Airline Network Structures

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Lecture Outline

- **Evolution of Airline Network Strategies**
  - From point-to-point to hub/spoke to global hub-to-hub
- **Hub Economics and Network Structure**
  - Hub/spoke vs. point-to-point
  - Basic airline hub economics
  - Revenue power and load consolidation
  - Operational advantages and incremental costs
- **Hub Network Impacts on Route Planning**
  - Incremental revenue logic for new routes
  - Hub growth by adding cities
- **Recent Trends: Hub Strengthening**

Evolving Network Strategies

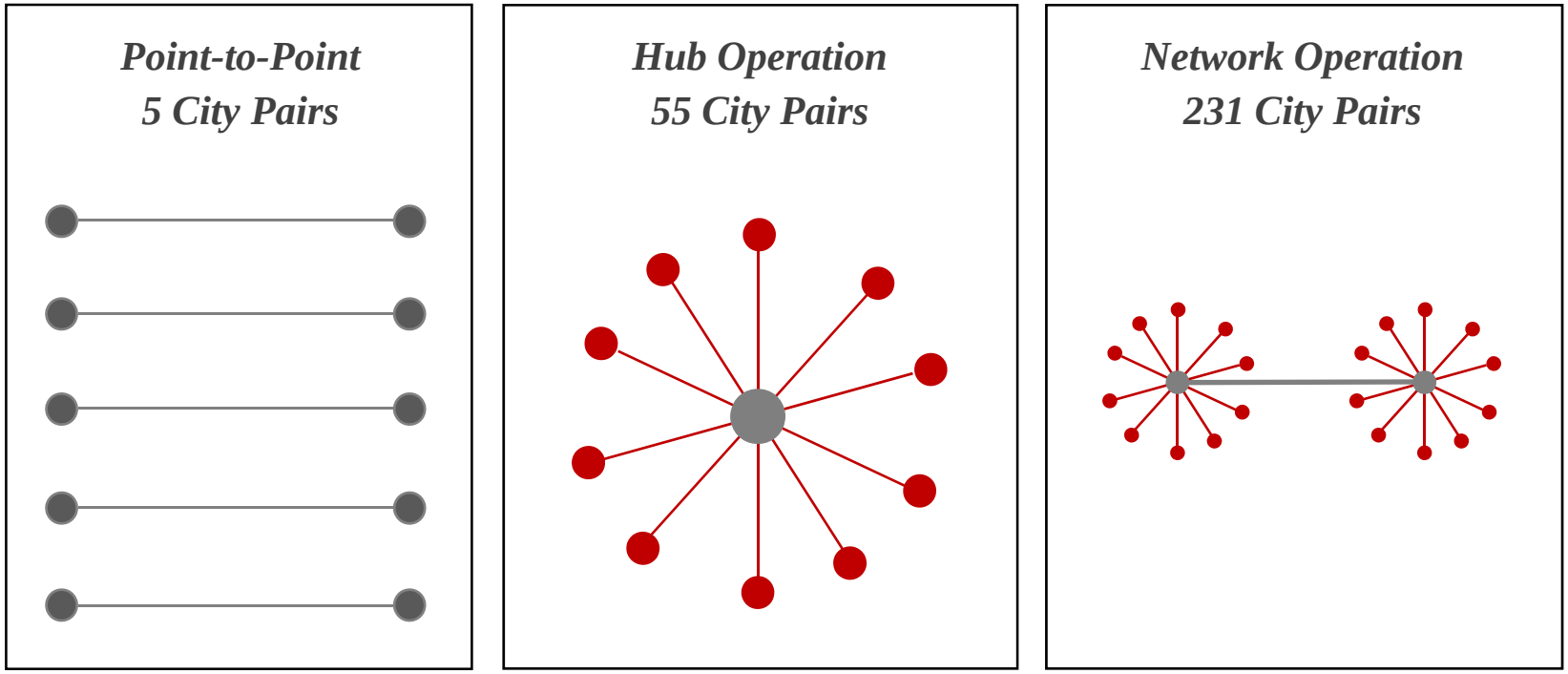
- **From linear – to hub construction – to hub-to-hub flying**
- **From regional/country dominance – to a continental footprint – to an inter-continental focus**
- **Intra-country networks supporting intra-continental and inter-continental growth**
- **International expansion contributed to improved revenue for the intra-country operations**

The Evolution of Networks and Competition

COMPETITION

Pre-Deregulation	***1980s-1990s***	***21st Century***
Route vs. Route	***Hub vs. Hub***	***Network vs. Network***

STRUCTURE



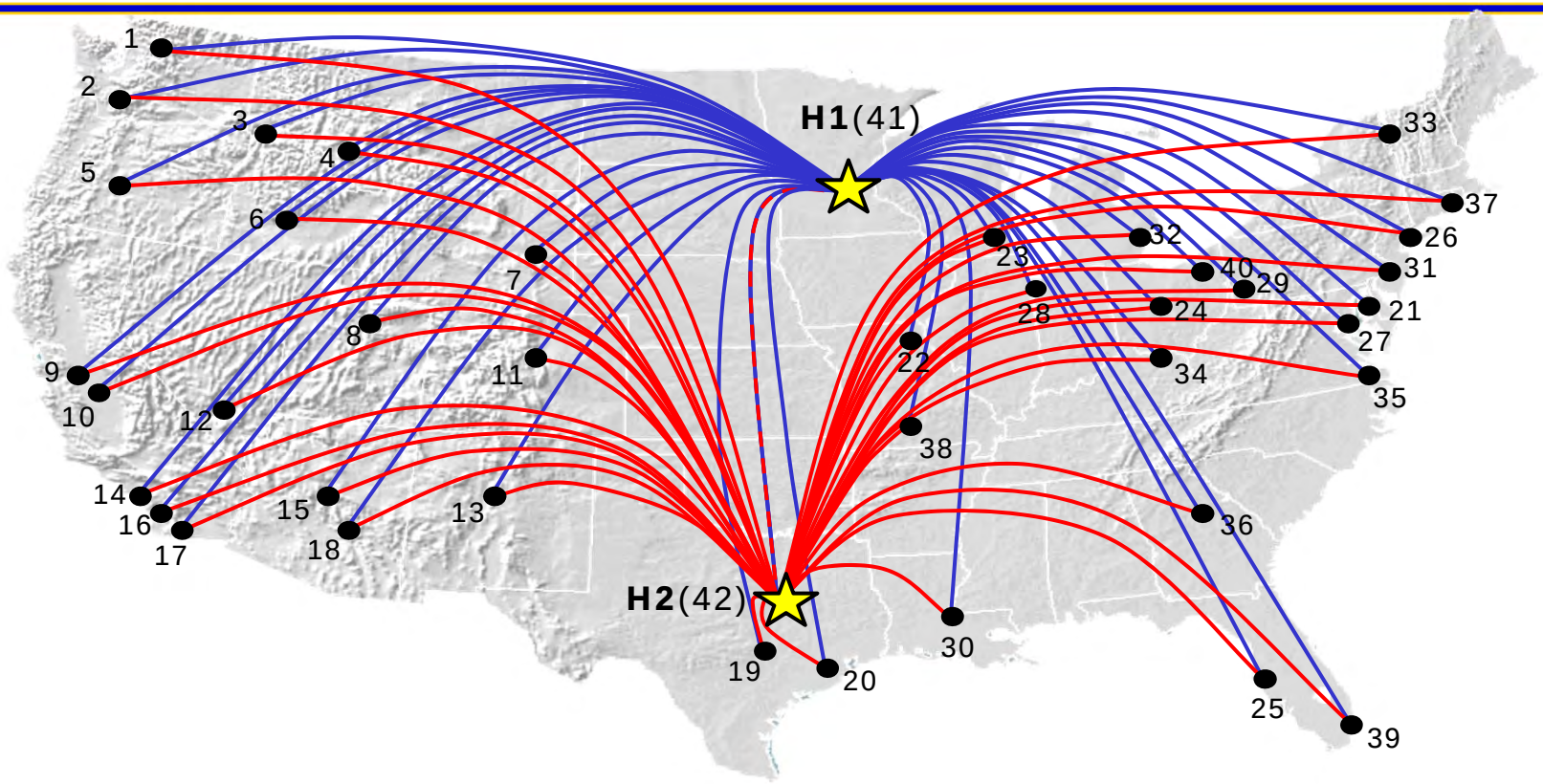
www.airlines.org

Hub Economics and Network Structure

- **Hub/spoke network structures allow airlines to serve many O-D markets with fewer flight departures.**

- **Consider a hub network with 20 flights in and 20 flights out of a single "connecting bank" at a hub:**
  - Each flight serves 21 O-D markets (1 local + 20 connecting)
  - Total of 440 O-D markets served with only 40 flight legs and as few as 20 aircraft flying through the hub
  - Consolidation of loads into and out of the hub allows connecting service to be provided to low demand O-D markets that cannot support non-stop flights
  - Several connecting departures per day in these markets may be more convenient for travelers than 1 daily non-stop flight ("Total Trip Time" is lower, when schedule displacement time included)

Example: Competitive Hub Networks



Basic Airline Hub Economics

- **Routing flights and passengers through a hub is more profitable for the airline if:**
  - COST SAVINGS from operating fewer flights with larger aircraft and more passengers per flight

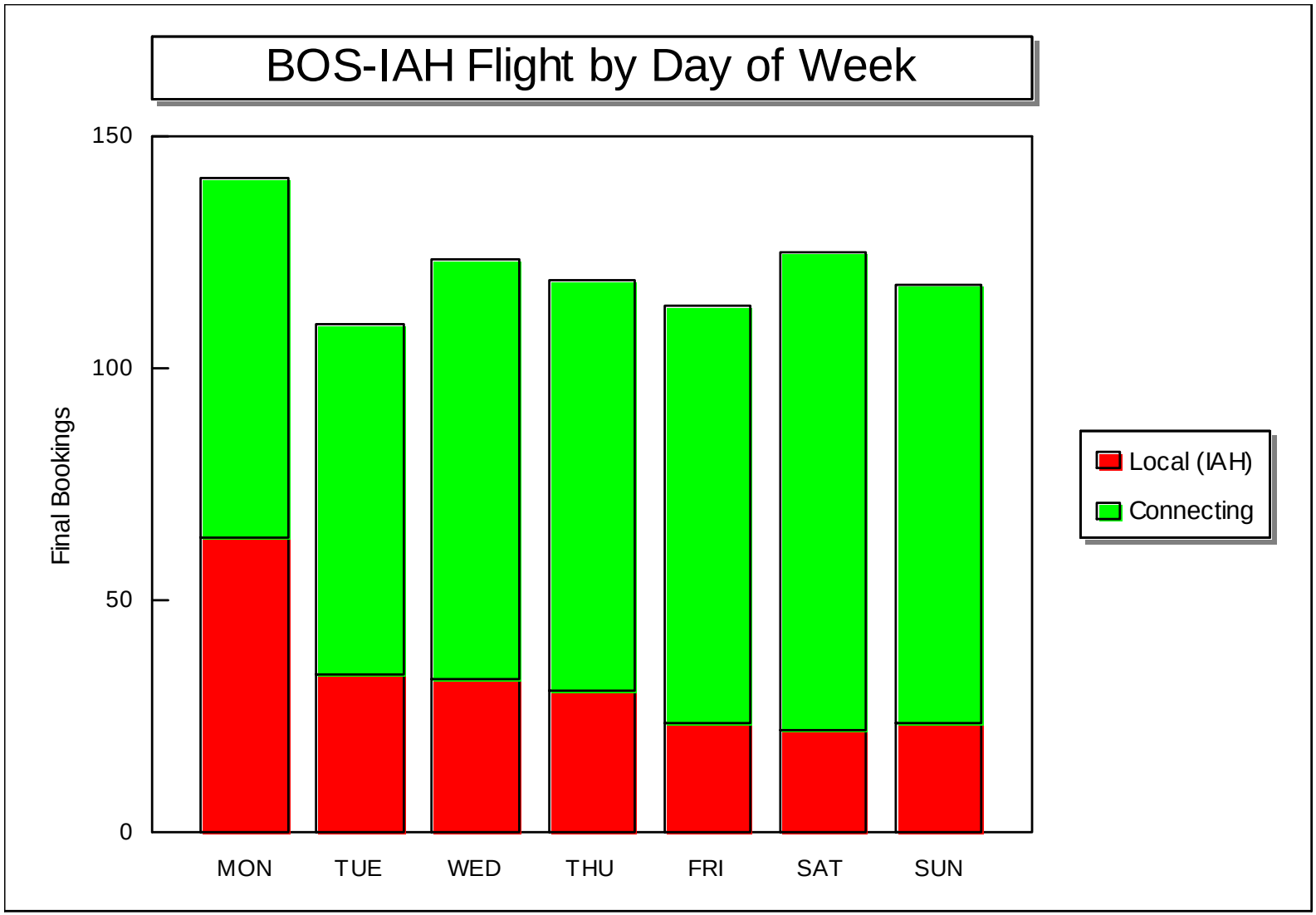
    is greater than
  - REVENUE LOSS from passengers who reject connecting service and choose a non-stop flight instead, if it exists

- **Passenger preference for multiple connecting departures vs. 1 or 2 non-stops per day:**
  - Large multiple hub network operated by Delta, for example, provides over a dozen daily connections Boston-San Diego
  - Total trip time is lower, even with connecting flights

The Revenue Power of Hub Networks

- **Large hub networks result in market share advantages that translate into increased revenue:**
  - Potential for greater departure frequency for many O-D markets, meaning more convenient schedules and higher market shares
  - On-line “seamless” connections improve passenger convenience, compared to inter-line connections
  - Greater frequent flyer program earning and reward options for passengers given larger network coverage
  - Market dominance of “local” markets in/out of hub may lead to pricing and revenue advantages
- **Over 50% of Network Legacy Carriers’ revenue comes from passengers connecting at hubs**

Example: Local vs. Connecting Passengers



Operational Advantages of Hubs

- **Consolidation of airline operations at a large hub airport has operational advantages:**
  - Fewer aircraft and crew bases required, meaning reduced crew and aircraft maintenance expenses
  - Fewer locations where passengers or bags misconnect
  - Large volume of operations at the hub can result in economies of scale in aircraft maintenance, catering facilities, etc.
- **Scheduled connecting banks allow for:**
  - Simplified (if less flexible) aircraft and crew scheduling
  - Greater opportunities for “swapping” of aircraft in response to delays, cancellations and irregular operations
  - Planning for aircraft swaps in response to changing demand (“Demand Driven Dispatch”)

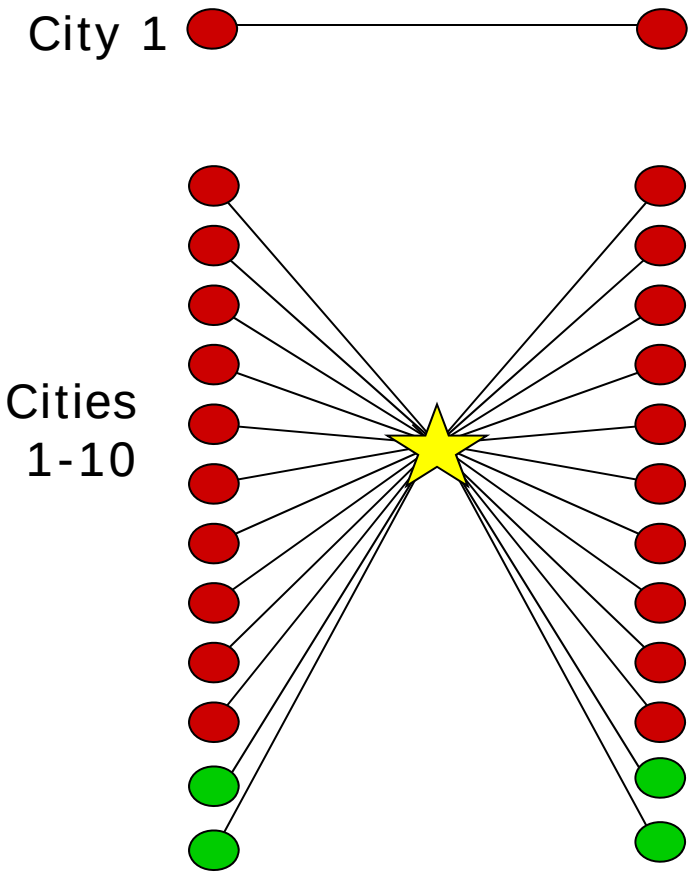
Incremental Costs of Hub Networks

- **Hub operations also raise the potential of reduced aircraft and crew utilization:**
  - Reduced flexibility in scheduling of departures, rotations due to fixed connecting bank timing at hubs
  - Increased ground times at hubs, to accommodate connections
  - Greater turn-around times at spoke cities, waiting for a given departure time to meet next connecting bank
- **Congestion and delay costs at the hub airport:**
  - Connecting banks create extreme staffing peaks
  - Peaks of scheduled operations above and beyond runway capacity
  - Weather delays at a hub will affect the airline's entire network

Hub Impacts on Route Planning

- **New routes to smaller spoke cities become much easier to justify in an established hub network:**
  - An airline needs only 1 or 2 passengers per flight to each of 30+ connecting destinations to make a 100-seat aircraft “profitable”
  - However, such incremental analysis leads to a tendency to overlook potential displacement of other traffic on connecting legs
  - Same “incremental” logic makes it more difficult to stop service to a potentially unprofitable destination, which provides connecting traffic support to other flights
- **Difficult to justify a new non-stop service to by-pass the hub, as it might steal traffic from hub flights:**
  - However, large number of departures in a connecting market can allow airline to build market share and perhaps introduce a non-stop flight supported by many connecting opportunities

Hub Growth by Adding Cities



1 O-D Market

120 O-D Markets

+ 2 Cities…

143 O-D Markets

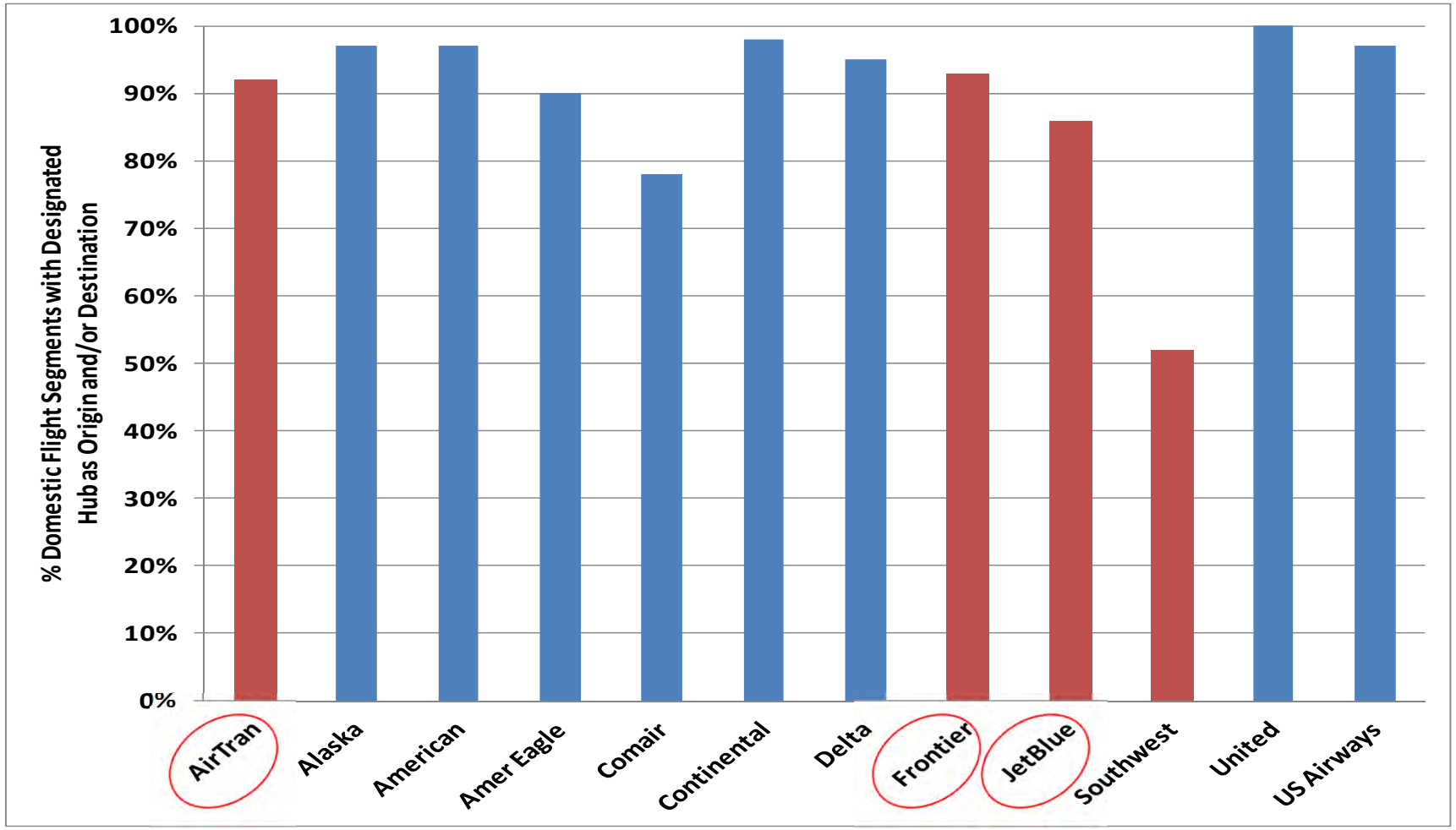
+ 2 More Cities…

168 O-D Markets

Recent Trends: Hub Strengthening

- **Despite forecasts of more non-stop flights, a trend toward bigger and stronger hubs has re-emerged:**
  - Largest US and European airlines have cut virtually all flights that do not originate or terminate at their hubs
  - Several smaller, weaker US hubs have been shut down
- **Factors that continue to reinforce hub growth:**
  - Liberalized bilateral agreements have allowed airlines to fly even low-density international routes from their hubs (e.g., CVG-MUC)
  - Small regional jets are being used to increase frequency of flights to small spoke cities, not to over-fly the hub with non-stops
  - Airline alliances focus on linkages between major hub networks
- **Hub operations will continue to be important, given their fundamental economics.**

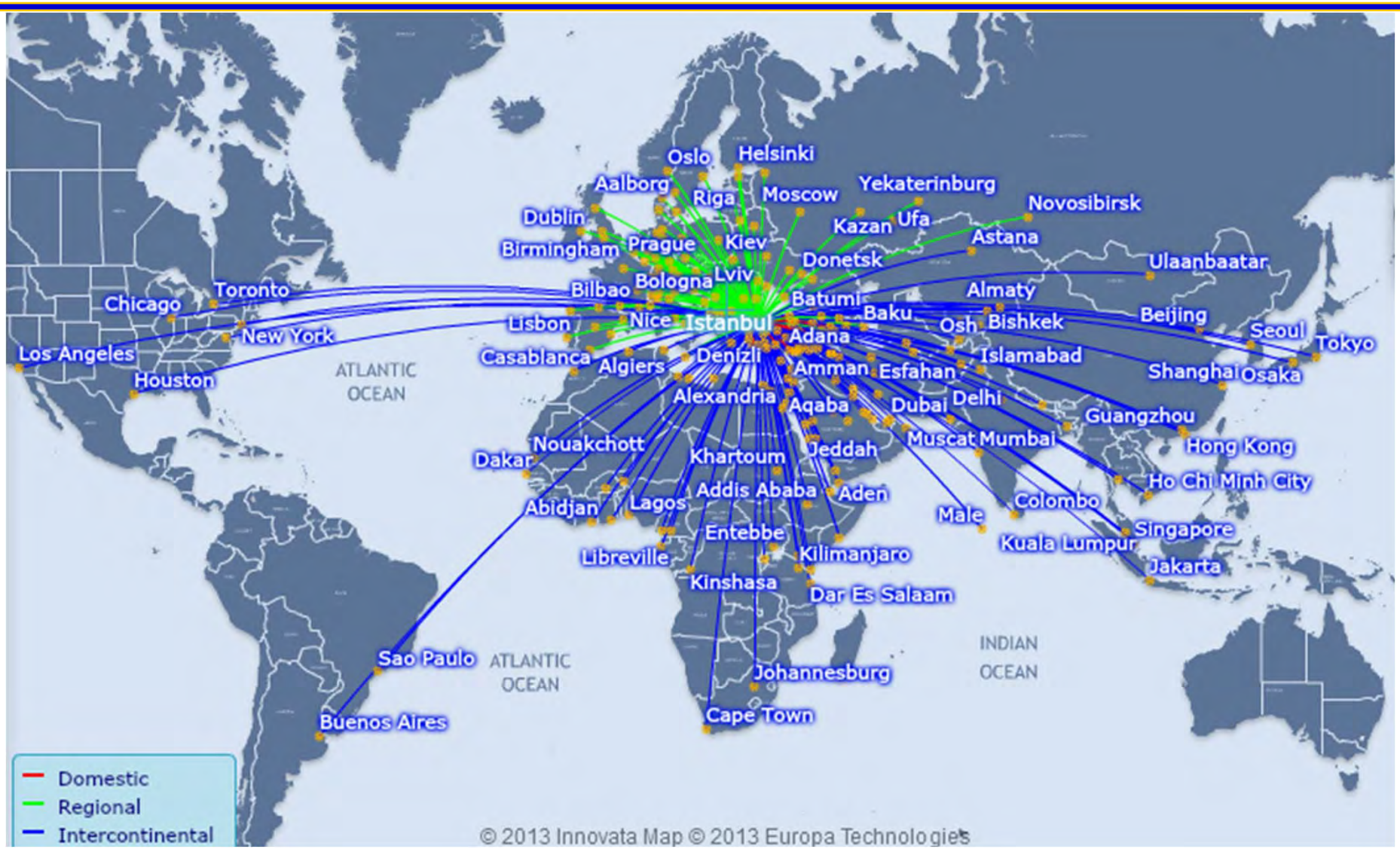
U.S. Example: Over 90% of US domestic flights are to/from hub airports – including most LCCs!



Source: MIT Airline Productivity Study (2011)

Chicago Hub Network: Which Airline?

Turkish Airlines – IST Hub Network



Source: *http://www.backrowflier.com/category/turkish-airlines/*