

## ECONOMICAL IMPACT OF REGIONAL AIR TRANSPORTATION

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**Abstract.** The influence of air transportation on regional economic development has garnered attention from scholars, policymakers, and industry leaders. This article aims to examine and assess how regional air transportation contributes to economic growth. The article highlights the impact of regional air travel on economic progress through a review of literature, statistical data, and previous studies. The findings indicate that regional air transportation is vital for economic development, improving connectivity, boosting trade and tourism, supporting infrastructure growth, and fostering entrepreneurship. Increased accessibility through regional airports stimulates business, facilitates goods and services movement, and drives productivity. Additionally, regional air networks support development initiatives by creating jobs and aiding local businesses.

**Keywords:** Aviation, economic expansion, regional prosperity, local air travel, community advancement

### 1. INTRODUCTION

Airports are becoming more and more significant as the effects of expanding globalization continue to influence economies. A key component of achieving the economic potential of transportation is air travel and general transportation, the potential of a place [1][3]. However, economic progress is not always a result of transportation infrastructure. It can also go the other way around: a region's economic growth could encourage the provision of more and better transportation. Therefore, although air traffic and economic growth often have a high link, it is unclear exactly how they cause one another [4][6].

According to a hypothesis that emphasizes the supply-side components, airports serve as catalysts for local investment, and the development of transportation infrastructure and accessibility results in economic growth. Demand-side theory, on the other hand, contends that the demands and services for transportation are determined by economic development. There is still much debate about which kind of effects—supply-side or demand-side—are more significant.

The technique of instrumental variables (IV) in panel data was applied in previous airport studies by Brueckner [7] and Green [8] to account for the possible endogeneity of airline traffic. The issue with the IV technique as it is now implemented is that it only finds relevant instruments to explain airport activity, not regional growth. While significant overall effects of aviation on the economy have been established, the extent and orientation of these effects may vary throughout airports. In this research, we examine the capital stock and air service supply of airports as possible factors influencing these variations.

Traditional Granger causality studies use time series data from a single observation, as in the research of Button [6]. However, the application of Granger tests to assess causal links in panel data is growing. Panel Granger tests are much more effective than traditional Granger tests [10], [11]. However, an improper assumption of causal homogeneity may be a common problem in many investigations. In this work, we examine the nature of the link between air traffic as an indicator of transportation infrastructure and regional growth, to address the presence of causation.

We question whether accessibility contributes to or detracts from economic success. We shall examine this causality in-depth since regional policymakers consider this subject to be extremely important. We use the Hurlin and Venet technique [10][11].

Most of the previous research on the economic impact of air travel on regional development has focused on major airports in core areas [6][9]. The idea of peripherality may be used to determine the causal relationship between air traffic and regional performance. This is because distant locations need air links to develop. On the other hand, although core regions necessarily require efficient airlines, a variety of agglomerative forces drives their development, and their success is not inherently reliant on the influence of airports.

The main query in the context of the New Economic Geography is whether lowering the cost of transportation between central and periphery areas permits the outlying areas to take advantage of lower manufacturing costs or if economies of scale are more prevalent [12][13]. According to this idea, there is a negative U-shaped relationship between regional disparities and transportation costs, with decreases in transportation costs first leading to an increase in regional disparity and subsequently a decrease in it. Only when beginning transportation costs are not excessively high may transportation improvements reduce output and pay disparities between the two types of areas [14].

## **2. THE ROLE OF AIR TRANSPORTATION IN REGIONAL GROWTH**

It is widely believed that demand for air travel rises in proportion to a region's population growth and increases in both national and international economic activity [15]. However, access to air travel is also considered one of several requirements for a region to become more competitive and achieve faster growth. In today's globalized world, air travel provides a quick and reliable means of moving people, products, and services between locations. Good airline service is essential for businesses, facilitating in-person interactions with coworkers, vendors, clients, and other partners. As a key component of an efficient transportation system, air travel promotes the global competitiveness of businesses and regions.

In peripheral regions, the competitive and locational advantages may be significantly influenced by airline networks, as air traffic can mitigate the negative effects of long distances. Enhanced accessibility allows firms in these areas to be more productive and competitive compared to those in less accessible regions. Improvements in transportation infrastructure reduce travel times and improve scheduling, creating new locational advantages [16]. Greater accessibility attracts firms and economic activities to a region and stimulates employment growth, even among established businesses [17].

Earlier studies and surveys have shown that access to air transportation significantly affects the locational decisions of businesses [18][20]. High-tech industries, in particular, benefit from proximity to airports due to the importance of face-to-face interactions in their operations [21][22][23].

The debate over whether transportation accessibility drives general economic development or merely enables it persists [23][24]. Improved accessibility allows firms in remote regions to be more productive and competitive. Infrastructure improvements shorten travel times and provide better scheduling, creating locational advantages [25]. This accessibility attracts firms and stimulates regional economic growth [26].

Debbage [23] identified two ways in which aviation accessibility impacts local economies. First, constructing an airport creates local jobs and directly boosts the area's economy, with significant investments influencing related sectors like ground transportation and wholesale trade. Second, the presence of air connectivity alters a region's economic ties to other regions, potentially affecting its competitiveness.

The relationship between regional growth and transportation infrastructure can be categorized as non-spatial and spatial. Non-spatial relationships involve infrastructure spending's overall effects on economic activity, productivity, and competitiveness. In contrast, spatial implications focus on how infrastructure influences economic performance across regions. While much of the research has emphasized the role of airports in urban growth, the interaction between airports and peripheral regions remains underexplored.

Goetz [2] demonstrated a positive correlation between employment and population growth and the volume of air passenger traffic, though it was unclear whether this correlation was stronger before or after increases in passenger numbers. Green [8] identified a causal relationship between airports and economic growth but found the direction of causality ambiguous. However, evidence suggests that passenger activity predicts growth under various conditions.

Brueckner [7] examined the relationship between airline traffic and employment in U.S. metropolitan areas, using instrumental variables to account for potential reverse causality. The findings confirmed that quality airline services play a critical role in urban economic development. Similarly, Button [6] highlighted the influence of high-technology employment in U.S. metropolitan areas, incorporating explanatory variables such as airport presence.

In China, Yao and Yang found that airport development positively correlates with economic growth, industrial structure, population density, and openness, while negatively affecting ground transportation [11]. Using panel data, Button [6] analysed small airports' contributions to economic development in Virginia, concluding that local air travel increases per capita income.

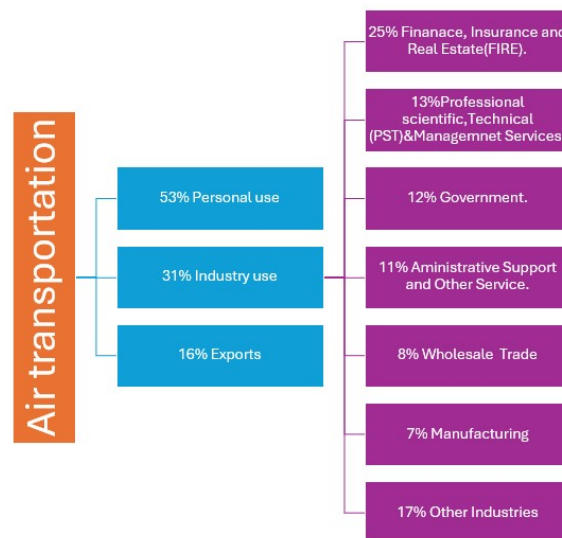


Figure 1 Role of aviation in local economic growth

In addition to lowering manufacturing costs, the region's ease of accessibility draws businesses, investments, and other economic activity while boosting employment and output at already established companies. Previous research and surveys unequivocally show that the availability of air travel has a significant role in influencing where many firms choose to locate. A region's economic potential may be fulfilled more easily when its transportation infrastructure is built.

### 3. RESEARCH METHODOLOGY

This study employs a mixed-methods approach, combining quantitative and qualitative data to assess the economic impact of regional air transportation. The research design includes a comprehensive literature review, statistical analysis, and case studies to provide a holistic understanding of the subject.



**Figure 2** Research methodology

#### a. Data Collection

1. **Literature Review:** A thorough review of existing literature on the economic impact of air transportation was conducted. This included academic journals, industry reports, and previous studies to identify key themes and findings.
2. **Statistical Data:** Quantitative data was collected from various sources, including government databases, airport authorities, and industry reports. This data includes passenger numbers, cargo volumes, economic indicators, and employment statistics.
3. **Case Studies:** Specific regional airports were selected for detailed case studies. These case studies involved collecting data on airport operations, economic contributions, and regional development initiatives.

#### b. Data Analysis

1. **Descriptive Statistics:** Basic statistical techniques, including mean, median, and standard deviation, were used to summarize the data, providing an overview of the trends and patterns in the data.

2. **Correlation Analysis:** To examine the relationship between air transportation and economic growth, correlation analysis was performed. This helped identify the strength and direction of the relationships between variables.
3. **Granger Causality Tests:** Panel Granger causality tests were applied to determine the direction of causality between air traffic and regional economic growth. This method is more effective than traditional Granger tests and helps address the issue of causal homogeneity.
4. **Instrumental Variables (IV) Technique:** The IV technique was used to account for potential endogeneity. This involved identifying relevant instruments that explain airport activity and regional growth.

#### c. Steps

1. **Identify Research Questions:** Define the main research questions and hypotheses based on the literature review.
2. **Select Data Sources:** Choose appropriate data sources for quantitative and qualitative data collection.
3. **Collect Data:** Gather data through literature review, statistical databases, and case studies.
4. **Analyse Data:** Perform descriptive statistics, correlation analysis, Granger causality tests, and IV technique.
5. **Interpret Results:** Interpret the findings in the context of the research questions and existing literature.
6. **Draw Conclusions:** Summarize the key findings and their implications for regional economic development and air transportation policy.

#### d. Ethical Considerations

All data collection and analysis were conducted in accordance with ethical guidelines. Confidentiality and anonymity of data sources were maintained, and all sources were properly cited.

## 4. AIR TRANSPORT SERVICE MANAGERMENTS STRATEGIES TO IMPROVE THE ECONOMIC BENEFITS FOR REMOTE REGIONS

The distribution of resources, value added, and income are all impacted by the aviation sector as well as other manufacturing activities. Additionally, air transportation services act as a stimulus for industrial growth, especially when it comes to the utilization of regionally unique natural and human resources. These catalytic effects may have significant implications for regional balance and economic efficiency. An appropriate balance between service quality, airfare, and subsidies is necessary to offer effective air transportation services. The advantages of the resources invested in air transport services are not completely realized when charges are too high, as this may discourage unwanted travel. Conversely, excessive demand and overspending on the air transportation system might result from too low or too high of a fare and/or service quality. USA and Canada: In distant areas, essential air services. Europe: Public Service Obligation in Remote Air Transport: Introduce and talk about the USA, Canada, and Europe's schemes for subsidized air services. The distant air services air price structure, Fares, and operational costs for aircraft and airports in remote areas are covered. How airport marketing may aid in the development of rural areas are discussed in Section. Section discusses employment and air transportation. In closing, Section 8 offers some management takeaways.

#### 4.1. USA

Concerns have been raised regarding the situation of small towns in the United States following deregulation. One of the most significant tools for supporting small towns has been the Essential Air Service Program (EAS), which provides financial incentives for airlines to operate on designated routes. Airlines submit bids that meet the basic parameters outlined by EAS, and they are selected through a competitive tendering process. These parameters are linked to various operational aspects. [26] notes that "Articles 16, 17, and 18 of Regulation (EEC) No 1008/2008 define a system of public service obligations which can be imposed on carriers operating on designated routes, thereby enabling governments to maintain essential air services." Essentially, this law grants Member States the authority to impose a public service obligation (PSO) on scheduled air services between any airport within the Community and an airport serving a developing or peripheral region.

Using panel data between 1991 and 2002, Santana [27] examined airline prices in PSO and EAS areas, comparing them with prices outside these programs. Her research found that, unlike the U.S. EAS program, the PSO program negatively impacted carriers' economic performance by raising their operating costs. Furthermore, PSO operations led to higher costs compared to similar airlines operating on European commercial routes. The study highlighted the importance of air travel for both nationals and businesses, especially in situations where few or no other options for long-distance transportation are available. The significance of air travel becomes especially evident when the system is temporarily disrupted—such as during labor strikes or natural disasters—demonstrating its crucial role for a nation's citizens and industry. In cases where alternative transportation is limited due to distance or other factors, the importance of air travel is amplified, particularly when the air transportation system experiences inefficiencies, such as strikes or disasters.

#### 4.2 IMPACT MECHANISM AND CASUAL RELATIONSHIP OF AIR TRANSPORT AND GROWTH

The fact that it might be challenging to identify causal relationships between aviation and the economy is one of the primary causes. On the one side, the aviation sector moves people and goods around the world, opening doors to markets, jobs, labor, resources, and expertise. and technology, which may stimulate economic expansion. However, prosperity in the economy increases demand for air travel, both for passengers and cargo. Air travel may therefore be considered both a "cause" and an "effect" of economic success. Theoretically and practically, causal analysis is extremely important. References to governments, airports, airlines, logistical firms, transportation planners, and other interested parties and policymakers may be found there. There are surprisingly few studies that have looked at bi-directional causation, despite the obvious potential for it. Numerous research in the subject only looks at one way or the other separately [28]. The prevalence of market distortion is a significant issue that obstructs our comprehension of aviation's causal relationship. For instance, significant rents are passing through to labor and airlines because of inefficiencies in the slot allocation process, distorting the regular routes via which economic activity is transferred. Economic activity and jobs are directly and significantly generated by the aviation sector. The effects of enterprises like terminal commerce, lodging, and vehicle rental services that are connected to flights. Airport income comes from two main sources: commercial income from other airport operations (which contributes to the indirect effects of air travel) and aeronautical income from airlines and passenger fees (which correspond to the direct consequences of air transport). Airports are becoming more and more dependent on their

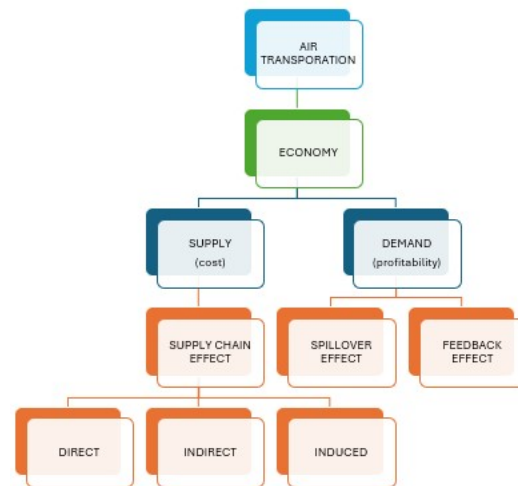
commercial earnings, with an average of 45% of all airport revenue coming from commercial operations in 2014, according to the Airports Council International (ACI) economics report [30]. Terminal retailing is the most important commercial source out of all of them (see, for example, [31]). Apart from research on the public sector, there has been significant scholarly curiosity in using econometric techniques to measure the effects of air travel on other sectors. The local One of the main economic indicators that these studies focus on is employment. This contains studies that examined employment trends in an area as well as those that further investigated employment in particular businesses or sectors. Previous research, for instance, examined the econometric relationships between, among other things, (i) the accessibility of air travel and the growth of employment in metropolitan areas [32]; (ii) the presence of a hub airport and the growth of employment in high technology [9]; and (iii) the existence of direct access to international air services and employment in the new economy [34]. Regarding determinants of the spillover effects, passenger and cargo activities attracted the most attention. Many studies established strong associations between passenger movement and regional economic indicators. Brueckner [35] finds that a 10% increase in passenger enplanement is associated with a 1% increase in employment in service-related industries and no effect on manufacturing-related employment. Although most of the research mentioned above concentrates on the actual passenger volume, [8] uses the planned passenger capacity to investigate the impact of airport size and discovers that the intended passenger volume does not result in an overall rise in local employment.

The challenge of identifying causal relationships between aviation and the economy remains a significant issue. On one hand, the aviation sector moves people and goods globally, opening doors to markets, jobs, labor, resources, and expertise, which may stimulate economic expansion. However, prosperity in the economy increases demand for air travel, both for passengers and cargo. Air travel, therefore, can be considered both a "cause" and an "effect" of economic success. Causal analysis is crucial, both theoretically and practically, as it provides insights for governments, airports, airlines, logistics firms, transportation planners, and policymakers. Despite the clear potential for bi-directional causation, surprisingly few studies have investigated this aspect, with most focusing solely on one direction. Market distortions, such as inefficiencies in the slot allocation process, hinder the understanding of aviation's causal relationship with the economy. For instance, significant rents pass through to labor and airlines, distorting the normal economic channels.

Economic activity and jobs are directly and significantly generated by the aviation sector. Enterprises such as terminal commerce, lodging, and vehicle rental services are all connected to air travel. Airport income is derived from two primary sources: commercial income from other airport operations, which contributes to the indirect effects of air travel, and aeronautical income from airlines and passenger fees, which correspond to the direct impacts of air transport. Airports are increasingly reliant on their commercial earnings, with 45% of all airport revenue coming from commercial operations in 2014, according to the Airports Council International (ACI) Economics Report. Terminal retailing, for example, is the most important source of commercial income.

In addition to research on the public sector, significant scholarly interest exists in using econometric techniques to measure the effects of air travel on other sectors, especially regarding employment trends in metropolitan areas. For example, studies have investigated the relationship between air travel accessibility and employment growth in metropolitan areas [3], the presence of a hub airport and the growth of high-tech employment [4], and the impact of direct access to international air services on employment in the new economy [5]. In terms

of spillover effects, passenger and cargo activities have attracted significant attention. Many studies have shown strong associations between passenger movement and regional economic indicators. Brueckner [7] found that a 10% increase in passenger enplanement is associated with a 1% increase in employment in service-related industries, with no effect on manufacturing-related employment. Most of the research on this topic focuses on actual passenger volume; however, Sheard [37] used planned passenger capacity to explore the impact of airport size and found that the intended passenger volume did not lead to a general increase in local employment.



**Figure 3** Air transportation and economics growth impact

The benefits of a new airport for economic development refer to the positive impacts that the establishment of an airport can have on the surrounding region's economy. These benefits typically include:

The construction and operation of a new airport creates direct employment opportunities in airport management, security, customer service, logistics, and related industries like retail and hospitality.

A new airport improves transportation links, making it easier for businesses to access global markets and for people to travel for work, leisure, and tourism.

Airports stimulate local economic development by attracting investments, encouraging business expansion, and supporting industries such as tourism, trade, and manufacturing.

## 5. CONCLUSION

In some geographic locations, regional aviation is essential for promoting economic development. First and foremost, regional airports promote trade and commerce by improving connectivity, which makes it easier for people to transport both people and commodities. Effective aviation networks facilitate enterprises' access to larger markets, investor attraction, and supply chain establishment—all of which support economic growth. Furthermore, easier access to local attractions promotes travel, which raises the amount of money generated from tourist expenditures. The increase in visitors not only helps the accommodation industry but also opens doors for nearby establishments, such as eateries and gift stores, strengthening the local economy.

Secondly, regional air transport serves as an engine for job creation and skill development. The presence of airports and associated aviation services generates employment opportunities



across various sectors, including aviation, hospitality, transportation, and retail. Furthermore, the demand for skilled labor in fields such as aviation maintenance, air traffic control, and airport management fosters workforce development and training programs, leading to the acquisition of specialized skills within the region. These employment opportunities not only provide individuals with steady incomes but also contribute to poverty reduction and social mobility, thereby promoting inclusive economic growth.

## References

- [1] Debbage, C. and Delk, D. (2001) *The influence of aviation on regional economic development*. Journal of Economic Geography, 7(1), pp. 39–58.
- [2] Goetz, A. (1992) *Air transportation and regional economic development*. Transportation Research Part A: Policy and Practice, 26(3), pp. 217–233.
- [3] Alkaabi, K. and Debbage, K. (2007) *The economic impacts of airports on regional economies*. Transportation Research Part D: Transport and Environment, 12(3), pp. 177–183.
- [4] Ndoh, N. and Caves, R. (1995) *Transportation infrastructure and regional economic development: An evaluation of causal relationships*. Transportation Research Part A: Policy and Practice, 29(5), pp. 357–372.
- [5] Green, R.K. (2002) *Airports and economic development*. Real Estate Economics, 30(1), pp. 91–112.
- [6] Button, K., Lall, S., Stough, R. and Trice, M. (2009) *High-technology employment and hub airports*. Journal of Economic Geography, 9(2), pp. 193–214.
- [7] Brueckner, J.K. (2003) *Airline traffic and urban economic development*. Urban Studies, 40(8), pp. 1455–1469.
- [8] Green, R.K. (2007) *Airports and growth: Econometric evidence*. Journal of Regional Science, 47(5), pp. 875–905.
- [9] Button, K., Stough, R. and Trice, M. (1999) *Regional economic development and the role of airports*. Transportation Research Part E: Logistics and Transportation Review, 35(4), pp. 225–238.
- [10] Hurlin, C. and Venet, B. (2001) *Granger causality tests in panel data models*. Economics Letters, 77(3), pp. 265–275.
- [11] Hurlin, C. and Venet, B. (2005) *Causal homogeneity in panel data: An application to air traffic and regional growth*. Applied Economics, 37(12), pp. 1351–1361.
- [12] Krugman, P. (1991) *Geography and Trade*. Cambridge, MA: MIT Press.
- [13] Martin, P. and Rogers, C. (1995) *Industrial location and public infrastructure*. Journal of International Economics, 39(3), pp. 335–351.
- [14] Venables, A.J. and Gasiorek, M. (1998) *The impact of transport improvements on regional disparities*. Regional Studies, 32(4), pp. 303–312.
- [15] K. Button, R. Stough, and M. Trice, "High-technology employment and hub airports," Journal of Economic Geography, vol. 9, no. 2, pp. 193–214, 2009.
- [16] J. K. Brueckner, "Airline traffic and urban economic development," Urban Studies, vol. 40, no. 8, pp. 1455–1469, 2003.
- [17] P. Ivy, D. Debbage, and Ministry of Transport and Communication Finland, "Locational decision-making and air accessibility," 1995.
- [18] D. Debbage, "Aviation and regional economic competitiveness," 1999.
- [19] D. Delk and C. Debbage, "The accessibility of aviation in regional economies," 2001.
- [20] K. Button and S. Taylor, "High-technology industries and air accessibility," 2000.
- [21] A. Markusen, P. Hall, and A. Glasmeier, "Airport economies: Infrastructure and innovation," 1986.
- [22] M. Hovanec, V. Tymofiiv, J. Horkay, S. Al-Rabeei. Comparison of Airport Operations Before, During and After the COVID-19 Period in Slovakia. TEM Journal, 12(4), pp.2166–2176. (2023). <https://doi.org/10.18421/TEM12-27>

- [23] D. Debbage and D. Delk, "Airline networks and regional disparities," 2001.
- [24] Korba, P., Jenčová, E., Al-Rabeei, S., Koščáková, M., Sekelová, I. (2024). Analysis of Serious Challenges Faced by the Aviation Industry. In: Perakovic, D., Knapcikova, L. (eds) Future Access Enablers for Ubiquitous and Intelligent Infrastructures. FABULOUS 2023. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, vol 542. Springer, Cham. [https://doi.org/10.1007/978-3-031-50051-0\\_3](https://doi.org/10.1007/978-3-031-50051-0_3)
- [25] Y. Yao and Z. Yang, "Airport development and regional economic impacts in China," 2008.
- [26] R. Williams, "Articles 16, 17, and 18 of Regulation (EEC) No 1008/2008 define a system of public service obligations," *European Air Transport Policy Journal*, 2010.
- [27] M. Santana, "Airline prices in PSO and EAS areas: A comparison," *Journal of Transport Economics*, vol. 45, no. 4, pp. 529–548, 2009.
- [28] J. Hura, S. Al-Rabeei, P. Korba, M. Hovanec, P. Šváb. Possible Methods of Valuing Startups. In: Knapčíková, L., Peraković, D. (eds) 6th EAI International Conference on Management of Manufacturing Systems. EAI/Springer Innovations in Communication and Computing. Springer, Cham. (2023). [https://doi.org/10.1007/978-3-030-96314-9\\_18](https://doi.org/10.1007/978-3-030-96314-9_18)
- [29] M. Hovanec, P. Korba, S. Al-Rabeei, M. Vencel, B. Racek. Digital Ergonomics—The Reliability of the Human Factor and Its Impact on the Maintenance of Aircraft Brakes and Wheels. *Machines* 2024, 12, 203. (2024). <https://doi.org/10.3390/machines12030203>
- [30] Airports Council International (ACI), "ACI economics report 2016," *Airports Council International*, 2016.
- [31] M. Starkie, "The economic effects of air transport: An overview," *Journal of Transport Economics and Policy*, vol. 36, no. 4, pp. 283–300, 2002.
- [32] R. Irwin and D. Kasarda, "The relationship between air travel and metropolitan employment growth," *Journal of Economic Geography*, vol. 19, no. 2, pp. 175–190, 1991.
- [33] K. Button, R. Stough, and M. Trice, "High-technology employment and hub airports," *Journal of Economic Geography*, vol. 9, no. 2, pp. 193–214, 1999.
- [34] K. Button and S. Taylor, "International air transportation and economic development," *Transport Economics Review*, vol. 34, no. 1, pp. 1–25, 2000.
- [35] J. K. Brueckner, "Airline traffic and urban economic development," *Urban Studies*, vol. 40, no. 8, pp. 1455–1469, 2003.
- [36] C. Sheard, "The impact of airport size on local employment," *Transportation Research Part E: Logistics and Transportation Review*, vol. 72, pp. 116–130, 2014.

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