



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

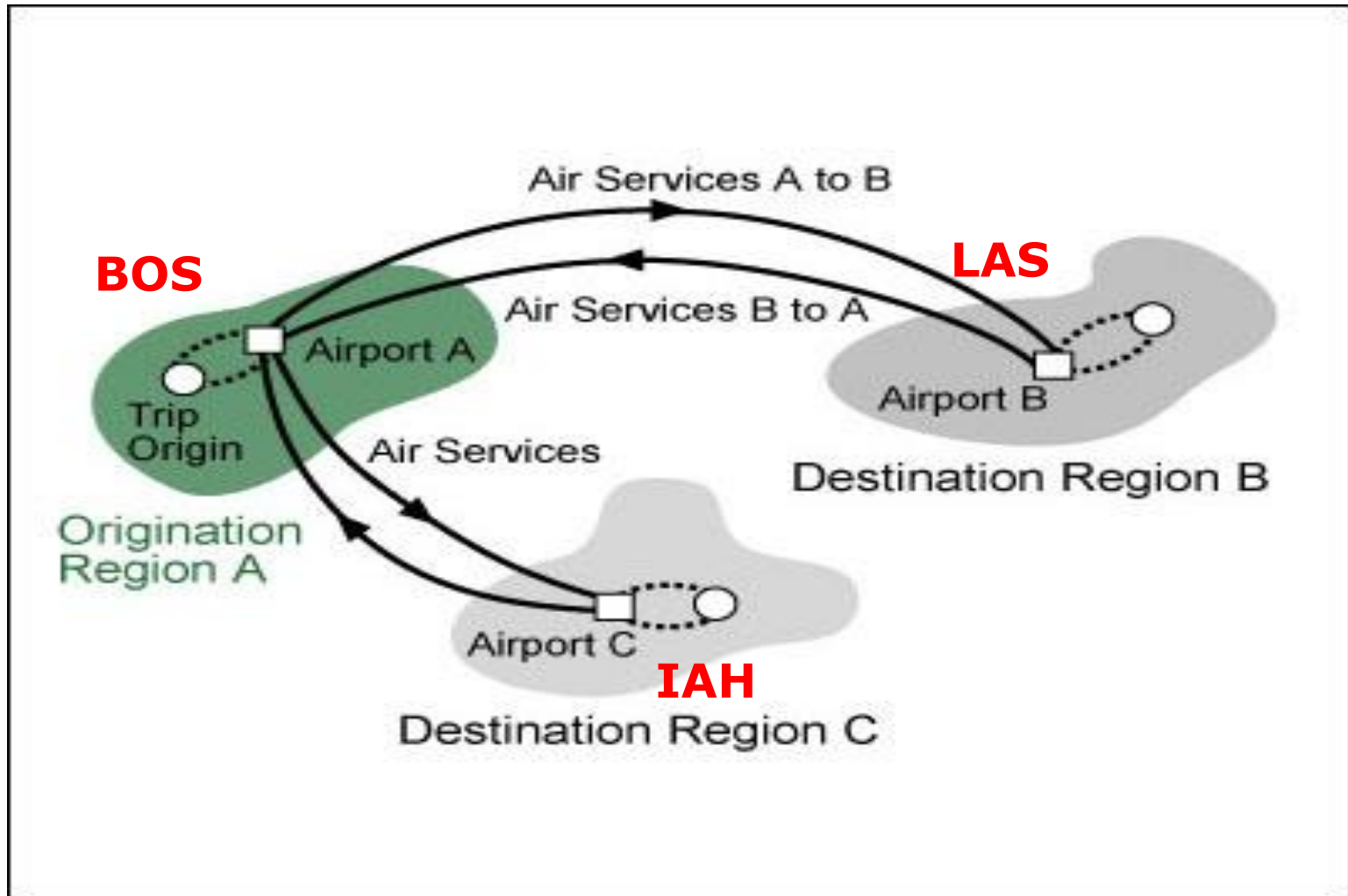
Air Travel Demand in an O-D Market

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

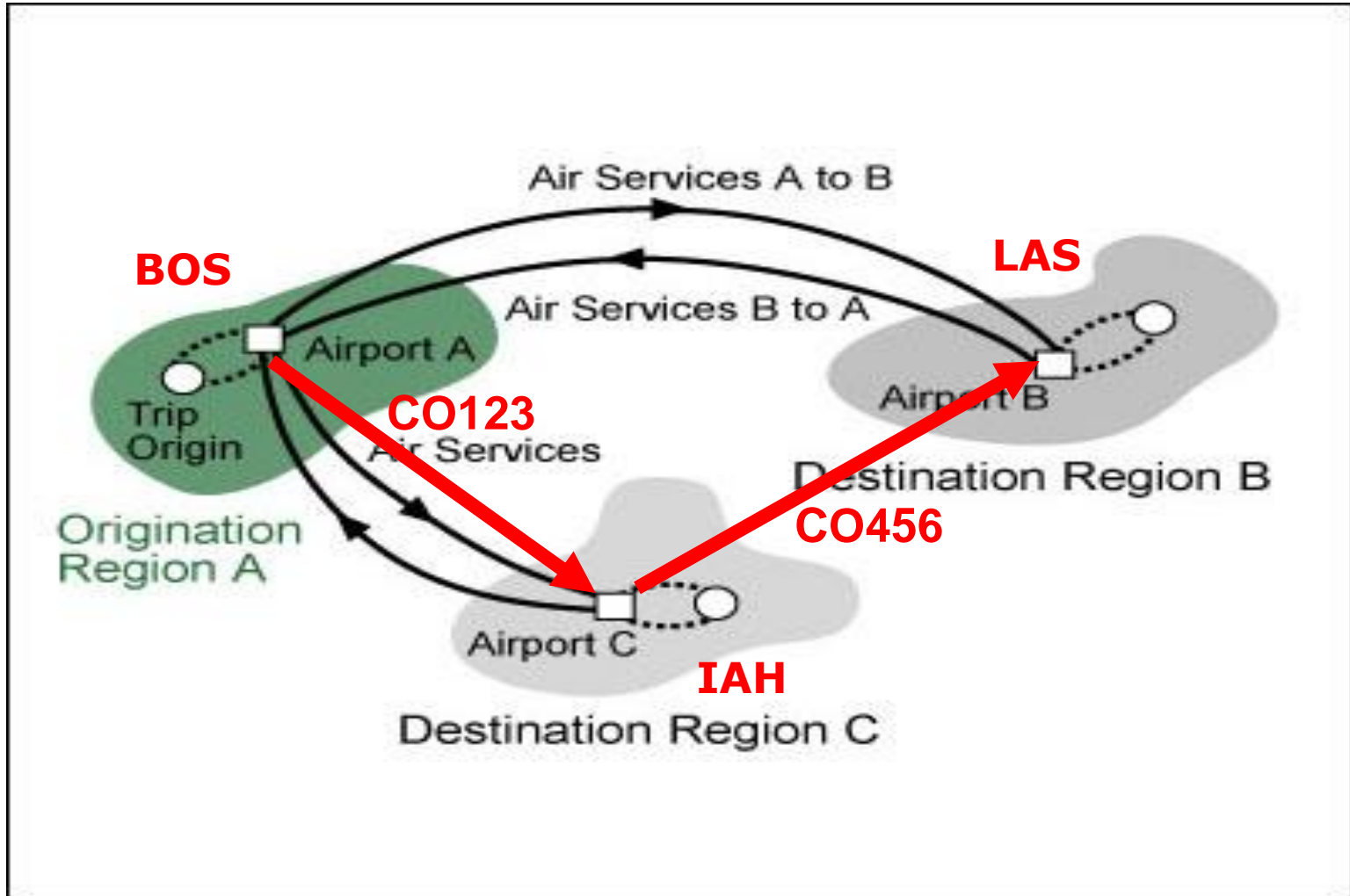
Air Travel Markets

- **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



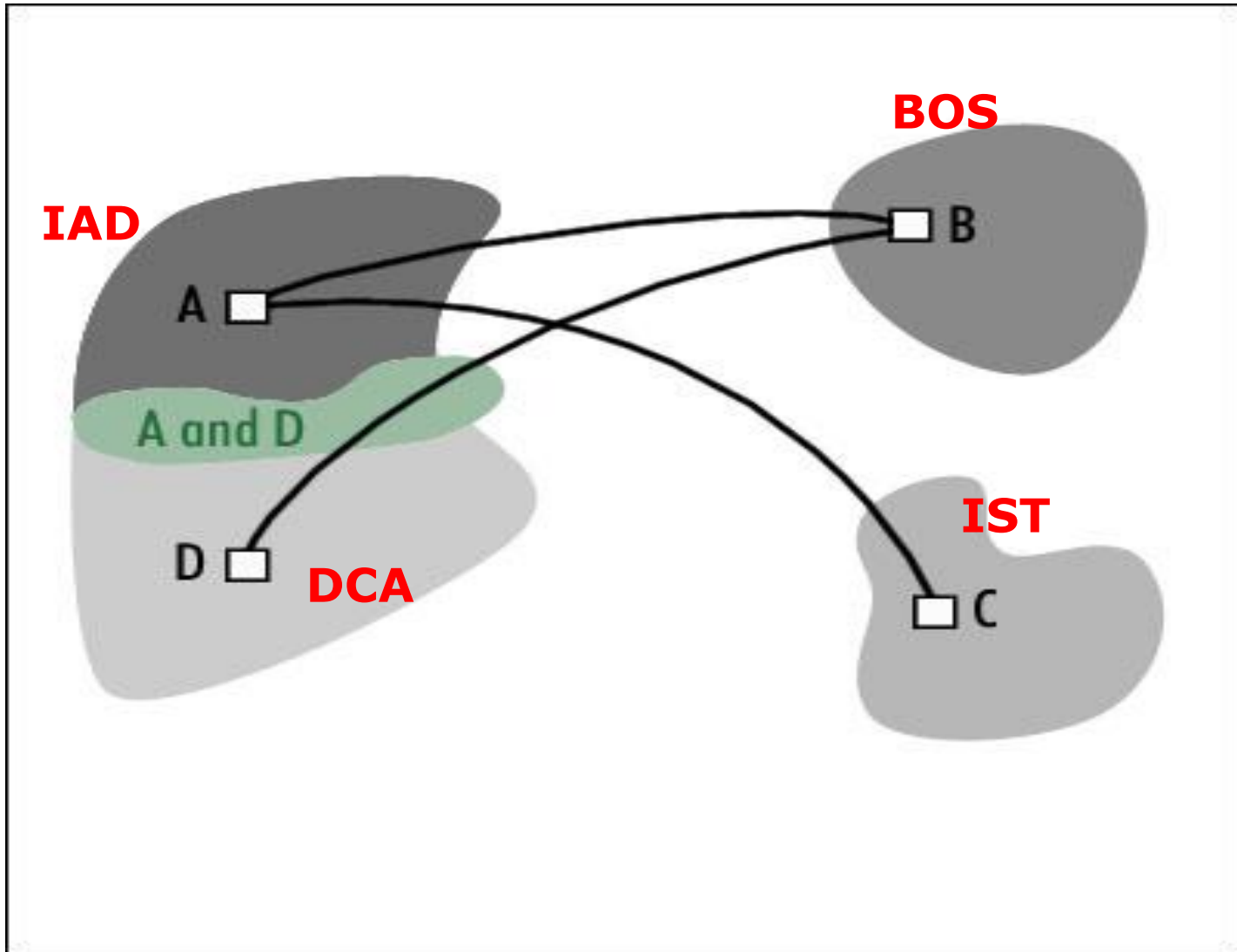
Distinct and Separate O-D Markets



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)

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

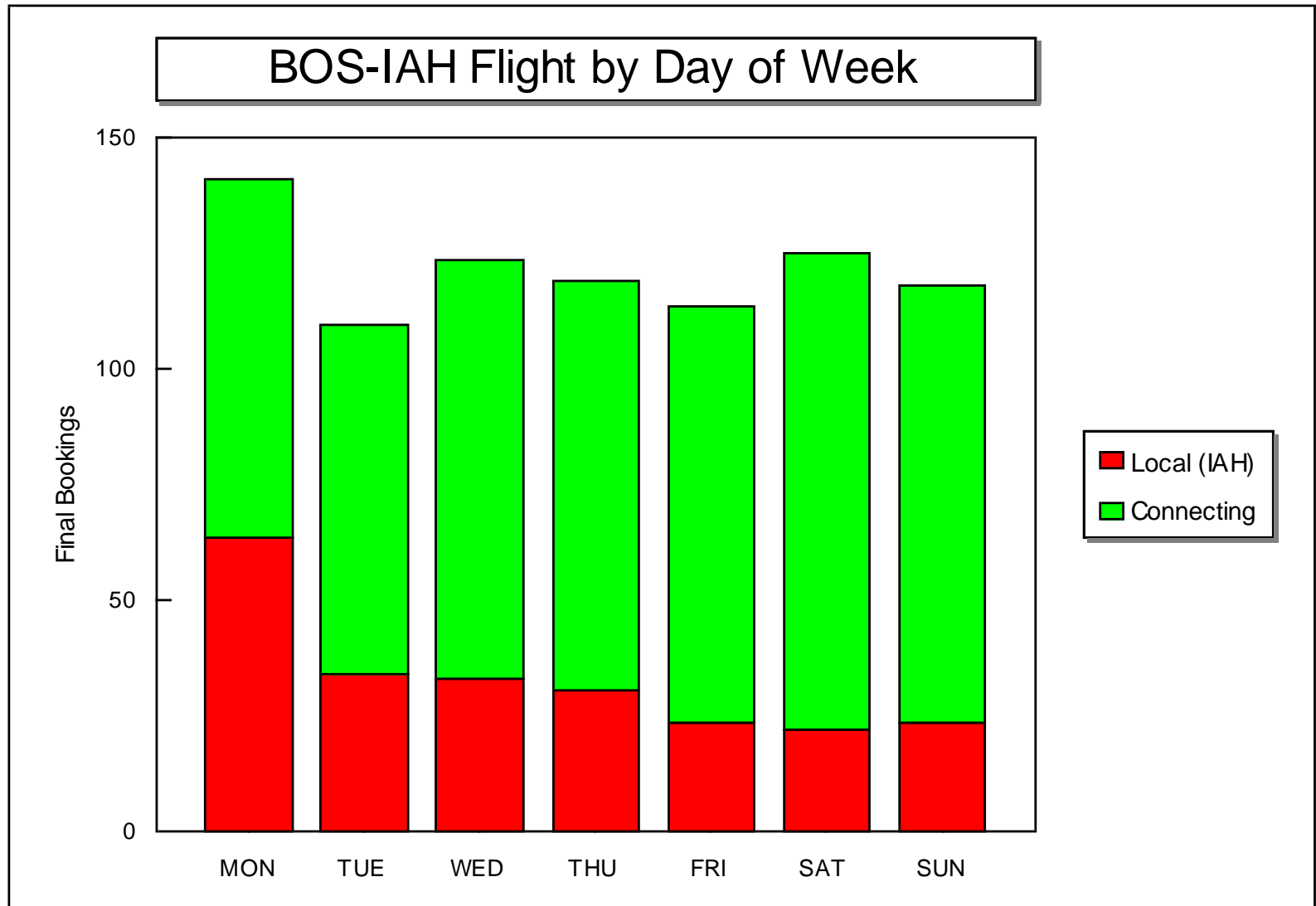
***Example: Choice of Paths in BOS-LAS
O-D Market (430 passengers PDEW)***

<u>PATH QUALITY</u>	<u>AIRLINE</u>	<u>Avg. PAX/DAY</u>	
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...

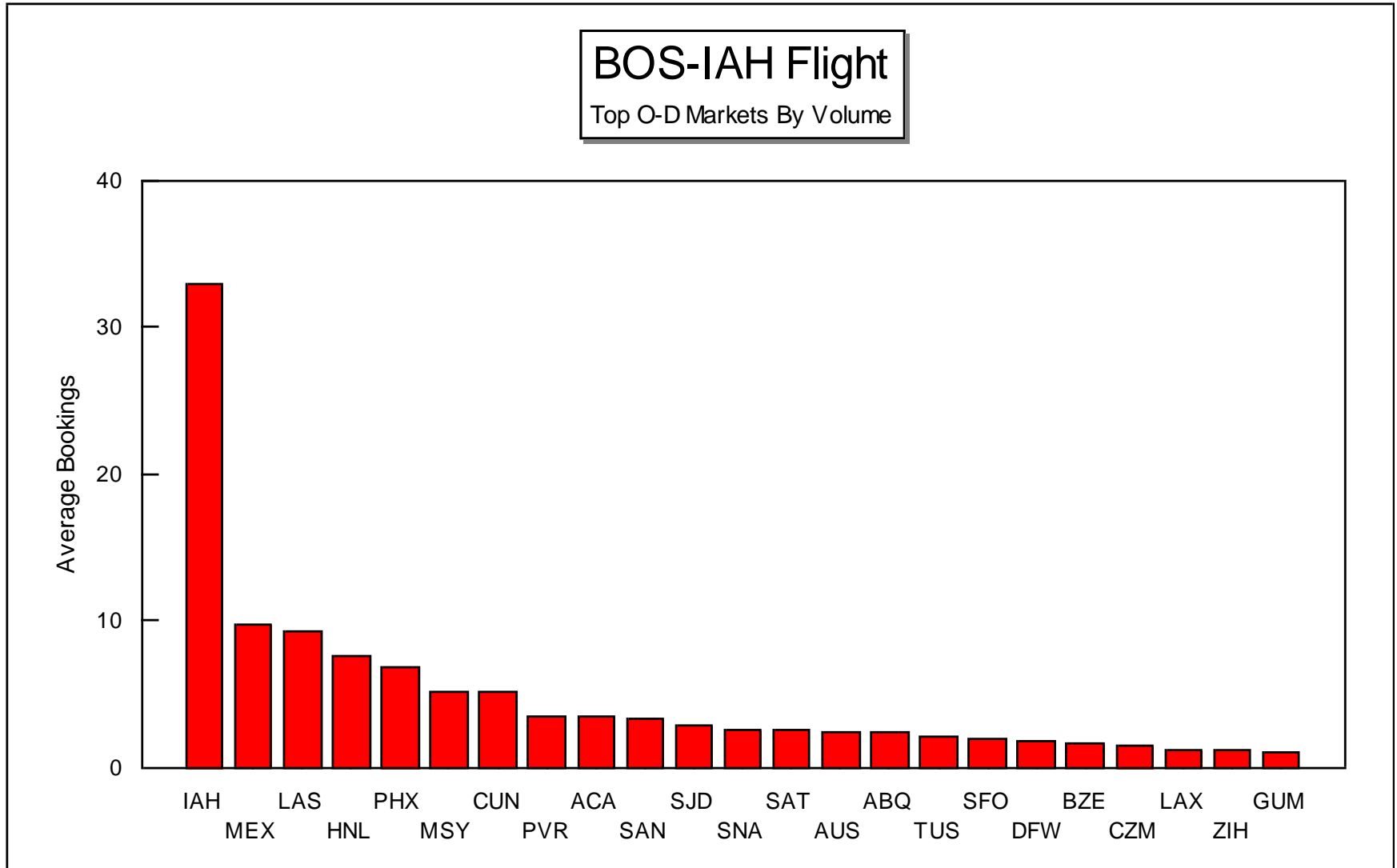
**Example: Passenger Loads on Nonstop
US Airways Flight **BOS-LAS** (150 seats)**

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
		<u>etc...</u>
	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

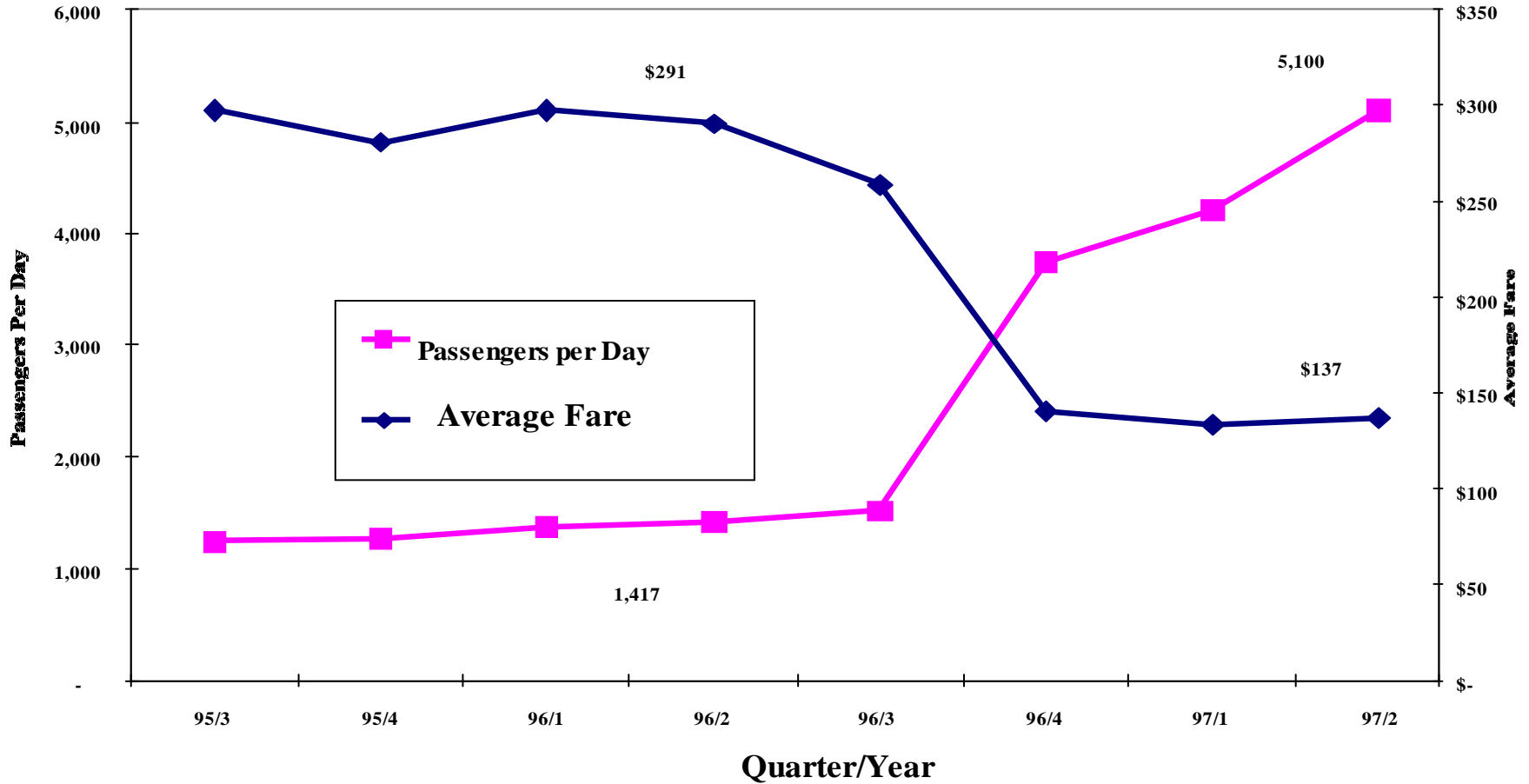
- **Definition: Percent change in total demand that occurs with a 1% increase in average price charged.**
- **Price elasticity of demand is always negative:**
 - A 10% price increase will cause an X% demand decrease, all else being equal (e.g., no change to frequency or market variables)
 - Business 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

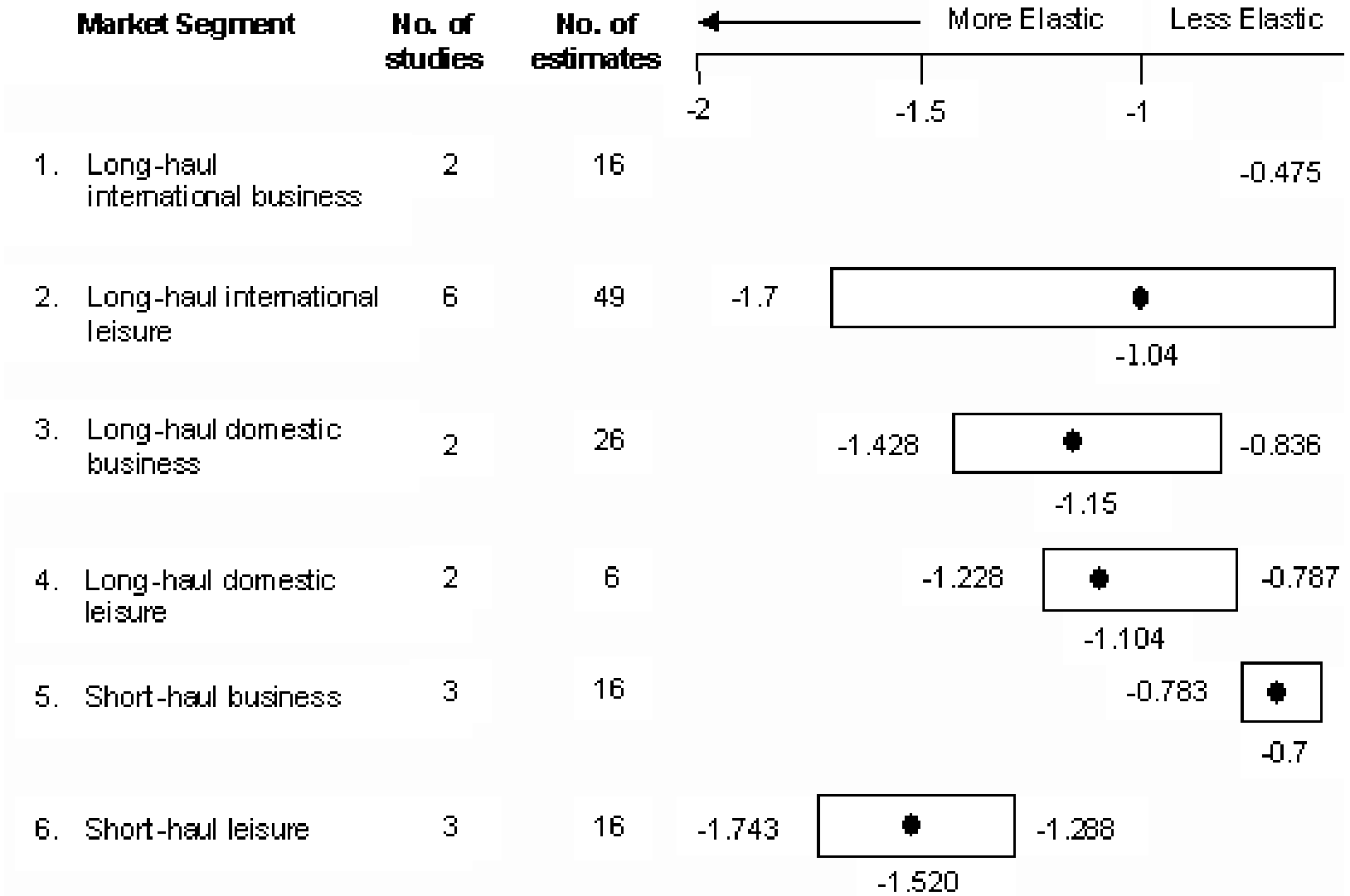
- **Inelastic (-0.8) business demand for air travel means less sensitivity to price changes:**
 - 10% price increase leads to only 8% demand reduction
 - Total airline revenues increase, despite price increase
- **Elastic (-1.6) leisure demand for air travel means greater sensitivity to price changes**
 - 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

Fare and Passenger Trends in 14 Providence Markets Before and After Entry by Southwest in October 1996

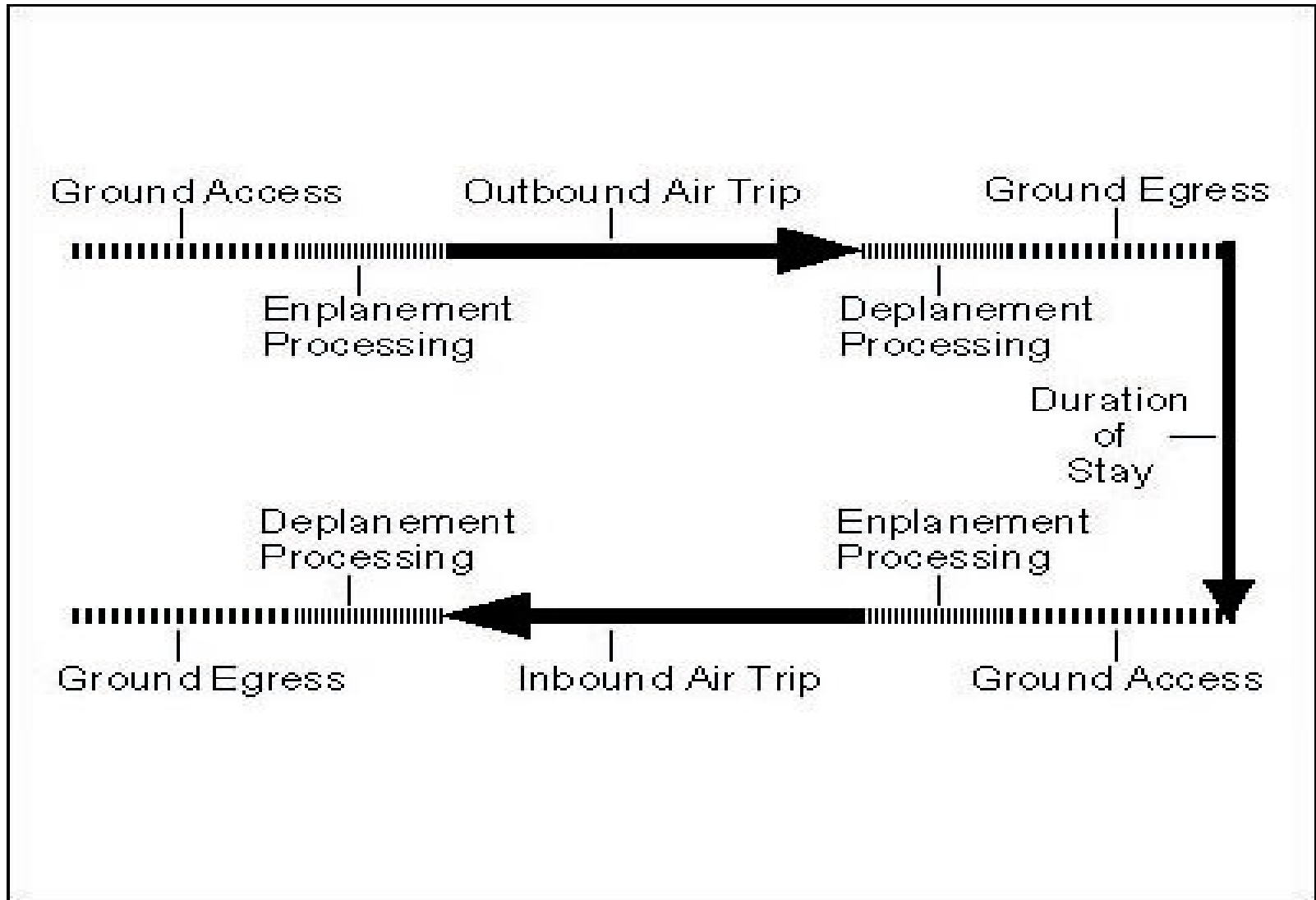


Summary of Air Travel Price Elasticities



Source: Dept of Finance Canada (2003)

Air Travel: Typical Passenger Trip



Total Trip Time and Frequency

$$\mathbf{T = t(\text{fixed}) + t(\text{flight}) + t(\text{schedule displacement})}$$

- 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 ($E_t < -1.0$), as demand can be stimulated by improving travel convenience
 - Leisure demand is time inelastic ($E_t > -1.0$), 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