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Estimation of multipliers for the activity of hotels and restaurants

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HIGHLIGHTS

- We model Rasmussen multipliers for the Hotels and Restaurants industry.
- The significant explanatory variables are: income, size of the, country and imports.
- The income has a negative sign in our model, in contrast to previous, works results.
- Tourism impact depends heavily on the economic complexity of the receiving countries.

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ABSTRACT

The purpose of this paper is to model and estimate the multipliers for Hotels and Restaurants, the most characteristic of the industries that make up the tourism business. This multiplier can be used for estimating the economic impact of tourism demand. Likewise, a tool for planners and policy makers is provided. The data source is the set of Input–Output tables gathered by the OECD, which, in its last edition, has collected a sufficiently representative number of countries with an equally suitable disaggregation level. Two models are elaborated, for the estimation of the Rasmussen backwards multiplier and of the imports multiplier, respectively. Some explanatory variables previously used in the literature are confirmed, while others are proposed as alternative ones.

1. Introduction

1.1. General considerations

The Input–Output literature has often analysed relationships between multipliers and tourism, frequently to calculate the impacts of tourism. One reason is that these calculations permit a very appropriate application of the Leontief demand model (the most robust analysis of the Input–Output analysis), thereby giving reasonable estimations about economic impacts under different conditions. However, there is a gap relating to the estimation of explicative models of those multipliers. This is due to the fact that historically there has been an inadequate number of homogeneous Input–Output Tables within the same time frame to provide an adequate number of multipliers. Although today the number of Input–Output Tables that can be obtained from the different Statistical Offices is relatively high, their different aggregation levels make the simple task of homogenisation both laborious and tedious. Nonetheless the existence of tables in a growing number of countries, their regular publication and their use as the basis for a wide number of related statistics, have not only improved their availability but, more importantly, their quality and reliability.

Recently, the introduction of Tourism Satellite Accounts has constituted a considerable advance over the previous situation, allowing the knowledge of the main entries of tourism expenditures, and facilitating the impact studies of tourism. Nevertheless, the problem of converting the expenditure account of the Tourism Satellite Account into a wider and more detailed expenditure vector like the household consumption one of the Input–Output Table is still a difficult task.

Likewise, Tourism Satellite Accounts aim to delve deeper into the characteristics of supply, that is, production in the tourism characteristic industries, by proposing a recompilation of their purchase structure, which would be an alternative to the one found in the Input–Output Tables. In any case, it should be stressed that this issue remains a complex undertaking which has seldom been carried out. For this reason, in general, IOTs are still needed in order to study the supply in the industries related to tourism.

The methodologies concerning the Input–Output Tables, all of them derived from the System of National Accounts, do not impose

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the publication of the final domestic consumption vector disaggregated depending on the circumstance of the consumers being residents or not in the territory. So, we face the paradox that those vectors are estimated but not published – but on few occasions – maybe because of lack of confidence in the breakdown of the non-resident expenditures – mainly tourists – depriving the researchers interested in them from a valuable source of information. It is surprising that the methodologies behind the construction of the System of National Accounts and Satellite Accounts are so exhaustive and rigorous but forsake the publication of such an important vector.

1.2. Objectives

The studies of tourism impact require two prior conditions: the estimation of a tourists' expenditure vector, which is always expensive, and the existence of an input–output table for the area, which is even more costly.

In the case that these two instruments are not available, the existence of an estimation model for the multipliers would allow substituting them and discerning the impact of tourism expenditure. If the differences in the multipliers of various countries can be explained by a model, then an efficient procedure for their estimation, with little cost, can be established, just requiring that the needed information about the explanatory variables is accessible.

As is well known, tourism has a remarkable multi-sectoral profile, being integrated by very different activities and does not appear as a specific sector in the input output tables. This is the reason why we chose to carry out a study of the multipliers of Hotels and Restaurants, the most representative industry of the touristic activity, among the possibilities allowed by the source used. In this work we will consider comparative situations both in relation to other activities and to countries with different economic structures. The goal of the article is to investigate the similarities and differences among the multipliers of the Hotels and Restaurants industry for different countries, explaining them through a multiple regression model which will also allow predicting their value.

The work is articulated in two distinct parts. The first one is a theory section where a disquisition on the source used, the multiplier concept that will be used and a survey of the previous literature on the subject with a brief description of the antecedents can be found. The second one is the estimation section where the models used and the results obtained are presented and explained.

1.3. Information source

Since 1995 the OECD has been involved in the commendable task of compiling Input–Output Tables from different countries and making them available to researchers. What began as a limited group of tables subjected to considerable aggregation (Ahmad, 2002; Yamanon and Ahmad, 2006), has been vastly improved with the 2000 and 2006 edition (OECD, 2006), both in the number of countries (37, 28 OECD and 9 non-OECD), as well as in the number of activities (48 industries) included, thus permitting more consistent and detailed comparative studies among countries.

Despite these considerable advances, the database is not entirely free of certain inevitable drawbacks. The sample in question is unselected and not representative of all the possible countries and cases, although it does include the largest economies and a large group of other developed and developing countries.

The information provided by eleven of the countries is quite complete (symmetric Input–Output Tables at the necessary 48 industry level), however, in other cases the OECD has received only partial information (supply-use tables at purchaser's prices, product-by-product tables…), which has required a transformation of the data into a harmonised, based on basic prices and industry-by-industry symmetric table.

Moreover, data on certain industries of several countries are missing. In the majority of the cases it is a matter of aggregation since not all countries have constructed their tables according to the choice of industries used by the OECD. This means, for example, that activity 42, Research & Development, may not appear if a given country has chosen to include it in activity 45, Education. In the Hotels and Restaurants industry, three countries (Israel, Russia and Taiwan) were eliminated from the sample due to insufficient information.

2. Antecedents

2.1. Input output analysis, linkages, multipliers and models

The input–output analysis has a long-standing tradition as much due to its existence for half a century as for having been the focus of constant debate. Those that may be called pioneer works appear at the end of the 1950s and are attributed to well-known authors as Chenery and Watanabe (1958), Rasmussen (1956) and Hirschman (1958). Given that, in matrix form, an input–output table can be expressed as a sum of rows or columns:

$$x = Ax + D, \quad x = xB = v$$

with x being the total output, A the matrix of technical coefficients, B the matrix of allocation coefficients, D the final demand and v the primary inputs. Chenery and Watanabe (1958) proposed the sum of the columns of the matrix of technical coefficients as a measurement of the *backward linkages*, a_{ij}, and the sum of the rows of matrix of allocation coefficients as a measurement of the *forward linkages*, b_{ij}.[2]

$$A = Z \cdot \hat{x}^{-1} \qquad \begin{array}{l} Z: \text{ matrix } (n \times n) \text{ of intermediate inputs} \\ A: \text{ matrix } (n \times n) \text{ of technical coefficients} \end{array}$$

$$a_{ij} = \frac{z_{ij}}{x_j} \quad A = \{a_{ij}\}; \; z_{ij} \text{ being the intermediate output of sector } i \text{ to sector } j$$

where a_{ij} is the amount of output of industry i needed to produce an output unit of industry j and b_{ij} are the allocation coefficients that represent the share of the output of industry i sold to industry j over the total production of industry i.

$$B = \hat{x}^{-1} \cdot Z \quad B = \{b_{ij}\}, \text{ matrix } (n \times n) \text{ of allocation coefficients}$$

$$b_{ij} = \frac{z_{ij}}{x_i} = a_{ij}\left(\frac{x_j}{x_i}\right)$$

These first multipliers were called *direct multipliers* since they only collected the relationships between production and distribution among the industries in the first place, without taking into account the following rounds of intermediary purchases that would have taken place to supply, in the most classic model by Leontief, an exogenous stimulus of final demand. To broaden the concept of the multiplier, Rasmussen (1956) suggested using the sums of the columns and rows of the Leontief inverse matrix, L:

[2] The circumflex sign is used to convert a vector into a diagonal matrix. It must be remembered that the inverse of a diagonal matrix is one whose elements are reciprocals of the elements of the original matrix.