

## Research Article

# Robustness Analysis of the Regional and Interregional Components of the Weighted World Air Transportation Network

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The robustness of a system indicates its ability to withstand disturbances while maintaining its properties, performance, and efficiency. There are plenty of studies on the robustness of air transport networks in the literature. However, few works consider its mesoscopic organization. Building on the recently introduced component structure, we explore the impact of targeted attacks on the weighted world air transportation network on its components. Indeed, it contains five local components covering different regions (North America-Caribbean, Europe-Russia, East and Southeast Asia-Oceania, Africa-Middle East-Southern Asia, and South America) and one global component linking these regions. We investigate targeted attacks based on influential weighted centrality measures (strength, betweenness, and PageRank). Results show that the local components gradually separate from the world air transportation network as the fraction of removed airports grows. The weighted betweenness attack removes fewer top airports to isolate the regions compared to its alternatives. Furthermore, it is still convenient to travel locally in the separate areas. In contrast, strength and PageRank attacks need to target more airports to split the network. However, they are more disruptive. Indeed, the size of the isolated local components reduces drastically, so it becomes more challenging to travel locally. Looking at the world air transportation network through its component structure reveals a new viewpoint on its resilience. It opens new perspectives to design more efficient attacks.

## 1. Introduction

The air transportation network is essential for the development and integration of countries. Indeed, millions of people and tons of frets from different world regions pass through the air. Ensuring secure and effective air transport infrastructure and traffic is a vital issue. The complex network paradigm allows for a better understanding of an extensive range of complex in-interconnected systems such as infrastructure, economics, and social networks [1]. Considering the air transportation networks where nodes represent airports and links are flights between two airports, network robustness is a popular tool to study the response to possible disruptions. Disruptions can be accidents or intentional attacks on airports or flights. Numerous

investigations on the robustness of air transport networks (worldwide, regional, and national airlines) have been conducted [2–7]. In the following paragraph, we concentrate on targeted attacks based on centrality measures. It consists in ranking the airports according to a given centrality measure and removing the nodes in the descending order of their centrality value. The following paragraph summarizes some important related works.

In [8], the authors explore the robustness of the global air transportation network. They investigate five centrality measures (degree, betweenness, modal analysis, damage, and Bonacich power). They measure the effectiveness of the attacks using the size of the largest connected component (LOC). Indeed, the attacks split the network into multiple components. Results show that damage is most effective

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*Understanding and Interpreting Economic Structure* Geoffrey J.D. Hewings,Michael Sonis,Moss Madden,Yoshio  
Kimura,2013-06-29 In 1976 volume 116 of the Lecture Notes in Economics and Mathematical Systems appeared in the  
library of the University of Illinois The title of the book Input Output Analysis and the Structure of Income Distribution was  
sufficiently intriguing to one of the present editors Hewings to command attention Some years later during the First World  
Congress of the Regional Science Association in Cambridge Massachusetts in 1980 Madden and Batey presented some of  
their work using their now familiar demographic economic modeling system Discussion ensued about the relationship  
between this system Miyazawa s formulation and the social accounting matrices most closely associated with the work of  
Stone During a year s residence at the University of Illinois Batey was able to produce a valuable typology of multipliers that  
began the process of integrating these several modeling systems into a coherent package Thereafter a number of regional  
scientists have exploited the ideas and insights proposed by Miyazawa especially the notion of the interrelational income  
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Olsen,1977    **Labor Literature** United States. Department of Labor. Library,1977    RIMS II Joseph V.  
Cartwright,Richard M. Beemiller,Richard D. Gustely,1981    Regional Input-output Model for Small Scale Industries  
Kaushal Kumar Saxena,1987    **Creating Jobs Through Energy Policy** United States. Department of Energy. Advanced  
Energy Systems Policy Division,1979    Labor Literature ,1977    **Monthly Labor Review** ,1976-06 Publishes in depth  
articles on labor subjects current labor statistics information about current labor contracts and book reviews    **Regional**  
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and the University of Illinois at Urbana Champaign has been a significant source of intellectual inspiration for many students  
visiting colleagues and members of the participating institutions for the past decade The idea for REAL was hatched by Philip  
Israilevich and Geoffrey Hewings in typical Chicago style in the back room of a local bar In early December 1997 their

collaboration came to an untimely end when Philip died after a three year battle with cancer The challenge of moving across a spectrum from theory to model development to implementation and interpretation provided the underlying motivation for REAL s formation together with an equally important component namely the translation of many of these efforts into a form that could be understood and implemented by policy makers For Philip REAL and the Regional Science Association International provided the forums for his intellectual endeavors although he also contributed many papers in banking In recognition of his contributions and to provide a sense of the current research in the fields in which he published many of the authors of these chapters assembled in Chicago in November 1998 to participate in a small seminar in his honor Several others who were not able to come nevertheless contributed chapters to this volume Subsequently all of the papers have been revised and updated

**A selected annotated bibliography** ,1975      *Economic Research Studies of the Economic Development Administration* United States. Economic Development Administration,1974

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