An Economic Analysis of the Impact of Airport Infrastructure on Population Arrangements in a Tourism Region

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Abstract

This paper aims to present results from a modeling approach designed to estimate the economic contribution on population arrangements under the influence of overlapping effects of the three main airports: Florianópolis, Joinville, and Navegantes, an important tourist region in the South of Brazil. This study presents an original methodology that uses Input-Output Tables weighted with the Huff Gravity Model. First, this paper describes the application of regionalized Brazilian Input-Output Tables weighted by the attractiveness of passenger movement/year through Huff's Gravity Model to estimate its regional economic effects (total product, income, jobs generation, and added value) applied to the analysis of three major airports on the east coast of Santa Catarina state, Brazil. This method allows to identify and quantify the effects generated by the investment in airport infrastructure in this region. The expected results will include the multipliers of direct and indirect impacts of economic activities of each airport over their influence area. These data should disclose structural differences between the financial profile and investment opportunities considering the total product, income, jobs generation, and added value. Thus, the paper presents a methodology capable of filling a gap in the literature regarding decision-making support to public and private managers regarding investments in tourist airports that compete for the same passenger profile.

Keywords: IO-Tables; Airport Infrastructure; Population Arrangements

Introduction

In a global economy, the movement of goods and passengers is crucial for a nation's economic and social development. The aviation sector, as highlighted by ANAC [1], plays a pivotal role in a country's economy, influencing its competitive advantage in the global market. The study of air transport's impact on regions has been explored by various authors, such as Yao and Yang [2] in China, Olipra and Augustyniak [3] in Poland, and Mokhele [4] in South Africa, all demonstrating its potential to reduce economic inequality and spur regional development. In Brazil, the growth of the air transport sector in Santa Catarina and Parana states, supported by major airports like Florianopolis, Navegantes, Joinville, and Curitiba, has significant economic implications. To assess this impact, this study employs input-output analysis and Huff's model, offering a valuable alternative to understanding the air transport sector's influence.

Methodology

The methodological development considering populational arrangements for the analysis of the economic impact of the airports Hercílio Luz (SBFL), Minister Victor Konder (SBNF), Lauro Carneiro de Loyola (SBJV), and Afonso Pena (SBCT) presents three stages. The first stage is composed of the study's directives. The second stage contains the data survey, and the final stage the regionalization by the IO tables. From these stages, it is obtained the results with the effects of economic multipliers. Figure 1 presents a schematic flowchart.

The first step presents the spatial cut of the region and the temporal cut of analysis on data collection. Regarding the study area, four airports were analyzed, where 17 population arrangements were identified. The analysis period was from 2010 to 2017. The data were obtained from the official bodies of

the Brazilian government, ANAC (national civil aviation agency), Ministry of Economy (job and income data -RAIS) and IBGE (Brazilian Institute of Geography and Statistics), input-output matrices estimated by the NEREUS laboratory/ Universidade de São Paulo. The second step highlights the adaptation of Huff's gravitational model to obtain the weights associated with each of the ARPs. These weights were obtained according to the distance from the ARPs' host cities to the airports in the study and the passenger's number movements/year. The third step deals with the regionalization of the air sector, where the weights found in the Huff model are used as input data for the IO-Tables calculation routine. Then, the economic effects of the product (eDN Product), income (eDN Income), and jobs (eDN Jobs) multipliers are calculated. From the economic benefits obtained in the IO-Table model proposed for ARPs, the impact of airport infrastructure can be quantified. Each of these steps will be explained in detail in the subtopics below.
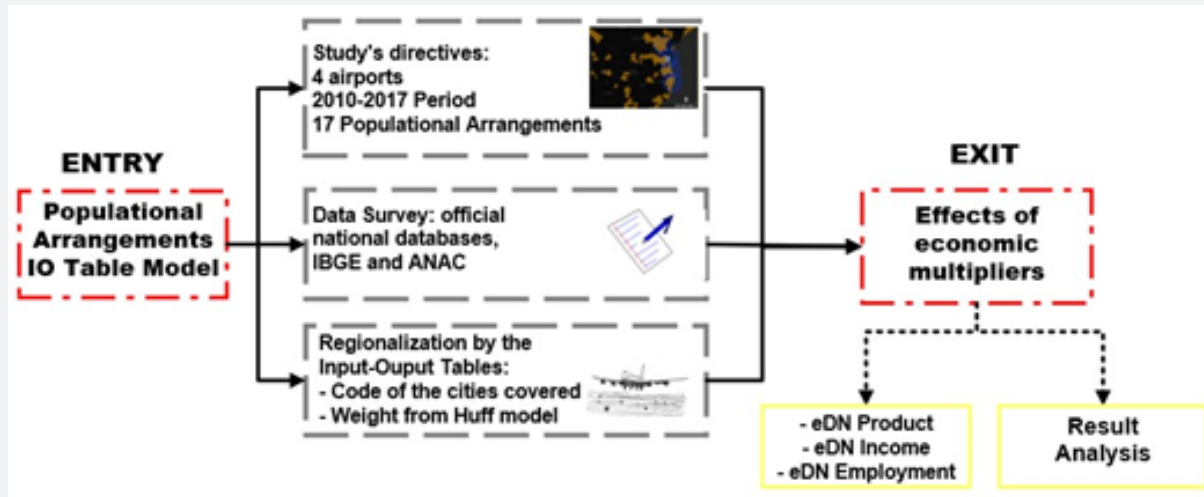

Figure 1: Schematic flowchart. Source: Authors.

Results

This chapter presents the analysis of the results obtained by the proposed methodology for the four evaluated airports. The analysis of the results obtained by the regionalization of the "IO-Tables" shows the effects of the multipliers calculated for the period from 2010 to 2017, the average value of the national air transport sector: (i) eDN Product; (ii) eDN Income; and (iii) eDN Jobs. Such multipliers present the direct and indirect effects but exclude values related to families and salaries.

eDN Product

The eDN Product is a matrix multiplier with direct and indirect effects on the product value. The values for mean, standard deviation (SD), lower limit (IL) and upper limit (UL) of the multipliers. The averages of the national and the airports' multipliers for the variable eDN Product are presented in Table 1. In contrast, it is noted that the airport of Navegantes (SBNF) has the lowest generation of direct and indirect product in the local economy, around 21,526 monetary units can be said that both airports are very far from the national average, in this case, 780,354 monetary units per million air transport products. This indicates that a large part of the designated air transport product consumed in the region is imported from other locations, generating products outside the analyzed region.

Table 1: Average eDN Product (Source: MIPX App, Authors).

References	Mean	Standard Deviation	Upper Limit	Under Limit	Margin of Error
NATIONAL	1.7803	0.0694	1.7223	1.8384	0.058
SBCT	1.0994	0.0162	1.0859	1.1129	0.0135
SBFL	1.2017	0.0166	1.1879	1.2156	0.0138
SBJV	1.1214	0.013	1.1106	1.1323	0.0108
SBNF	1.0215	0.0081	1.7223	1.0283	0.0067

eDN Income

The eDN Income is a matrix multiplier with direct and indirect effects on the amount of income related to the air transport sector. The averages of the national and the airports' multipliers concerning the variable eDN Income are presented in Table 2.

eDN Jobs

The eDN Jobs are a matrix multiplier with direct and indirect effects on the number of jobs in the air transport sector. The averages of national and airport multipliers concerning the variable eDN Jobs are presented in Table 3. It is notable that all airports in the region generate few local jobs when compared to the national average of 8.25 jobs per million currency units of increased demand in the air transport sector. These results indicate that the region is an importer of air transport services from other regions of the country. Therefore, the increased demand for air transport in the region, and the consequent investment, more strongly induces the generation of more jobs outside the analyzed region and less within the region.

Table 2: Average eDN Income (Source: MIPX App, Authors).

References	Mean	Standard Deviation	Upper Limit	Under Limit	Margin of Error
NATIONAL	0.2824	0.011	0.2732	0.2917	-0.0092
SBCT	0.041	0.0045	0.0372	0.0447	-0.0038
SBFL	0.0835	0.0067	0.0779	0.089	-0.0056
SBJV	0.0507	0.0067	0.0451	0.0563	-0.0056
SBNF	0.009	0.0038	0.0059	0.0122	-0.0031

Table 3: Average eDN Jobs (Source: MIPX App, Authors).

References	Mean	Standard Deviation	Upper Limit	Under Limit	Margin of Error
NATIONAL	8.2575	1.4529	7.0429	9.4722	-1.2146
SBCT	1.1098	0.1606	0.9756	1.2441	-0.1342
SBFL	2.2548	0.5835	1.767	2.7426	-0.4878
SBJV	1.3753	0.4196	1.0245	1.726	-0.3508
SBNF	0.2615	0.1392	0.1452	0.3779	-0.1163

Conclusion

This study introduces a novel methodology that combines the IO-Tables model with population arrangement as an economic analysis weight for regions impacted by airports. It focused on four airports in southern Brazil: Hercílio Luz (SBFL), Minister Victor Konder (SBNF), Lauro Carneiro de Loyola (SBJV), and Afonso Pena (SBCT), considering air traffic and economic data within a 120 km radius. Seventeen population arrangements were identified in the airport influence zones. Unlike previous studies, this approach offers three key features: (i) the use of IO-Tables to regionalize population arrangements; (ii) assessment of economic effects in a prominent tourist region; and (iii) incorporation of airport attractiveness weights. It adopted geographic and temporal parameters to quantify the impact on airports in the same region, including product, income, and job multipliers.

Results indicate that all airports deviate significantly from the national economic average in direct and indirect effects. SBFL, privatized in 2017, showed the highest economic multipliers, while SBNF, public-administered at the time, displayed the lowest. Future studies should compare the effects of privatization.

Using IO-Tables for population arrangements necessitates careful geographic definition, especially considering Brazil's data quality challenges. This study is crucial for assessing airport infrastructure impacts and adhering to ICAO recommendations. It supports decision-making and investment allocation in public aviation management, enhancing collaboration between the Technological Institute of Aeronautics and the Civil Aviation Secretariat.

Acknowledgment

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