. “Manufacture of coke and refined petroleum products”, 13. “Manufacture of rubber and plastic products”, 14. “Manufacture of other non-metallic mineral products”, 19. “Manufacture of machinery and equipment”, 27. “Construction”, 34. “warehousing and support activities for transportation” and 53. “Travel agency, tour operator reservation service and related activities”. The remaining industries are activated at a low level or very low level.

From the set of structures for the policy, v_i ($i=1, \dots, 64$), it is possible to choose the most effective policies that use the Tourism Cluster. Table 1 shows the most effective policies that use the output of the Tourism Cluster. From table 1 policy structure 24 uses industry 59. “Creative, arts & entertainment activities; libraries, archives, museums, cultural activities” output. Policy structure 49 uses industry 33. “Air transport services” and policy structure 50 uses industry, 60. “Sports activities and amusement and recreation activities” outputs. Policy structure 55 uses industry 31. “Land transport and transport via pipelines” and policy structure 57 the industry 36. “Accommodation and food service activities” outputs and finally policy structure 60 uses industry 53. “Travel agency, tour operator reservation service and related activities” and industry 32. “Water Transport services” outputs however the impact is in opposite direction.

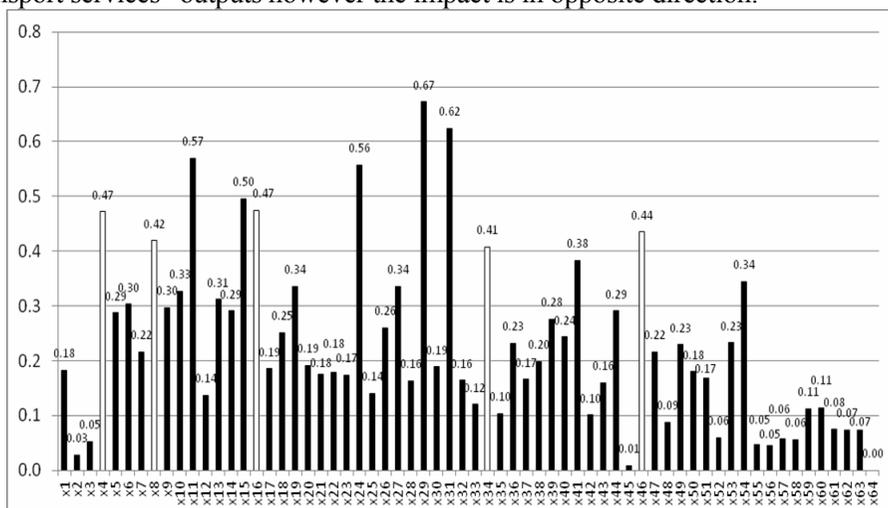


Fig. 5. *Dominating policy objective and tourism industries*

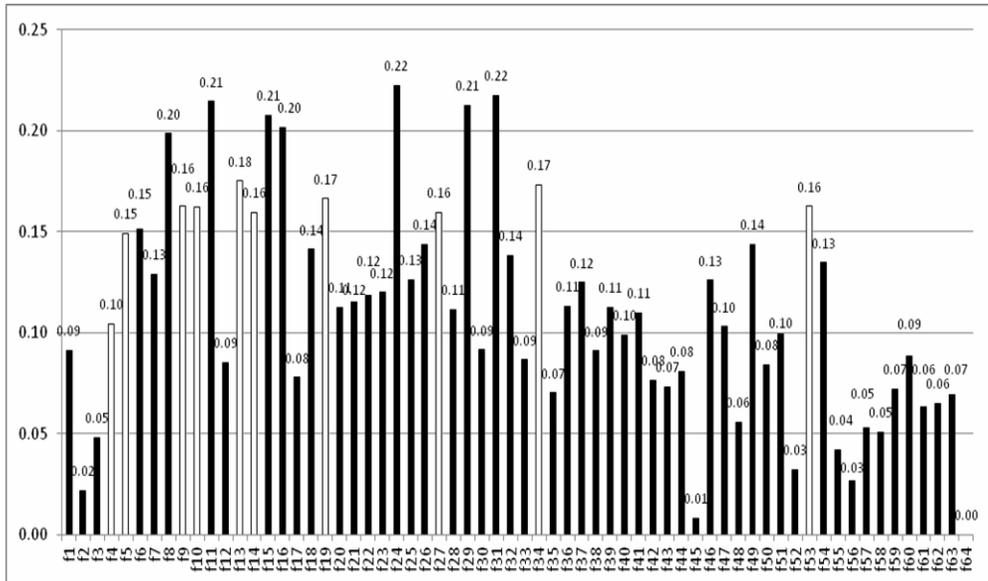


Fig. 6. *Dominating policy control and tourism industries*

From figure 5 we can see that the highest impact is borne by a group of two industries: 29. “Wholesale trades, except of motor vehicles and motorcycles” and 31. “Land transport and transport via pipelines”. Three industries are part of a second group with highest impact: 11. “Manufacture of chemicals and chemical products”, 15. “Manufacture of basic metal” and 24. “Electricity, gas, steam and air conditioning supply”. Five industries are part of a third group with highest impact: 4. “Mining and quarrying”, 8. “Manufacture of paper and paper products”, 16. “Manufacture of fabricated metal products, except machinery and equipment”, 34. “Warehousing and support activities for transportation” and 46. “Legal and accounting activities; activities of head offices; management consultancy activities”. Fourth group of 50. “industries bears” an impact of intermediate intensity and a set of four industries is under an impact of low intensity.

6. Conclusion

The economic relevance of tourism has been the subject of considerable debate. In order to synthesize the conclusions of such disputes into a meaningful outcome, we need to establish the reliability and authenticity of information on tourism and tourism-related consumption expenditures. Once attained fairly verifiable sources of information on such facts and figures, we can try to get a more accurate measure of its impact on different industries of the economy. One common and preliminary

issue, debated by the research community regards the economic articulation of tourism in national accounts since tourism does not appear as a distinct industry rather it looks as a cluster of industries contributing to the definition of tourism.

The evidence of our analysis starts from the results of the dispersion analysis (power of dispersion & Sensitivity of dispersion) but we expand the focus to include the discussion of the efficiency of different existing configurations of policies (policy target efficiency & policy control effectiveness)

The approach starts from the assessment of the intensity of economic flows involved in the output of the tourism industry identified with what we have defined as the Tourism Cluster: a set of industries that includes industry 31: Land transport and transport via pipelines, industry 32: Water transport, industry 33: Air transport, industry 36: Accommodation and food service activities, industry 53: Travel agency, tour operator reservation service and related activities, industry 59: Creative, arts & entertainment activities; libraries, archives, museums, cultural activities and industry 60: Sports activities & amusement and recreation activities.

Then the dispersion analysis is applied to the inverse matrix of the multisectoral model. The results obtained emphasize the relevance of a set of industries in stimulating the economic growth of Italy's tourism industry in terms of both the "power of dispersion" and "sensitivity of dispersion" effects. The results also outline the importance of key industries that have higher potential to increase the output of tourism industry. In particular, the power of dispersion reveals a high potential stimulus to other industries from a demand shock in tourism industry. The power dispersion results indicate that travel agency, tour operator reservation service and related activities is the key and highest rank industry, which plays a central role. Both the power of dispersion and the sensitivity of dispersion results confirm that the industries of the Tourism Cluster - i.e. 31. Land transport and transport via pipelines; 32. Water transport; 33 Air transport; 36 Accommodation and food service activities; 53 Travel agency, tour operator reservation service and related activities; 59 Creative, arts & entertainment activities; libraries, archives, museums, cultural activities and 60 Sports activities & amusement and recreation activities - are the key and highest rank industries for tourism.

In order to get a wider picture of the actual and potential impacts of tourism industry, the analysis has been concentrated on the role played by the sectoral composition, i.e. the structure of macroeconomic variables. Each macroeconomic variable is decomposed into an aggregated scale component and a disaggregated structure component through a rigorously consistent procedure. This advance has been realized through the application of our approach of Macro Multipliers (MM), for checking the relevance of tourism industries from a policy perspective, and this is done in the two sides: **i)** the final demand, as the multisectoral policy control, and **ii)** the total output, as multisectoral policy target. Within a scheme of economic policy, in fact the final demand vector can be manipulated in its composition to lead to a desired effect on the total output vector.

The MM analysis performed through the determination of the target efficiency and control effectiveness reveal, for the target, that all the seven tourism industries composing the Tourism Cluster, appear in the key target structures with non-negligible proportions. While the control effectiveness reveals a high potential stimulus to other industries since in all the key structures the Tourism Cluster appear with a relevant weight. Industry 53 Travel agency, tour operator reservation service and related activities get the highest rank, 5, among the entire economic industry and tourism industry. The policy problem is then transformed into the choice of a convenient structure for the policy control.

Each of the 64 MM is associated with a structure of a policy control that activates each multiplier effect. This multiplier effect is directed towards each specific industry component of the policy target according the target key structures. Focus on the dominant policy means a positive effect on the system as a whole. Both the target and control key structures associated with the dominant policy have all positive components thus the policy control increases both the scale of total output and each industrial component. In particular, the results of the analysis performed shows that tourism industry, the tourism cluster, has a role to play in the composition of both the policy target and the policy control variable. The policies of final demand are determined in terms of the effects on the target of changing the inner composition of the policy variable while its magnitude is kept constant. Then the allocation of resources directly to tourism, within a policy demand control of convenient composition, generates a general increase in total output.

The analysis also reveals the policy targets where the tourism cluster is more stimulated and further establishes that the TC is as much effective as other relevant industries in generating changes in output if it is stimulated conveniently. The results also stress the role of all other industries when the final demand policy tends to privilege tourism industry's demand. Finally, an extension of the method has been provided in terms of interaction analysis, which presents an interpretation of the strength of the mutual links between the Tourism Cluster and other industries in terms of disaggregated components of total output and final demand.

7. References

- Ahlert, G., 2009. Estimating the Economic Impact of an Increase in Inbound Tourism on the German Economy Using TSA Results. *Journal of Travel Research*, 47(2), pp. 225-234.
- Ali, Y., Ciaschini, M., Pretaroli, R., and Socci, C., 2015. Measuring the economic landscape of Italy: target efficiency and control effectiveness. *Journal of Industrial and Business Economics*, 42(3), pp. 297-321.
- Archer, B.H., 1982. The value of multipliers and their policy implications. *Tourism Management*, 3, pp. 236-241.

- Archer, B. and Fletcher, J., 1996. The economic impact of tourism in the Seychelles. *Annals of Tourism Research*, 23, pp. 32-47.
- Babalola, A., 2011. Tourism Cluster in Italy. *Microeconomics of Competitiveness* final report, May, 34.
- Cai, J., Leung, P., and Mak, J., 2006. "Tourism's Forward and Backward Linkages." *Journal of Travel Research*, 45(1): 36-52.
- Ciaschini, M. and Socci, C., 2006. Income distribution and output change: a macro multiplier approach. In: N. Salvadori (ed.), *Economic Growth and Distribution: on the Nature and Causes of the Wealth of Nations*, pp. 247-270.
- Ciaschini, M. and Socci, C., 2007. Final demand impact on output: A macro multiplier approach. *Journal of Policy Modeling*, 29(1), pp.115-132.
- Ciaschini, M., Pretaroli, R. and C. Socci. 2009. A Convenient Multisectoral Policy Control For ICT In The US Economy. *Metroeconomica*, 60(4), pp. 660-685.
- EUROSTAT, 2008. *Eurostat Manual of Supply, Use and Input-Output Tables: Collection, Methodologies and Working Papers.*" Luxembourg: Eurostat.
- Fan, T. and Ooasterhaven, J., 2005. *The impact of international tourism on the Chinese economy.*" Paper presented at the 15th International Input-Output Conference, Beijing, China, June.
- Fletcher, J.E., 1989. Input-output analysis and tourism impact studies. *Annals of Tourism Research*, 16, pp. 514-529.
- Fletcher, J. 1994. "Input-output analysis." *Tourism Management and Marketing Handbook*, New York: Prentice Hall.
- Frechtling, D. and E. Horvath. 1999. "Estimating the Multiplier Effects of Tourism Expenditures on a Local Economy through a Regional Input-Output Model." *Journal of Travel Research* 37(4): 324-329.
- Gul, H. and Cagatay, S., 2015. Impact Analysis of Demand-Driven Shocks in Turkey's Tourism Industry within the Framework of the Social Accounting Matrix. *Tourism Economics*, 21(1), pp. 33-48.
- Henry, E.W. and Deane, B., 1997. The contribution of tourism to the economy of Ireland in 1990 and 1995. *Tourism Management*, 18, pp. 535-553.
- Holloway, J., 2006. *The Business of Tourism*. London: Longman.
- Khanal, B. R., Gan, C. and Becken, S., 2014. Tourism Inter-industry Linkages in the Lao PDR Economy: An Input-Output Analysis. *Tourism Economics*, 20(1), pp. 171-94.
- Leontief, W., 1986. *Input-output economics*. Oxford: Oxford University Press.
- Madsen, B. and Zhang, J., 2010. Towards a new framework for accounting and modelling the regional and local impacts of tourism. *Economic Systems Research*, 22(4), pp. 313-340.
- Mak, J., 2004. *Tourism and the economy: Understanding the economics of tourism*. Hawaii: University of Hawaii Press.

- Manente, M., 1999. Regional and Inter-Regional Economic Impacts of Tourism Consumption: Methodology and the Case of Italy. *Tourism Economics*, 5(4), pp. 425-36.
- Manente, M. and Zanette, M., 2010. Macroeconomic effects of a VAT reduction in the Italian Hotels & Restaurants industry. *Economic Systems Research*, 22(4), pp. 407-425.
- Maresca, S. and Anzalone, M., 2011. *Versus the first Italian Tourism Satellite Account: The production Approach*. ISTAT 36.
- Miller, R.E. and Blair, P.D., 2009. *“Input-output analysis: foundations and extensions.”* Cambridge: Cambridge University press.
- Rasmussen, P.N., 1956. *Studies in inter-sectoral relations*. E. Harck, 15.
- Smeral, E., 2006. Tourism Satellite Accounts: A Critical Assessment. *Journal of Travel Research*, 45(1), pp. 92-98.
- Soulie, J. and Valle, E., 2014. Trade Effects of Specialization in Tourism: An Inter-regional Input-Output Model of the Balearic Islands. *Tourism Economics*, 20(5), pp. 961-985.
- Steenge, A.E. and Steeg, V., 2010. Tourism Multipliers For A Small Caribbean Island State; The Case Of Aruba. *Economic Systems Research*, 22(4), pp. 359-384.
- Tantirigama, T. and Taniguchi, S., 2009. *Economic Impacts of Transport & Tourism in New Zealand An Input-output Multipliers Approach*. The paper submitted to NZAE Conference.
- Ten, R.T., 2005. *The economics of input-output analysis*. Cambridge: Cambridge University press.
- Tyrrell, T.J. and R.J. Johnston. 2001. “A framework for assessing direct economic impacts of tourist events: distinguishing origins, destinations, and causes of expenditures.” *Journal of Travel Research*, 40: 94-100.
- United Nations, 2008. *Tourism Satellite Account: Recommended Methodological Framework.* Eurostat, Madrid, Spain.
- UNWTO, 2007. *Climate change and tourism: Responding to global challenges. Advanced Summary*. Davos, Switzerland: 23.
- UNWTO, 2010. *Tourism Highlights*. 2010 Edition: UNWTO.
- WTTC, 2003. *Travel and Tourism: A World of Opportunity.* available at <http://www.wtcc.org/measure/PDF/Executive%20Summary.pdf>.

Appendix A: Tables

Activities	ID	Activities	ID
Crop and animal production, hunting and related service activities	1	Air transport	33
Forestry and logging	2	Warehousing and support activities for transportation	34
Fishing and aquaculture	3	Postal and courier activities	35
Mining and quarrying	4	Accommodation and food service activities	36
Manufacture of food products, beverages and tobacco products	5	Publishing activities	37
Manufacture of textiles, wearing apparel and leather products	6	Motion picture, video and television programme production, sound recording and music	38
Manufacture of wood and of products of wood and cork, except furniture;	7	Telecommunications	39
Manufacture of paper and paper products	8	Computer programming, consultancy and related activities; information service activities	40
Printing and reproduction of recorded media	9	Financial service activities, except insurance and pension funding	41
Manufacture of coke and refined petroleum products	10	Insurance, reinsurance and pension funding, except compulsory social security	42
Manufacture of chemicals and chemical products	11	Activities auxiliary to financial services and insurance activities	43
Manufacture of basic pharmaceutical products and pharmaceutical preparations	12	Real estate activities (excluding imputed rent)	44
Manufacture of rubber and plastic products	13	Imputed rents of owner-occupied dwellings	45
Manufacture of other non-metallic mineral products	14	Legal and accounting activities; activities of head offices; management consultancy activities	46
Manufacture of basic metals	15	Architectural and engineering activities; technical testing and analysis	47
Manufacture of fabricated metal products, except machinery and equipment	16	Scientific research and development	48
Manufacture of computer, electronic and optical products	17	Advertising and market research	49
Manufacture of electrical equipment	18	Other professional, scientific and technical activities; veterinary activities	50
Manufacture of machinery and equipment n.e.c.	19	Rental and leasing activities	51
Manufacture of motor vehicles, trailers and semi-trailers	20	Employment activities	52

Activities	ID	Activities	ID
Manufacture of other transport equipment	21	Travel agency, tour operator reservation service and related activities	53
Manufacture of furniture; other manufacturing	22	Security and investigation activities; services to buildings and landscape activities;	54
Repair and installation of machinery and equipment	23	Public administration and defence; compulsory social security	55
Electricity, gas, steam and air conditioning supply	24	Education	56
Water collection, treatment and supply	25	Human health activities	57
Sewerage; waste collection, treatment and disposal activities; materials recovery;	26	Social work activities	58
Construction	27	Creative, arts & entertainment activities; libraries, archives, museums, cultural activities;	59
Wholesale and retail trade and repair of motor vehicles and motorcycles	28	Sports activities and amusement and recreation activities	60
Wholesale trade, except of motor vehicles and motorcycles	29	Activities of membership organisations	61
Retail trade, except of motor vehicles and motorcycles	30	Repair of computers and personal and household goods	62
Land transport and transport via pipelines	31	Other personal service activities	63
Water transport	32	Activities of households as employers; undifferentiated goods- and services-producing	64

Table A1. I-O *Industries Classification*

Activities	PD π_j	RANK	SD τ_i	RANK	PD>1, SD>1
Crop and animal production, hunting and related service activities	0.923	41	0.900	33	
Forestry and logging	0.623	61	0.548	59	
Fishing and aquaculture	0.793	56	0.543	61	
Mining and quarrying	0.583	62	1.818	5	
Manufacture of food products, beverages and tobacco products	1.221	5	1.104	20	x
Manufacture of textiles, wearing apparel and leather products	1.186	9	1.105	19	x
Manufacture of wood and of products of wood and cork, except furniture; manufacture	1.150	17	0.887	34	
Manufacture of paper and paper products	1.245	4	1.298	13	x
Printing and reproduction of recorded media	1.221	6	1.049	21	x
Manufacture of coke and refined petroleum products	1.080	27	1.166	18	x
Manufacture of chemicals and chemical products	1.126	23	1.794	6	x
Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.979	36	0.796	40	
Manufacture of rubber and plastic products	1.221	7	1.040	22	x
Manufacture of other non-metallic mineral products	1.182	13	1.006	27	x
Manufacture of basic metals	1.168	16	1.501	9	x
Manufacture of fabricated metal products, except machinery and equipment	1.186	11	1.523	8	x
Manufacture of computer, electronic and optical products	0.854	51	1.012	25	
Manufacture of electrical equipment	1.141	20	0.963	30	
Manufacture of machinery and equipment n.e.c.	1.176	15	1.180	16	x
Manufacture of motor vehicles, trailers and semi-trailers	1.055	30	0.856	36	
Manufacture of other transport equipment	1.143	19	0.799	39	
Manufacture of furniture; other manufacturing	1.132	21	0.783	41	
Repair and installation of machinery and equipment	1.112	26	0.745	42	
Electricity, gas, steam and air conditioning supply	1.216	8	1.918	3	x
Water collection, treatment and supply	1.146	18	0.579	54	
Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation	1.180	12	0.983	28	
Construction	1.186	10	1.286	14	x
Wholesale and retail trade and repair of motor vehicles and motorcycles	1.116	24	0.731	43	
Wholesale trade, except of motor vehicles and motorcycles	1.055	29	2.316	1	x
Retail trade, except of motor vehicles and motorcycles	0.906	43	0.926	32	
Land transport and transport via pipelines	1.129	22	2.032	2	x
Water transport	1.279	3	0.619	52	
Air transport	0.965	38	0.657	48	
Warehousing and support activities for transportation	1.115	25	1.391	12	x
Postal and courier activities	0.841	52	0.674	47	

Activities	PD π_j	RANK	SD τ_i	RANK	PD>1, SD>1
Accommodation and food service activities	1.025	32	1.028	24	x
Publishing activities	1.180	14	0.695	45	
Motion picture, video and television programme production, sound recording and music	0.948	40	0.976	29	
Telecommunications	0.976	37	1.229	15	
Computer programming, consultancy and related activities; information service activities	0.924	42	1.181	17	
Financial service activities, except insurance and pension funding	0.797	55	1.780	7	
Insurance, reinsurance and pension funding, except compulsory social security	1.049	31	0.632	51	
Activities auxiliary to financial services and insurance activities	0.881	48	1.008	26	
Real estate activities (excluding imputed rent)	0.690	58	1.465	10	
Imputed rents of owner-occupied dwellings	0.571	63	0.526	63	
Legal and accounting activities; activities of head offices; management consultancy activities	0.815	54	1.855	4	
Architectural and engineering activities; technical testing and analysis	0.987	35	1.033	23	
Scientific research and development	0.831	53	0.675	46	
Advertising and market research	1.308	2	0.873	35	
Other professional, scientific and technical activities; veterinary activities	0.894	46	0.953	31	
Rental and leasing activities	0.997	34	0.816	37	
Employment activities	0.673	59	0.638	50	
Travel agency, tour operator reservation service and related activities	1.384	1	0.812	38	
Security and investigation activities; services to buildings and landscape activities; office	1.020	33	1.423	11	x
Public administration and defense; compulsory social security	0.774	57	0.543	62	
Education	0.655	60	0.615	53	
Human health activities	0.869	50	0.552	58	
Social work activities	0.876	49	0.575	56	
Creative, arts and entertainment activities; libraries, archives, museums and other cultural	0.950	39	0.722	44	
Sports activities and amusement and recreation activities	1.073	28	0.651	49	
Activities of membership organizations	0.893	47	0.578	55	
Repair of computers and personal and household goods	0.898	45	0.569	57	
Other personal service activities	0.899	44	0.545	60	
Activities of households as employers; undifferentiated goods- and services-producing activities	0.526	64	0.526	64	

Table A2. *Power and Sensitivity Dispersion of Tourism Components*

Activities	BD	Rank	FD	Rank	FD>1, BD>1
Crop and animal production, hunting and related service activities	1.155	13	1.172	9	x
Forestry and logging	0.850	51	0.773	57	
Fishing and aquaculture	0.904	45	0.826	51	
Mining and quarrying	0.642	62	0.791	56	
Manufacture of food products, beverages and tobacco products	1.026	35	1.110	17	x
Manufacture of textiles, wearing apparel and leather products	0.563	63	0.719	61	
Manufacture of wood and of products of wood and cork, except furniture	0.754	60	0.868	50	
Manufacture of paper and paper products	1.067	28	1.156	11	x
Printing and reproduction of recorded media	1.241	3	1.285	4	x
Manufacture of coke and refined petroleum products	0.850	52	0.798	55	
Manufacture of chemicals and chemical products	1.036	32	1.135	13	x
Manufacture of basic pharmaceutical products and pharmaceutical preparatin	0.701	61	0.751	59	
Manufacture of rubber and plastic products	1.047	30	1.085	24	x
Manufacture of other non-metallic mineral products	0.846	53	0.935	45	
Manufacture of basic metals	0.896	46	1.042	32	
Manufacture of fabricated metal products, except machinery and equipment	1.098	22	1.170	10	x
Manufacture of computer, electronic and optical products	1.005	38	1.016	34	x
Manufacture of electrical equipment	0.845	54	0.869	49	
Manufacture of machinery and equipment n.e.c.	0.944	43	0.991	38	
Manufacture of motor vehicles, trailers and semi-trailers	1.094	23	1.077	26	x
Manufacture of other transport equipment	0.956	41	0.961	43	
Manufacture of furniture; other manufacturing	0.842	55	0.882	48	
Repair and installation of machinery and equipment	1.133	15	1.049	30	x
Electricity, gas, steam and air conditioning supply	1.047	29	1.121	14	x
Water collection, treatment and supply	1.158	11	1.050	29	x
Sewerage; waste collection, treatment and disposal activities;	0.972	40	1.004	36	
Construction	0.876	48	0.955	44	
Wholesale and retail trade and repair of motor vehicles and motorcycles	1.106	19	1.045	31	x
Wholesale trade, except of motor vehicles and motorcycles	1.238	4	1.300	3	x
Retail trade, except of motor vehicles and motorcycles	1.175	10	1.090	22	x
Land transport and transport via pipelines	1.205	7	1.247	6	x

Activities	BD	Rank	FD	Rank	FD>1, BD>1
Water transport	1.200	8	1.114	16	x
Air transport	1.101	21	1.011	35	x
Warehousing and support activities for transportation	1.212	6	1.248	5	x
Postal and courier activities	1.072	27	0.997	37	x
Accommodation and food service activities	1.152	14	1.102	20	x
Publishing activities	1.181	9	1.109	18	x
Motion picture, video and television program production, sound recording	0.951	42	1.052	28	
Telecommunications	1.156	12	1.147	12	x
Computer programming, consultancy and related activities; information serv	1.012	36	1.054	27	x
Financial service activities, except insurance and pension funding	1.130	17	1.196	8	x
Insurance, reinsurance and pension funding, except compulsory social security	0.787	58	0.719	62	
Activities auxiliary to financial services and insurance activities	1.009	37	1.116	15	x
Real estate activities (excluding imputed rent)	1.103	20	1.109	19	x
Imputed rents of owner-occupied dwellings	0.986	39	0.888	47	
Legal and accounting activities; activities of head offices; management	1.347	1	1.352	1	x
Architectural and engineering activities; technical testing and analysis	1.072	26	1.082	25	x
Scientific research and development	1.029	34	0.980	39	
Advertising and market research	0.876	49	0.813	53	
Other professional, scientific and technical activities; veterinary activities	1.133	16	1.102	21	x
Rental and leasing activities	1.031	33	0.966	41	
Employment activities	0.834	56	0.761	58	
Travel agency, tour operator reservation service and related activities	1.224	5	1.243	7	x
Security and investigation activities; services to buildings and landscape	1.341	2	1.333	2	x
Public administration and defence; compulsory social security	0.886	47	0.800	54	
Education	0.789	57	0.725	60	
Human health activities	0.873	50	0.817	52	
Social work activities	0.924	44	0.909	46	
Creative, arts & entertainment activities; libraries, archives, museums, culture	1.110	18	1.086	23	x
Sports activities and amusement and recreation activities	1.086	24	1.041	33	x

Activities	BD	Rank	FD	Rank	FD>1, BD>1
Activities of membership organisations	1.076	25	0.975	40	
Repair of computers and personal and household goods	0.787	59	0.716	63	
Other personal service activities	1.043	31	0.965	42	
Activities of households as employers; undifferentiated goods- and services	0.216	64	0.195	64	

Table A3. *Macro Multiplier Backward & Forward Dispersion*