The economic impact of international travelers in the hospitality industry of Austin, Texas, USA in 2021: a regional input-output and data visualization approach

Rafael Perez Pena[a*]

[a] Colorado Mountain College, Steamboat Springs, Colorado, USA

A b s t r a c t

The purpose of this paper is to estimate the economic impact of departing international flights in the hospitality industry and other related industries of Austin, Texas, USA in 2021 using an input-output approach and to present the results using data visualization tools. The estimated total economic impact of the international flights departing from Austin, Texas in its economy is around $77 million USD in business sales. The total impact is comprised by the direct, indirect, and induced effects in the regional economy. The indirect and induced effects are estimated to be $26 million in output and a direct effect of $51 million. These estimates imply an estimated output multiplier of 1.6. For every $100 USD spent in the air passenger industry, $60 additional USD are generated due to related industries to the air transportation industry. While the literature on regional economic impact of the hospitality industry is extensive, this paper intends to present a holistic and integrated approach by attempting to present a bridge between travelers' sentiments, patterns in preferences, and the economic impact of international flight in the regional economy.
Keywords: *economic impact, international travelers, input-output approach*

1. Introduction

The purpose of this paper is to estimate the economic impact of international flights in the hospitality industry and other industries of Austin, Texas, USA in 2021 using an input-output approach and to present the results using data visualization tools. The paper estimates, quantifies, and visualizes the economic impact of the calculated international fares in the economy of Austin in terms of output or business sales. Other authors have applied input-output analysis to estimate the economic impact of travelers in cities or counties (Economic Development Research Group, 2019; ICF, 2021; Coffman Associates, 2020; Tourism Economics, 2020).

Another group of authors have estimated this economic impact of travelers by state (Arizona Department of Transportation, 2021; Nebraska Aviation Counts, 2019; Kimley Horn, 2021; Wyoming Department of Transportation, 2020; Georgia Department of Transportation Aviation Programs Office, 2020; Tourism Economics, 2021; Research Department of the U.S. Travel Association, 2017; Rockport Analytics, 2022; Tourism Economics, 2020; Tourism Economics, 2023) and by country (Leontief, 1986; Mariolis and others, 2020; Faber and Gauber, 2019; Bonet-Moron and others, 2020; Artal-Tur and other, 2021; Ali, Bakhsh, Yasin, 2023).

This type of analysis helps to guide different stakeholders in the hospitality industry to identify the effect of travelers flying abroad in the hospitality industry and other related industries. In addition, this study intends to start a holistic/integrated approach by suggesting an initial bridge between travelers' sentiments, patterns in preferences, and the economic impact of international flights.

This paper includes an explanation of the input-output analysis and its application to estimate economic impact analysis for regions. In addition, the paper describes data visualization tools to analyze and describe the results of the economic impact of international fares in the economy of Austin by industry. Specifically, this paper suggests a Decision Treemap to visualize the results of the economic impact analysis for departing international flights from the USA by industry. The paper also provides a descriptive analysis of international travelers to the USA using side-by-side boxplots to identify

patterns of international travelers and explore potential travel preferences in the USA. Author authors have followed data visualization approaches to identify travelers' preferences (PeCoy and Redmond, 2023; Lu and Wu, 2023; Benckendrorff, 2006). Lastly, the chapter describes a word cloud analysis approach to analyze the sentiments of travelers from one of the largest airlines in the USA to identify potential drivers of revealed preferences and suggest a bridge from the sentiment analysis to the economic impact analysis.

After this introduction, the rest of the paper is presented in 6 additional sections. Section 2 describes the application of input-output analysis to estimate the impact of travelers on local economies such as counties or cities and on broader scales regions such as states or countries. This section also provides a survey of regional economic impact studies. Section 3 analyzes the incoming travelers' distribution from different countries to the USA and international flights at Austin's airport. Section 4 estimates, visualizes and describes the economic impact of international flights originating in Austin, Texas, USA on its economy by industry using the input-output multipliers from the Regional Input-Output Modeling System (RIMS II). Section 5 concludes. Lastly, Section 6 includes the source.

2. Input-output analysis and travel preferences

The purpose of this section is to describe the input-output analysis which is the technique applied to estimate the economic impact in this study. Specifically, this paper uses RIMS II multipliers to estimate the economic impact of travelers flying abroad from Austin, TX, USA. Results are estimated for business sales in the hospitality industry and other related industries of Austin, Texas, USA in 2021. After describing the input-output analysis, the section elaborates on applications of the input-output technique to estimate the impact of the transport sector, tourism spending, and airport spending in the economy of groups of countries and in smaller regions such as states or counties. In addition, this section describes how other authors have approached travelers' preferences to identify travelers' preferences.

2.1. Input-output analysis

Input-output analysis is a widely used technique to estimate the economic impact of an event taking place in a local economy in monetary terms. "Input-output analysis is a method by which the flow of production can be traced among the various sectors of the economy, through to final demand or export. The most fundamental problem of input-output analysis is to calculate the necessary output levels of each industry required to achieve a final output" (Hewings, 1985, 1). This type of analysis is helpful in estimating the effect on the local economy of business sales spent in a local economy. In addition, this type of analysis allows us to trace the economic linkages between regions and how equilibrium between regions is achieved. "An input-output economic activity model estimates additional indirect and induced impacts, or ripple effects, that result from all direct impacts related to airport and airport-supported employment, payroll, and spending" (Jviation, a Woolpert Company, 2020).

There are some regional modeling tools that allow the application of input-output analysis to estimate the economic impact of an activity in a local economy. RIMS II is a model developed by the U.S. Bureau of Economic Analysis (BEA). This modeling technique is used to "objectively assess the potential economic impacts of various projects" (Bureau of Economic Analysis US Department of Commerce, 2013, 1). The input-output analysis helps estimate economic multipliers. The idea of these multipliers is that "the initial change in economic activity results in other rounds of spending" (Bureau of Economic Analysis US Department of Commerce, 2013, 1). The additional spending originates from two effects: indirect and induced effects. Direct effects consist of the original set of spending in the local region. Indirect economic effects refer to the second round of spending in related industries or otherwise stated by intermediate demand or supplies to produce the end product or service. Lastly, the induced economic effects consist of spending carried out by household spending in the local economy.

In addition to RIMS II input-output tables and multipliers, Economic Impact for Planning (IMPLAN) and Regional Model Incorporation (REMI) are other platforms or software that are widely used to estimate economic impact analysis using the input-output technique (Lynch, 2000). The differences between the usage of these economic tools to estimate economic impact analysis are in the price of the interfaces or software, the requirements of the users, and the modeling tools that each interface uses (Rickman & Schwer, 1995).

The economic analysis of input-output has been widely used in other studies at the regional level to estimate the economic impact of travelers' spending in the hospitality industry and tourism (Bonn & Harrington, 2008). For example, for some cities or counties in states of the USA in 2020, there are economic impact estimated analyses related to tourism or travelers. In addition to regional impacts, input-output analysis is applicable to estimate the impact of travelers in the country or group of countries as indicated in the next section. The input-output analysis can be applied to estimate the economic impact of travelers spending in terms of employment, value-added, and personal income, in addition to output or business sales. These examples summarize the economic impact of travelers in terms of business sales.

2.1.1. Economic impact studies of travelers by counties or cities

San Francisco, California, USA

The Economic Development Research Group (2019) estimated the economic impact of San Francisco International Airport (SFO) in 2018. The report estimated the economic impact of the airport in the counties of Alameda, Contra Costa, Marin, Napa, San Mateo, San Francisco, Santa Clara, Solano, and Sonoma. In 2018, this airport served 58 million incoming and outcoming passengers. The initial spending or direct effect that the authors used in this study consisted of the sum of business revenues in the SFO, the spending of SFO users, orders made to SFO suppliers, and re-spending of worker income. The direct effect of the SFO airport in the Bay Area of San Francisco attributed to the spending of visitors was $12.5 billion USD in 2018. This direct impact of visitors spending supported $8.4 billion USD in related industries or sectors and in ripple effects. In particular, $4.02 billion in indirect effects and $4.4 billion in indirect effects (Economic Development Research Group, 2019). These estimates lead to an estimated multiplier of 1.67. This means that for every $100 USD generated in the Bay Area by the SFO, $67 additional dollars are supported in related industries.

San Diego, California, USA

Similarly, ICF applied an input-output analysis to estimate the economic impact of McCellan Palomar Airport in five California counties of the San Diego region in 2019. These counties are San Diego, Riverside, Los Angeles, Orange, and San Bernardino. In this report, ICF estimated the economic impact of the airport in terms of jobs, labor income, total industry activity, and taxes. ICF estimated the total impact of the airport in 2,594 jobs, $460.6 million in industry activity, and $72.2 million in federal, state, and local tax revenue. This total effect encompassed the direct effect of these activities: airport, tenant, business park, as well as visitor spending. ICF estimated that the initial spending of visitors in San Diego region was $66 million in 2021 USD. This direct impact generated an additional output or business sales of $61.7 million 2021 USD in induced and indirect effects. These estimates lead to an estimated multiplier of 1.93 (ICF, 2021). This multiplier indicates that in the San Diego region, for every $100 USD spent by visitors, they support $93 additional USD in related industries and additional spending.

Salinas municipality, California, USA and other Cities

Coffman Associates (2020) estimated the economic impact of Salinas Municipal airport in Monterey County in 2019. The authors estimated the direct, indirect, and induced effects of general aviation visitors arriving to Salinas Municipal Airport. The total estimated impact of visitors' spending in Monterey County in 2019 was $8.5 million in 2019 USD (Coffman Associates, 2020). This total effect accounted for $5 million direct business sales in lodging, food, retail sales, entertainment, and ground transportation sectors. This $5 million supported an additional $3.5 million in business sales in related industries. With these estimates, the estimated output multiplier is 1.7. This multiplier means that for every $100 USD spent in Monterey County by visitors, $70 USD additional are supported in related industries/sectors in terms of indirect and induced effects. Other cities have an estimated economic impact of tourism such as Orlando, Florida, USA in 2020 (Tourism Economics, 2020).

2.1.2. Economic impact studies of travelers by state in the USA

Arizona

The economic impact study of the public airports in the state of Arizona was estimated at $6.6 billion USD by visitor spending in business sales. This total effect encompasses $2.4 in induced business sales, $1.24 billion USD in indirect business sales, and 2.9 billion USD in direct business sales (Arizona Department of Tranposrtation, 2021).

Nebraska

Other authors have used regional input-output analysis to estimate the economic impact of business sales in a regional economy. For example, Nebraska Aviation Counts (2019) estimated the economic impact that the airports have in the USA state of Nebraska in 2018-2019. This report breaks down the economic impact into three effects: direct, indirect, and induced effects. The report estimated an aggregated economic impact of $8.6 billion USD attributed to 79 airports included in their study. $4.8 billion USD is attributed to the direct effects and $3.7 billion USD is attributed to indirect and induced effects.

West Virginia

Kimley Horn (2021) prepared an economic impact study to estimate the contributions of the 24 public airports in West Virginia in the state of West Virgina. The estimated total impact of business sales in the economy of West Virgina is $1.44 billion USD. This total effect accounted for $1.04 billion in direct sales, $0.12 billion USD in indirect sales, and

$0.27 billion USD in induced sales. These estimates lead to an estimated multiplier of 1.38. This multiplier implies that for every $100 USD spent in West Virginia by its airports, an additional $38 USD is generated.

Wyoming

Another economic impact study at the state level was conducted for the State of Wyoming, USA in 2020 (Wyoming Department of Transportation, 2020). In this study, WYDOT estimated the annual impact of the 34 public airports in the state of Wyoming. In this study, the WYDOT estimated a total impact of $1.08 billion USD in statewide spending attributed to the public airports. This total impact considers $0.70 billion USD in direct spending and $0.38 billion USD in indirect and induced spendings. The output multiplier is then 1.5. These multipliers means that for every $100 USD spent in the state of Wyoming by the 34 public airports, $50 USD additional are attributed to the economy in Wyoming.

Other states

Other authors have computed economic impact studies of tourism spending in other states such as Idaho (Kimley Horn, 2020), Georgia (Georgia Department of Transportation Aviation Programs Office, 2020), South Dakota (Tourism Economics, 2021); Massachusetts (Research Department of the U.S. Travel Association, 2017); Florida (Rockport Analytics, 2022); Illinois (Tourism Economics, 2020); Pennsylvania (Tourism Economics, 2023). This is not a comprehensive list of economic impact studies; however, the purpose of this list is to highlight that the application of input-output analysis to estimate the impact of tourism-related activities at the state level is wide.

2.1.3. Economic impact studies of tourism or travelers by country

The input-output technique was originally developed to conduct economic studies at the country level (Leontief, 1986). Many authors have applied this methodology to estimate the economic impact of tourism at the country level. For example, Mariolis and others (2020) estimated the COVID-19 multiplier effect on tourism on the Greek economy. Faber and Gauber (2019) estimated the impact of tourism in Mexico. Bonet-Moron and others (2020) estimated the impact of COVID-19 in Colombia using an input-output touching base on tourism effects. Similarly, Artal-Tur and other (2021) uses input-output to estimate the economic impact of cruise tourism in Spain. Ali, Bakhsh, Yasin (2023) studied a nexus bewteen air transportation and economic growth in the BRICS countries.

2.1.4. Travelers preferences

The concept of revealed preferences is one of the most impactful concepts explaining consumer choice theory as stated by Varian (2006) and highlighted by Demuynck and Hjertstrand (2019). The revealed preferences concept was developed by Samuelson (1938, 1948). Revealed preference is a concept that refers to the idea that consumers reveal their maximized utility by purchasing a good or service over a set of goods or services that the individual had access to. In the words of Beshears and others "revealed preferences are tastes that rationalize an economic agent's observed actions" (2008, 1). Similarly, Demuynck and Hjertstrand explain that "if a consumer is observed to have chosen a certain consumption bundle x, while another bundle y was also available (e.g. because it was less expensive), then she reveals her preference for x over y" (2019, 1).

When the revealed preferences concept is applied to travelers the travelers reveal their preferences by traveling to a particular destination given that they have many destinations available to them. Using data visualization studies, researchers investigated traveler preferences for flights (PeCoy & Redmond, 2023), airline websites, and flight bookings (Liu, Jiang, & Gleasure, 2023). In addition to data visualization approaches for capturing travelers preferences, other studies focused on identifying the traveler preferences for airline website content grouping the website content into groups of factors explaining the propensity to purchase a flight (Benckendrorff, 2006).

Another study analyzes travelers' preference to substitute from airplanes trips to night trains trips using a stated preferences experiment through an integrated choice and latent variable model (Curtale, Larsson, & Nassen, 2023). Another research was conducted to identify the drivers of demand for airfares during and after the COVID-19 pandemic bewteen 37 European countries from 2019 to 2022 (Randrianarisoa & Gillen, 2023). While there are a wide variety of studies to analyze travelers' preferences, there is a gap between the travelers' preferences and their impact on regional business sales. The next section provides descriptive analysis of incoming flights to the USA from other countries.

3. Data analysis: incoming international travelers to the USA, revealed preferences, and word cloud analysis

3.1. Incoming international travelers to the USA

This section analyzes the distribution of incoming international travelers from different countries to the USA using boxplots. The purpose of this analysis is to analyze traveler preferences from abroad to the USA. This analysis uses the number of incoming air travelers from Mexico, Canada, and abroad from international travelers. These data were obtained

from the U.S. Trade Department. More specifically, this section uses the I-94 arrivals statistics. Boxplots are a data visualization technique helpful to visualize and compare distributions. In this case, box plots are used to visualize the distributions of international travelers to the USA from different countries.

Figure 1. Boxplot of monthly incoming travelers to the USA from Mexico, Canada, and Abroad in 2021
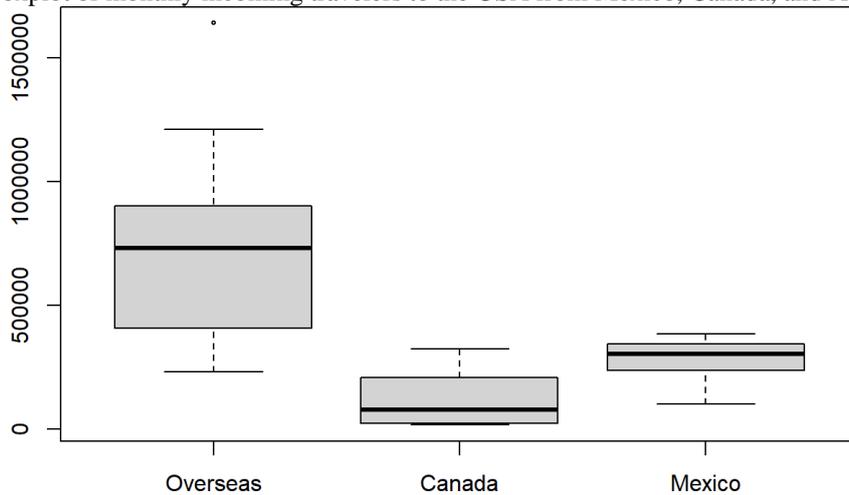
Source: Author's elaboration using I-94 data from the U.S. Trade Department.

This study case uses the monthly air travelers' arrivals from overseas, Mexico, and Canada to continue with the exploratory analysis. Plotting side-by-side box plots for travelers from overseas, Mexico, and Canada an exploratory analysis can be conducted.

When analyzing the boxplot for overseas travelers to the USA, it looks relatively normal with a slight skewness. It is slightly positively skewed. This shape could reflect that there might be a seasonality of holiday Christmas months coming from overseas to the USA.

The box plot of monthly travelers in 2021 to the USA from Mexico looks relatively normal with a slight skewness. It is slightly positively skewed. The shape of this boxplot reflects a similar seasonality pattern possibly explained by the holiday months toward the end of the year. There are some potential outliers during certain months, in which the number of travelers decreased as observed in the boxplot for Mexico.

The box plot of monthly travelers to the USA from Canada looks relatively normal with negative skewness. The shape of the box plot from Canada differs from those of Mexico and overseas. This could potentially reflect that the seasonality from the holiday months behaves in the opposite direction in Canada than in Mexico and overseas.

In summary, side-by-side boxplots are helpful data visualization techniques to monitor the traveler's behavior by analyzing the patterns of incoming passengers such as the example plotted in this study case. By understanding, this type of pattern such as the seasonality of incoming travelers by origin airlines could get a better understanding of their consumers' patterns and set up marketing strategies. Further studies must be conducted to provide better recommendations such as measuring elasticities or in other words how sensitive travelers are from each of these origins to changes in prices.

3.2. Word clouds analysis of American airlines reviews in November 2022

Word clouds are a data visualization technique that can be helpful to monitor attitudes and/or behaviors toward a particular airline. This section addresses how to use word clouds to assess the travelers' sentiments of some of the largest airlines in the USA While. This section also elaborates on the methodology to obtain data from an open-access source, TripAdvisor, and process this data to obtain a better insight into the sentiments of the largest airlines.

Word clouds are a visual representation of text processing emphasizing the usage frequency of a particular text. In other words, the most frequently a word is in a text, the larger its size will be in the word cloud. Atenstaedt defines this type of analysis as "a visual representation of word frequency. The more commonly the rem appears within the text being analyzed, the largest the word appears in the image generated" (2012, 1) and highlights the usage of this type of analysis in different fields such as business, politics, and education.

Tripadvisor offers a dataset of the largest airlines in the United States. Tripadvisor gathers this data from reviews of their users and creates a profile of each of the largest airlines in the USA This paper uses a sondage of the American Airlines company; however, it is not indented to be exhaustive; the main purpose of choosing this airline was because of

alphabetical ordering. In addition, the period that was used is not statistically representative. Again, the main purpose of this section is to present the idea of how to perform a word cloud from an open-access source to gain insight into the airlines' travelers.

Tripadvisor provides a profile of American Airlines (AA) including the number of reviews that this airline has from Tripadvisor's users. As of November 30, 2022, AA had 75,624 reviews collected in the Tripadvisor profile. Within this profile, Tripadvisor includes AA's headquarters location as well as the contact information of the airline. In addition, the profile also includes an overview considering some factors impacting the traveler's satisfaction such as legroom, seat comfort, onboard experience, and other factors. Along with this information, Tripadvisor also includes a Reviews section within the profile of AA. In this section, there is a section on Traveler rating and another section including the detailed reviews of the 75,624 participants.

This section suggests using the reviews included in AA profile to complete a word cloud analysis to analyze the attitudes and/or behaviors of customers. This paper uses a sample of customer reviews from November 1 to November 27, 2022. While this is not intended to be an exhaustive analysis, it serves to share the idea and set up the recommendation of using word cloud analysis with this type of data source to analyze travelers' sentiments in the air transportation sector and eventually make a bridge bewteen this concept and the economic impact of travelers spending in a regional economy.

There are some open-access tools to perform word cloud analysis such as word art which was used in this study case. Figure 2 includes the word cloud generated by processing the reviews of Tripadvisor customers. This graph shows the most frequently used words retrieved from the American Airlines customer reviews included in Tripadvisor from November 1 to November 27, 2022. This type of analysis is helpful to get a quick summary of large texts such as the reviews of customers of this airline.

Figure 2. Word cloud of American Airlines reviews, Nov 1- Nov 27, 2022

Source: Author elaboration using Tripadvisor data and WordArt

While further analysis should be conducted to perform sentiment analysis, this type of data visualization helps to provide a first insight into the main concerns that are being shared by AA customers. For example, the words that are emphasized in this analysis are time-related and service related. This first insight could be helpful to airline stakeholders and researchers. Emphasizing that further analysis must be conducted, and this word cloud is for information purposes only to provide an example of how to use word clouds to assess the travelers' sentiments of some of the largest airlines in the USA.

4. Economic impact by industry of international flights departing from Austin, Texas, USA, 2021

This section estimates the impact of international flights departing from Austin, Texas, USA on its economy in terms of output or business sales in 2021 using RIMS II multipliers. The data to complete this study consists of passenger activity data from the Austin-Bergstrom International Airport (ABIA) Aviation Activity Report in 2021. The activity considered to estimate the economic impact analysis was the international enplaned revenue passengers indicated in this report. This report accounted for 116,470 passengers from January 2021 to December 2021. This study created a list of direct

international flights departing from Austin to abroad and calculated an average airfare in USD to gather business sales information from the internationally deplaned passengers from Austin Airport. The calculated business sales, using the calculated international average airfare, from internationally enplaned passengers was $47.9 million USD.

Using RIMS II to estimate the output multiplier, this study estimated an economic impact of $77.2 million USD in total output. These estimates imply an estimated output multiplier of 1.6. For every $100 USD spent in the air passenger industry, $60 additional USD are generated due to indirect and induced effects. When compared to the output multipliers of other major cities/counties in the USA this multiplier is close to the San Francisco, CA multiplier of 1.67 as estimated by the Economic Development Research Group (2019); however, the estimated output multiplier for Austin is lower than the San Diego and Monterey County. ICF (2021) and Coffman Associates (2020) estimated the output multipliers for San Diego, CA and Monterey County, CA in 1.93 and 1.7, respectively.

The RIMS II model allows for breaking down this impact into different industries of the economy or sectors. RIMS II use the same industries as the North American Identification System sectors (NAICS codes). For a comprehensive explanation of the North American Industry Classification System review the U.S. Census Bureau (2022). Treemaps are data visualization tools suitable to visualize nested proportions such as the economic impact by industry of international flights in the Austin economy in 2021 by NAICS sector. In the words of Wilke, a Treemap takes "an enclosing rectangle and subdivides it into smaller rectangles whose areas represent the proportions... we recursively nest rectangles inside each other" (Wilke, 2019). Graph 3 shows the estimated impact of international flights on Austin's economy by industry using a treemap chart.

As noted in Figure 3, the most impacted sector by the estimated sales of travelers flying internationally from Austin airport is the Transportation and warehousing sector with the NAICS Sector 48-49 reaching $50.69 million USD. Sector 53 or the real estate and rental and leasing sector is the second largest industry in business sales or output with $5 million USD. Finance and insurance sector ranks three in the list of most impacted industries by the business sales of air passengers in Austin airport with $3 million USD. The other most impacted in this analysis are Wholesale trade or Sector 42, Food services and drinking places or Sector 72, Health care and social assistance or Sector 62, Retail trade or Sector 44-45, Administrative and support and waste management and remediation services or Sector 56, Information sector or Sector 51, Professional, scientific, and technical services or Sector 54, and other sectors. The other sectors category encompasses these sectors: Other services, Nondurable goods manufacturing, Accommodation, Utilities, Educational services, Construction, Mining, quarrying, and oil and gas extraction, Durable goods manufacturing, Management of companies and enterprises, Arts, entertainment, and recreation, and Agriculture, forestry, fishing, and hunting. This result should be taken with caution as the initial spending consisted of a rough estimate of the traveler spending departing from Austin to international destinations using a specific average price for that destination.

Figure 3. Treemap of economic impact of international flights departing from Austin, TX
Output by industry, 2021

Remark: Numbers are in million 2020 USD
Source: Author's elaboration using RIMS II and ABIA Aviation Activity Report, 2021

4.1. Economic impact, sentiment analysis, revealed preference preliminary nexus

While it is not the primary intent of this paper, this section specifies the steps to suggest a bridge or nexus between sentiment analysis, traveler preferences, and the regional multipliers. Other authors have developed integrated models to explain flight demand through analyzing traveler preferences (Curtale, Larsson and Nassen 2023; PeCoy and Redmond, 2023; Lu and Wu, 2023; Benckendrorff 2006); however, there is still a gap bewteen traveler preference and their effect on regional output multipliers.

The first step of the suggested methodology to integrate sentiment analysis, traveler preferences, and regional output multipliers consists of conducting a text analysis of travelers by county of the airlines flying internationally. The purpose of this study would be to identify the most frequent reasons, if any, to group these and assign an index. Then, the integrated model would need to integrate to the output multiplier by county in the air passenger industry. Geographical Information System (GIS) software could be helpful to harmonize the datasets geographically by county. An initial analysis to find a correlation between frequency of sentiment analysis and multipliers can be conducted through a dispersion plot. Another approach to find any correlation between categorical data and output multiplier by county using Ridge Regression or LASSO.

4.2. Limitations of economic impact analysis and integrated models

Analysis conducted through RIMS II multipliers such as the impact of international flights departing from Austin, Texas, USA, by Industry in 2021 have limitations or drawbacks. The drawbacks of the RIMS II multipliers and their corresponding analysis are bound by the assumptions of the input-output analysis. These assumptions consist of fixed production coefficients, constant return to scale assumptions, and static in nature (Lynch 2000; Rickman and Schwer 1995; Bonn and Harrington 2008). The regional input-output model assumes that every region in the model mirrors the national production function. Lastly, data quality of the initial spending in the original event such as the spending of travelers flying abroad in Austin, TX, USA drives the quality of the results. Integrated models adopt the limitations of the models that these integrated models encompass.

5. Concluding remarks

This paper suggested the use of tree maps to visualize the nested proportion of the economic impact of travelers flying internationally in a regional economy. By using data from the AIBA, this section estimates an economic impact analysis and plots a treemap of these results in terms of output or business sales by industry. The main purpose of this section is to suggest the use of this type of data visualization to provide strategies to airline stakeholders. Policy stakeholders could visualize the estimated economic impact by industry in a quick data visualization by using treemap charts. This data visualization emphasizes the industries that are affected by business sales in international flights in a local economy. By having a quick overview of the most impacted industries in a local economy, stakeholders could make theoretically informed decisions.

Practitioners or stakeholders in the tourism sector should use surveyed data and select in detail the specific data that the clients want to meet or measure for a more realistic analysis (Loomis & Caughlan, 2006). The results of this economic impact analysis should be taken with caution before making any decision based on these results. The input-output analysis is embedded with different assumptions and the calculated business sales of international sales were calculated to provide a visual example of the Treemap and must be revised before making any decisions.

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