# The importance of tourism for the Brazilian economy: an input-output analysis

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# THE IMPORTANCE OF TOURISM FOR THE BRAZILIAN ECONOMY: AN INPUT-OUTPUT ANALYSIS

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## ABSTRACT

This study is aimed to analyze the tourism contributions to the Brazilian economy by using a tourism input-output matrix constructed for the Brazilian economy by Casimiro Filho (2002) for the year of 1999. The analysis is conducted by using the traditional approach of the Hirschmann-Rasmussem backward and forward linkages as well as more recent theories, like the field of influence, and the pure linkage approach. The results allow the identification of key-sectors in the economy. Among the sectors classified as key ones, six are included into the tourism complex: a) schedule air transportation; b) nonscheduled air transportation; c) travel agencies; d) support activities for air transportation; e) accommodation; and f) foodservices and drinking places. In face of this, it is pointed out the importance of implementing policies and programs to promote the development of the tourism in the Brazilian economy.

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## 1. INTRODUCTION

One of the few economic sectors that have been showing continuous growth in the world economy is tourism. Following the World Tourism Organization – WTO (2000), in the last years it has presented an yearly average growth rate of 7%, while sectors like agriculture and industry have had growth, respectively, of 2.3% and 3% (World Bank, 2001). Based on this fact, some countries have given to this economic segment the task of balance and even get surplus in their external accounts. Other countries, mainly the developing ones, see the tourism as one of the alternatives capable of improving the way of life of their population, i.e., as an activity capable of promote development, generating income and employment, manly in the regions that show exotic landscapes and shortage of financial recourses (Lopes, 1990). One of the reasons for this is the low relative level of investment required for the implementation of a strategy of development based on the tourism sector, when compared with the other sectors in the economy.

As such, it is possible to say that the tourism is a solid option to minimize the regional disparities of a country (Cruz, 2000). However, despite recognizing that the tourism has a great importance over the economy of a given country, there are few studies in Brazil that quantify, with a solid methodology, the importance of this segment for the Brazilian economy.

As such it is necessary to identify and to measure the contribution of the sectors that make the tourism cluster, relatively to the other sectors in the economy. Using an input-output model constructed for the Brazilian economy for the year of 1999, this study aim exactly at this goal.

In the next section it will presented the methodology used in the analysis, in the third section the results will be presented and discussed, and finally some end comments will be made in the last section.

## 2. THEORETICAL BACKGROUND

This section first starts with a presentation of the Rasmussen and Hirschman approach used in the identification of key sectors in the economy, based on its productive structure. Them it is followed by a presentation of the pure linkage theory which considers, besides the productive structure, the value of production generated into each economic sector. Ending this section, a presentation of the field of influence approach is made, recognizing that some coefficients are more "influential" than others, this approaches is used to identify the sectors responsible for the greater changes in the economy.

### *2.1. The Rasmussen/Hirschman Approach*

The work of Rasmussen (1956) and Hirschman (1958) led to the development of indices of linkage that have now become part of the generally accepted procedures for identifying key sectors in the economy. Define $b_{ij}$ as a typical element of the Leontief inverse matrix, $B$; $B^*$ as the average value of all elements of $B$, and if $B_{\bullet j}$ and $B_{i\bullet}$ are the associated typical column and row sums, then the indices may be developed as follows:
Backward linkage index (power of dispersion):

$$U_j = B_{\bullet j} / n \; / B^* \tag{1}$$

Forward linkage index (sensitivity of dispersion):

$$U_i = B_{i\bullet} / n \; / B^* \tag{2}$$

One of the criticisms of the above indices is that they do not take into consideration the different *levels* of production in each sector of the economy, what it is done by the pure linkage approach presented in the next section.

### *2.2. The Pure Linkage Approach*

As presented by Guilhoto, Sonis and Hewings (1996) the pure linkage approach can be used to measure the importance of the sectors in terms of production generation in the economy.

Consider a two-region input-output system represented by the following block matrix, *A*, of direct inputs:

$$A = \left[\begin{array}{c|c} A_{jj} & A_{jr} \\ \hline A_{rj} & A_{rr} \end{array}\right] \tag{3}$$

where $A_{jj}$ and $A_{rr}$ are the quadrate matrices of direct inputs within the first and second region and $A_{jr}$ and $A_{rj}$ are the rectangular matrices showing the direct inputs purchased by the second region and vice versa.

From (3), one can generate the following expression:

$$B = (I - A)^{-1} = \begin{bmatrix} B_{jj} & B_{jr} \\ B_{rj} & B_{rr} \end{bmatrix} = \begin{bmatrix} \Delta_{jj} & 0 \\ 0 & \Delta_{rr} \end{bmatrix} \begin{bmatrix} I & A_{jr}\Delta_r \\ \Delta_r A_{rj} & I \end{bmatrix} \tag{4}$$

where:

$$\Delta_j = \left(I - A_{jj}\right)^{-1} \tag{5}$$

$$\Delta_r = \left(I - A_{rr}\right)^{-1} \tag{6}$$

$$\Delta_{jj} = \left(I - \Delta_j A_{jr} \Delta_r A_{rj}\right)^{-1} \tag{7}$$

$$\Delta_{rr} = \left(I - \Delta_r A_{rj} \Delta_j A_{jr}\right)^{-1} \tag{8}$$

By utilizing this decomposition (equation 4), it is possible to reveal the process of production in an economy as well as derive a set of multipliers/linkages.

From the Leontief formulation:

$$X = \left(I - A\right)^{-1} Y \tag{9}$$

and using the information contained in equations (4) through (8), one can derive a set of indexes that can be used: a) to rank the regions in terms of its importance in the economy; b) to see how the production process occurs in the economy.

From equations (4) and (9) one obtains:

$$\begin{bmatrix} \Delta_j Y_j \\ X_r \end{bmatrix} = \begin{bmatrix} 0 & \Delta_j \\ \Delta_{rr} & 0 \end{bmatrix} \begin{bmatrix} 0 & I \\ \Delta_r A_{rj} \Delta_j & I \end{bmatrix} \begin{bmatrix} A_{jr} \Delta_r \\ I \end{bmatrix} \begin{bmatrix} Y_j \\ Y_r \end{bmatrix} \tag{13}$$

which leads to the definitions for the Pure Backward Linkage (PBL) and for the Pure Forward Linkage (PFL), i.e.,

$$\begin{aligned} PBL &= \Delta_r A_{rj} \Delta_j Y_j \\ PFL &= \Delta_j A_{jr} \Delta_r Y_r \end{aligned} \tag{14}$$

where the PBL will give the pure impact on the rest of the economy of the value of the total production in region $j$, $\Delta_j Y_j$: i.e., the impact that is free from a) the demand inputs that region $j$ makes from region $j$ , and b) the feedbacks from the rest of the economy to region $j$ and vice-versa. The PFL will give the pure impact on region $j$ of the total production in the rest of the economy $\Delta_r Y_r$.

The pure linkages as defined above are defined in value terms. So, to make it possible to compare indices values in time and space, it is necessary to normalize the value of these indices as given by the equations below.

The pure backward linkage normalized (PBLN) is given by:

$$PBLN = \frac{PBL}{\frac{\sum_i^n PBL}{n}} \tag{15}$$

The pure forward linkage normalized (PFLN) is given by:

$$PFLN = \frac{PFL}{\frac{\sum_i^n PFL}{n}} \tag{16}$$

The pure total linkage normalized (PTLN) is given by:

$$PTLN = \frac{PTL}{\frac{\sum_i^n PTL}{n}} \tag{17}$$

### *2.3. The Fields of Influence*

The concept of field of influence was introduced and elaborated by Sonis and Hewings (1989, 1995). It is mainly concerned with the problem of coefficient change, namely the influence of a change in one or more direct coefficients on the associated Leontief inverse matrix.[3] Since, given an economic system, some coefficients are more "influential" than others, the sectors responsible for the greater changes in the economy can be determined. Together with the Rasmussen/Hirschman linkage indices and the pure linkage indices, it completes our analytical framework for the determination of key sectors in an economic system.

Considering a small enough variation, ε, in the input coefficient, $a_{ij}$, the presentation of the *basic* solution of the coefficient change problem proposed by Sonis and Hewings may be presented as follows. let $A = (a_{ij})$ be an *nxn* matrix of direct input coefficients; let $E(e_{ij})$ be a matrix of incremental changes in the direct input coefficients; let $B = (I - A) = \|b_{ij}\|$, $B(\varepsilon) = (I - A - E) = \|b(e)_{ij}\|$ be the Leontief inverses before and after changes.

Using the notion of inverse-important input coefficients that is based on the conception of the field of influence associated with the change *in only one* input coefficient, assume that this change occurs in location $(i_1, j_1)$, that is,

$$e_{ij} = \begin{cases} \varepsilon & i = i_1,\ j = j_1 \\ 0 & i \neq i_1 \text{ or } j \neq j_1 \end{cases} \tag{18}$$

then, the field of influence can be constructed as the matrix $F(e_{ij})$ generated by multiplication of the $j^{th}$ column of the Leontief matrix, B, with the $i^{th}$ row:

$$F(e_{ij}) = \begin{bmatrix} b_{1i} \\ b_{2i} \\ \vdots \\ b_{ni} \end{bmatrix} \begin{bmatrix} b_{j1} & b_{j2} & \dots & b_{jn} \end{bmatrix} \tag{19}$$

[3]We considered here only the simplest case, i.e., the case in which the change occurs in only one input parameter. However, the analysis can be extended to the cases of changes in whole rows or columns.

where $F\left(\frac{dx_{ij}}{a_{ij}}\right)$ is a *nxn* matrix, interpreted as the field of influence of the change on the input coefficient, $a_{ij}$. For every coefficient, $a_{ij}$, there will be an associated *nxn* field of influence matrix.

In order to determine which coefficients have the greater field of influence, reference is made to the rank-size ordering of the elements, $S_{ij}$, from the largest to the smallest ones. Therefore, for every matrix $F\left(\frac{dx_{ij}}{a_{ij}}\right)$, there will be an associated value given by:

$$S_{ij} = \sum_{k}^{n} \sum_{l}^{n} f_{kl} \left(\frac{dx_{ij}}{a_{ij}}\right). \tag{20}$$

It is possible to see that $S_{ij} = b_{\bullet j} b_{i\bullet}$ and thus provides a direct relationship with the intensity matrix defined in (19). Thus, from the values of $S_{ij}$, a hierarchy can be developed of the direct coefficients, based on their fields of influence, i.e., ranking sectoral relations in terms of their sensitivity to changes, in a sense that they will be responsible for more significant impacts on the economy.

## 3. THE TOURISM SECTOR IN BRAZIL

The input-output (i-o) tables released by the official Brazilian institute of statistics (IBGE) only takes into consideration 42 economic sectors, and the last year that official i-o information is available is for the year of 1996. As so, to conduct the research being presented here some previous estimation needed to be made. First, based on the national accounts (see Guilhoto and Sesso Filho, 2004), an input-output table was constructed for the Brazilian economy for the year of 1999. Second, taking this i-o table as the base data, and using information from various sources, a set of new sectors, linked with the tourism segment, were estimated and introduced into the i-o table constructed for 1999, which now takes into consideration 54 economic sectors (see Casimiro Filho, 2002).

The results, using the estimated Tourism Input-Output Table constructed for the year of 1999 for the Brazilian economy, and the methodology presented in section 2, above, are presented below.

### *3.1. Intersectoral relations and the tourism segment in the Brazilian economy*

Table 1 gives an idea of the importance of the Tourism sector for the Brazilian economy, with a detailing of the sectors that make its aggregate. It is possible to see that, among the macro-sectors being considered, Non-Tourism services was the one with the greatest share in total production and value added, where inside this macro-sector the ones that have the biggest shares are Public Administration, Real Estate, and Trade. The second largest share was assigned to the industry macro-sector.

Considering only the macro-sector of Tourism Services, it can be seen that the Foodservices and Drinking Places sector shows the greatest share in the value added and in the total production value, while the smallest share is of the sector Scenic and Sightseeing Transportation.

Table 1. Share of the Sectors in Production and Value Added, Brazil, 1999.

| Sectors | Share in Total Production (%) | Share in Value Added (%) |
|---|---|---|
| Agriculture | 7.47 | 7.89 |
| Industry | 35.44 | 22.06 |
| Electricity, gas and water supply | 2.81 | 2.73 |
| Civil Construction | 8.37 | 9.06 |
| Non-tourism Services | 41.70 | 54.68 |
| **Tourism Services** | **4.22** | **3.59** |
| Transit and Ground Passenger Transportation, schedule | 19.72 | 21.78 |
| Transit and Ground Passenger Transportation, nonscheduled | 1.44 | 1.59 |
| Scenic and Sightseeing Transportation | 0.02 | 0.02 |
| Scheduled Air Transportation | 16.17 | 13.55 |
| Nonscheduled Air Transportation | 0.91 | 0.76 |
| Travel agencies | 4.46 | 3.74 |
| Support Activities for Ground Transportation | 1.48 | 1.63 |
| Support Activities for Air Transportation | 1.20 | 1.01 |
| Accommodation | 9.95 | 9.43 |
| Foodservices and Drinking Places | 34.98 | 33.14 |
| Amusement and Recreation Services | 8.73 | 11.90 |
| Automotive and other Transportation Equipment Rental and Leasing | 0.95 | 1.46 |

Source: Casimiro Filho (2002).

### *3.1.1. The Hirschman-Rasmussen Linkages*

As it was show before, from the Hirschman-Rasmussen linkages it is possible to identify and to analyze the level of sectoral integration in a given economy, i.e., how the sectors do relate with each other in terms of supply (forward linkages) and demand (backward linkages) of goods and services.

Table 2 shows the results for the Hirschman-Rasmussen linkages.

The backward linkages show heterogeneity of results, with 28 sectors with values greater than 1, showing a relatively high integration in the Brazilian economy

Table 2. Hirschman-Rasmussen Backward and Forward Linkages: Brazil, 1999.

| | Sectors | Backward Linkages | Rank | Forward Linkages | Rank |
|---|---|---|---|---|---|
| 1 | Agriculture | 0.9056 | 40 | 3.4300 | 2 |
| 2 | Mining | 0.8279 | 46 | 1.3217 | 10 |
| 3 | Non-metallic mineral industries | 0.9982 | 30 | 0.8776 | 19 |
| 4 | Steel industries | 1.3008 | 1 | 1.7334 | 4 |
| 5 | Metallurgic industries | 1.1885 | 8 | 1.7056 | 5 |
| 6 | Machinery and tractors industries | 0.9074 | 39 | 1.0020 | 15 |
| 7 | Electric equipment industries | 1.1668 | 11 | 0.6909 | 31 |
| 8 | Electronic equipment industries | 0.9154 | 38 | 0.6051 | 40 |
| 9 | Automobiles, trucks and buses industries | 1.1066 | 17 | 0.5616 | 47 |
| 10 | Motors and parts for vehicles industries | 1.1243 | 13 | 1.2525 | 12 |
| 11 | Wood and furniture industries | 1.0627 | 20 | 0.6977 | 29 |
| 12 | Pulp and paper industries | 1.1092 | 15 | 1.3610 | 9 |
| 13 | Rubber industries | 1.0770 | 19 | 1.1052 | 13 |
| 14 | Chemicals | 1.0079 | 27 | 5.1681 | 1 |
| 15 | Pharmaceutical and medicine industries | 0.9991 | 29 | 0.6162 | 37 |
| 16 | Plastic industries | 1.0057 | 28 | 0.9479 | 16 |
| 17 | Textile industries | 1.2400 | 6 | 1.4459 | 8 |
| 18 | Clothing industries | 1.1699 | 10 | 0.5399 | 51 |
| 19 | Footwear industries | 1.0879 | 18 | 0.6148 | 38 |
| 20 | Coffee industries | 1.2714 | 2 | 0.6934 | 30 |
| 21 | Other vegetables processing | 1.1734 | 9 | 0.7206 | 27 |
| 22 | Meat and meat industries | 1.2566 | 4 | 0.6906 | 32 |
| 23 | Dairy products industries | 1.1612 | 12 | 0.6598 | 34 |
| 24 | Sugar industries | 1.2525 | 5 | 0.7194 | 28 |
| 25 | Vegetable oil mills | 1.2676 | 3 | 0.8682 | 21 |
| 26 | Other food industries | 1.2019 | 7 | 0.9197 | 18 |
| 27 | Miscellaneous manufacturing | 0.9940 | 31 | 0.6580 | 35 |
| 28 | Electricity, gas and water supply | 0.9019 | 41 | 1.5554 | 6 |
| 29 | Civil Construction | 0.8821 | 44 | 0.7241 | 26 |
| 30 | Trade | 0.9312 | 32 | 2.5431 | 3 |
| 31 | Transit and Ground Passenger Transportation, schedule | 0.9240 | 35 | 0.7519 | 24 |
| 32 | Transit and Ground Passenger Transportation, nonscheduled | 0.9240 | 34 | 0.5467 | 49 |
| 33 | Scenic and Sightseeing Transportation | 0.9240 | 36 | 0.5307 | 53 |
| 34 | Truck Transportation | 0.9240 | 33 | 1.1017 | 14 |
| 35 | Other ground transportation | 1.1071 | 16 | 0.5834 | 44 |
| 36 | Water transportation | 0.8951 | 42 | 0.5758 | 45 |
| 37 | Scheduled Air Transportation | 1.0582 | 23 | 0.7837 | 23 |
| 38 | Nonscheduled Air Transportation | 1.0586 | 22 | 0.5447 | 50 |
| 39 | Travel agencies | 1.0623 | 21 | 0.7312 | 25 |
| 40 | Support Activities for Ground Transportation | 0.9214 | 37 | 0.5860 | 43 |

Continue …

Table 2 (Continued). Hirschman-Rasmussen Backward and Forward Linkages: Brazil, 1999.

| | Sectors | Backward Linkages | Rank | Forward Linkages | Rank |
|---|---|---|---|---|---|
| 41 | Support Activities for Water Transportation | 0.8901 | 43 | 0.6116 | 39 |
| 42 | Support Activities for Air Transportation | 1.0539 | 24 | 0.5755 | 46 |
| 43 | Other Support Activities for Transportation | 1.1111 | 14 | 0.6843 | 33 |
| 44 | Communications | 0.7436 | 52 | 0.9478 | 17 |
| 45 | Financial intermediation | 0.7646 | 48 | 1.3146 | 11 |
| 46 | Accommodation | 1.0316 | 25 | 0.5553 | 48 |
| 47 | Foodservices and Drinking Places | 1.0316 | 26 | 0.5894 | 42 |
| 48 | Amusement and Recreation Services | 0.8324 | 45 | 0.5939 | 41 |
| 49 | Other Personal services | 0.8194 | 47 | 0.6386 | 36 |
| 50 | Automotive and other Transportation Equipment Rental and Leasing | 0.7577 | 50 | 0.5392 | 52 |
| 51 | Other Business services | 0.7577 | 49 | 1.5485 | 7 |
| 52 | Real estate | 0.5656 | 54 | 0.8356 | 22 |
| 53 | Public administration | 0.7559 | 51 | 0.8698 | 20 |
| 54 | Private households with employed persons | 0.5913 | 53 | 0.5305 | 54 |

Source: Casimiro Filho (2002).

Mainly with respect to the investment in the tourism macro sector, following Saab & Daemon (2001), in the last years there was the entrance of international chains of hotels in the country, this was accompanied by the construction of thematic parks by international companies as show in Embratur/FADE (1998).

Among the more integrated sectors, the ones that stand up with high values for the backward linkages are Steel Industries (4), Coffee industries (20), Vegetal Oil Mills (25), Meat and Meat Industries (22), and Sugar Industries (24).

As for the tourism complex, the higher values for the backward linkages are found in Schedule Air Transportation (37), Nonscheduled Air Transportation (38), Travel Agencies (39), Support Activities for Air Transportation (42), Accommodation (46), and Foodservices and Drinking Places (47).

Concerning the forward linkages, and following Table 2, there 14 sectors with values greater than one. Taking the first five, one has Chemicals (14), Agriculture (1), Trade (30), Steel Industries (4) and Metallurgic Industries (5). For the tourism complex, all the sectors show values below one. This shows that the main destination of the production done by the tourism is to the final demand, i.e., families and exports (foreign tourists in Brazil).

From the backward and forward linkages it is possible to classify the sectors as key ones in the economic system. McGilvray (1977) uses a more restricted definition for a key sector. Following this author, a sector to be considered a key one in the Hirschman-Rasmussen approach must have the backward and the forward linkages greater than one. However, there are authors who use a broader concept for a key-sector.

From Figure 1 and tanking into consideration the narrow definition, it is possible to classify the following sectors as key ones: Steel Industries (4), Metallurgic Industries (5), Motors and Parts for Vehicles Industries (10), Pulp and Paper Industries (12), Rubber Industries (13), Chemicals (14), and Textiles Industries (17). All of which belong to the industry.

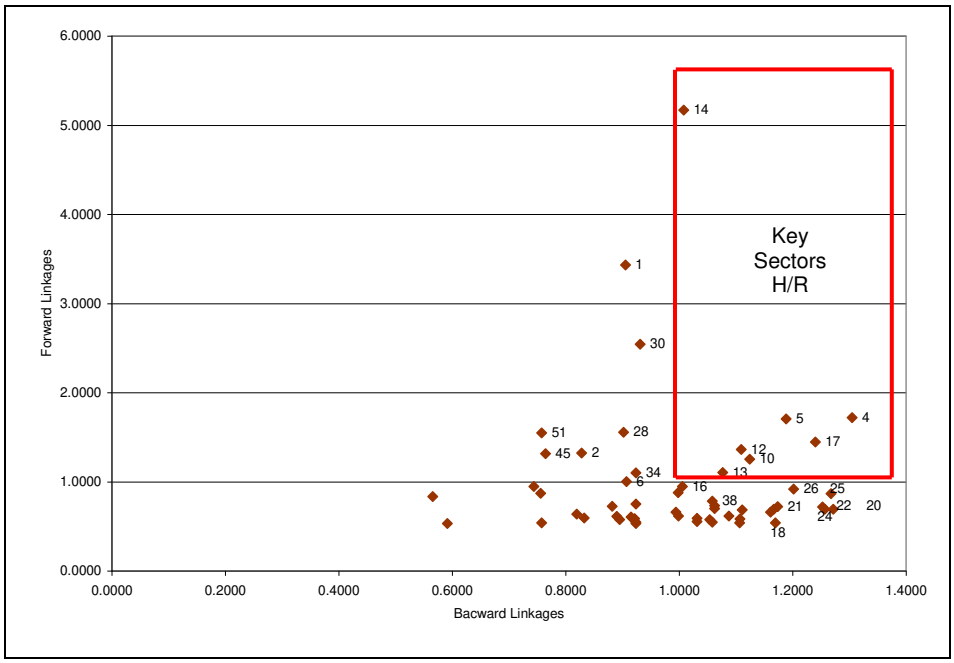


Figure 1 – Key Sectors H/R Approach: Brazil, 1999.

### *3.1.2. The Fields of Influence*

Complementing the analysis of the Hirschman-Rasmussen approach and using the fields of influence approach to identify the main links in the economy, it can be seen from Figure 2, which take into consideration the 200 highest values of the fields of influence, that the greatest changes in the economy would occur with changes in the coefficients of the following sectors: Agriculture (1); Steel Industries (4); Chemicals (14); and Textiles industries (17).

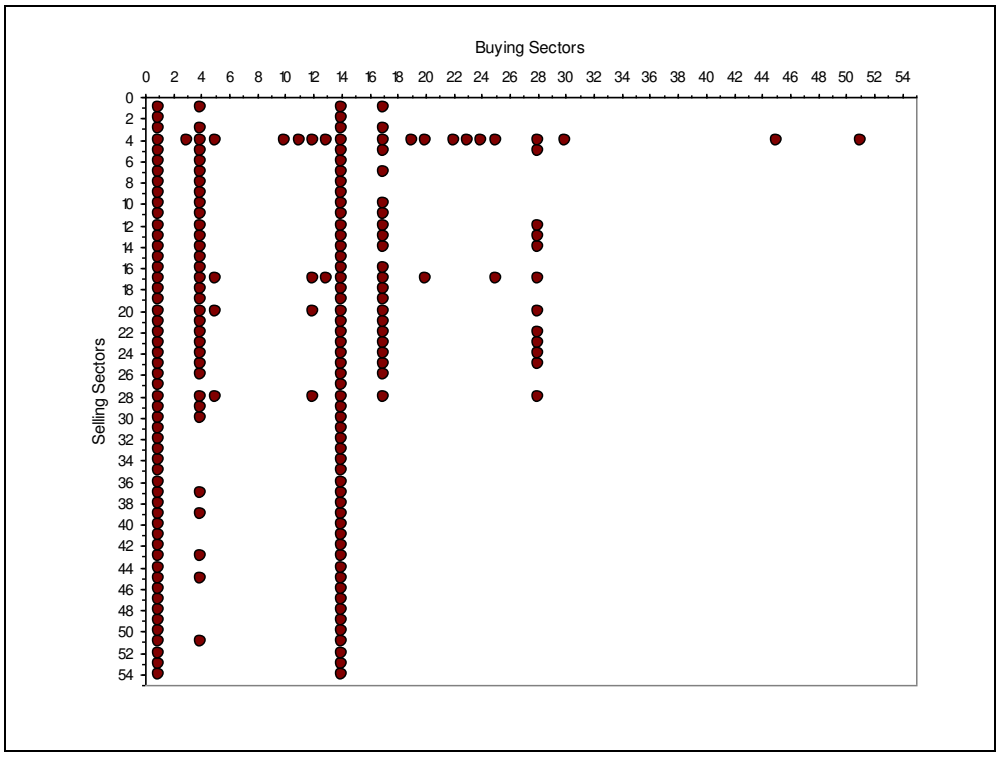


Figure 2 – Greatest Values of the Fields of Influence: Brazil, 1999.

### *3.1.3. The Pure Linkages*

The Hirschman-Rasmussen approach does not take into consideration the value of the total production in each sector, which is done by the pure linkages approach (Guilhoto et al., 1996).

Table 3 shows the results for the pure normalized linkages.

The greatest values for the pure backward linkages are found in the following sectors: Civil Construction (29), Public Administration (53), Trade (30), Other Food industries (26), and Meat and Meat Industries (22).

For the pure forward linkages the sectors with the highest values are: Chemicals (14), Agriculture (1), Trade (3), Other Business Services (51), and Metallurgic Industries (5).

In general, the values of the linkages for the sectors in the tourism complex are smaller than one, with the exception of the forward linkage in the sector of Foodservices and Drinking Places (47).

Table 3. Pure Normalized Linkages for the Brazilian Economy – 1999.

| | Sectors | Backward Linkages | Rank | Forward Linkages | Rank | Total Linkages | Rank |
|---|---|---|---|---|---|---|---|
| 1 | Agriculture | 2.1370 | 8 | 6.2046 | 2 | 4.1620 | 3 |
| 2 | Mining | 0.2577 | 37 | 1.5929 | 10 | 0.9224 | 20 |
| 3 | Non-metallic mineral industries | 0.1485 | 40 | 1.7000 | 9 | 0.9209 | 21 |
| 4 | Steel industries | 0.3791 | 36 | 2.0038 | 7 | 1.1879 | 14 |
| 5 | Metallurgic industries | 0.6910 | 21 | 2.8017 | 5 | 1.7418 | 8 |
| 6 | Machinery and tractors industries | 1.0605 | 12 | 0.9695 | 16 | 1.0152 | 17 |
| 7 | Electric equipment industries | 0.9645 | 15 | 0.4867 | 26 | 0.7266 | 27 |
| 8 | Electronic equipment industries | 0.5400 | 27 | 0.0849 | 42 | 0.3135 | 39 |
| 9 | Automobiles, trucks and buses industries | 1.8958 | 10 | 0.0598 | 46 | 0.9817 | 18 |
| 10 | Motors and parts for vehicles industries | 0.8619 | 17 | 1.0516 | 14 | 0.9563 | 19 |
| 11 | Wood and furniture industries | 0.7715 | 19 | 0.4552 | 28 | 0.6140 | 29 |
| 12 | Pulp and paper industries | 0.4844 | 29 | 1.7671 | 8 | 1.1230 | 15 |
| 13 | Rubber industries | 0.0994 | 44 | 0.7643 | 20 | 0.4304 | 35 |
| 14 | Chemicals | 0.5421 | 26 | 8.9589 | 1 | 4.7323 | 1 |
| 15 | Pharmaceutical and medicine industries | 1.0433 | 13 | 0.2475 | 34 | 0.6471 | 28 |
| 16 | Plastic industries | 0.0954 | 45 | 0.8955 | 19 | 0.4937 | 33 |
| 17 | Textile industries | 0.4331 | 33 | 1.1141 | 13 | 0.7722 | 24 |
| 18 | Clothing industries | 1.0174 | 14 | 0.0192 | 51 | 0.5205 | 31 |
| 19 | Footwear industries | 0.4379 | 32 | 0.0361 | 48 | 0.2379 | 42 |
| 20 | Coffee industries | 0.8541 | 18 | 0.0673 | 44 | 0.4624 | 34 |
| 21 | Other vegetables processing | 2.1844 | 7 | 0.5648 | 25 | 1.3781 | 11 |
| 22 | Meat and meat industries | 2.4354 | 5 | 0.2655 | 33 | 1.3551 | 12 |
| 23 | Dairy products industries | 0.5956 | 25 | 0.1166 | 40 | 0.3571 | 38 |
| 24 | Sugar industries | 0.5183 | 28 | 0.2460 | 35 | 0.3827 | 36 |
| 25 | Vegetable oil mills | 0.8898 | 16 | 0.6225 | 23 | 0.7567 | 25 |
| 26 | Other food industries | 2.6059 | 4 | 0.9443 | 18 | 1.7787 | 7 |
| 27 | Miscellaneous manufacturing | 0.3971 | 35 | 0.3671 | 30 | 0.3821 | 37 |
| 28 | Electricity, gas and water supply | 0.4019 | 34 | 2.1340 | 6 | 1.2642 | 13 |
| 29 | Civil Construction | 7.1990 | 1 | 0.7465 | 22 | 3.9867 | 4 |
| 30 | Trade | 4.6027 | 3 | 4.5987 | 3 | 4.6007 | 2 |
| 31 | Transit and Ground Passenger Transportation, schedule | 0.5979 | 24 | 0.4566 | 27 | 0.5275 | 30 |
| 32 | Transit and Ground Passenger Transportation, nonscheduled | 0.0441 | 48 | 0.0337 | 49 | 0.0389 | 50 |
| 33 | Scenic and Sightseeing Transportation | 0.0005 | 54 | 0.0004 | 53 | 0.0005 | 54 |
| 34 | Truck Transportation | 0.6070 | 23 | 1.1625 | 12 | 0.8835 | 22 |
| 35 | Other ground transportation | 0.2085 | 38 | 0.1337 | 39 | 0.1712 | 43 |
| 36 | Water transportation | 0.0823 | 46 | 0.0700 | 43 | 0.0761 | 46 |
| 37 | Scheduled Air Transportation | 0.6789 | 22 | 0.3162 | 32 | 0.4983 | 32 |
| 38 | Nonscheduled Air Transportation | 0.0394 | 49 | 0.0189 | 52 | 0.0292 | 52 |
| 39 | Travel agencies | 0.0544 | 47 | 0.2330 | 36 | 0.1433 | 44 |
| 40 | Support Activities for Ground Transportation | 0.0256 | 52 | 0.0609 | 45 | 0.0432 | 49 |

Continue …

Table 3 (Continued). Pure Normalized Linkages for the Brazilian Economy – 1999.

| | Sectors | Backward Linkages | Rank | Forward Linkages | Rank | Total Linkages | Rank |
|---|---|---|---|---|---|---|---|
| 41 | Support Activities for Water Transportation | 0.0341 | 50 | 0.0888 | 41 | 0.0613 | 47 |
| 42 | Support Activities for Air Transportation | 0.0278 | 51 | 0.0494 | 47 | 0.0385 | 51 |
| 43 | Other Support Activities for Transportation | 0.1046 | 43 | 0.1679 | 37 | 0.1361 | 45 |
| 44 | Communications | 0.4638 | 31 | 1.0466 | 15 | 0.7540 | 26 |
| 45 | Financial intermediation | 1.9125 | 9 | 1.5035 | 11 | 1.7089 | 9 |
| 46 | Accommodation | 0.4694 | 30 | 0.1457 | 38 | 0.3082 | 40 |
| 47 | Foodservices and Drinking Places | 1.8041 | 11 | 0.3439 | 31 | 1.0772 | 16 |
| 48 | Amusement and Recreation Services | 0.1074 | 42 | 0.3768 | 29 | 0.2415 | 41 |
| 49 | Other Personal services | 2.3463 | 6 | 0.5754 | 24 | 1.4647 | 10 |
| 50 | Automotive and other Transportation Equipment Rental and Leasing | 0.0130 | 53 | 0.0310 | 50 | 0.0220 | 53 |
| 51 | Other Business services | 0.1843 | 39 | 3.6024 | 4 | 1.8859 | 6 |
| 52 | Real estate | 0.7039 | 20 | 0.9456 | 17 | 0.8242 | 23 |
| 53 | Public administration | 6.8350 | 2 | 0.7504 | 21 | 3.8058 | 5 |
| 54 | Private households with employed persons | 0.1109 | 41 | 0.0000 | 54 | 0.0557 | 48 |

Source: Casimiro Filho (2002).

Taking as a key sector the one that presents its value for the pure normalized total linkage greater than one, the following ones can be considered key ones: Chemicals (14), Trade (30), Agriculture (1), Civil Construction (29), Public Administration (53), Other Business Services (51), Other Food Industries (26), Metallurgic Industries (5), Financial Intermediation (45), Other Personal Services (49), Other Vegetables Processing (21), Meat and Meat Industries (22), Electricity, Gas and Water Supply (28), Steel Industries (4), Pulp and Paper Industries (12), Foodservices and Drinking Places (47), and Machinery and Tractors Industries.

As it can be seen, the key sectors in the Brazilian economy for the year of 1999 show a great diversity. This can be attributed to the complex productive structure of the Brazilian economy.

It also needs to be pointed out here that the results for the identification of a key sector in a given economy, either by the concept of the Hirschman-Rasmussen or the Pure linkages approach depends on the level o aggregation that it is been taken into consideration, and attention should be made about this when comparing results from studies with different levels of aggregation.

## 4. FINAL REMARKS

The aim of this study was to construct an input-output model for the tourism complex of the Brazilian economy, for the year of 1999, and from there to measure and to analyze the intersectoral relations that take place in the economy, with the identification of key economic sectors.

Among the sectors considered as key one, six are found in the tourism complex: Schedule Air Transportation (37), Nonscheduled Air Transportation (38), Travel Agencies (39), Support Activities for Air Transportation (42), Accommodation (46), and Foodservices and Drinking Places (47).

A better understanding of the economic relations in the economy and the role that the tourism complex plays in it certainly will help in the formulation of public policy linked with development strategies and employment generation.

**REFERENCES**

CASIMIRO FILHO, F. **Contribuições do turismo à economia brasileira.** Piracicaba, 2002. 220p. Ph.D. Dissertation – Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo.

CRUZ, R. C. **Política de turismo e território**. São Paulo: Contexto, 2000. 167p.

GUILHOTO, J.J.M.; SONIS, M.; HEWINGS, G.J.D. **Linkages and multipliers in a multiregional framework**: integration of alternative approaches. Urbana: University of Illinois/Regional Economics Applications Laboratory, 1996. (Discussion paper)

GUILHOTO, J.J.M.; SESSO FILHO, U. Estimação da Matriz Insumo-Produto à Partir de Dados Preliminares das Contas Nacionais. *Economia Aplicada.* 2004. In Printing.

HIRSCHMAN, A. O **The strategy of economic development**. New Haven: Yale University Press, 1958. 217p.

INSTITUTO BRASILEIRO DE TURISMO; FUNDAÇÃO DE APOIO AO DESENVOLVIMENTO DA UFPE. **Estudo econômico-financeiro dos meios de hospedagens e parque temáticos no Brasil**. Brasília: EMBRATUR, 1998. 180p.

LOPES, J.C. O turismo e o desenvolvimento regional do Norte e Nordeste. **Informações FIPE**, n.120, p.15-17, jul. 1990.

McGILVRAY, J. Linkages, key sectors and development strategy In: Leontief, W. (Ed.). **Structure, system and economic policy**. Cambridge: University Press, 1977. p.49-56.

RASMUSSEN, P. N. **Studies in intersectoral relations**, Amsterdam: North-Holland, 1956.

SAAB, W.G.L.; DAEMON, I.G.O segmento hoteleiro no Brasil. **BNDES Setorial**, n.13, p.127-156, mar. 2001.

SONIS, M.; HEWINGS, G.J.D. Erro and sensitivity input-output analysis: a new approach. In: MILLER, R.E.; POLENSKE, K.R.; ROSE, A.Z. (Ed.). **Frontiers of input-output analysis**. New York: Oxford University Press, 1989. p. 232-244.

SONIS, M.; HEWINGS, G.J.D. **Fieds of influence in input-output systems**. Urbana: University of Illinois / Regional Economics Applications Laboratory, 1995. 27p.

WORLD BANK. **Growth of output**. http://www.worldbank.org/data (02/04/2001)

WORLD TOURISM ORGANIZATION. **Tourism highlights**. http://www.world-tourism.org (12/11/2000).