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Economic relevance of Tourism industry: the Italian case

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Abstract

Tourism is one of the fastest growing industry in Italy. It has proven a valuable financial part of the Italian economy. Businesses, public and private organizations are strongly interested in the economic impacts of tourism at national and regional level. The main problem which arises when measuring the impact of tourism is that tourism is not only a single industry but it's an amalgamation of different industries. In order to solve this problem we will identify the relationship among the synthetic tourism industry (cluster of tourism). The synthetic tourism industry has three primary components which are Transport, Hotel and Restaurants and Natural Resources. Our attempt is to present an input output analysis for Italy to investigate the interrelations existing among all industries (including tourism) and to examine the economic costs and benefits associated with tourism in Italy. Further we will apply a backward and forward dispersion approach, starting from the original Rasmussen definition, which can give further insight into the interactions between synthetic tourism industry and other industries. The method is based on identification of the Macro Multipliers and the related impact components of a multisectoral model based on the Input-Output table for Italian economy in year 2010. Further the strength of these techniques is evaluated in terms of interaction of the impact components within the sectors and cross interaction between clusters of tourism and the rest of the sectors. This study will further give a full picture of policies that aid policy makers in improving the country's tourism industry through identifying the key sectors that are interrelated with cluster of tourism.

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1. Introduction

The economic benefits and cost of tourism reach directly or indirectly to everyone in the region. From the statistics of World Travel and Tourism Council (WTTC) tourism is the second largest industry in the world which generates 200 million jobs worldwide and holds 10% accounts of global GDP (WTTC, 2003). The main problem which arises when measuring the impact of tourism is that tourism is not only a single industry but it's an amalgamation of different industries which cannot be incorporated into the national account framework. In the System of National Accounts there is no separate tourism industry exists in the list of industries because tourism is a typically demand driven activity. However we should consider this industry as a group of industrial industries which are associated with tourism at various levels. In order to know the potential economic contribution of tourism to a country economy we need to examine the role played by System of National Accounts in providing a consistent and reliable source of information on the economic dimensions of tourism.

The geographical location of Italy as well as its historic heritage offers a wealth of scenic views that attracts both locals and foreigners to participate in tourism related activities. Tourism is one of the fastest growing industry in Italy (WTTC). It has proven a valuable economic pillar of the Italian economy. This study, first of all, tries to measure the impact of tourism on Italian economy because an economic impact assessment is most useful when evaluating the effects of an economic policy. But once again to determine that what does belong to tourism is a complex process. According to (UNWTO) certain economic industries (where the main economic activities are tourism) are defined as tourism industries (UN, 2008). In order to solve this problem we will identify the relationship among the synthetic tourism industry (cluster of tourism). As mentioned earlier that tourism industry is implicitly included in the Input-Output (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 (UN World Tourism Organization (UNWTO, 2007)) covered a number of studies through a variety of methods, ranging from pure guess work to complex mathematical models. Many economist have emphasized the importance of more accurate quantification of economic impacts of tourism (Madsen and Zhang, 2010) identified four different approaches to estimate the regional and local impacts of tourism based on national accounts and economic modelling. (Steenge and Van De Steeg, 2010) discussed the importance of tourism by using input output table and tourism satellite accounts for a small Caribbean island. (Manente and Zanette, 2010) conduct a study on the macroeconomic effects of a VAT reduction in the Italian hotels and restaurants industry. (Tantirigama and Taniguchi-Singh, 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 widely used in tourism economics impacts studies as it is more comprehensive in providing a holistic picture of economic structure, (Fan and Oosterhaven, 2005) investigated the impact of international tourism on the Chinese economy.

The mixed structure and the consistency of tourism industry strictly depend on the qualitative and quantitative elements performed on the demand side. In this scenario tourism refers that how will the

number of tourists increase or decrease in a particular area due to change in prices, competition, promotion, quality and quantity of facilities. The demand approach solves the problem in the industry approach by redirecting the focus toward tourist (Madsen and Zhang, 2010).

According to the structural definition of tourism industry we will perform the dispersion analysis (Rasmussen, 1956)². In order to evaluate both the importance of tourism industry on the Italian economy and the weight of each synthetic tourism industry subsectors, i.e., Land transport and transport via pipelines, Air transport, Water transport, Accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities, Sports activities, amusement and recreation activities etc. Such analysis is made on the aggregated Italian I-O table for 2010 that has 64 industries and an industry by industry structure. I-O analysis has been the most sophisticated and traditional tool used to analyze tourism effects and quantify the impact of tourism in the economy (see (Henry and Deane, 1997); (Fletcher, 1994); (Archer and Fletcher, 1996); (Tyrrell and Johnston, 2001)).

Further this study utilise the input output table data to compile an inter industry transaction table and Leontief matrix, and then using these to derive industry wise multipliers and linkages for the tourism industries. By following the results of multipliers and linkages analysis we will focus our attention on the subsector of tourism industry and will try to find that which one is the convenient composition of the policy variable, namely the final demand change, to obtain a particular effect on the objective vector variable or (total output vector variable). Moreover we will also examine the contribution of each subsector of tourism industry to the total output change, which is generated by a change in final demand.

The analysis we propose in this study is based on a decomposition that allows for the identification and quantitative determination of aggregated Macro Multipliers (MM), which lead the economic interactions and the structure of macroeconomic variables that either activate or deactivate these forces (Ciaschini and Soggi, 2007). The Macro Multipliers approach gives a complete account of the effects of the changing

²Research on dispersion/linkage analysis dates back to the definitions elaborated by Rasmussen (1956) of summary measures for the inverse matrix. He noted that the sum, $r_{.j}$, of column elements ($r_{.j} = \sum_{i=1}^m r_{ij}$) Corresponds to the total increase in output from the whole system of industries needed to match an increase in the final demand for the product of industry j by one unit. Similarly the sum, $(r_{.i})$, of row elements ($r_{.i} = \sum_{j=1}^m r_{ij}$) gives the increase in output of industry i required to meet a unit increase in final demand for the product of each industry. We can take the average, $\frac{1}{m}r_{.j}$, and it will represent an estimate of the (direct and indirect) increase in output to be supplied by an industry chosen at random if final demand for the products of industry j expand by one unit. Similarly $\frac{1}{m}r_{.i}$ can be regarded as the average increase in output to be supplied by industry i if the final demand for the products of an industry chosen at random is increased by one unit. To carry out consistent inter industry comparisons, we need to normalize these averages by the overall average defined as $\frac{1}{m^2} \sum_{i=1}^m r_{.i}$ and thus consider the indices

$$\pi_j = \frac{\frac{1}{m}r_{.j}}{\frac{1}{m^2} \sum_{j=1}^m r_{.j}}$$

and

$$\tau_i = \frac{\frac{1}{m}r_{.i}}{\frac{1}{m^2} \sum_{i=1}^m r_{.i}}$$

The aim of the direct and indirect backward dispersion index (π_j), the power of dispersion in the Rasmussen definition, is to measure the potential stimulus to other activities from a demand shock in any industry j . The forward dispersion (τ_i), the sensitivity of dispersion in the Rasmussen definition, measures the degree to which one industry output is used by other industries as an input.

structures of macro variable while the traditional tools like impact multipliers and linkages does not give the full shape. The analysis of Macro Multipliers identifies a different set of scalars extracted from the multi industry structural coefficients, which leads to the definition of new indices we define as backward and forward dispersions. It further develops along the lines of industry and industry grouping. The methodology of Macro Multiplier is based on the Singular Value Decomposition (SVD). Singular value decomposition has singular values that can be easily interpreted as aggregated macroeconomic multipliers. This approach further evaluate that if the decomposition is applied on the standardized structural matrix then we can have the picture of the degree of interaction between each row and column of the matrix in terms of interactions. However the role of singular values identified as the aggregated Macro Multiplier and the role of the associated structures interpreted as compositions of two fundamental aggregated macroeconomic variables namely, final demand and total output. These tools are developed as tools of multi-sectoral analysis on the model parameters, rather than as tools of statistical multivariate analysis on the data base (Ciaschini, 1989), (Ciaschini and Socci, 2006).

In this respect second section discuss the concept and definition of tourism, section three discusses the tourism and input output tables. Section four shows the input output model based on the input output table for Italian economy and Macro Multiplier approach. Section five shows hypothesis on tourism industry. Section six present the key structures of policy target and policy and section seven conclusions.

2. Definition of Tourism

Now a day's tourism as an industry being studies by various economists from notable international institutions, such as Organization of Economic Cooperation and Development (OECD), the United Nations, the World Bank and the World Tourism Organization (WTO) etc. The important question studying tourism is: what is the definition of tourism or what exactly is tourism? Usually tourism is associated with the fun and pleasure 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) express 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 hundreds of others. From the perspective of the supply side, some operators, such as a hotelier, see themselves as essentially in the tourism business. Others, such as a medical doctor or a postman, of course would not. But, nevertheless, for that period of time in which they are working to meet the needs of the tourist, they are, in fact, a part of the tourist industry.*

The United States Department of Commerce Office of Tourism Industries defines tourism as a industry made up of a diverse group of industries that supply goods and services purchased by business (Mak, 2004). The main and complex problem which arises is to determine that what belong to the tourism industry, because tourism industry cannot be reduced to a single industry and it could not be incorporated into the national account structure. Since tourism should be regarded as being made up of many different industrial industries which in general not related to tourism. For example, let us consider the air transport industry.

Airplane can be used both by tourists and 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 will consider tourism industry as a group of industrial industries which associate directly or indirectly with tourists at various levels. From the perspective of different analyst it's concluded that tourism should be associated with 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 Van De Steeg, 2010). In this context tourism is not only related to fun and pleasures but also to encompass other purposes.

Now to understand the tourism phenomenon it is important to have both a conceptual basis to understand it and empirical tools to measure the impact of tourism activities. Thus which industries relate to tourism industry, and what percentage of their total sales should be attributed to tourism industry, so that we can compose all these fractions into larger pieces without altering the national accounts structure.

2.1. Economic Role of Tourism

As we already discussed that tourism is not only a single industry but it's an amalgamation of different industries. Almost all industries of an economy get benefit from the tourism industry given that the process of tourism involves several types of services. Among the industries those benefits from tourism are Transportation i.e. Land transport and transport via pipelines, water transport, Air transport, accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts and entertainment activities; libraries, archives, museums and other cultural activities; gambling and betting activities, Sports activities and amusement and recreation activities, agriculture, Fashion and manufacturing industries etc. To explain this phenomenon briefly, more travellers means more use of transportation, more food and beverages consumption, more expenses on hotel and restaurant accommodation and precisely more demand will generate for manufacturing goods as the industries that have been primarily affected demand more manufacturing goods for the maintenance of their services.

Tourism affects the economy of a country through different angles. Government and industries realize the contribution which tourism makes to the economy in terms of employment, profit, income generation, balance of payment and investment. Basically tourism is a labour intensive industry, the greatest proportion of this industry is likely to be derived from wages and salaries paid to those working in jobs either directly serving the needs of tourist or indirectly benefiting from the tourists expenditure. Through economic perspective tourism is also important for the economy because it generates employments for locals and increase profit margins for the country.

Another contribution of tourism industry is that it has a significant influence on a country balance of payments. Foreigner tourists are buying tourist services in the destination countries and the payment which they pay 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 the United Nation World Tourism Organization report that 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% and it represents 6-7% of the overall number of jobs worldwide (direct and indirect) (Organization, 2010).

2.2. Tourism in the context of Italy

Italy is the 4th largest economy in Europe and the 7th largest economy in the world with a GDP per capita of \$30700 (Factbook, 2010). In the performance terms Italy Ranks 5th worldwide by the number of international tourist arrivals and place number 4th worldwide by the amount of international tourism receipts (Organization, 2010). Italy long history being a centre of the Roman Empire, endows it with a myriad of heritages and culture landmarks. More than 45 United Nations World Heritage sites are include in Italy which is the highest number of sites exist in a single country. Itâ€™s also include 393 archaeological sites like Pompeii, the Greek ruins in Agrigento, its offer visitors 7,300 churches, of which 750 are in Rome (Babalola, May6, 2011). The total number of museums in Italy are 4100, 12 of which are include in 100 most visited museums in the world. Additionally Italy has the most moderate climate; its climate offers visitors an average of more than 282 days of Sun per year and 60 degrees Fahrenheit average temperature³.

The Italian hotel and restaurant industry is well developed that includes the second biggest hotel offering in the world with more than 36,000 hotels and 1.7 million beds. Compare to Hotel and restaurant industry the Italian logistical infrastructure is not so satisfactory, according to the Economic Forum Travel and Tourism Competitiveness Report of 2009 ranked its quality of air transport infrastructure 78th out of 133 countries which is so poor compared to France 5th and Spain 34th. Despite having high density of road and railway tracks the Italian land transport quality of networks was ranked 99th compared to Spain 20th and France 5th. Another important aspect of Italian tourism industry is the role of employment; this industry generates employment for locals and increase profit margins for the country. According to the Ministry of Foreign Affairs, 69% of Italy GDP is the services industry. The tourism industry is reflected incisively by the job market, with more than 2.6 million jobs created in 2013, equals to 11.6% of total Italian employment (WTTC, 2014).

As we discuss earlier that tourism industry is the mixture of different industries, numerous industries support the tourism cluster and create additional incentives to visit Italy. Among these supporting industries the main cluster is the food cluster; Italian Cuisine is recognized as world class and one of the best internationally. With food industry wine is another cluster. Italy is the world largest wine producer, producing over 4.5 million tons compared to the 4.1 million tons of France and the 3.5 million tons of The Spain (Nation, 2008). Within the European Union, Italian wine is present with about 322 DOC (or controlled place name) wines (Ciaschini and Socci, 2005). Both food and wine cluster increase the positive perception of Italy and attract tourist. Agriculture tourism is expanding rapidly in several areas of Italy, among these areas Tuscany is the prime destination of this kind of tourism. Health cluster is another important industry which can play an important role to attract new tourist. Among the other supporting industries Italian fashion industry (footwear, clothing, Yacht and sporting cars) gaining increasing importance in directly attracting tourist.

Italy manages to attract many national and international tourists but in the last few yearâ€™s due to the economic and financial crisis the consumer spending in each industry decline. Despite a wealth of

³Current results:<http://www.currentresults.com>)

culture, history, natural endowments and strong demand conditions, the context of tourism industry and its strategy remain challenging. Tourism contribution to the Italian economy in 2013 was slightly decrease (-1.6%) compared to 2012. In 2013 this contribution was amounted to 159.6 billion of euro which was equivalent to 10.3% of GDP (WTTC). Over the last five years the tourism consumptions decline 6.7%. Italian national tourists have paid particular attention to save money for their daily life expenses (expenses made in supermarket and shops for the purchase of local products).

Recently some of the Italy supporting industries represent a burden to the growth of tourism industry. The first example of poor support is related to the hospitality industry, due to its poor performance catering fall 46.6% of the costs incurred by Italian and foreign tourist during their stay in Italy. Another most affected area is clothing, footwear and other products made in Italy, between 2008 and 2012 spending on this industry fell by -31.5% (ISNART, 2012).

3. Input-Output Analysis and Tourism Industry

The input output analysis is the traditional tool for assessing and measuring the contribution of tourism activity to a region economy. This is one of the most useful technique to measure economic impacts, with the advantage being the ability to numerically measure indirect and induced impacts. The most important and best known results of I-O analysis is its ability to derive multipliers using supply and use sides of the national accounts. The main postulates and applications of I-O analysis have been discussed in (Miller and Blair, 2009), (Leontief, 1986), (Eurostat, 2008), (Ten Raa, 2005).

(Fletcher, 1989) discussed in great details the usefulness of input output analysis in studying the economic impact of tourism. In his paper he stated that I-O analysis is the most comprehensive method available for studying the economic impact of tourism, and that no other technique can offer the same flexibility and level of details. (Archer, 1982) discussed in great details the use of I-O models for Tourism industry, he also analyzed different policy choices to compare each for its implications on income, employment and wages, which would be valuable to policy makers and policy planners in the tourism industry.

In order to explore the full meaning of tourism it is necessary to have both a conceptual background to understand tourism and quantitative tools to analyze and measures the impacts of tourism activities. Information related to tourism such as theory and data must include both the tourism activities themselves as well as their relationship with other activities, within or outside the local and regional economic system. Generally we find both the data and theory on tourism in the national accounts and economic models. So it is important to look into both national accounts and associated models to learn more about how to examine the role and the impacts of tourism in local and regional economies.

3.1. I-O Model

An input output model is a model that describes the flows of income between industries within an economy, these flows represent that what each industry must buy from every other industry to produce a Euro or any other specific currency worth of output. By using the production function of each industry, input output models also determines the proportions of sales that go to wage and salary income and taxes.

The core of input output model is the input output table which shows the economy of destination in a matrix form. I-O model provides useful information for studying the transactions among producers and

consumers in national economy. The model represents that the total output (\mathbf{x}) of n economic industries is a function of the interdependencies among the industries, describe by the direct or technical coefficient matrix (\mathbf{A}), and consumption of goods in each industry, denoted by the final use vector (\mathbf{c}).

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

$$\mathbf{x} = \mathbf{Ax} + \mathbf{c} \quad (1)$$

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

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

The equilibrium output vector can also be written as

$$\mathbf{x} = \mathbf{Rx} \quad (3)$$

Where $\mathbf{R} = (\mathbf{I} - \mathbf{A})^{-1}$ and \mathbf{A} is the constant technical coefficient matrix which satisfies the Hawkins-Simon conditions. The \mathbf{R} matrix is usually referred to as the Leontief multipliers matrix (Leontief, 1965) and its elements, r_{ij} shows the direct and indirect requirements of industry output i per unit of final demand of product at industry j . Extensive use is made of matrix \mathbf{R} within the traditional multipliers analysis. The Leontief inverse matrix \mathbf{R} provides in fact a set of disaggregated multipliers that are recognize to be the most precise and sensitive for studies of detailed economic impacts. These disaggregated multipliers recognize the evidence that total impact on output will alter depending on which industries are affected by changes in final demand. The i^{th} total output multiplier measures the sum of direct and indirect input requirements needed to satisfy a unit final demand for goods produced by industry i (Bulmer-Thomas, 1982).

It has to be stressed, however, that all these measures, built starting from matrix \mathbf{R} , are not independent of the structure of final demand. The column and row sums of the \mathbf{R} matrix used in the linkage analysis procedures necessarily imply the consideration of a set of final demand vectors which has a predetermined structure.

We can expect that these measures hold for demand vectors of varying scale but with the same structures. However neither the demand vector nor its changes will ever assume this type of structure for this reason some authors go to the drastic conclusion that "linkage analysis should be never used" (Skolka, 1989).

From another side it can be argued that the structure of final demand produces the most different effects on the level of total output (Ciaschini, 1989). Given a set of non-zero final demand vectors whose elements sum up to a predetermined level, but with varying structures, we will expect that the corresponding level of total output will also vary considerably (Ciaschini, 1993).

A genuine multisectoral solution, in fact cannot come from a methodology, as the Leontief multipliers that gives the effect of one single element of final demand on one single element of total output at a time. Neither can it reside in the linkage analysis for the reasons considered. A genuine multisectoral solution is a "general equilibrium" solution where a configuration conveniently given, of all the elements of the final demand determines simultaneously all the elements of the total output. For these reasons we cannot confine our knowledge of the system to the picture emerging from measures, which can only show what would happen if final demand assumed a predetermined and unlikely structure and refer to more innovative methodologies.

4. Macro Multiplier Approach and Key Structures

In traditional analysis the main focus will be given to the effects of final demand shocks at the industry level on total output by industry and the reduced form of the model will be expressed as in equation (3). In our model the structural matrix \mathbf{R} can be easily decomposed in a sum of m different matrices through the singular Value Decomposition (SVD) (Lancaster and Tismenetsky, 1985). Further policies for tourism industry will be design on the basis of characteristic structure obtained from the elements of inverse matrix of the extended model, \mathbf{R} , through the Macro Multiplier (MM) approach (Ciaschini et al., 2006; Ciaschini et al., 2007; (Ciaschini and Pretaoli, 2013)). The MM approach is based on the (SVD) of the Leontief inverse, 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 (Ciaschini and Socci 2006). Avoiding the main criticism associated with the traditional multiplier analysis which are 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 modeled.

The singular value decomposition of the square matrix \mathbf{R} can be written as the product of three matrices:

$$\mathbf{R} = \mathbf{U}\mathbf{S}\mathbf{V}^t \quad (4)$$

The matrices \mathbf{U} and \mathbf{V} are two unitary or orthonormal basis matrices of dimension $n \times n$ in \mathbf{R} . The columns of matrix \mathbf{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 \mathbf{V} represent the structures of the policies control, these structures measure and establish the composition of all the possible policies control. The matrix \mathbf{S} is a $n \times n$ diagonal matrix whose elements are positive scalars called singular values⁴. The elements along the diagonal represent aggregate multipliers, which are all real positive and ordered according their magnitude as: $s_1 \geq s_2 \geq \dots \geq s_n \geq 0$.

The structure identified plays a fundamental role in determining the potential behaviour of the economic system. We can evaluate which will be the effect on total output of all possible final demand structures. In this respect, we note that matrix \mathbf{R} hides the fundamental combinations of the policy variables (total output). Each of them is obtained multiplying the corresponding combination of final demand by a predetermined scalar, which has in fact the role of aggregated multiplier (Ciaschini et al., 2010),(Ciaschini et al., 2009).

⁴From this consideration matrices \mathbf{U} , \mathbf{S} and \mathbf{V} can be easily shown working on equation (4). Further premultiplying matrix \mathbf{R} by its transpose \mathbf{R}^t one obtain

$$\mathbf{R}^t\mathbf{R} = [\mathbf{U}\mathbf{S}\mathbf{V}^t]^t[\mathbf{U}\mathbf{S}\mathbf{V}^t] = \mathbf{V}\mathbf{S}^2\mathbf{V}^t$$

The columns of matrix \mathbf{V} are the set of orthonormal eigenvectors of the real symmetric matrix $\mathbf{R}^t\mathbf{R}$ and that the elements of the diagonal matrix \mathbf{S} are the square roots of the eigenvalues of matrix $\mathbf{R}^t\mathbf{R}$, that is $s_i = \sqrt{\lambda_i\mathbf{R}^t\mathbf{R}}$. By post multiplying matrix \mathbf{R} by its transpose one obtains $\mathbf{R}\mathbf{R}^t = \mathbf{U}\mathbf{S}\mathbf{V}^t[\mathbf{U}\mathbf{S}\mathbf{V}^t]^t = \mathbf{U}\mathbf{S}^2\mathbf{U}^t$. Where the columns of matrix \mathbf{U} are the set of orthonormal eigenvectors of the real symmetric matrix $\mathbf{R}\mathbf{R}^t$ and the elements of the diagonal matrix \mathbf{S} are the square roots of the eigenvalues of matrix $\mathbf{R}\mathbf{R}^t$. It is worthwhile to mention that the square matrices $\mathbf{R}\mathbf{R}^t$ and $\mathbf{R}^t\mathbf{R}$ have the same set of eigenvalues.

The SVD of the inverse matrix \mathbf{R} can be express from equation 4 as a sum of n matrices

$$\mathbf{R} = s_1 \mathbf{u}_1 \mathbf{v}_1^t + s_2 \mathbf{u}_2 \mathbf{v}_2^t + \dots + s_n \mathbf{u}_n \mathbf{v}_n^t = \sum_{i=1}^n s_i \mathbf{u}_i \mathbf{v}_i^t \quad (5)$$

where \mathbf{u}_i and \mathbf{v}_i are the i-th columns of matrix \mathbf{U} and \mathbf{V} and s_i is the i-th singular value of matrix \mathbf{R} . As the columns of matrix \mathbf{V} are orthonormal therefore each operator $s_i \mathbf{u}_i \mathbf{v}_i^t$ acts as a filter. From this perspective component of the control vector v_i is transmitted along the axis which is scaled by a scalar s_i and reoriented along the axis identified by u_i .

Now we have all the elements to show how this decomposition correctly represents the MM that quantify the aggregate scale effects and the associated structures of the impact of a change in final demand on total output. Further we can also observed the actual vector \mathbf{c} in terms of the structures identified by matrix \mathbf{V} , we obtain a new final demand vector \mathbf{c}° expressed in terms of the structures suggested by matrix \mathbf{R} .

$$\mathbf{c}^\circ = \mathbf{V} \mathbf{c} \quad (6)$$

Is the representation of the control vector. \mathbf{c} , in the orthonormal basis defined by matrix \mathbf{V} . While the representation of the target vector, \mathbf{x} in the orthonormal basis defined by matrix \mathbf{U} is

$$\mathbf{x}^\circ = \mathbf{U}^t \mathbf{x} \quad (7)$$

By premultiplying equation 4 by the transpose of \mathbf{U} , \mathbf{U}^t we get

$$\mathbf{x}^\circ = \mathbf{S} \mathbf{c}^\circ \quad (8)$$

which implies

$$x_i^\circ = s_i \cdot c_i^\circ \quad (9)$$

The equations of the reduce form in equation 9 are completely independent one from the other. This property expresses that when final demand assumes one of the characteristic structures defined by the orthonormal vector of matrix \mathbf{V} , only one of the singular value is activated and the output coincides with the correspondent vector of matrix \mathbf{U} scaled by the singular value. Singular values s_i then determine the aggregated effect of a final demand shock on output. For this reason we will call them Macro Multipliers (Ciaschini and Socci, 2007).

It is worthwhile to mention that the numbers of components of the key target structures are not necessarily equal to the number of the components of the key control structures, since matrix \mathbf{R} is not necessarily a square matrix. In fact:

$$\mathbf{R} \mathbf{v}_1 = s_1 \mathbf{u}_1 \quad (10)$$

where \mathbf{v}_1 corresponds to the most sensitive key control structure and \mathbf{u}_1 is the most sensitive key target structure.

With reference to the target and control key structure in matrix \mathbf{R} let us build two types of indices with respect to key structures of both the target variable and the control variable (Ciaschini et al., 2009). These indices, which can be focused on each single commodity, reveal the role of each commodity inside the set of

key structures and quantify their relevance both in terms of target and control variable. For the key target structures, given matrix \mathbf{U} , it is possible to define the index:

$$\mu_{ij} = \frac{\frac{|s_i u_{ij}|}{\frac{1}{n} |s_i u_j|}}{\frac{1}{n^2} \sum_{j=1}^n |s_i u_j|} \quad (11)$$

That quantifies the relevance of the i th commodity in all the n key target structures. In particular, the index can reveal the role played by the selected commodity inside the key target structures u_i when the corresponding Macro Multiplier s_i is activated⁵. Also for the key policy control structures, it is possible to define the index starting from matrix \mathbf{V} :

$$\gamma_{ij} = \frac{\frac{|v_{ij}|}{\frac{1}{n} |v_j|}}{\frac{1}{n^2} \sum_{j=1}^n |v_j|} \quad (12)$$

The index quantifies the importance of the i th good in all the n key control structures. In particular, the index can reveal the role played by the selected good inside the key objective structures v_i .

Another potential of Singular value Decomposition of matrix \mathbf{R} reveals the interaction of each commodity inside the set of key structure and quantify their interaction coefficient both in terms of policy target and policy control variables. The system of eigenvectors \mathbf{u}_i for $\mathbf{R}^t \mathbf{R}$ and \mathbf{v}_i for $\mathbf{R} \mathbf{R}^t$ are orthonormal bases which represent the interaction matrices of industry input and output respectively. This interaction or inter industrial interaction will be quantified by two macro multipliers. The angular distance between two dots will represent the interaction coefficient.

$$\gamma(s_i u_i, s_j u_j) = \frac{s_i u_i' \cdot s_j u_j}{\|s_i u_i\| \cdot \|s_j u_j\|} \quad (13)$$

and

$$\rho(v_i, v_j) = \frac{v_i' \cdot v_j}{\|v_i\| \cdot \|v_j\|} \quad (14)$$

5. Hypothesis on Tourism Industry: Empirical Analysis

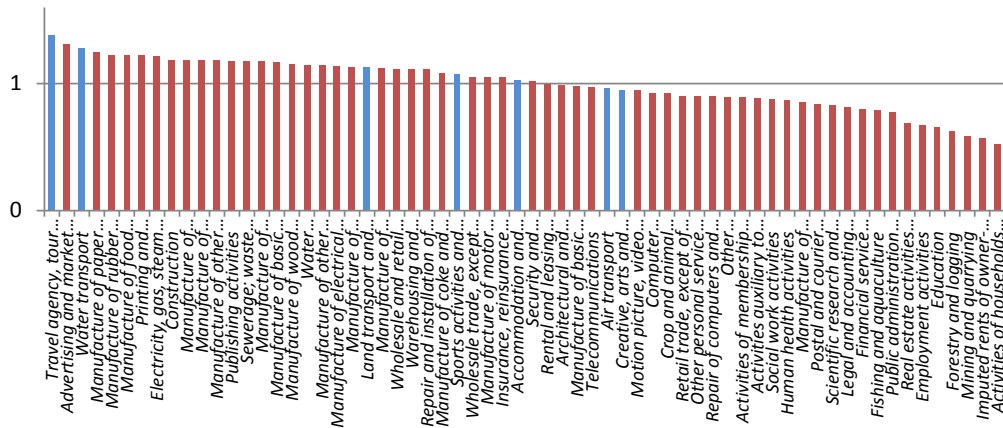
5.1. Power and Sensitivity dispersion for Tourism industry

The inverse matrix \mathbf{R} has the potential to underline the direct and indirect effects on the disaggregated output generated. This is possible performing an exogenous shock through a predetermined final demand or through any other macroeconomic variables described in the model. Starting from matrix \mathbf{R} the reduce form we can build two types of indexes of dispersion that are able to point out the role of any products in terms of power and sensitivity dispersion. The first type of index can appreciate the relevance of a good to activate the production chain or, to put it better, the index evaluate an increase of a unit final demand shock of the i th good in terms of a change of the output of the other commodities. The second type of index evaluates the relevance of a good when a unit final demand shock of all commodities is performed.

⁵When the index assumes a value lower than 1 the good has a low importance inside both the key objective and control structures i.e. $\mu_{ij} < 1$ and $\gamma_{ij} < 1$

These indexes of dispersion determine those key commodities that play an important role in the tourism industry and give a rank to all commodities in term of power and sensitivity of dispersion. Results of the power of dispersion and sensitivity of dispersion indices are reported in the below figures 1 and 2. These figures show the results based on the Leontief inverse for the period of 2010.

Figure 1: Power of Dispersion (PD): Tourism Relevance

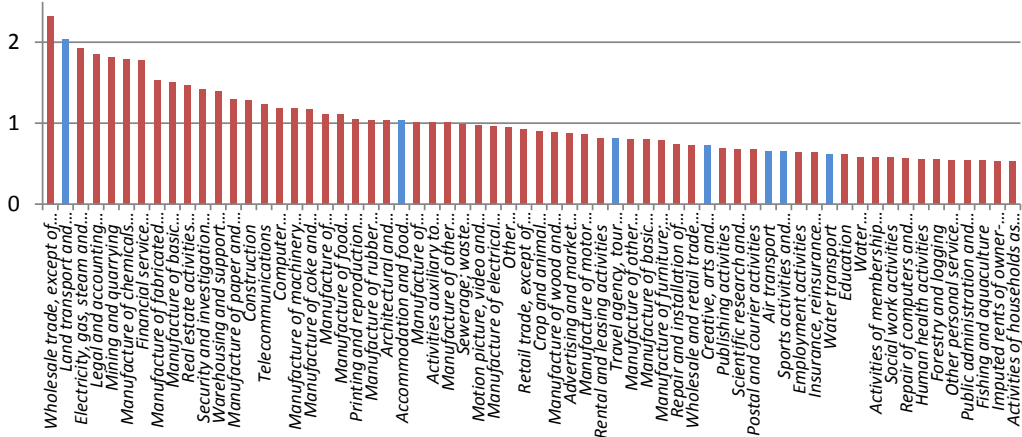


Using the dispersion analysis proposed by Rasmussen, an industry is considered as a key industry if $PD_j > 1$ and $SD_i > 1$. The second case If a industry $PD_j < 1$ and $SD_i > 1$ then it is considered as a Sensitivity dispersion oriented industry. Third case is if $PD_j > 1$ and $SD_i < 1$ then it is considered as power dispersion oriented industry.

Table A.5 in the appendix present the full details of sensitivity and power dispersion indices for each of the tourism components within the 64 I-O industries. Table A.5 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 that 53. "Travel agency, tour operator reservation service and related activities" and 32. "water transport and transport via pipelines (32)" are the key and highest rank industries which plays an important role in the tourism industry. From figure 1 we also observe that 34 industries out of 64 for which the value of index is greater than 1 and they are the key industries which play an important role in the tourism industry.

Figure 2 shows the sensitivity dispersion index. The results of the sensitivity 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 and important industry is the "Land transport and transport via pipelines". The results support the importance of different industries in stimulating the economic growth of Italy tourism industry through both the power and sensitivity dispersion effects; they also show the importance of key industries that have higher potential to increase the output of tourism industry. Tourism contributes directly and indirectly to Gross Domestic Product (GDP), its make an indirect contribution through the flow on effect that changes in its output have on other industries output and hence

Figure 2: Sensitivity Dispersion (SD): Tourism Relevance



output in general.

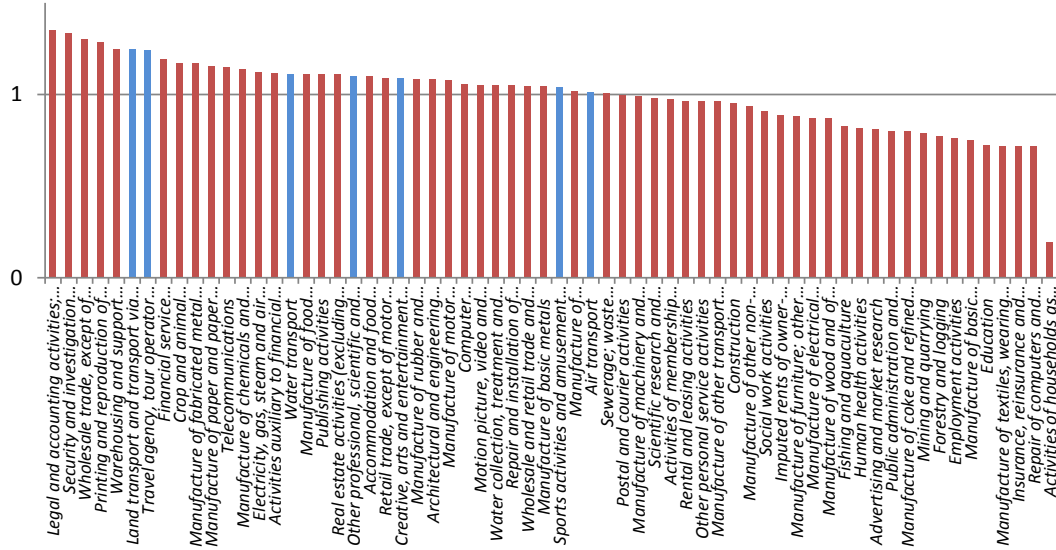
5.2. Backward and Forward Dispersion

The matrix \mathbf{R} also has the potential to reveal the role of each commodity inside the set of key structures and quantify their relevance both in terms of target and control variable. For this purpose we will use two types of indices with respect to key structures of both the target variable (Forward dispersion) and the control variable (Backward dispersion). These indexes of dispersion determine those key commodities that play an important role in the tourism industry and give a rank to all commodities in term of forward and backward dispersion. In order to calculate these indices we will use equation 11 and 12. The equation 11 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 good has a low importance inside the target structure.

The results regarding the key objective structures or Forward Dispersion index for the Italian tourism industry are shown in the figure 3. We observe that 37 industries out of 64 for which the value of index is greater than 1 and they are the key industries which play an important role in the tourism industry. We can notice that the industry 1â€šIJLegal and accounting activities; activities of head offices; management consultancy activitiesâ€šI get an important role into 37 key objective structures among 64. The other key objective structures are number 54, 29, 9, 34, 31, 53, 41, 1, 16, 8, 39, 11, 24, 43, 32, 5, 37, 44, 50, 36, 30, 59, 13, 47, 20, 40, 38, 25, 23, 28, 15, 60, 17, 33, 26 and 35. All the tourism cluster industries are placed in the key objective structures which are â€šYLand transport and transport via pipelines, Water Transport services, Air transport services, Accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts & entertainment activities; libraries, archives, museums, cultural activities; and Sports activities and amusement and recreation activities.

Table A.6 in the appendix present the full details of forward and backward linkage indices and the ranking for each of the tourism components within the 64 I-O industries. From this table we can see that land transport and transport via pipeline get a highest rank 6 among the entire tourism cluster.

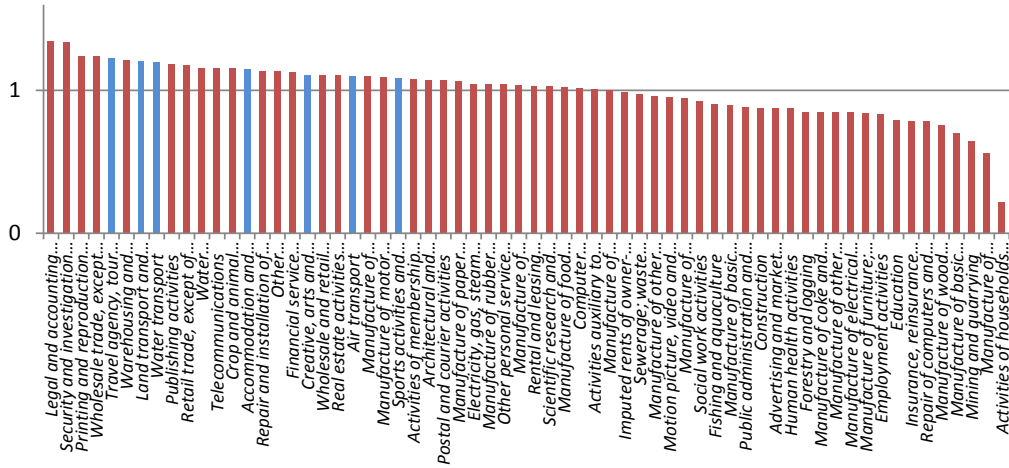
Figure 3: Forward Dispersion (FD) for tourism industries



The index for the key control structures or backward dispersion is represent in equation 12, which quantifies the importance of the i th good in all n key control structures. In particular this index reveals the role played by the selected good inside the key objective structure (v_i). When the index assumes a value lower than 1 (i.e. $\gamma_{ij} < 1$) than the good has a low importance inside the key control structure. Further these indexes identify the key structure of final demand in which the tourism industry play an important role. From the figure 4 we can identify 38 key structures of final demand that have an index more than or equal to one ($\gamma_{ij} \geq 1$). On the basis of these key structures of final demand we can identify the goods that get the major change in terms of output.

From figure 4 we can see that the industry 46 and Legal and accounting activities; activities of head offices; management consultancy activities get an important role into 38 key control structures among 64. The other key control structures are number 54, 9, 29, 53, 34, 31, 32, 37, 30, 25, 39, 1, 36, 23, 50, 41, 59, 28, 44, 33, 16, 20, 60, 61, 47, 35, 8, 24, 13, 63, 11, 51, 48, 4, 40, 43 and 17. From tourism cluster all the 7 industries are placed in the key objective structures which are Land transport and transport via pipelines, Water Transport services, Air transport services, Accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts & entertainment activities; libraries, archives, museums, cultural activities; and Sports activities and amusement and recreation activities. From table 3 we can see that Travel agency, tour operator reservation service and related activities get a highest rank 5 among the entire tourism cluster. Another influential tourism industry is Land transport and transport via pipelines which have ranked 7.

Figure 4: Backward Dispersion (BD) for the tourism industries



6. Policy target and policy control for tourism industries

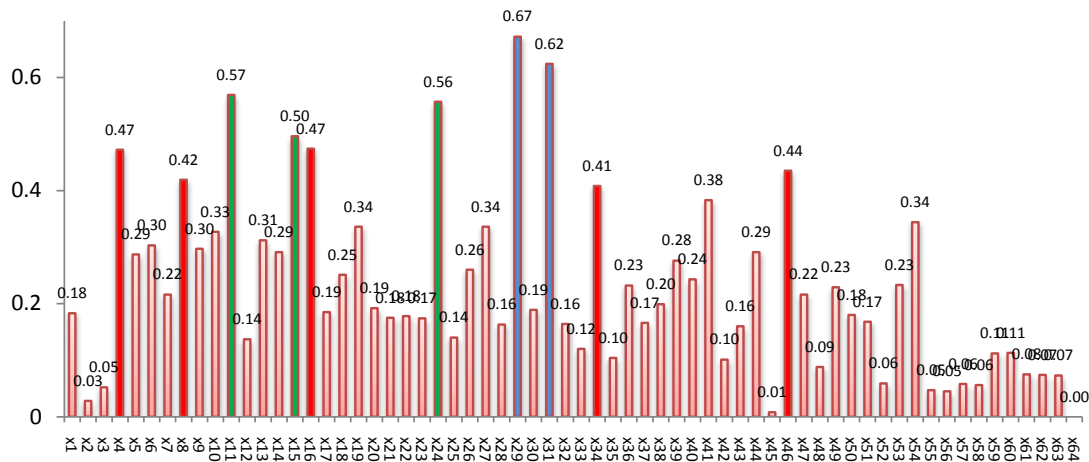
In this section we will identify the demand control policies (policy variable) that promote the tourism cluster (i.e. Land transport and transport via pipelines, Water Transport services, Air transport services, Accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts & entertainment activities; libraries, archives, museums, cultural activities; Sports activities & amusement and recreation activities.) within the realized total output (Objective variable). By using the Macro Multiplier approach we will identify the convenient final demand and output vectors, operating on the whole structures. We determine than a particular structure of final demand, which has a positive effect on the growth of tourism cluster as a whole taking into consideration also the effects on the remaining industries output. By using the MM approach we obtain a set of 64 MM (s_i), a set of 64 structures of demand control matrix \mathbf{V} and a set of 64 structures of objective matrix \mathbf{U} . The structures identified by matrix \mathbf{V} and \mathbf{U} play an important role to determine the potential behavior of the economic system.

From the set of structures of the target variable, $s_i \cdot \mathbf{u}_i$ ($i = 1 \dots 64$), it is possible to choose the most effective policies for 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). Table 1 shows the most effective policies that give the highest push to at least one of the industries composing the tourism cluster set. Policy structures 1 has a MM s_1 , a demand control structure \mathbf{v}_1 and an overall policy effect on the objective, $s_1 \cdot \mathbf{u}_1$, which is shown in the second column of the table 1. We can notice the most relevant component is industry 31."Land transport and transport via pipelines services". Policy structure 18 is convenient structure for industry 53."Travel agency, tour operator reservation service and

related activities". Objective policy structure 24 can be seen from the 4th column of table 1. This policy has an relevant impact on industry 59."Creative, arts & entertainment activities; libraries, archives, museums, cultural activities". Objective policy structure 49 has an relevant impact on industry 33."Air transport sector". Objective policy structure 50 can be seen from the 6th column of table 1. This policy has an relevant impact on industry 60."Sports activities & amusement and recreation activities". Objective policy structure 57 has an relevant impact on industry 36."Accommodation and food service activities" and finally the relevant impact of objective policy structure 60 is on industry 32."Water transport services".

Since policy objective 1 is a dominating policy, which is a demand driven policy that has the highest multiplier effect on output and being an expensive one on all industries. The policy control structure \mathbf{v}_1 of all positive final demand⁶ changes generates a vector of all positive (objective variable) total output changes $s_1\mathbf{u}_1$ (the structure of policy objective 1 is shown in figure 5).

Figure 5: Dominating policy objective and tourism industries



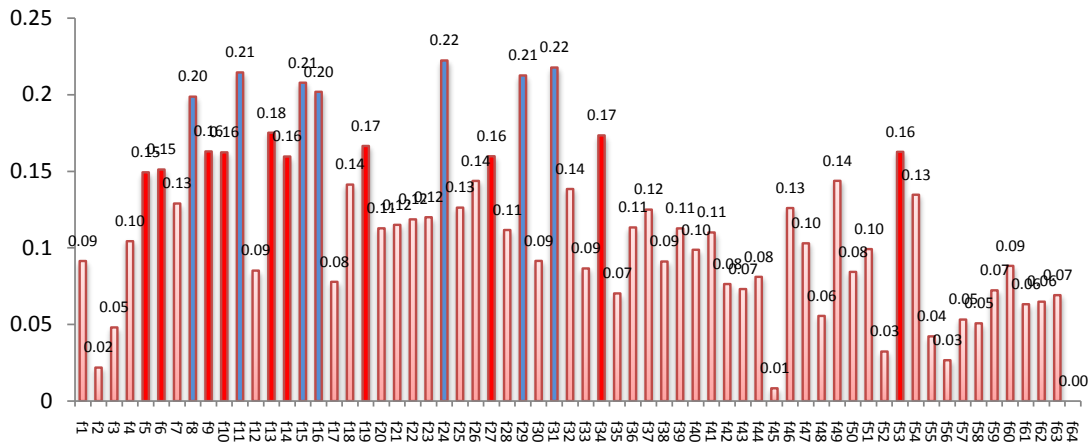
Among the 64 industries a hierarchy of industries to be stimulated to get the result of policy 1, can be established. From figure 6 we see that seven industries must stimulated at a very high degree, i.e. 8. Manufacture of paper and paper products, 11. Manufacture of chemicals and chemical products, 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: 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

⁶The policy control structure \mathbf{v}_1 is shown in the figure 6.

service and related activities⁷. The remaining industries are activated at a low level or very low level.

From the set of structures for the policy control, \mathbf{v}_i ($i = 1.....64$), it is possible to choose the most effective policies that use 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") as instrument of economic policy. Table 1 shows the most effective policies that use industries composing the tourism cluster set. From table 1 policy structure 24 uses industry 59. Creative, arts & entertainment activities; libraries, archives, museums, cultural activities. Policy structure 49 uses industry 33 Air transport and policy structure 50 uses industry 60 Sports activities & amusement and recreation activities. Policy structure 55 uses industry 31 Land transport and transport via pipelines and policy structure 57 the industry 36 Accommodation and food service activities and finally policy structure 60 uses industry 53. Travel agency, tour operator reservation service and related activities and industry 32. Water transport services however the impact is in opposite direction.

Figure 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;

⁷Twenty industries are activated at an intermediate degree the numbers are: 4., 7., 18., 20., 21., 22., 23., 25., 28., 32., 36., 37., 39., 40., 41., 46., 47., 49., 51. and 55.

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.

6.1. Interaction Analysis

Further we will extend our analysis and perform a consistent comparison in the terms of interaction analysis. Table 2 represent an interaction table that represent the interaction coefficients between the most effective policies objective that give the highest push to at least one of the industries composing the tourism industries (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").

From table 2 we can see that policy objective 1 has a very low positive interaction with respect to policy objective 18, policy objective 50 and policy objective 60, however it have a very low negative interaction with respect to policy objective 24, policy objective 49 and policy 57. Policy objective 18 has a very low negative interaction with respect to policy 24, policy 49, policy 50, policy 57 and policy 60. Policy 24 has a very low positive interaction with policy 49 however it has a very low negative interaction with policy 50, 57 and 60. Policy 49 has a very low positive interaction with policy 50 and policy 57; however its interaction with policy 60 is very low negative. The interaction of policy 50 with respect to policy 57 and policy 60 is very low negative. A very low negative interaction is observed between policy 57 and policy 60. In more precise way these results shows that the components of tourism industry have a very low interaction with one another.

Table 3 represents the interaction coefficients table of dominating policy 1 with respect to other key objective policies.

From Table 3 we can see that dominating policy 1 (u_1s_1) has a very low positive interaction with respect to policy 18, policy 50 and policy 60, however it has a very low negative interaction with policy 24, policy 49 and policy 57. In simple words these indexes shows that there is no interaction exist among the dominating structures and the structures for tourism industry.

Following equation 14 it is possible to calculate the interaction coefficient between the key control structures policies for 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). But from our analysis these indexes shows that there is no interaction exist among the key control structure policies.

7. Conclusion

The economic importance of tourism has been subject to considerable debate. In order to solve this debate it requires reliable and authentic information on the precise nature of tourism spending and its

impact on different industries of the economy. One common issue which always create hurdle, is to analyze the economic contribution of tourism because tourism is not a distinct industry in the systems of national accounts. In this paper we introduce some different analysis to provide a better understanding of tourism cluster. The evidence of this analysis is provided by the results of traditional dispersion analysis (power of dispersion & Sensitivity of dispersion) that has been preliminarily performed. This approach starts from the assessment of the intensity of economic flows implied in the output 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. Then the dispersion analysis has been applied to the inverse matrix of the multisectoral model, the results support the importance of different industries in stimulating the economic growth of Italy tourism industry through both the power of dispersion and sensitivity dispersion effects; they also show 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 cluster. The power dispersion results indicate that "Travel agency, tour operator reservation service and related activities" is the key and highest rank industry which plays an important role in the tourism industry. Both the power and sensitivity dispersion results indicate that 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 which plays an important role in the tourism industry.

In order to get a wider picture of the actual and potential impacts of tourism cluster, the analysis has been focused 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. Further the analysis has been refined through the implementation of our approach of Macro Multipliers (MM), this approach checks the relevance of tourism industries from a policy perspective in a two way fashion: as a part of final demand and as a total output, which within a scheme of economic policy can be considered respectively as the policy control and the policy objective. A dispersion analysis performed on the basis of these two types of policy indices i.e. the target variable (Forward dispersion) and the control variable (Backward dispersion). The results regarding the key objective structures or Forward Dispersion index reveals that all the seven industries of tourism cluster are placed in the key objective structures which are "Land transport and transport via pipelines, Water Transport services, Air transport services, Accommodation and food service activities, Travel agency, tour operator reservation service and related activities, Creative, arts & entertainment activities; libraries, archives, museums, cultural activities and Sports activities & amusement and recreation activities.

On contrary the backward dispersion reveals a high potential stimulus to other industries, all the key structures from tourism cluster are placed in the key objective structures. The industry 53 "Travel agency, tour operator reservation service and related activities" get a highest rank 5 among the entire economic industry and tourism cluster. The policy problem is then transformed into the choice of a conve-

nient structure for the policy control, each of the 64 MM is associated with a structure of a policy control that activate each multiplier effect. This multiplier effect is directed towards specific industry component of the policy target according the target key structures. Focus on the dominant policy mean 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 on key structures show that tourism cluster plays a relevant role in the composition both of the policy target and the policy control variable. Further the analysis shows that which are the policies of final demand, in terms of composition of the policy variable, that must allocate resources directly to tourism cluster in order to generate a general increase in total output. The analysis also reveals the policy targets where the tourism industries i.e. 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 more stimulated and examined that tourism cluster is as much effective as other key industries in generating changes in output if it is stimulated conveniently and it also present an important role within all industries when the final demand policy tends to privilege tourism cluster demand compared to other industries. An extension of the method has also been provided in terms of interaction analysis, which presents an interpretation of the strength of the mutual links among and between the tourism cluster in terms of disaggregated components of total output and final demand.

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Appendix A. Tables

Table 1: Key Policies structure for tourism industries

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
x ₁₅	0.50	-0.16	-0.13	0.00	0.01	0.00	-0.01	f ₁₅	-0.13	0.00	0.00	0.00	0.00	-0.01
x ₁₆	0.47	-0.11	0.16	0.05	-0.03	-0.02	-0.02	f ₁₆	0.14	0.05	-0.03	0.03	-0.02	-0.02
x ₁₇	0.19	0.44	-0.20	0.02	0.00	0.03	-0.01	f ₁₇	-0.19	0.02	0.00	0.02	0.03	-0.01
x ₁₈	0.25	0.39	0.27	0.02	0.02	0.01	0.01	f ₁₈	0.24	0.02	0.01	0.00	0.01	0.01
x ₁₉	0.34	0.02	0.02	0.01	0.02	0.02	0.02	f ₁₉	0.03	0.02	0.01	-0.01	0.02	0.03
x ₂₀	0.19	0.15	-0.25	0.06	-0.05	0.09	0.00	f ₂₀	-0.22	0.07	-0.05	-0.02	0.10	0.00
x ₂₁	0.18	0.32	0.04	-0.06	0.04	0.06	0.09	f ₂₁	0.04	-0.07	0.04	-0.02	0.06	0.12
x ₂₂	0.18	-0.05	0.19	0.00	0.02	0.03	0.01	f ₂₂	0.17	0.00	0.02	-0.02	0.03	0.01
x ₂₃	0.17	0.03	0.02	-0.24	0.09	-0.05	0.03	f ₂₃	0.03	-0.23	0.09	-0.12	-0.05	0.03
x ₂₄	0.56	-0.24	-0.11	0.04	-0.02	-0.01	-0.02	f ₂₄	-0.10	0.05	-0.03	-0.02	0.00	-0.01
x ₂₅	0.14	-0.11	-0.08	0.08	-0.10	-0.02	0.01	f ₂₅	-0.08	0.08	-0.10	0.06	-0.02	0.01
x ₂₆	0.26	0.40	0.01	-0.03	0.04	0.04	0.00	f ₂₆	0.01	-0.05	0.03	-0.02	0.04	0.00
x ₂₇	0.34	-0.06	-0.08	-0.02	0.00	0.00	0.01	f ₂₇	-0.07	-0.02	-0.01	0.04	0.00	0.01
x ₂₈	0.16	0.07	-0.19	-0.09	0.11	-0.17	-0.01	f ₂₈	-0.18	-0.09	0.11	-0.05	-0.16	-0.01
x ₂₉	0.67	-0.03	-0.17	0.00	-0.10	-0.21	0.04	f ₂₉	-0.15	0.00	-0.11	-0.12	-0.22	0.05
x ₃₀	0.19	-0.05	0.01	0.00	-0.04	-0.16	-0.04	f ₃₀	0.00	0.00	-0.04	0.31	-0.15	-0.04
x ₃₁	0.62	0.20	0.04	-0.05	-0.12	0.02	0.03	f ₃₁	0.04	-0.04	-0.13	0.47	0.02	0.04
x ₃₂	0.16	-0.11	-0.05	-0.29	0.18	-0.17	-0.56	f ₃₂	-0.05	-0.29	0.18	0.10	-0.18	-0.58
x ₃₃	0.12	-0.02	-0.03	0.52	-0.26	-0.10	-0.29	f ₃₃	-0.03	0.52	-0.26	-0.05	-0.11	-0.30
x ₃₄	0.41	0.05	0.07	0.11	0.05	0.06	0.08	f ₃₄	0.06	0.12	0.04	-0.42	0.07	0.10
x ₃₅	0.10	-0.03	0.00	-0.14	0.15	-0.05	-0.05	f ₃₅	0.00	-0.14	0.15	-0.40	-0.05	-0.05
x ₃₆	0.23	-0.17	-0.05	0.03	-0.02	0.48	-0.40	f ₃₆	-0.04	0.03	-0.02	-0.12	0.48	-0.42
x ₃₇	0.17	-0.03	-0.02	0.01	-0.04	0.43	0.04	f ₃₇	-0.01	0.01	-0.03	0.06	0.42	0.03
x ₃₈	0.20	0.18	-0.14	0.01	0.01	0.01	-0.04	f ₃₈	-0.09	0.01	0.01	-0.02	0.02	-0.04
x ₃₉	0.28	-0.12	0.09	0.07	0.11	-0.02	-0.06	f ₃₉	0.08	0.07	0.11	0.16	-0.02	-0.07
x ₄₀	0.24	-0.04	0.09	0.00	-0.06	-0.01	0.00	f ₄₀	0.08	0.00	-0.05	-0.02	-0.01	0.00
x ₄₁	0.38	0.01	-0.02	0.02	0.02	0.10	-0.01	f ₄₁	-0.01	0.02	0.02	0.11	0.12	-0.01
x ₄₂	0.10	0.04	-0.02	-0.02	-0.02	-0.02	0.01	f ₄₂	-0.02	-0.01	-0.02	0.00	-0.02	0.01
x ₄₃	0.16	0.08	-0.02	0.00	-0.03	-0.07	0.02	f ₄₃	-0.02	0.00	-0.02	-0.05	-0.06	0.01
x ₄₄	0.29	-0.12	0.06	0.02	0.01	0.10	0.08	f ₄₄	0.05	0.02	0.01	-0.27	0.11	0.09
x ₄₅	0.01	0.00	-0.01	-0.22	-0.17	-0.11	0.00	f ₄₅	0.00	-0.22	-0.17	-0.18	-0.11	0.00
x ₄₆	0.44	-0.09	0.04	-0.09	0.24	0.12	-0.06	f ₄₆	0.04	-0.09	0.24	0.21	0.14	-0.07
x ₄₇	0.22	0.01	-0.06	0.01	0.01	-0.02	0.01	f ₄₇	-0.05	0.01	0.01	-0.01	-0.01	0.00
x ₄₈	0.09	0.04	-0.02	-0.04	-0.05	-0.08	0.00	f ₄₈	-0.01	-0.04	-0.05	-0.04	-0.08	0.00
x ₄₉	0.23	0.16	-0.25	0.00	0.00	-0.01	0.02	f ₄₉	-0.25	0.00	0.00	-0.01	0.00	0.01
x ₅₀	0.18	-0.04	0.00	0.21	0.01	-0.09	0.02	f ₅₀	0.00	0.22	0.01	-0.05	-0.09	0.01
x ₅₁	0.17	-0.06	0.02	-0.04	0.19	0.07	0.17	f ₅₁	0.02	-0.03	0.19	0.09	0.08	0.20
x ₅₂	0.06	-0.02	-0.01	-0.27	-0.13	-0.03	0.00	f ₅₂	-0.01	-0.27	-0.13	0.06	-0.02	-0.01
x ₅₃	0.23	-0.45	-0.10	-0.02	-0.02	0.16	0.41	f ₅₃	-0.10	-0.01	-0.03	0.07	0.16	0.43
x ₅₄	0.34	-0.10	0.17	-0.12	-0.34	-0.14	0.00	f ₅₄	0.15	-0.13	-0.35	-0.08	-0.14	-0.01
x ₅₅	0.05	0.00	0.01	0.03	0.33	-0.06	0.01	f ₅₅	0.01	0.03	0.33	-0.03	-0.06	0.01
x ₅₆	0.05	-0.02	-0.02	0.03	0.01	0.02	0.00	f ₅₆	-0.02	0.03	0.01	-0.09	0.02	0.00
x ₅₇	0.06	-0.03	0.00	0.03	0.08	0.01	0.01	f ₅₇	0.00	0.02	0.07	0.00	0.01	0.01
x ₅₈	0.06	-0.12	-0.48	-0.01	-0.03	-0.07	0.04	f ₅₈	-0.44	-0.01	-0.03	-0.02	-0.06	0.03
x ₅₉	0.11	-0.05	0.51	0.11	0.33	-0.02	0.02	f ₅₉	0.46	0.11	0.34	-0.02	-0.02	0.02
x ₆₀	0.11	-0.05	0.39	-0.17	-0.48	-0.04	0.01	f ₆₀	0.36	-0.17	-0.47	0.02	-0.04	0.01
x ₆₁	0.08	0.01	0.03	0.45	0.09	-0.12	0.02	f ₆₁	0.03	0.45	0.09	0.08	-0.12	0.02
x ₆₂	0.07	0.03	-0.01	-0.12	-0.07	-0.05	0.01	f ₆₂	-0.01	-0.12	-0.07	-0.09	-0.05	0.01
x ₆₃	0.07	-0.12	-0.02	-0.07	0.04	-0.04	-0.01	f ₆₃	-0.02	-0.06	0.03	0.14	-0.04	-0.01
x ₆₄	0.00	0.00	0.00	0.00	0.00	0.00	0.00	f ₆₄	0.00	0.00	0.00	0.00	0.00	0.00

Table 2: Interaction coefficient among structures for policy objective for tourism industries

	u_1s_1	$u_{18}s_{18}$	$u_{24}s_{24}$	$u_{49}s_{49}$	$u_{50}s_{50}$	$u_{57}s_{57}$	$u_{60}s_{60}$
u_1s_1	1						
$u_{18}s_{18}$	0.00009	1					
$u_{24}s_{24}$	-0.00010	-0.00020	1				
$u_{49}s_{49}$	-0.00014	-0.00084	0.00017	1			
$u_{50}s_{50}$	0.00034	-0.00001	-0.00012	-0.00012	1		
$u_{57}s_{57}$	-0.00016	-0.00032	-0.00012	-0.00030	-0.0004	1	
$u_{60}s_{60}$	0.00026	-0.00028	-0.00056	0.00009	-0.00067	-0.00027	1

Table 3: Interaction coefficients between dominating policy and convenient policy for tourism industries

	$u_{18}s_{18}$	$u_{24}s_{24}$	$u_{49}s_{49}$	$u_{50}s_{50}$	$u_{57}s_{57}$	$u_{60}s_{60}$
u_1s_1	0.0001	-0.0001	-0.0001	0.0003	-0.0002	0.0003

Table A.4: I-O industries classification

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
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	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 A.5: Power and Sensitivity Dispersion of Tourism components

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	
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 A.6: Macro Multiplier Backward & Forward Dispersion

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
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 scertry	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, cultre	1.110	18	1.086	23	x
Sports activities and amusement and recreation activities	1.086	24	1.041	33	x
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	