# Air transport subsidies in regional development: A systematic review and meta-regression analysis

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Transport Knowledge Conference 2019

# Background Information and Research Purposes

**Background:**

- Air transport is important to facilitate the economic growth (including tourism) in smaller regions.
- Air connectivity plays an important social role in providing access to essential services (e.g. healthcare).
- NZ Airports Association report (2017) called on the New Zealand government to allocate dedicated funding to isolated airports.
- The knowledge of subsidy's impacts on regional development and wellbeing is still lacking.

**Research purposes:**

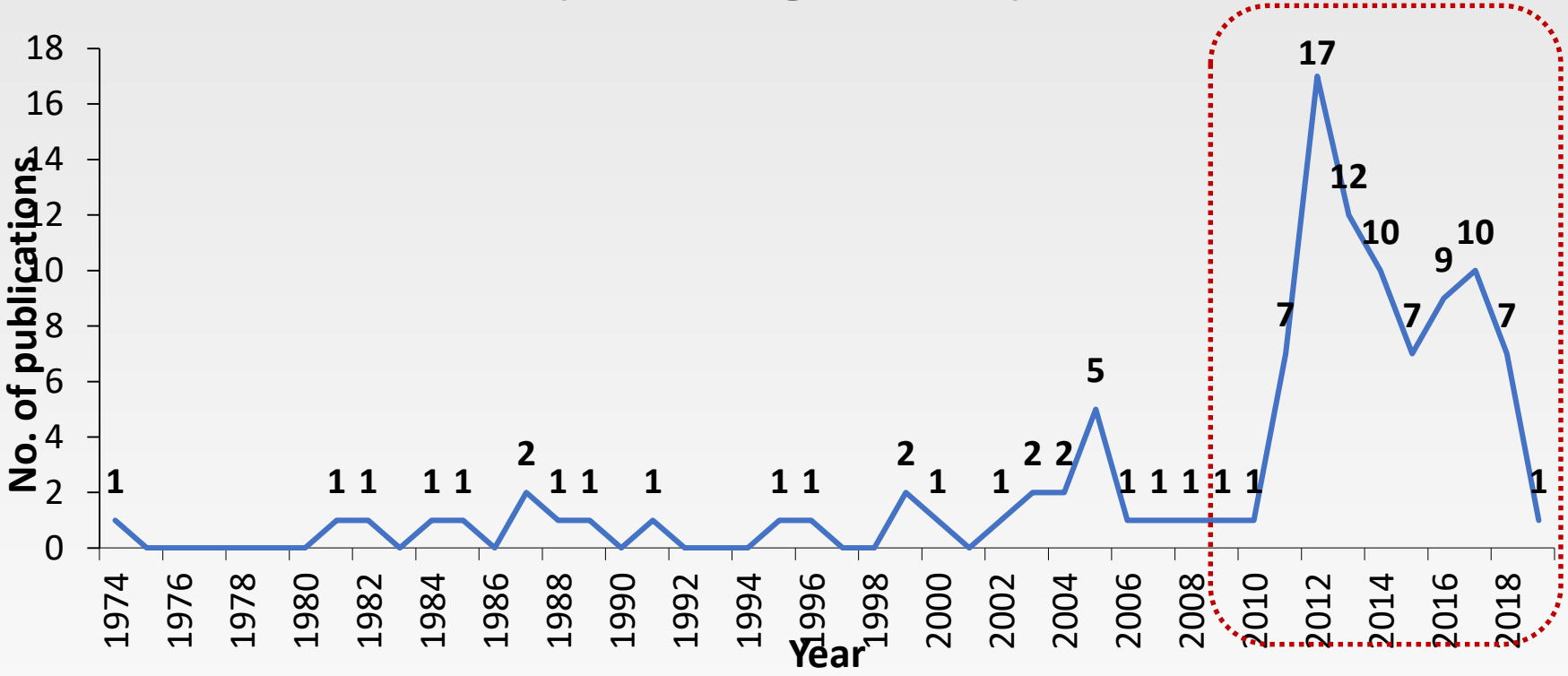
- Systematically review aviation subsidies relevant to regional development and wellbeing in previous studies
- Identify the benefits and impacts of aviation subsidies on regional air transport activity and wellbeing (economic, societal and environmental)
- Synthesize results of aviation subsidies impact on regional wellbeing

**Research method:**

- Three database (Google Scholar, Web of Science, and Scopus ) + supplementary searching (Google.com)
- English literature only, 1974–August 2019.

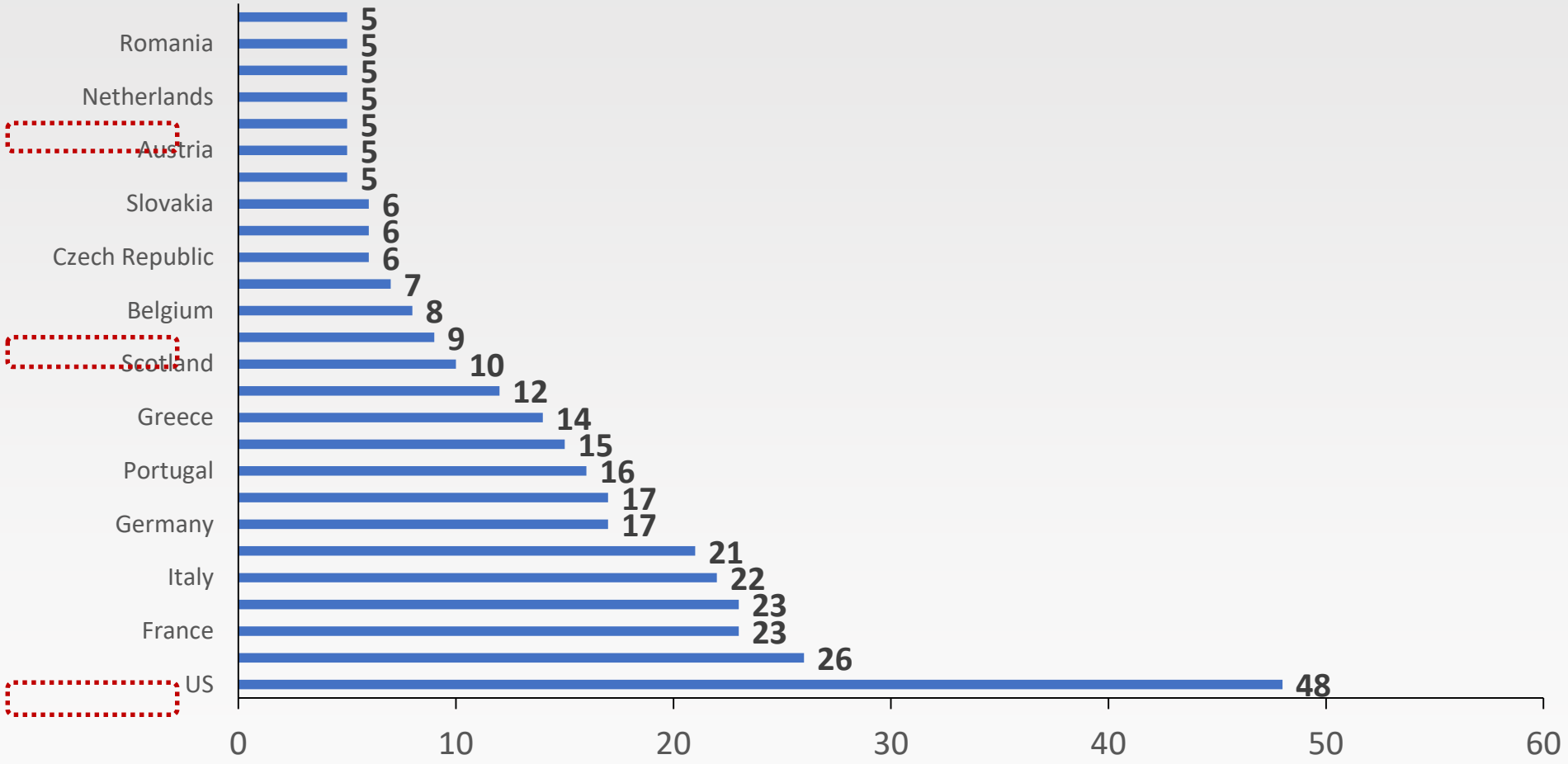
**Overall, 110 publications were included, with 86 journal articles, 21 reports, and 3 book chapters.**

# Number of Publication of Regional Aviation Subsidies (1974–August 2019)

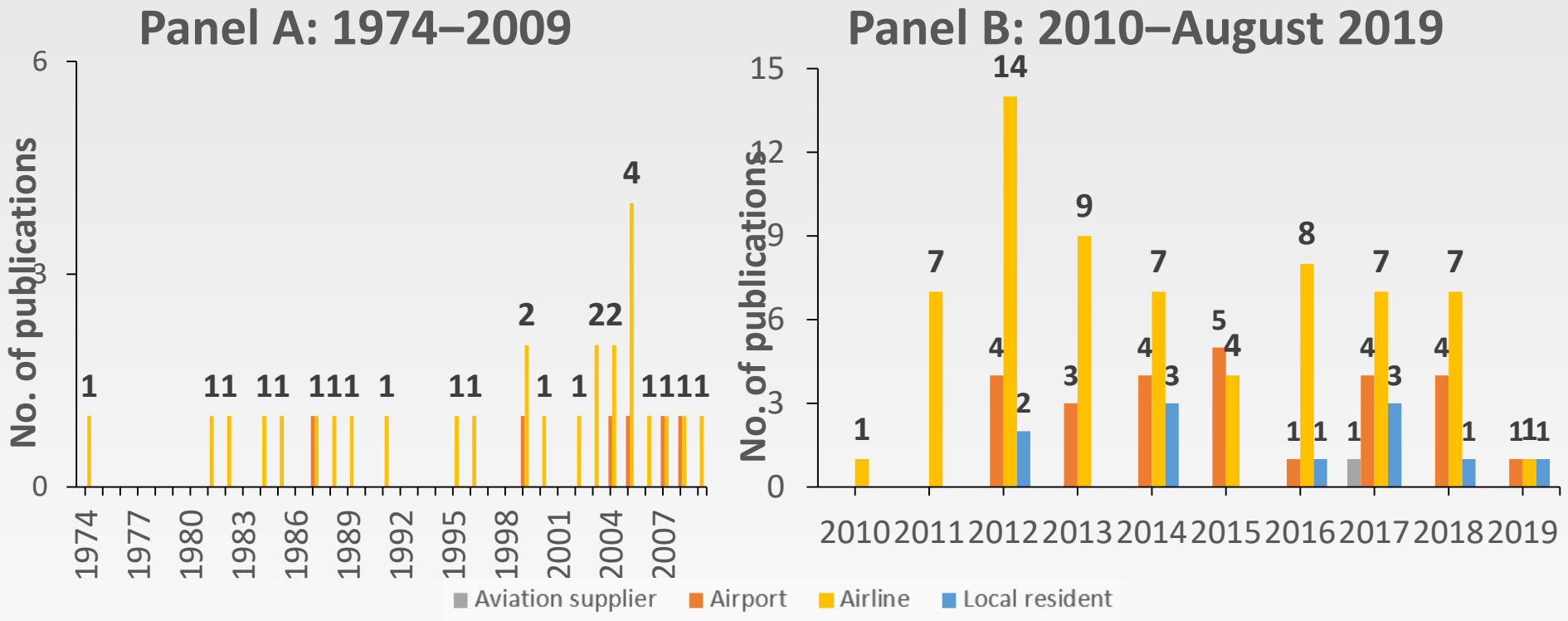



| | Before 2010 | After 2010 |
|---|---|---|
| **No. of publications** | 29 | 81 |

# Countries Studied in Publications (publications >=5)

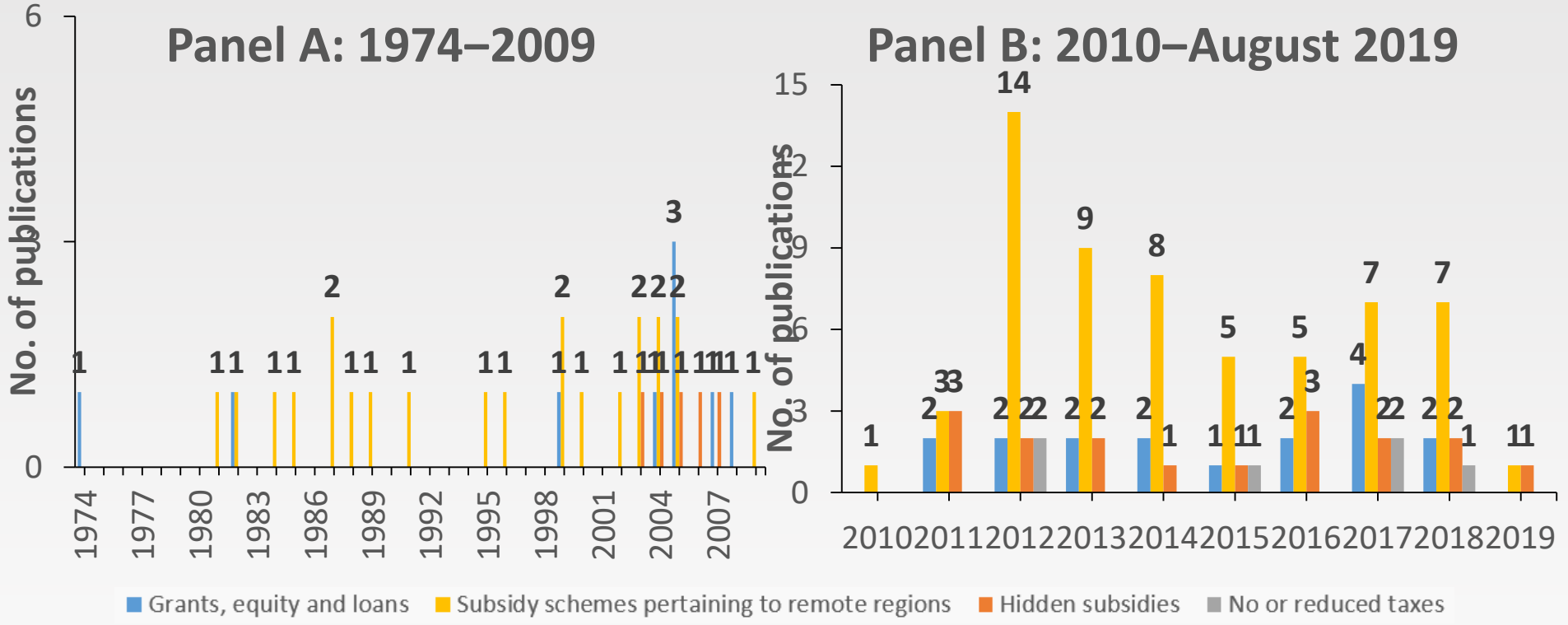


# Trends Showing Aviation Subsidies Beneficiaries



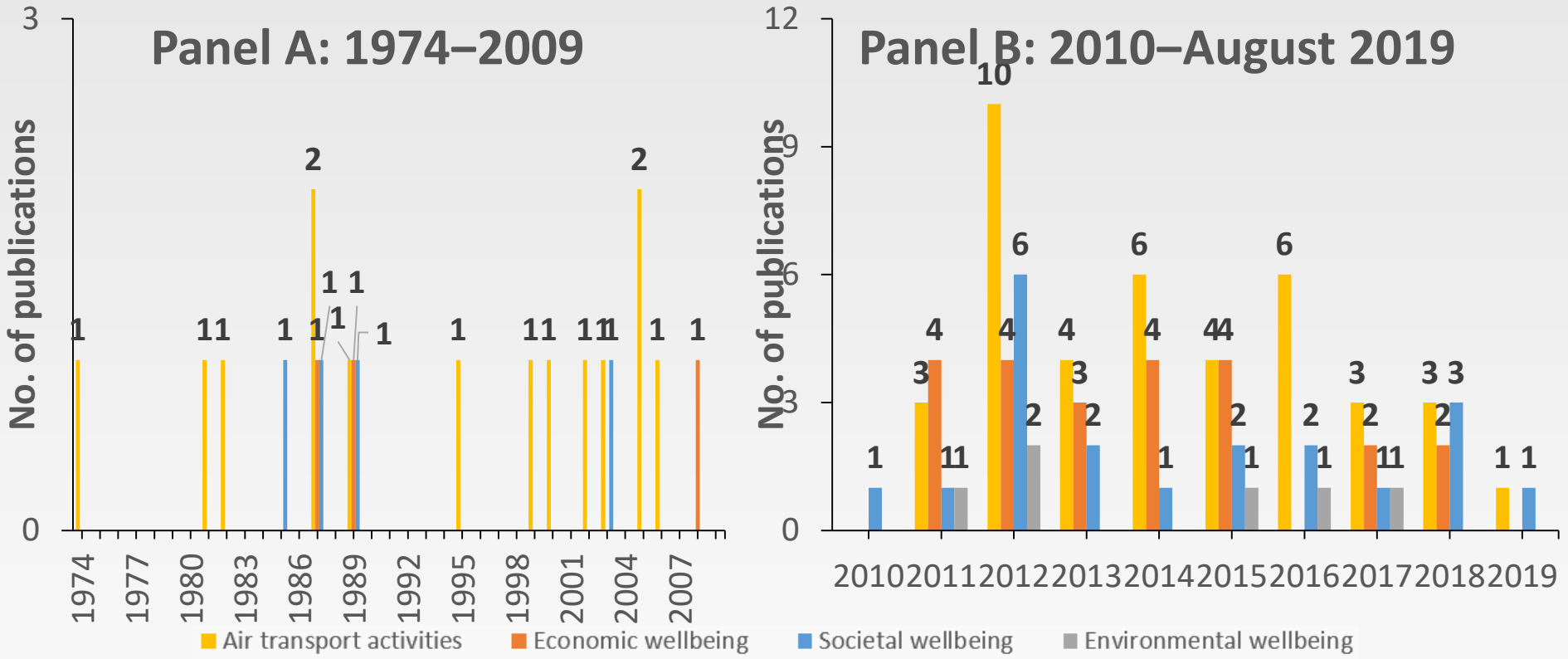

| | Aviation supplier | Airport | Airline | Local resident |
|---|---|---|---|---|
| **No. of publications** | 1 | 32 | 92 | 12 |

# Trends Showing Aviation Subsidies Types




| | Grants, equity and loans | Subsidy schemes pertaining to remote regions | Hidden subsidies | No or reduced taxes |
|---|---|---|---|---|
| **No. of publications** | 26 | 82 | 22 | 6 |

# Trends Showing Aviation Subsidies Impacts

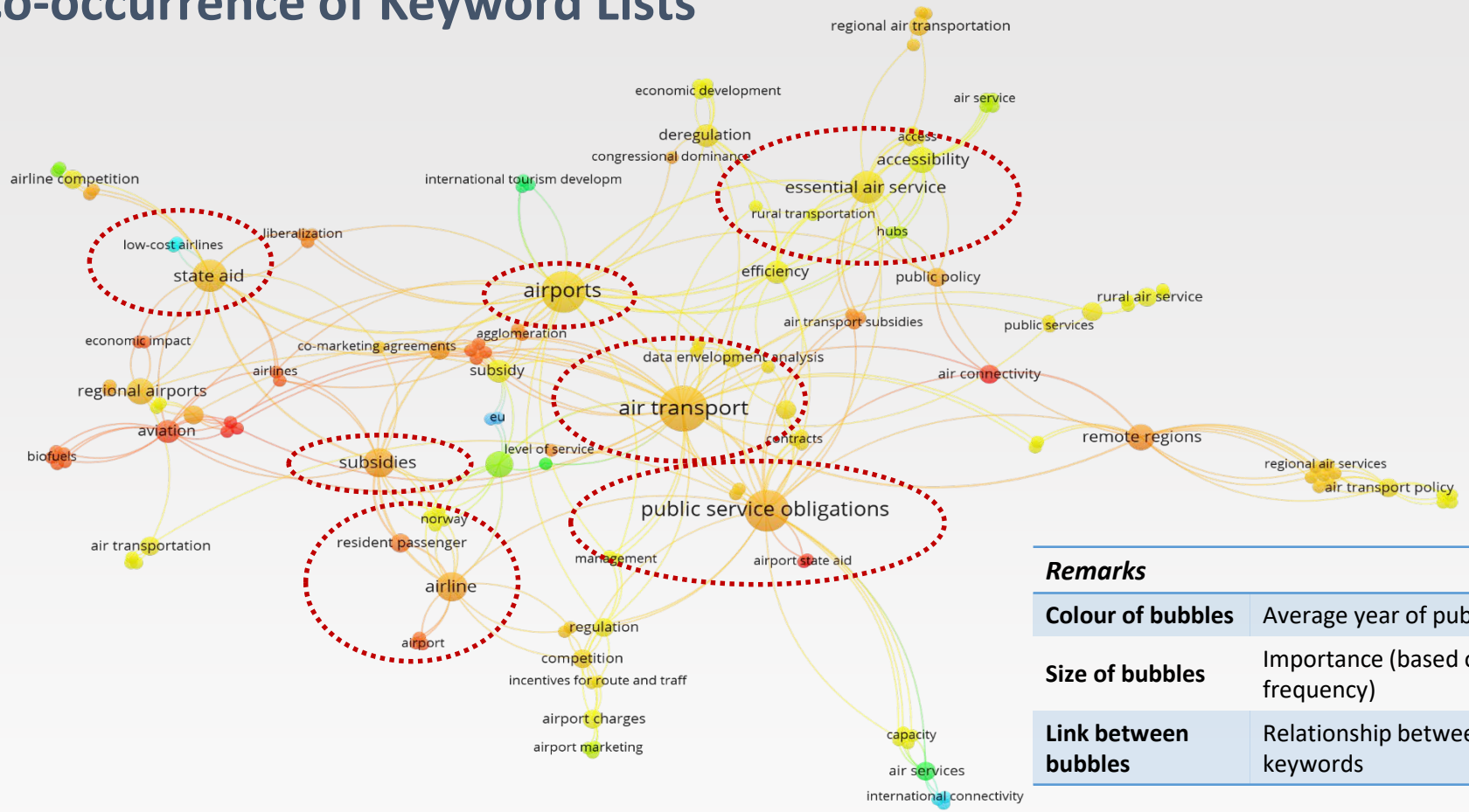



| | Air transport activities | Economic wellbeing | Societal wellbeing | Environmental wellbeing |
|---|---|---|---|---|
| **No. of publications** | 54 | 26 | 24 | 6 |

# Findings of Descriptive Analysis

- Aviation subsidies research has attracted increasing attention since 2011
- Most attention given to the USA and EU countries, while countries from other continents have rarely received attention
- Most studies were concerned with subsidies to airlines (routes), whereas less attention has been paid to airports and local residents
- Subsidies schemes pertaining to remote regions had by far receiving the dominant attention, while grants, equity and loans along with no or reduced tax have attached increasing attention since 2011
- 49% of publications regarding aviation subsidies' impact on societal wellbeing, followed by economic wellbeing (24%), and societal wellbeing (22%), and environmental wellbeing were considerably less studied

# Co-occurrence of Keyword Lists

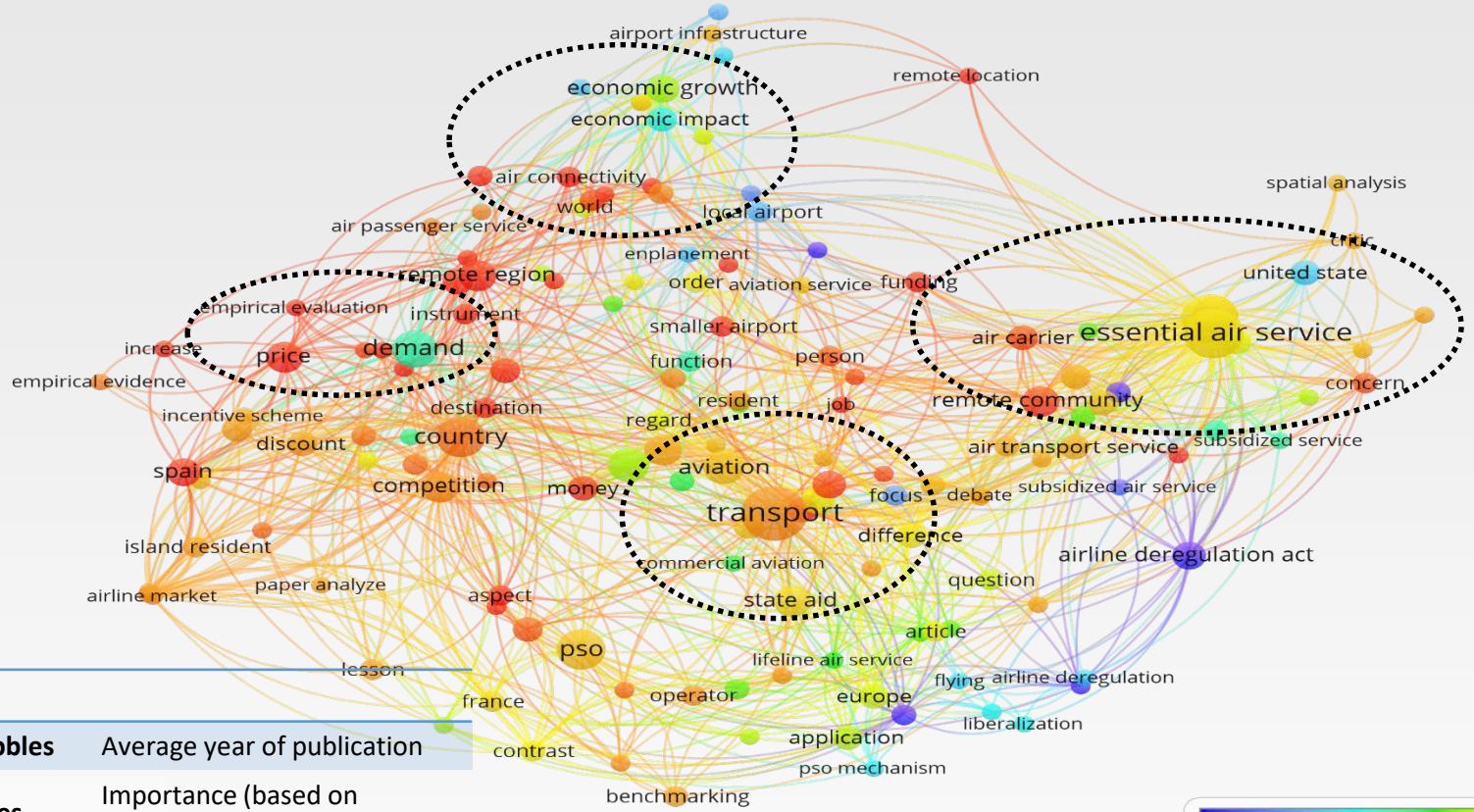



| *Remarks* | |
|---|---|
| **Colour of bubbles** | Average year of publication |
| **Size of bubbles** | Importance (based on frequency) |
| **Link between bubbles** | Relationship between keywords |

VOSviewer

2000 2005 2010 2015

# Co-occurrence of Common Words in Title and Abstract




| *Remarks* | |
|---|---|
| **Colour of bubbles** | Average year of publication |
| **Size of bubbles** | Importance (based on frequency) |
| **Link between bubbles** | Relationship between keywords |

# Word Cloud Showing Top 100 Frequently Used Words

# Aviation Subsidies Impact Categories & Indicators

| Impact categories | Indicators | % of publications with indicators | Number of publications |
|---|---|---|---|
| **Air transport activities** | | **49.09%** | **54** |
| | Air accessibility | 40.91% | 45 |
| | Flight frequency | 10.00% | 11 |
| | Flight movements or traffic | 4.55% | 5 |
| | Seat capacity | 4.55% | 5 |
| | Number of passengers | 10.91% | 12 |
| **Economic wellbeing** | | **23.64%** | **26** |
| | Employment growth | 7.27% | 8 |
| | GDP/GRP | 2.73% | 3 |
| | Gross Value Added (GVA) | 0.91% | 1 |
| | Local business | 5.45% | 6 |
| | Per capita income | 0.91% | 1 |
| | Population | 2.73% | 3 |
| | Real aggregate taxable income | 1.82% | 2 |
| | Tourism | 10.00% | 11 |
| | Cargo | 3.64% | 4 |
| **Societal wellbeing** | | **21.82%** | **24** |
| | Airfare | 16.36% | 18 |
| | Education | 5.45% | 6 |
| | Medical treatment | 6.36% | 7 |
| | Social cohesion | 3.64% | 4 |
| | Work-related mobility | 0.91% | 1 |
| **Environmental wellbeing** | | **5.45%** | **6** |
| | Carbon emission | 5.45% | 6 |

# Findings of Content Analysis

## Co-occurrence of Keyword List and Common Words in Abstract and Title

- The most frequently used keywords appear to be subsidies, subsidy programs, and air service providers
- Increasing attention to look at the aspects of regions and remote regions
- A distinct lack of knowledge regarding aviation subsidies' impacts

## Word Cloud

- Results are similar to co-occurrence maps
- Few keywords show the effect of aviation subsidies on regional air transport activity, economic and societal wellbeing (e.g. connects, economics, fare, pricing, and airline seats)

## Impact Categories and Indicators

- 20 indicators of aviation subsidies' impacts on regional development were identified.
- The most important indicator is air accessibility, followed by airfare, number of passengers, tourism, and flight frequency

# Meta-regression Estimation (Probit)

| | Air transport activity | Economic wellbeing | Societal wellbeing | Environmental wellbeing |
|---|---|---|---|---|
| ***Subsidy types*** | | | | |
| Grants, equity and loans | 1.142 (0.698) | 1.305 (0.854) | N/A | -0.734 (0.925) |
| Subsidy schemes pertaining to remote regions | 1.043 (0.722) | **1.701*** (0.992) | -1.086 (0.969) | **-2.094**** (0.835) |
| Hidden subsidies | 1.223 (0.835) | **2.745**** (1.149) | N/A | -1.341 (1.022) |
| | | | | |
| ***Subsidy beneficiaries*** | | | | |
| Airport | **6.341***** (0.521) | -0.982 (0.798) | **2.543***** (1.084) | N/A |
| Airline | **6.459***** (0.481) | **-1.892**** (0.782) | **3.203**** (1.024) | -0.817 (0.915) |
| Resident | **5.894***** (0.656) | N/A | **4.242***** (1.126) | N/A |

# Findings of Meta-regression Analysis

- Subsidy schemes and hidden subsidies are more likely to contribute to regional economic wellbeing
- Studies focusing on subsidy schemes pertaining to remote regions tend to less address environmental wellbeing
- Subsidies to airport, airline, and resident are more likely to find aviation subsidies impact on regional air transport activity and societal wellbeing
- Economic wellbeing is less addressed when study looking at subsidies to airline

# Possible future research directions

1. Extend identified indicators and develop more of air transport, economy, social wellbeing, and environmental wellbeing to measure aviation subsidies' impact

- Extend knowledge of indicators such as regional tourism (e.g. New Zealand and Taiwan)
- Develop more indicators such as unemployment rate, trade, etc.

2. More research studying aviation subsidies impact on economic, societal and environmental wellbeing is needed

- More empirical research studying airport and airline subsidies' impact on regional economic and societal wellbeing is needed
- More research studying subsidies to resident and reduced tax is needed
- Environmental wellbeing should be received more attention from academia and professional practitioner
- Employ surveys or interviews (e.g. stakeholders like tourism and airport authorities, airlines; government, regional councils; general public) to collect data for analysis (e.g. aviation subsidy data does not always available)

3. Explore the impact of regional aviation subsidies in countries outside the EU and US (e.g. China)

# Thanks for your attention!