Fundamentals of Airline Markets and Demand

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Lecture Outline

Air Travel Markets

- Distinct and Separate Origin-Destination Markets
- Spatial Definitions of Air Travel Markets

Origin-Destination Market Demand

- Joint Supply of Capacity to Multiple Markets
- Dichotomy of Airline Demand and Supply

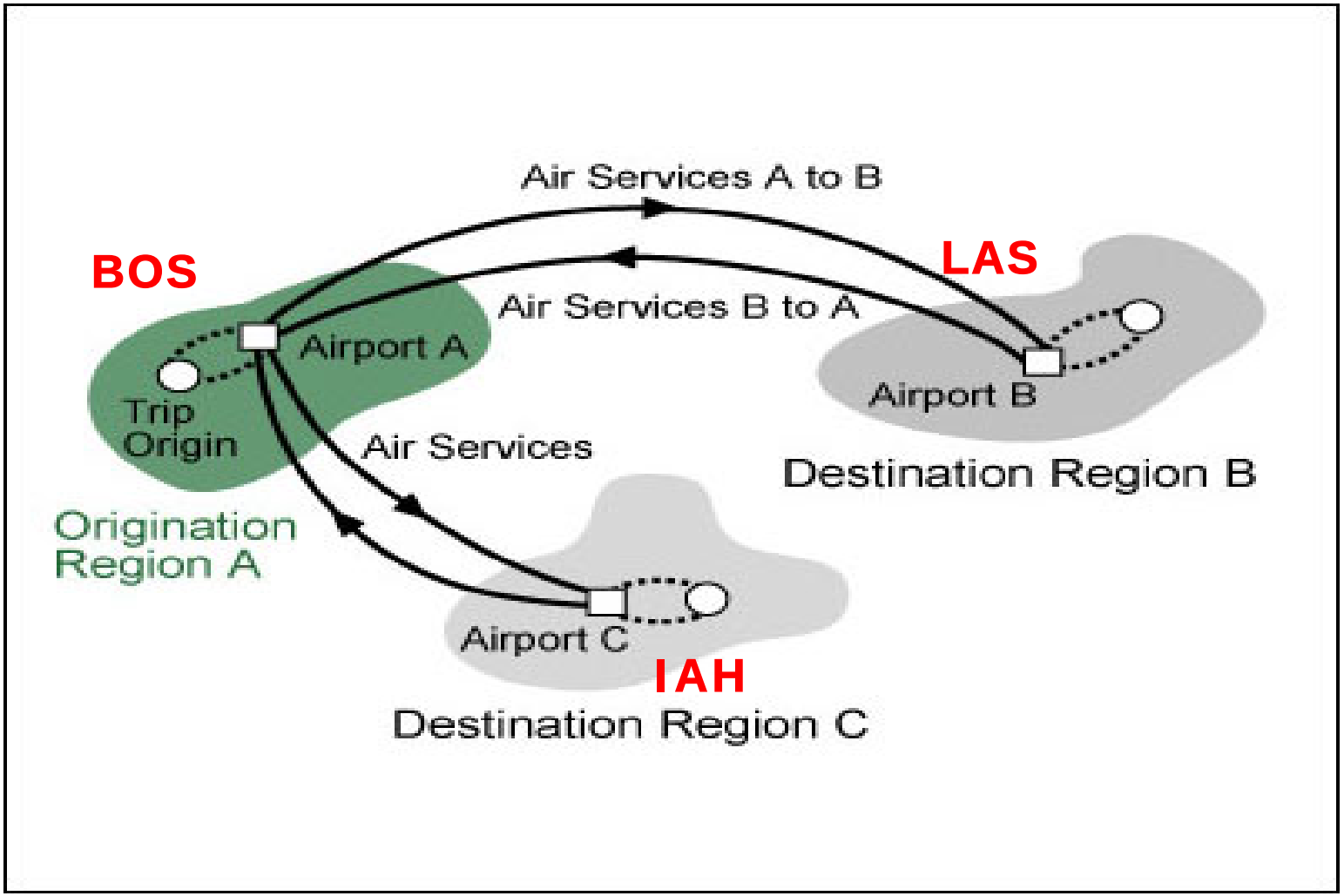
Air Travel Demand in an O-D Market

- Factors Affecting Volume of Demand
- Price time elasticity and implications for pricing
- Total trip time elasticity and implications for scheduling

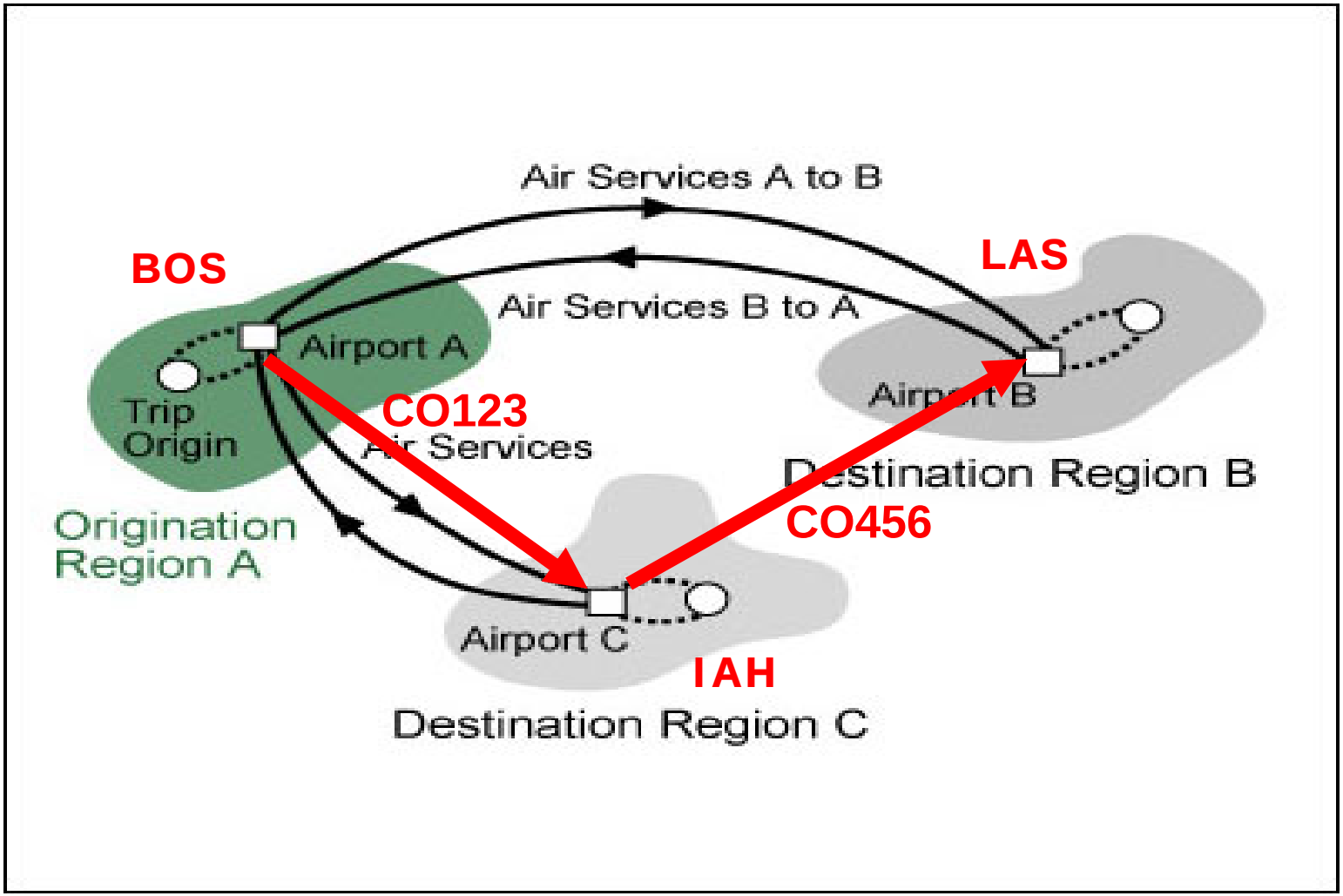
Air Travel Markets

- **Passenger trip characteristics and air travel markets:**
  - Purpose of trips is to move from “true” origin to “true” destination, not from airport to airport
  - Most involve round-trip travel
  - Characteristics of complete trip affect air travel demand, not simply in-flight times or on-board experience
- **Spatial definition of origin-destination (O-D) market:**
  - Potential travelers per period wishing to travel from all originating points served by airport A to destination points around airport B
  - Round-trip market has an “opposite” market, which can have different characteristics (e.g., BOS-LAS-BOS vs. LAS-BOS-LAS)
  - Because opposite markets share airline supply, O-D market traffic typically reported as combined totals

Distinct and Separate O-D Markets



Distinct and Separate O-D Markets

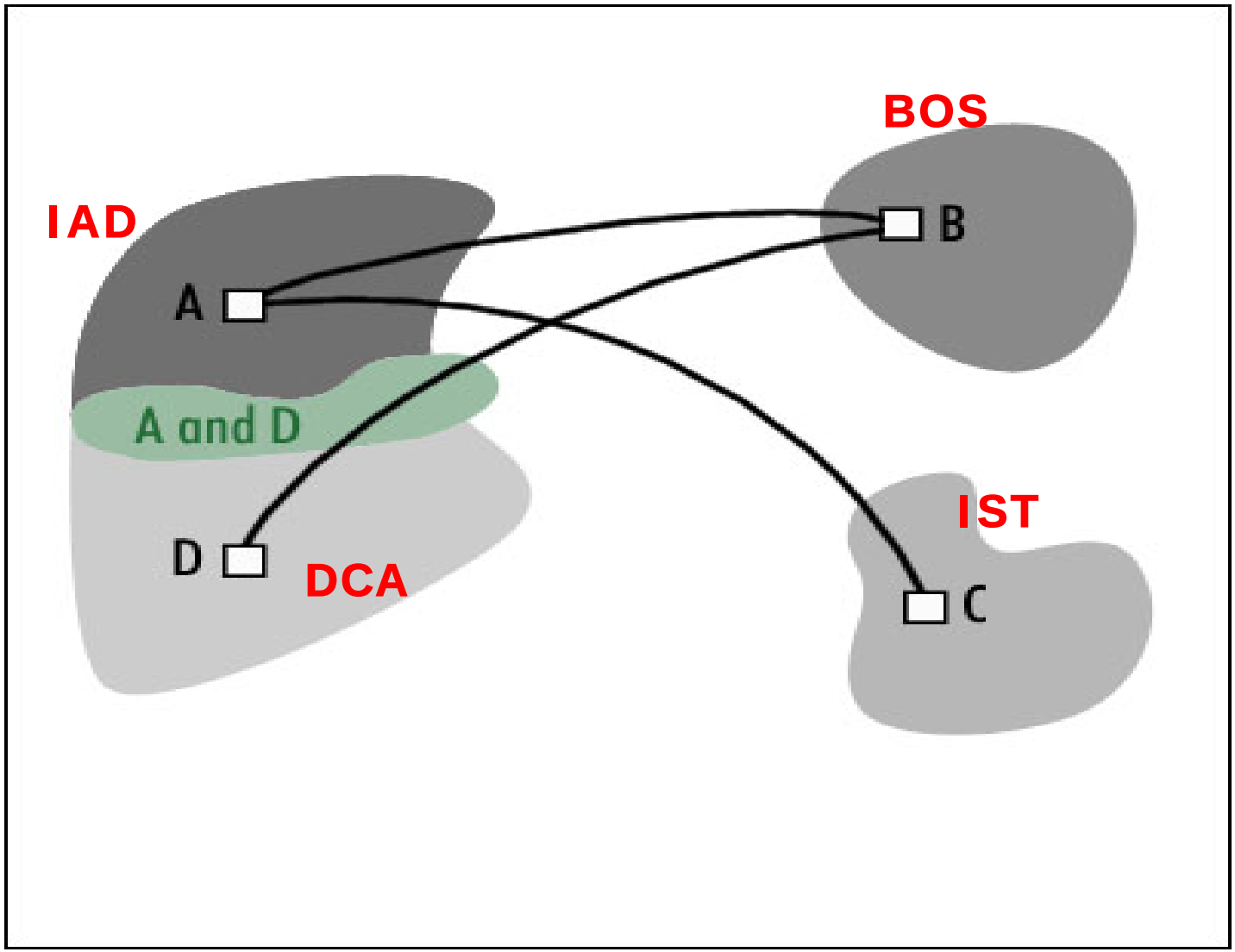


Spatial Definitions of Air Travel Markets

- **Distinct and separate O-D markets**
  - Markets A-B and A-C are effectively independent in terms of demand volume and characteristics, airline price and supply
  - BOS-IAH and BOS-LAS are distinct and separate O-D markets

- **Competitive airport regions -- Parallel markets**
  - Market regions served by multiple airports can lead to interrelated "parallel" markets (A-B and A-D on following slide)
  - Example: BOS-DCA (Washington National) and BOS-IAD (Washington Dulles) are strong "parallel" markets
  - Fares and services in one market affect demand in parallel market

Competitive Regions -- Parallel Markets



Origin-Destination Market Demand

- **Air travel demand is defined for an origin-destination market, not a flight leg in an airline network:**
  - Number of persons wishing to travel from origin A to destination B during a given time period (e.g., per day)
  - Includes both passengers starting their trip at A and those completing their travel by returning home to B (opposite markets)
  - Typically, volume of travel measured in one-way passenger trips between A and B, perhaps summed over both directions
- **Airline networks create complications for analysis:**
  - Not all A-B passengers will fly on non-stop flights from A to B, as some will choose one-stop or connecting paths
  - Any single non-stop flight leg A-B can also serve many other O-D markets, as part of connecting or multi-stop paths

Example: BOS-LAS O-D MARKET
430 Passengers per Day Each Way (PDEW)

DIRECTION	ITINERARY	Avg. PAX/DAY
BOS to LAS	BOS-LAS-BOS	250
	LAS-BOS-LAS	150
	BOS-LAS one-way	30
	TOTAL	430
LAS to BOS	LAS-BOS-LAS	150
	BOS-LAS-BOS	250
	LAS-BOS one-way	30
	TOTAL	430

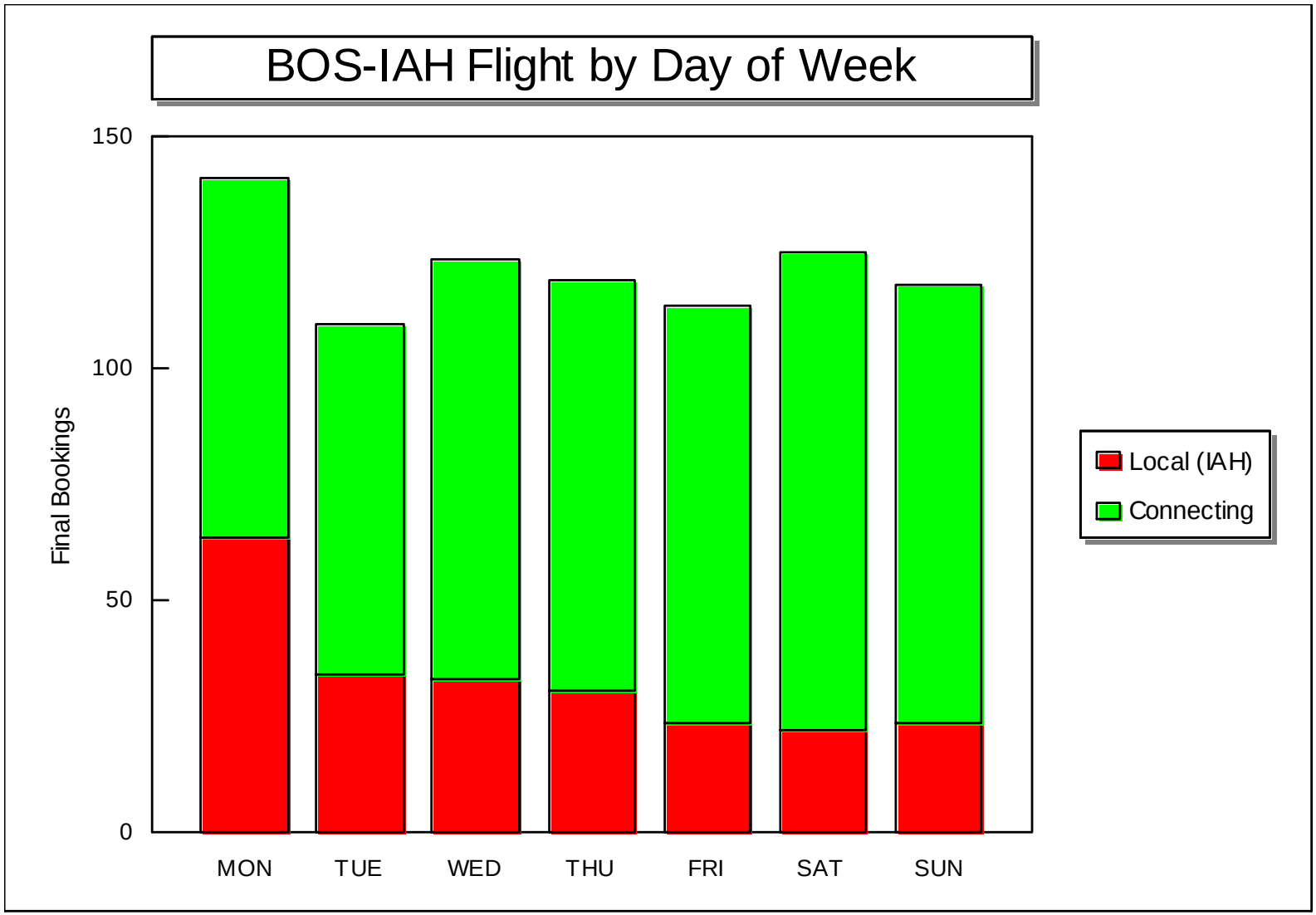
Example: Choice of Paths in BOS-LAS O-D Market (430 passengers PDEW)

PATH QUALITY	AIRLINE	Avg. PAX/DAY	
NONSTOP	US (2 flights)	160	
	B6 (1 flight)	110	
ONE-STOP	WN (2 flights)	40	
CONNECTIONS	DL via ATL	20	
	CO via IAH	15	
	NW via DTW	15	
	AA via DFW	10	
	UA via ORD	5	
	US via CLT	5	etc…

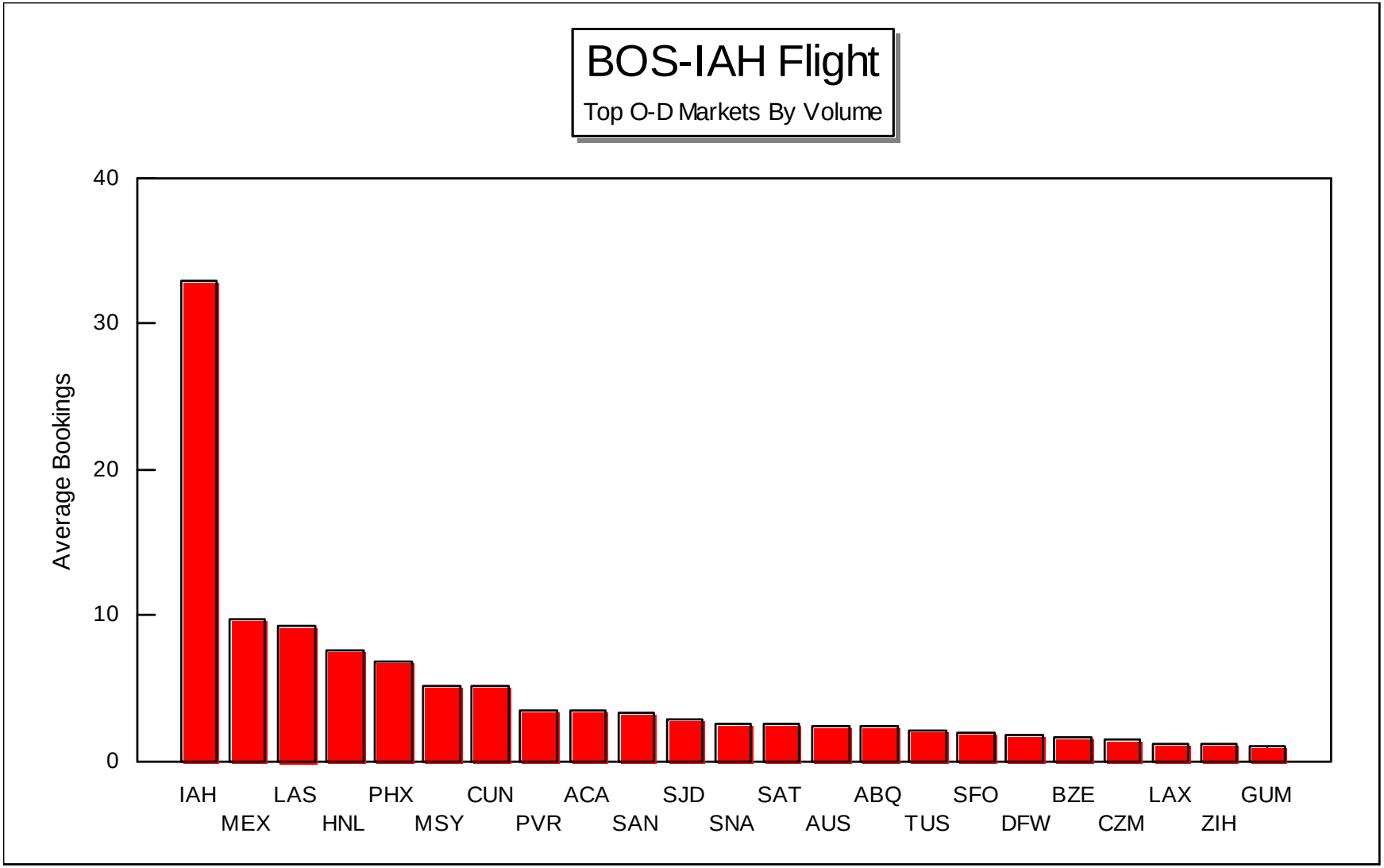
Example: Passenger Loads on Nonstop US Airways Flight BOS-LAS (150 seats)

O-D Market	Passenger Path	Avg. PAX/Flight
BOS-LAS	BOS-LAS	80
BOS-LAX	BOS-LAS-LAX	10
BOS-SEA	BOS-LAS-SEA	6
BOS-SAN	BOS-LAS-SAN	4
PWM-LAS	PWM-BOS-LAS	4
JFK-LAS	JFK-BOS-LAS	2
YQB-LAS	YQB-BOS-LAS	2
FRA-ONT	FRA-BOS-LAS-ONT	3
ATH-SAN	ATH-FRA-BOS-LAS-SAN	1
		etc…
	TOTAL LOAD	120
	AVG LOAD FACTOR	80%

Example: Local vs. Connecting Passengers



Joint Supply to O-D Markets



Dichotomy of Demand and Supply

- **Inherent inability to directly compare demand and supply at the "market" level**
- **Demand is generated by O-D market, while supply is provided as a set of flight leg departures over a network of operations**
- **One flight leg provides joint supply of seats to many O-D markets**
  - Number of seats on the flight is not the "supply" to a single market
  - Not possible to determine supply of seats to each O-D market
- **Single O-D market served by many airline paths**
  - Tabulation of total O-D market traffic requires detailed ticket coupon analysis

Implications for Analysis

- **Dichotomy of airline demand and supply complicates many facets of airline economic analysis**
- **Difficult, in theory, to answer seemingly "simple" economic questions, for example:**
  - Because we cannot quantify "supply" to an individual O-D market, we cannot determine if the market is in "equilibrium"
  - Cannot determine if the airline's service to that O-D market is "profitable", or whether fares are "too high" or "too low"
  - Serious difficulties in proving predatory pricing against low-fare new entrants, given joint supply of seats to multiple O-D markets
- **In practice, assumptions about cost and revenue allocation are required:**
  - Estimates of flight and/or route profitability are open to question

Factors Affecting Volume of O-D Demand

- **Socioeconomic and demographic variables:**
  - Populations, disposable income levels, and amount of economic interaction between cities A and B
- **Trip purpose characteristics:**
  - Business, vacation, personal "VFR" (visiting friends and relatives)
- **Prices of travel options:**
  - Airline fare products, as well as prices of competing modes
- **Quality of travel services**
  - Frequency of departures determines "total travel time" including schedule displacement or "wait times"
  - Also comfort, safety, and ease of travel by air and on other modes

Price Elasticity of Demand

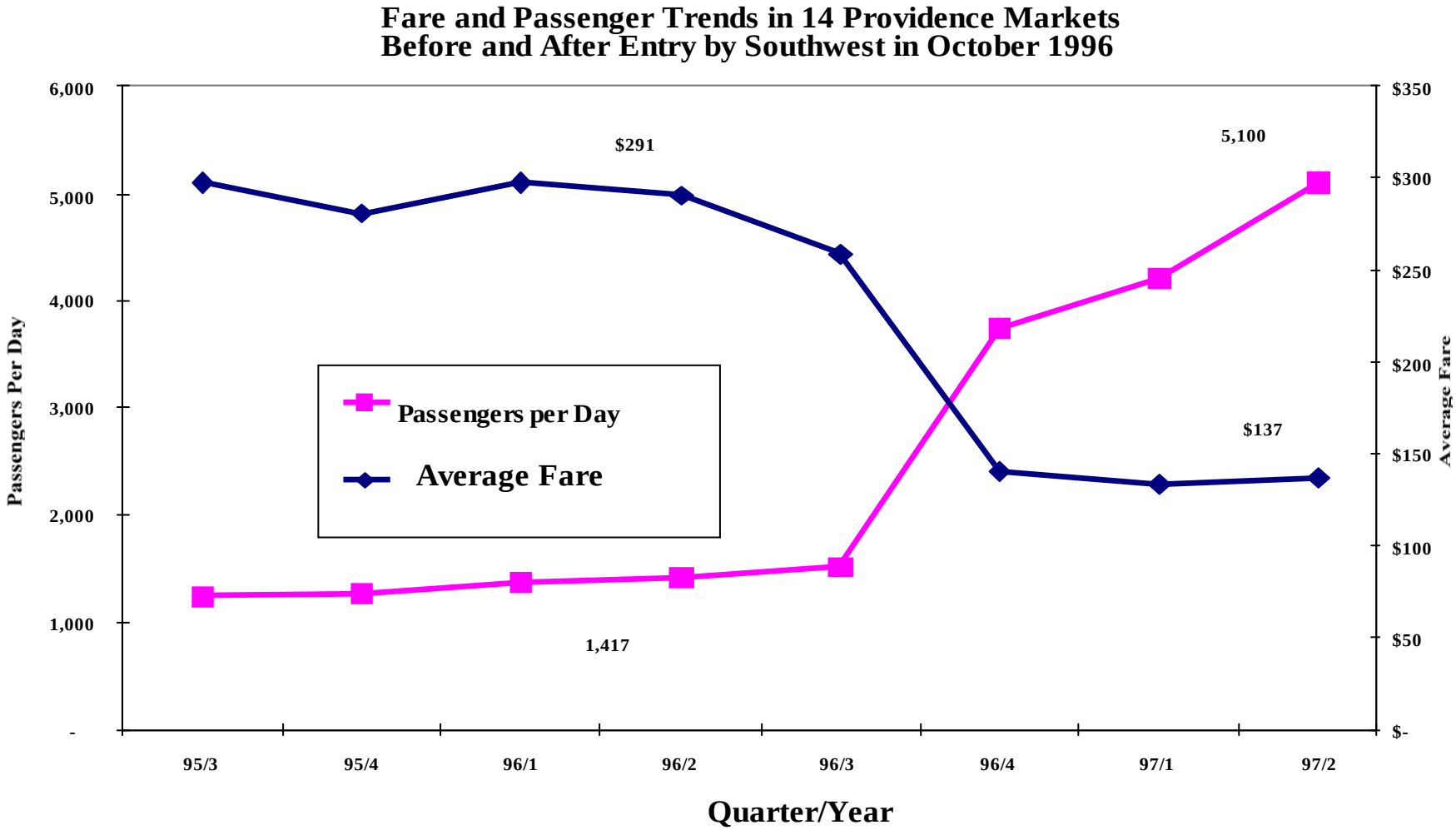
- **Definition: Percent change in total demand that occurs with a 1% increase in average price charged.**

- **Price elasticity of demand is always <u>negative</u>:**
  - A 10% price increase will cause an X% demand <u>decrease</u>, all else being equal (e.g., no change to frequency or market variables)
  - Business air travel demand is slightly "inelastic" ($0 > E_p > -1.0$)
  - Leisure demand for air travel is much more "elastic" ($E_p < -1.0$)
  - Empirical studies have shown typical range of airline market price elasticities from -0.8 to -2.0 (air travel demand tends to be elastic)
  - Elasticity of demand in specific O-D markets will depend on mix of business and leisure travel

Implications for Airline Pricing

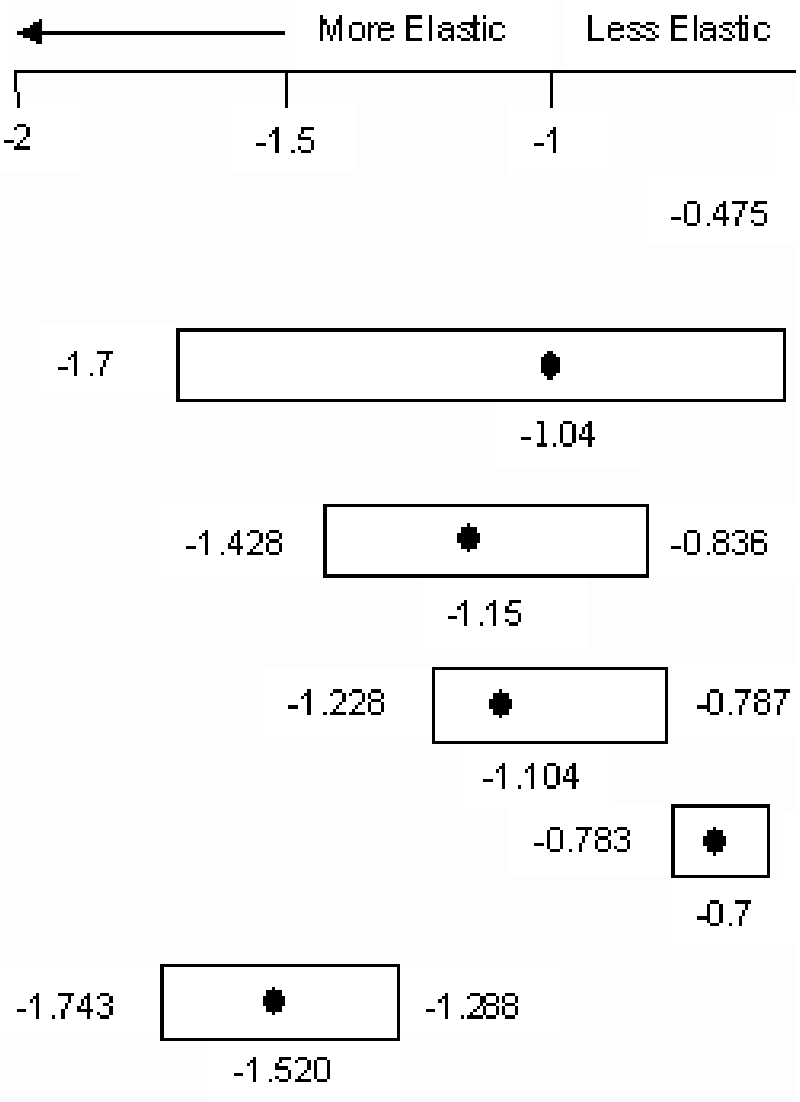
- **Inelastic (-0.8) business demand for air travel means less sensitivity to price changes:**
  - 10% price increase leads to only 8% demand reduction
  - Total airline revenues increase, despite price increase
- **Elastic (-1.6) leisure demand for air travel means greater sensitivity to price changes**
  - 10% price increase causes a 16% demand decrease
  - Total revenues decrease given price increase, and vice versa
- **Recent airline pricing practices are explained by price elasticities:**
  - Increase fares for inelastic business travelers to increase revenues
  - Decrease fares for elastic leisure travelers to increase revenues

Southwest Entry into Providence Markets



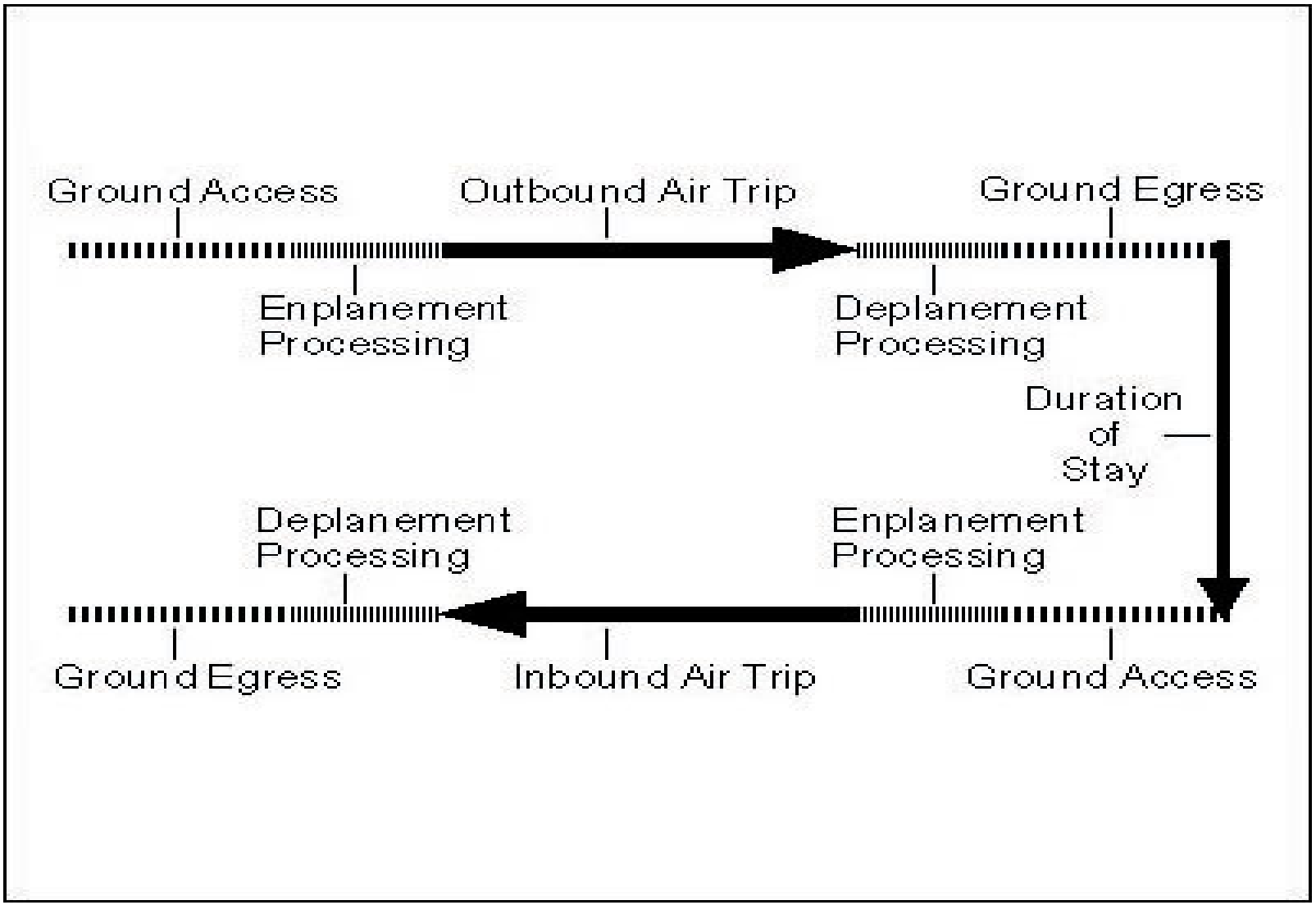
Summary of Air Travel Price Elasticities

Market Segment	No. of studies	No. of estimates
1. Long-haul international business	2	16
2. Long-haul international leisure	6	49
3. Long-haul domestic business	2	26
4. Long-haul domestic leisure	2	6
5. Short-haul business	3	16
6. Short-haul leisure	3	16



Source: Dept of Finance Canada (2003)

Air Travel: Typical Passenger Trip



Total Trip Time and Frequency

T = t(fixed) + t(flight) + t(schedule displacement)

- Fixed time elements include access and egress, airport processing
- Flight time includes aircraft “block” times plus connecting times
- Schedule displacement = (K hours / frequency), meaning it decreases with increases in frequency of departures

- **This model is useful in explaining why:**
  - Non-stop flights are preferred to connections (lower flight times)
  - More frequent service increases travel demand (lower schedule displacement times)
  - Frequency is more important in short-haul markets (schedule displacement is a much larger proportion of total T)
  - Many connecting departures through a hub might be better than 1 non-stop per day (lower total T for the average passenger)

Time Elasticity of Demand

- **Definition: Percent change in total O-D demand that occurs with a 1% increase in total trip time.**
- **Time elasticity of demand is also negative:**
  - A 10% increase in total trip time will cause an X% demand decrease, all else being equal (e.g., no change in prices)
  - Business air travel demand is more time elastic (Et < -1.0), as demand can be stimulated by improving travel convenience
  - Leisure demand is time inelastic (Et > -1.0), as price sensitive vacationers are willing to endure less convenient flight times
  - Empirical studies show narrower range of airline market time elasticities from -0.8 to -1.6, affected by existing frequency

Implications of Time Elasticity

- **Business demand responds more than leisure demand to reductions in total travel time:**
  - Increased frequency of departures is most important way for an airline to reduce total travel time in the short run
  - Reduced flight times can also have an impact (e.g., using jet vs. propeller aircraft)
  - More non-stop vs. connecting flights will also reduce T
- **Leisure demand not nearly as time sensitive:**
  - Frequency and path quality not as important as price
- **But there exists a market "saturation frequency"**
  - Point at which additional frequency does not increase demand