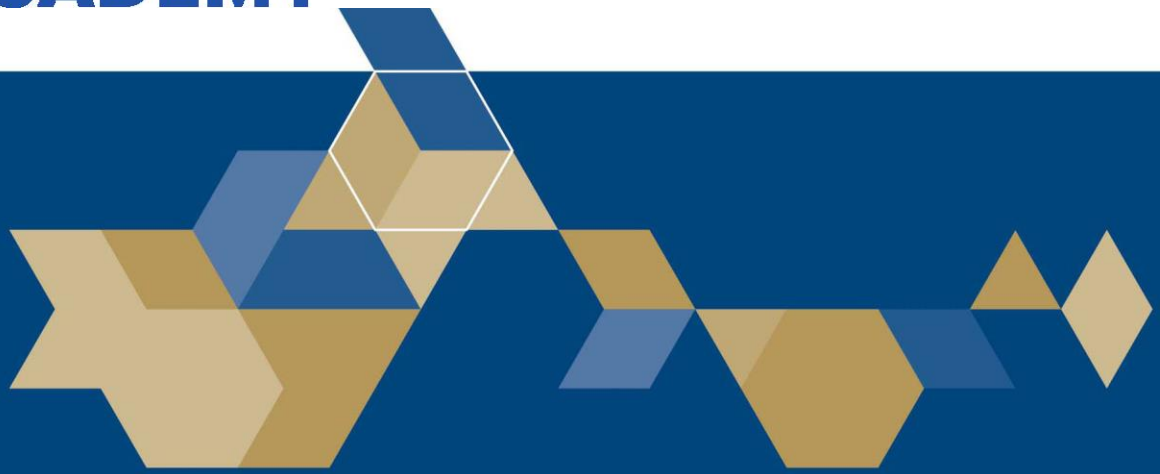

Aviation Economics & Finance

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Air Transportation Management
M.Sc. Program

Module 5 : 24 November 2015

OUTLINE

- Module 5 (2.5 hours) – Demand and Supply
  - Main characteristics of supply in the airline industry
    - Perishable (airline seats cannot be inventoried)
    - Excess capacity
    - S-curve
  - Main charateristics of demand in the airline industry
    - Derived demand
    - Determinants of demand
    - Market demand segmentation
      - Different classes/types of passengers
      - Different classes/types of freight
      - Demand elasticities

A. Supply

AIRLINE SUPPLY

- Perishability of seats
  - seats cannot be inventoried for future sale
  - once flight takes off, empty seats cannot be sold
- Joint production of seats in different fare classes
  - Airline can provide both full fare and discount seats on same flight
    - Previously, price sensitive leisure travel serviced by charters with business travel on network airlines
- Chronic overcapacity of seats
  - Load factors average around 70%
  - 30% of seats are unsold,
    - Load factors are usually lower on short haul and small aircraft routes
      - » 777 – 83%
      - » RJ – 70%

Excess Capacity

- Supply commonly exceeds demand in the industry
- This is not necessarily an issue
  - 100% load factors would leave many customers willing to pay for a flight
- The higher the load factor, the higher the probability that passengers will not be able to book a seat on their preferred flight
  - This is called ‘spill’

Source: Dempsey and Gesell (2006)

GLOBAL LOAD FACTORS

2012 vs. 2011	RPK Growth	ASK Growth	PLF	FTK Growth	AFTK Growth
International	6.0%	4.0%	78.9	-1.9%	0.6%
Domestic	4.0%	3.8%	79.5	1.4%	-1.2%
Total Market	5.3%	3.9%	79.1	-1.5%	0.2%

Source: IATA, Air Transport Market Analysis, December 2012

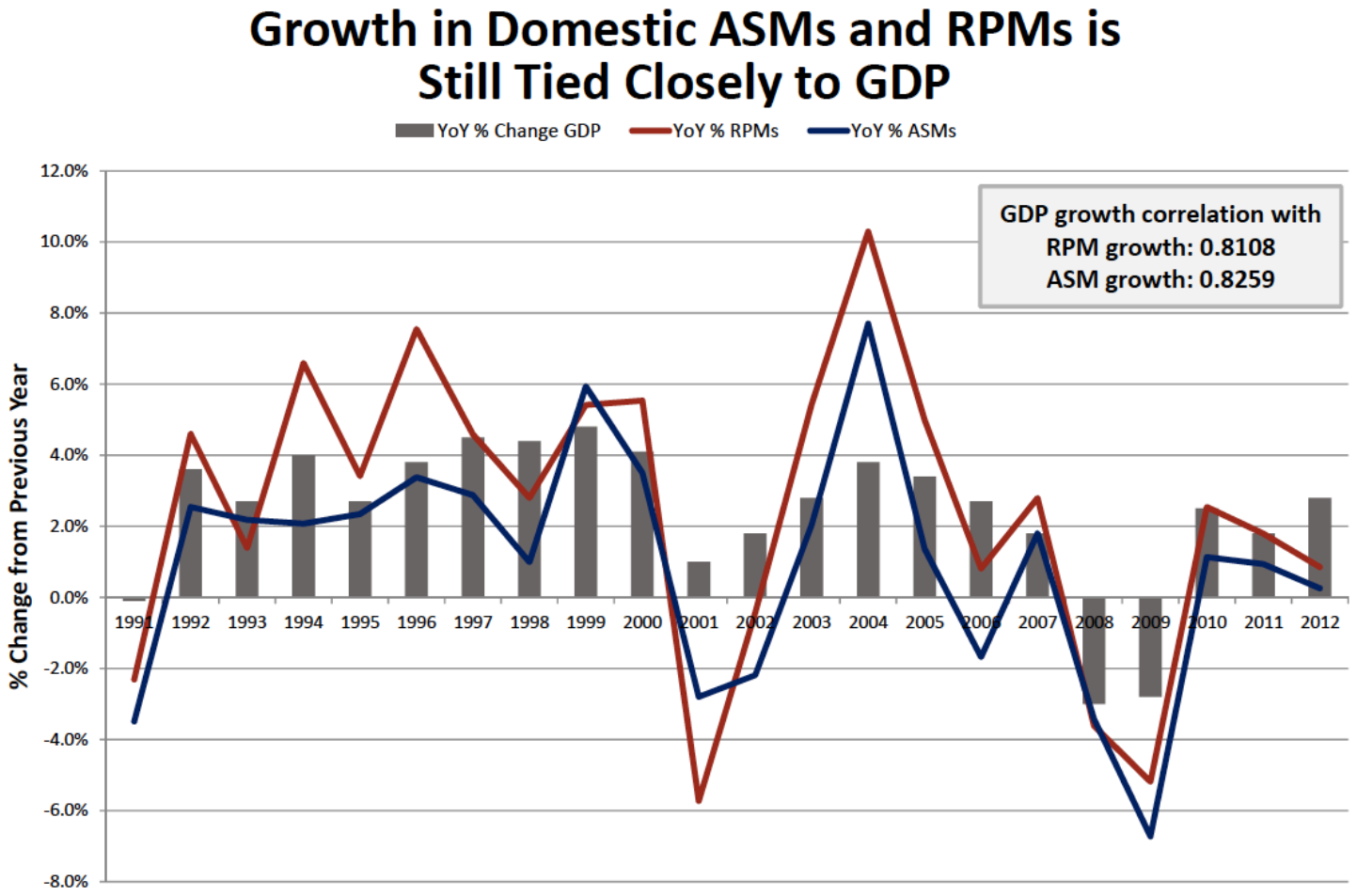
REGIONAL LOAD FACTORS

Year on Year Comparison	Sep 2013 vs Sep 2012		2013
	RPK	*ASK*	*PLF*
Africa	6.9%	7.4%	73.2%
Asia/Pacific	8.5%	7.1%	78.1%
Europe	3.4%	3.1%	83.9%
Latin America	8.3%	6.1%	80.9%
Middle East	10.4%	13.0%	77.2%
North America	2.3%	3.1%	83.9%
International	5.7%	5.7%	80.9%
Australia	2.6%	1.9%	78.1%
Brazil	1.0%	-1.9%	78.1%
China P.R.	10.6%	12.1%	80.2%
India	16.4%	5.7%	71.5%
Japan	7.8%	7.5%	69.3%
Russian Federation	12.1%	11.2%	78.7%
US	1.4%	1.0%	81.0%
Domestic	5.1%	4.7%	79.1%
Africa	5.7%	6.0%	73.7%
Asia/Pacific	9.2%	8.4%	78.0%
Europe	3.7%	3.2%	83.1%
Latin America	6.5%	4.0%	79.5%
Middle East	9.5%	12.5%	77.2%
North America	1.7%	1.8%	82.0%
Total Market	5.5%	5.3%	80.3%

RPK: Revenue-Passenger-Kilometers; ASK: Available-Seat-Kilometers; PLF: Passenger-Load-Factor;
All Figures are expressed in % change Year on Year except PLFwhich are the load factors for the specific month.

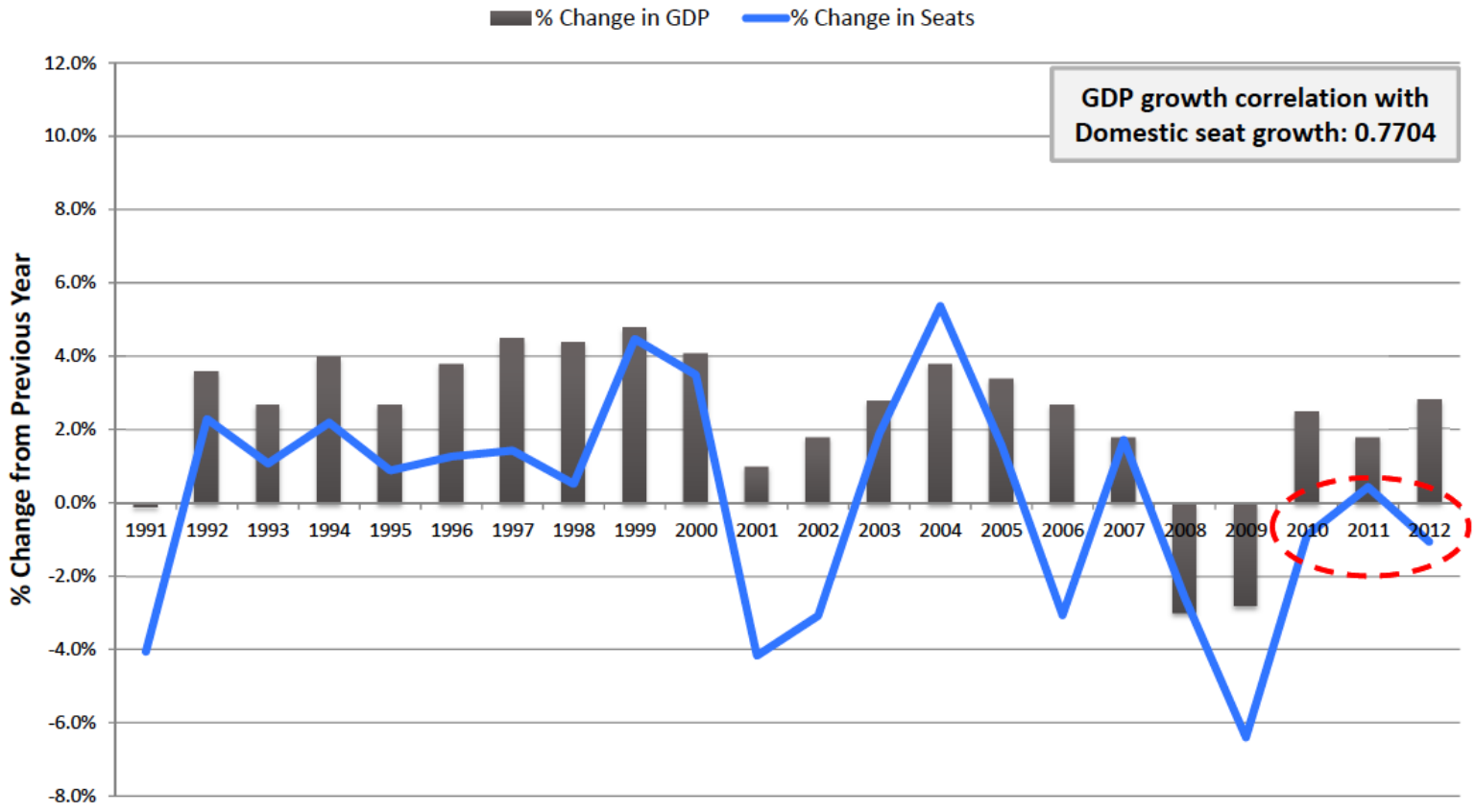
Source: IATA, September 2013

RECENT CHANGES IN U.S. DATA-CAPACITY



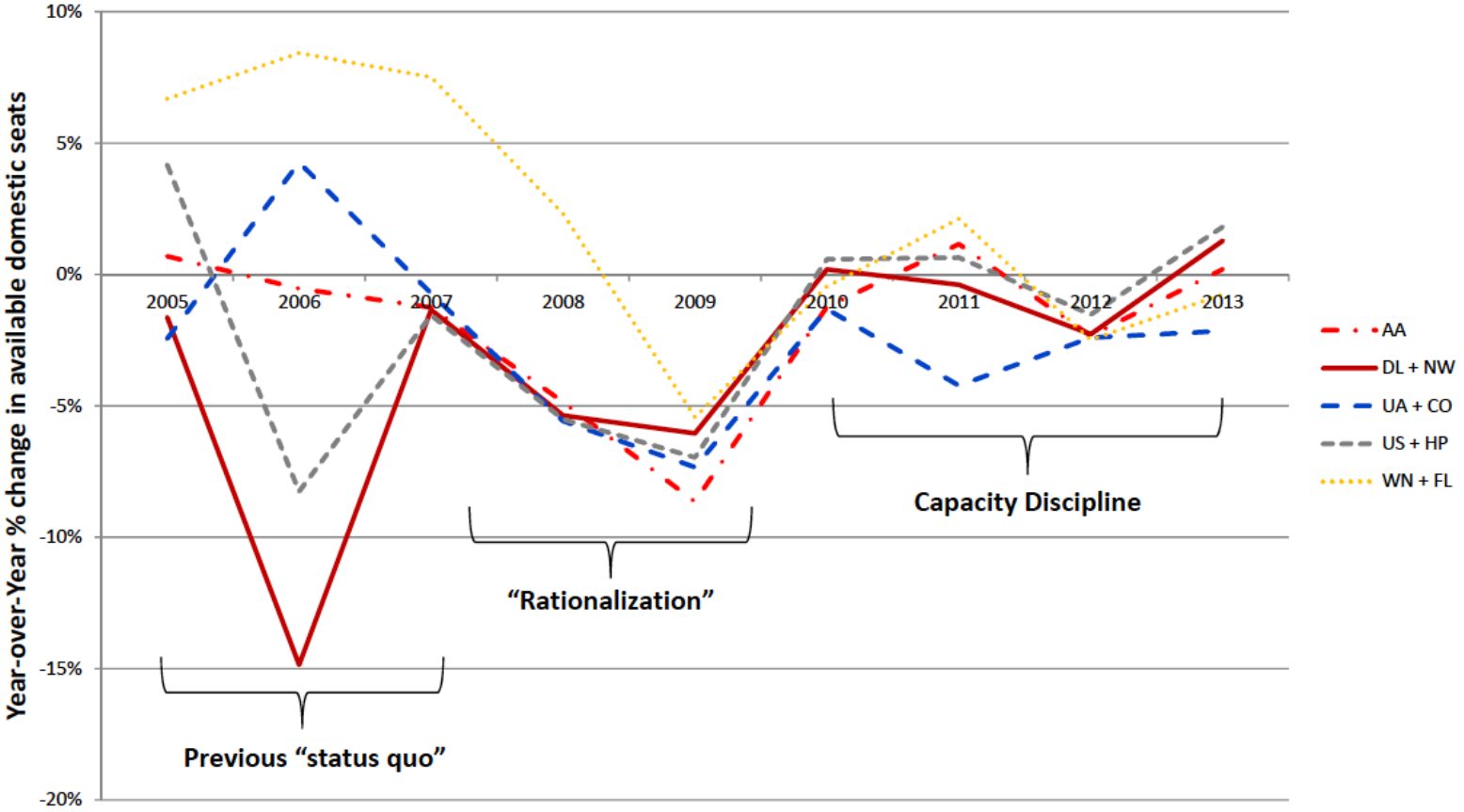
Source: Michael Wittman, *New Horizons in U.S. Airline Capacity Management: From Rationalization to "Capacity Discipline"*, MIT International Center for Air Transportation, November 2013

A Break in the Pattern? Domestic Seat Departures Have Recently Fallen Despite GDP Growth



Source: Michael Wittman, *New Horizons in U.S. Airline Capacity Management: From Rationalization to "Capacity Discipline"*, MIT International Center for Air Transportation, November 2013

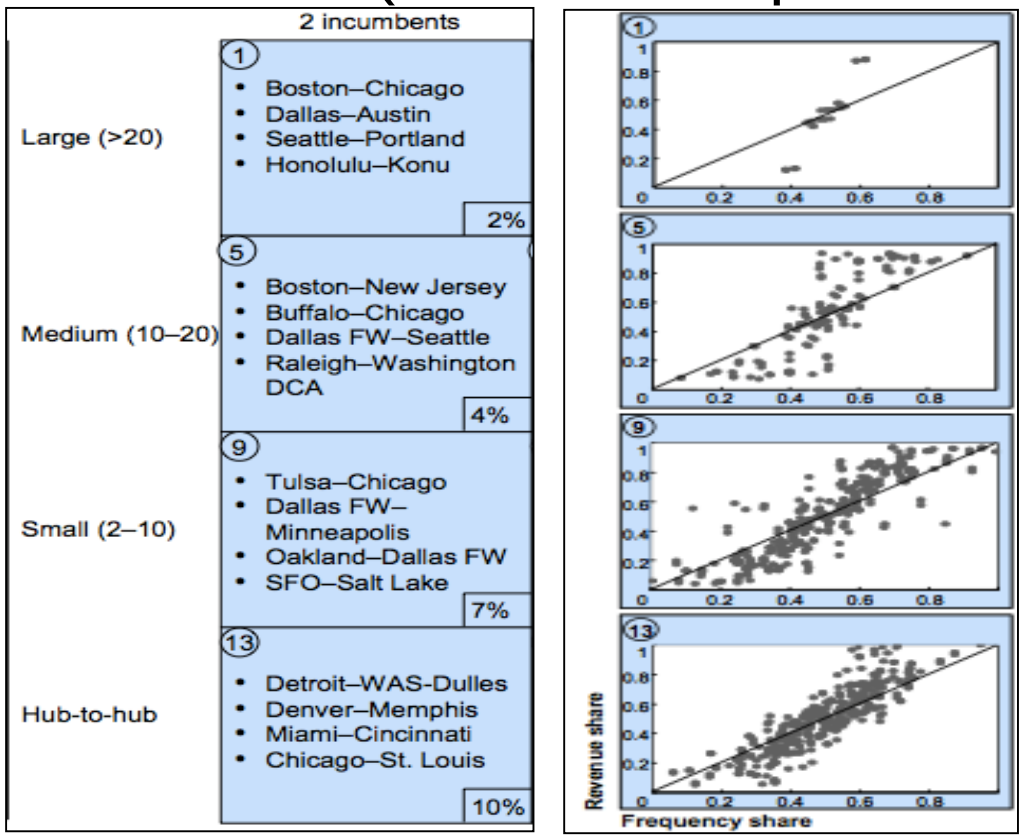
The Last Nine Years of Domestic Aviation Can Be Divided Into Three Epochs



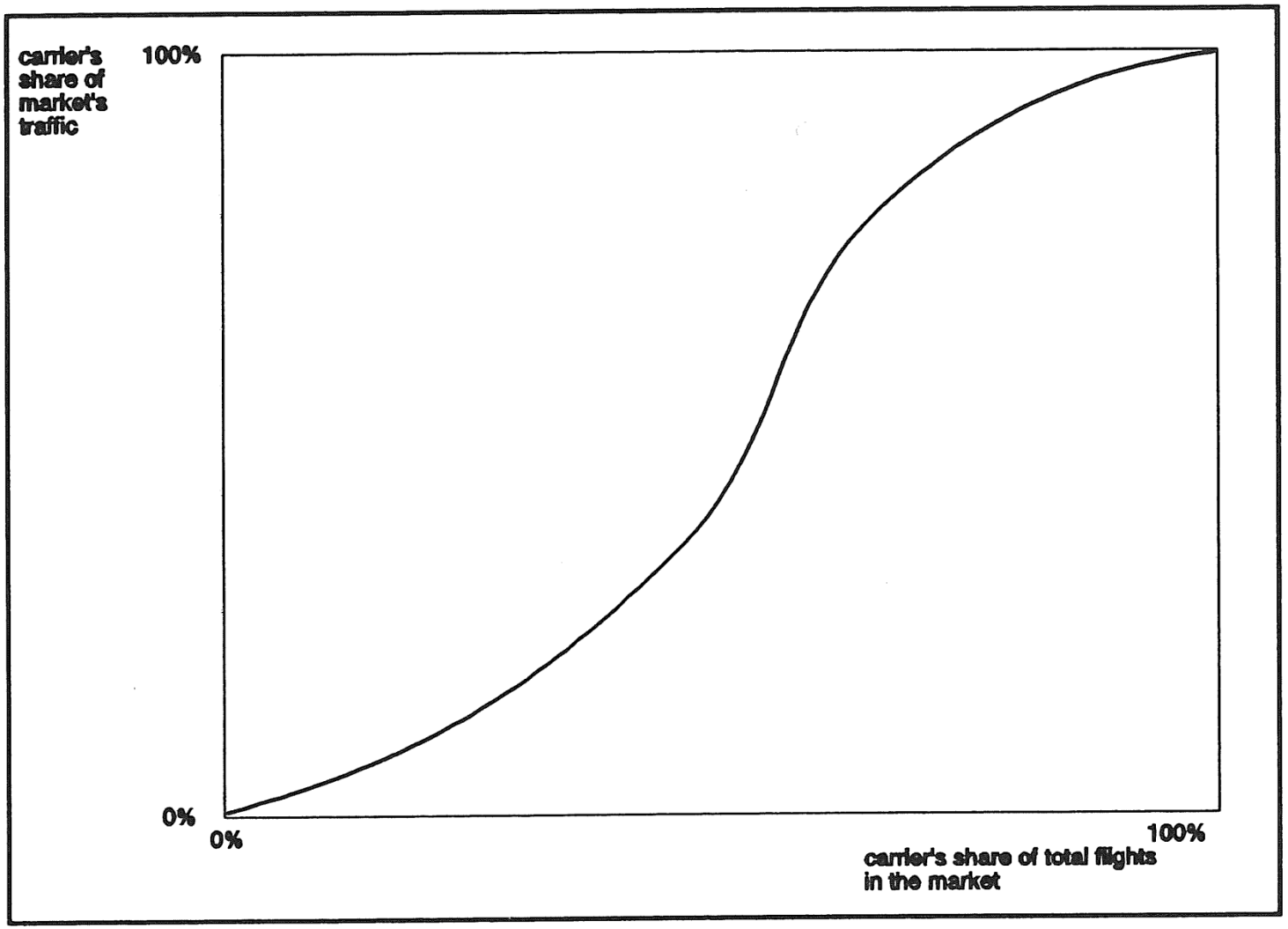
Source: Michael Wittman, *New Horizons in U.S. Airline Capacity Management: From Rationalization to "Capacity Discipline*", MIT International Center for Air Transportation, November 2013

WHY SUPPLY MORE SEATS?
REASON 1

- Reason 1: Schedule frequency disproportionately increases revenues (the S-curve phenomenon).



Source: McKinsey analysis for IATA, 2006



Source: Tretheway and Oum (1992)

November 23-28

WHY SUPPLY MORE SEATS?
REASON 2

- Reason 2: the addition of new network points geometrically increases product lines (city-pair markets)
  - If number of network points connected to a hub increases from
    - 9 to 14 (5 additional points),
    - But potential additional city pairs 45 to 105 (50 additional city-pairs).
    - A roughly 50% increase in points, increase number of markets (products) by 122%

Source: Dempsey and Gesell (2006)
November 23-28

WHY SUPPLY MORE SEATS?
REASON 3

- Reason 3: There is a time lag between order and delivery of aircraft
  - airlines increase aircraft orders aggressively when economy is strong
    - But take delivery during weak part of economic cycle

Source: Dempsey and Gesell (2006)

WHY SUPPLY MORE SEATS?
REASON 4

- Reason 4: High fixed costs provide an incentive to use aircraft even when demand is low
  - parked aircraft do not generate revenue
    - Yet the carrier incurs fixed costs of ownership
  - It may be more sensible to fly the aircraft at a loss, so that some contribution to the fixed costs can be made
    - The flight must generate at least enough revenue to cover the incremental flying costs of the flight (fuel, crew, catering, maintenance)
    - Any additional revenue contributes to fixed costs

Source: Dempsey and Gesell (2006)

BANKRUPTCY LAWS

- Stephen Wolf of United Airlines:
  - "In a truly free market (…) oversupply would be temporary. That is, the least efficient producers will exit the market.
  - **U.S. bankruptcy laws, however, in effect displace the realities of the marketplace and have now become a barrier to exit.** Carriers are able to operate literally for years without repaying their debt obligations; consequently, their capacity is artificially retained in the system (…)"

Source: S. Wolf, *Where Do We Go From Here?* (1995)

Structural Oversupply

- Why would structural overcapacity occur?
  - Large and indivisible capital
  - Long planning horizons
  - Incentives for firms to defer capacity adjustment
  - Subsidies to capital expansion
- What to look for
  - Profit over business cycle
  - Return on invested capital
  - Bankruptcies and reorganizations
  - Capacity utilization

Structural Oversupply - Myth or Reality?

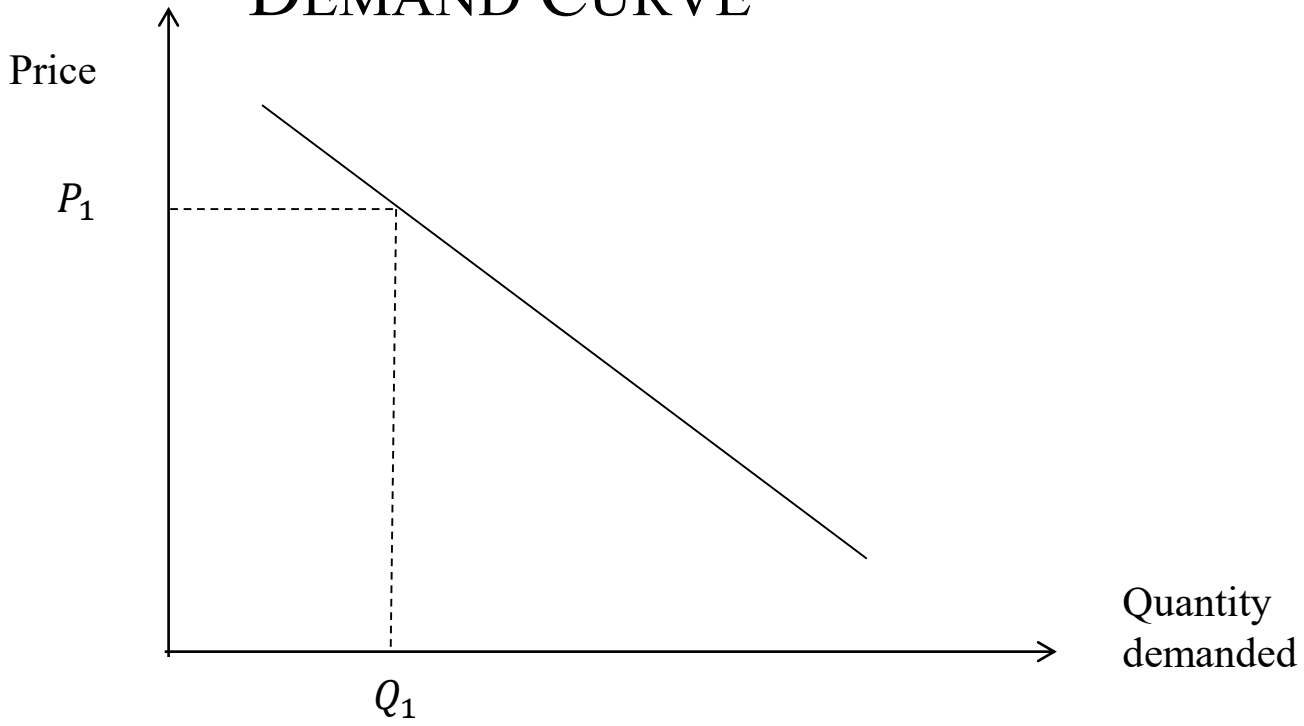
- Demand forecasts of +5.4% annually (IATA)
- Profitability is rising with less volatility over business cycle
- Airlines exhibiting capacity discipline (Metal Neutral Joint Ventures)
- Capacity utilization is trending upward
- Aircraft more nimble (B787) in serving a broader range of markets

B. Demand

DEMAND

- Demand is the total quantity of a good or service that buyers want to by at every price during a given time period.
- Demand explains behavior of buyers (consumers) in a market.
- Law of demand: *Other things constant, the higher the price of a good, the smaller is the quantity demanded; and the lower the price of a good, the greater is the quantity demanded.*

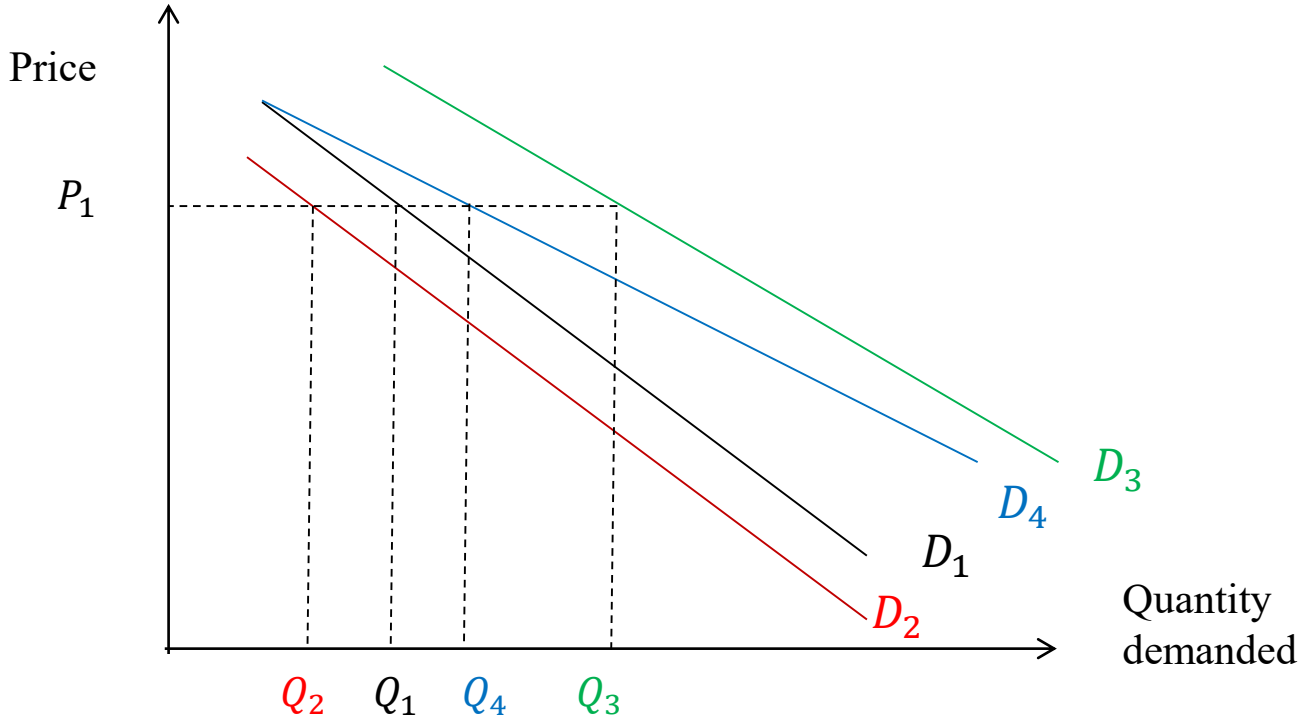
DEMAND CURVE*



- The term demand refers to the entire relationship between price of a good and the quantity demanded at every price. Demand is represented as a demand curve.
- The quantity demanded of good is the quantity that consumers want to buy at a particular price. Quantity demanded is a point on the demand curve.

* For simplicity, all demand curves are taken to be linear.

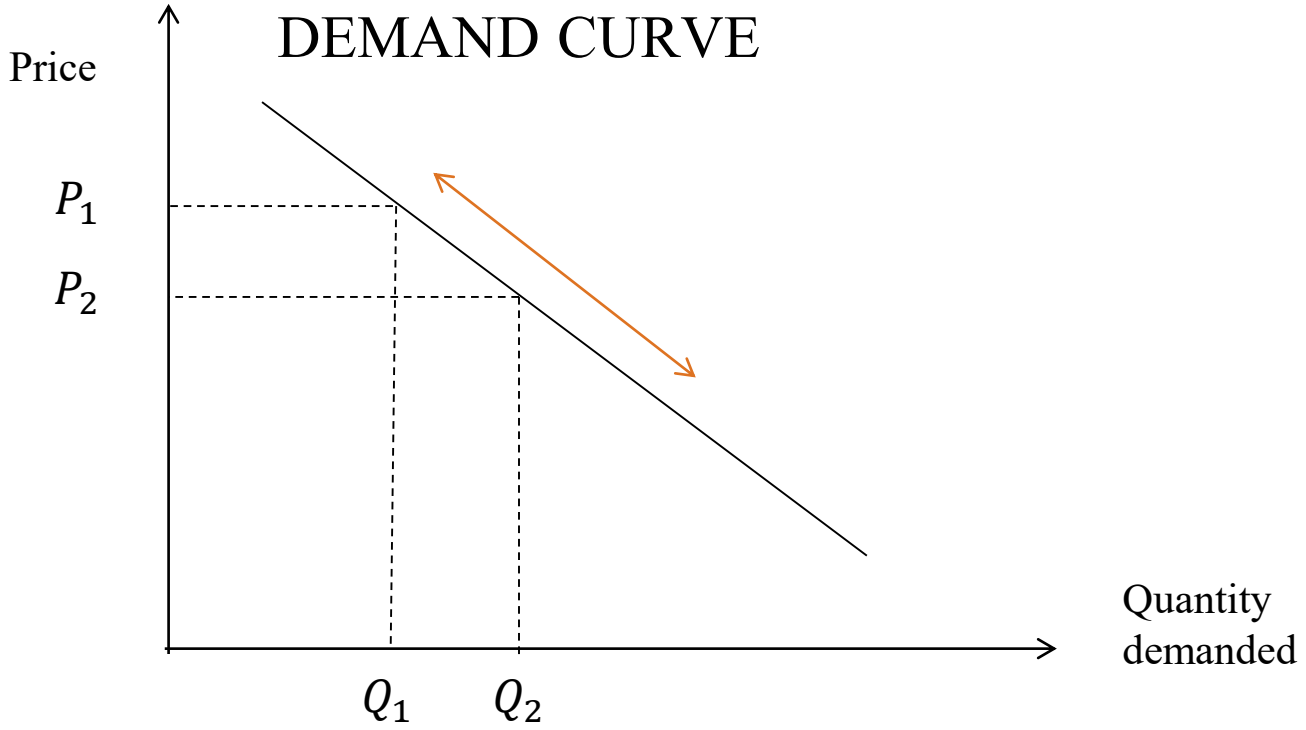
CHANGE IN DEMAND: SHIFTS



- If some other factor (e.g. income, price of complements, tastes change, season, population, expectations…) other than price changes the demand behavior of consumers for a good or service, then the demand cuve shifts
- $D_1 = f(P, X_1)$, $D_2 = f(P, X_2)$, $D_3 = f(P, X_3)$ and

$D_4 = f(P, X_4)$ (if the other factor has constant elasticity)

CHANGE IN DEMAND: MOVEMENT ALONG THE DEMAND CURVE



- If all other factors are constant and only price of the good changes, then we move along the original demand curve.

ELASTİCİTY OF DEMAND

- Elasticity measures the sensivity (responsiveness) of quantity demanded to changes price and income.
  - **Price elasticity of demand**

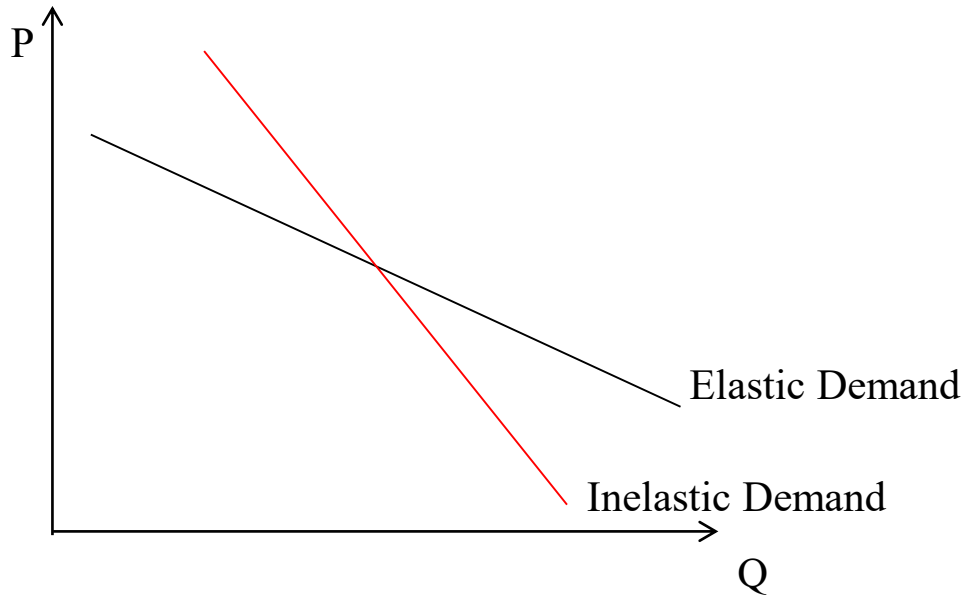
$$\varepsilon_P = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ price}$$

  - **Income elasticity of demand**

$$\varepsilon_Y = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ income}$$

PROPERTİES OF PRİCE ELASTİCİTY

1. Price elasticity of demand is usually a negative number.
2. Elastic if $|\varepsilon_p| > 1$ (very responsive to price changes) and Inelastic if $|\varepsilon_p| < 1$ (not very sensitive to prices) and Unitary elastic if $|\varepsilon_p| = 1$ (ratio of %Δ is 1)



PROPERTİES OF PRİCE ELASTİCİTY CTD.

3. Special cases
   - $|\varepsilon_p| = 0$ quantity independent of price (*Figure 1*)
   - $|\varepsilon_p| = \infty$ quantity very sensitive to price (*Figure 2*)

Figure 1

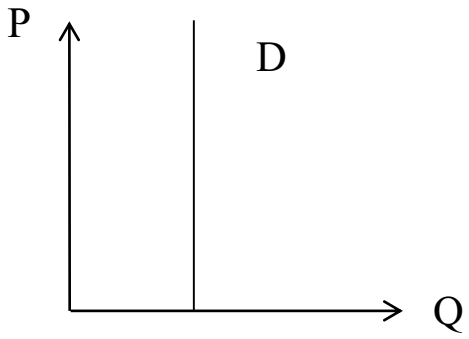
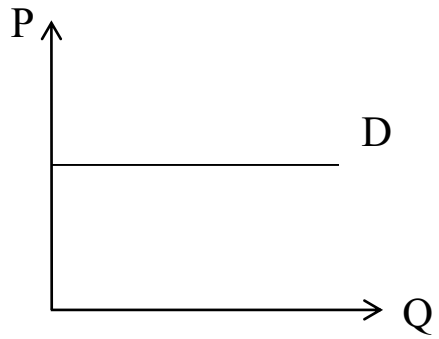
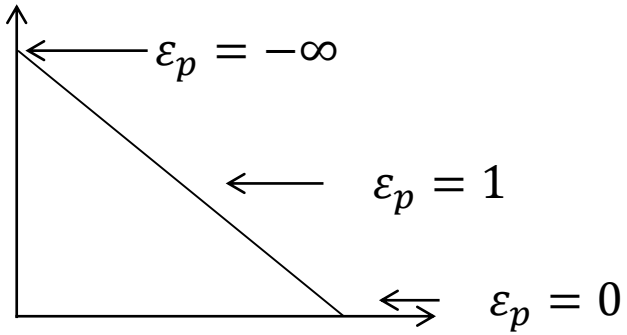


Figure 2



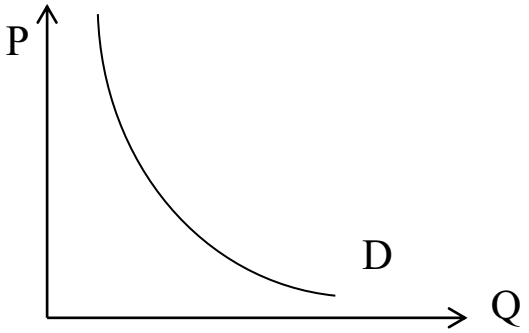
PROPERTİES OF PRİCE ELASTİCİTY CTD…

4. Given a linear demand curve, ε_p is not constant along the curve.



5. The constant elasticity function (isoelastic function) is

$$Q = aP^b$$



PROPERTİES OF PRİCE ELASTİCİTY CTD…

6. How do total consumer expenditure change when the price of a good changes?

$$Change\ in\ expenditure = Q(1 - |\varepsilon_P|)$$

EXAMPLE FOR PRİCE ELASTİCİTY OF DEMAND

- Example: This is the number of game tickets

Price (in dollar)	Quantity of tickets demanded (in thousand)	Price Elasticity of Demand
125	0	
100	20	$-\infty$
75	40	-4
62.5	50	-1.5
50	60	-1
25	80	-0.67
0	100	-0.25

EXAMPLE FOR PRİCE ELASTİCİTY OF DEMAND CTD…

- Example: This is the number of game tickets

Price (in dollar)	**Quantity of tickets demanded (in thousand)**	**Price Elasticity of Demand**	**Total Revenue (thousand dollars)**
125	0		0
100	20	$-\infty$	2000
75	40	-4	3000
62.5	50	-1.5	3125
50	60	-1	3000
25	80	-0.67	2000
0	100	-0.25	0

EXAMPLE FOR PRİCE ELASTİCİTY OF DEMAND CTD…

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50	60	-1	3000
25	80	-0.67	2000
0	100	-0.25	0

FACTORS THAT AFFECT DEMAND

- Factors that affect airline demand:
  - Price
  - Income
  - Travel time
  - Demographics
    - population
    - age distribution of population
    - cultural ties between cities
  - Price and convenience of other modes of transport
  - Price and convenience of competing airlines
  - Frequency of service
  - Timing of service

Source: Tretheway and Oum (1992)

FACTORS THAT AFFECT DEMAND – CONT.

- Day of the week
- Season
- Amenities (and price of amenities)
  - food quality
  - entertainment
  - seat width / seat pitch
- Customer loyalty
  - Frequent Flyer Programs
  - Corporate travel programs, where benefits are provided for commitment for large share of travel
- Safety and security
- Distance

Source: Tretheway and Oum (1992)

THE KEY FACTORS

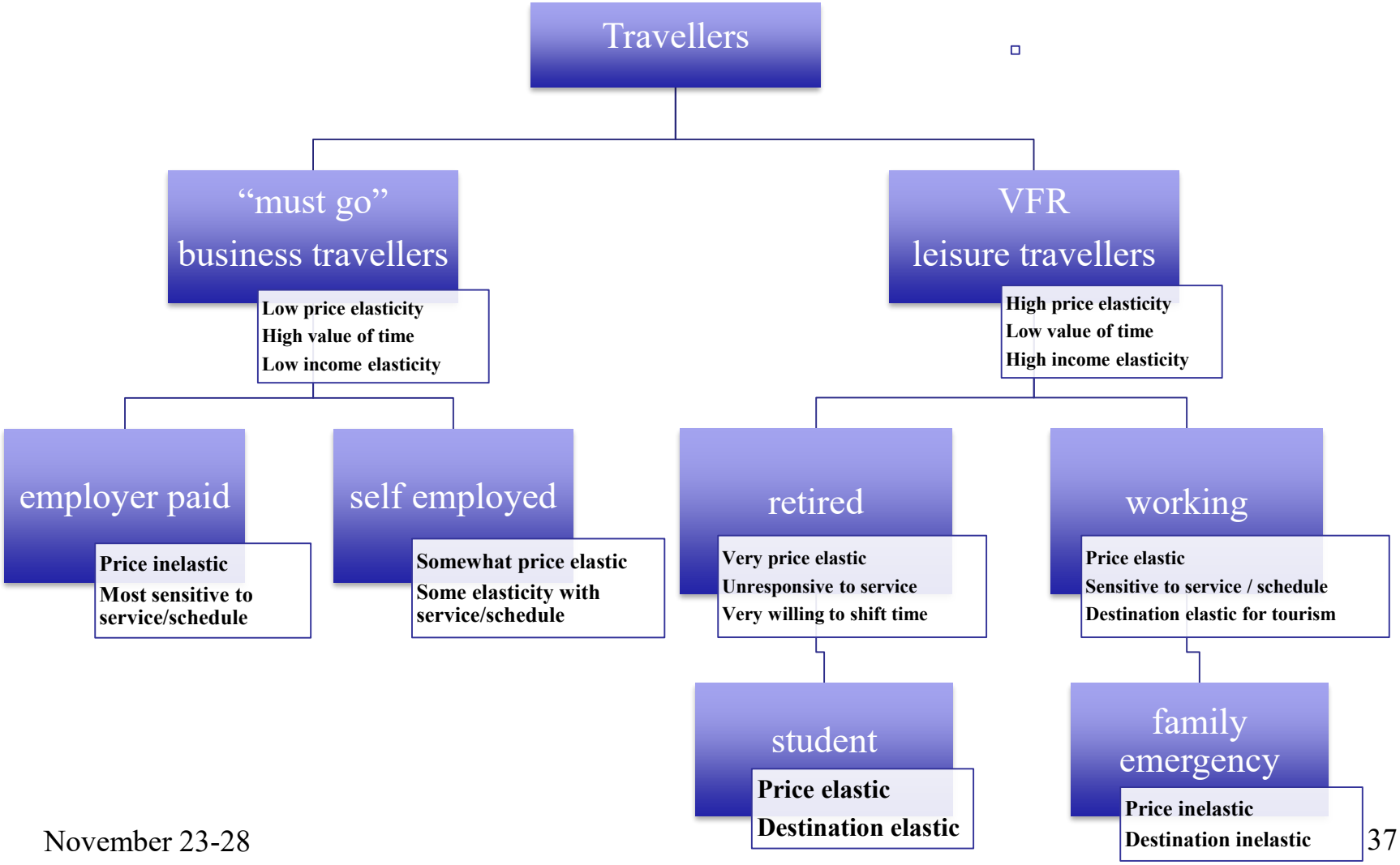
- Price
  - Lower fares lead to higher demand
- Frequency of service
  - More important for business travellers
  - One study found that doubling frequency would lead to a 20% increase in demand for business but only a 5% increase for leisure travellers
- Income
  - Air travel is pro-cyclic
    - When economy drops 5%, air travel may drop 9%

Source: Tretheway and Oum (1992)

DERIVED DEMAND

- Air Travel is a *derived* demand
  - People do not buy airline product simply because they want to fly
  - They buy airline product as part of another activity
    - A leisure experience
    - A business engagement
  - We say airline demand is derived from demand for leisure or business engagements, etc.
  - Thus airline demand is affected by prices and other aspects of other elements
    - Low hotel prices stimulate demand for air travel

SEGMENTATION OF MARKET DEMAND



LEISURE VS. BUSINESS

- Leisure travellers:
  - Travel on personal time
  - Low time sensitivity
  - High price sensitivity
  - Travel is generally booked in advance
- Business travellers:
  - Travel is on company time
  - High time sensitivity – frequency is important factor
  - Lower price sensitivity
  - Flexibility is also important – last minute bookings

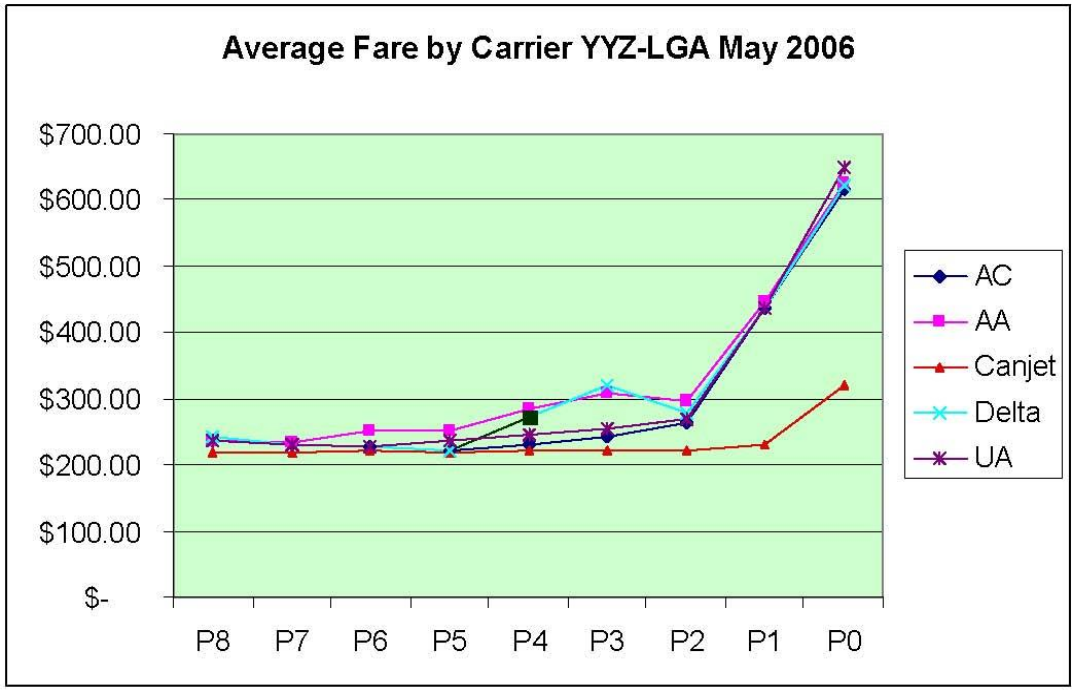
Source: Tretheway and Oum (1992)

PRICE DISCRIMINATION IN THE AIRLINE BUSINESS

- airline has ability to charge two consumers different fares
  - consumers of discount fare have no ability to sell their seat to a full fare consumer
- airlines differentiate the product
  - Ex) full fare seats allow flexibility to change travel plans
- airlines recognise that full fare product is often bought close to date of flight
- discount seats can be bought much earlier and are usually sold with restrictions
- Price discrimination
  - Sell flexible product at full fare
  - Sell a restricted product at lower fare, but with advance purchase

INTER-TEMPORAL PRICE DISCRIMINATION

- Can extract value from last minute booking passenger
- Varies with number of competitors
- Varies across markets



Gillen and Hazledine (2011) The New Pricing in North American Air Travel Markets: Implications for Competition and Antitrust

DEMAND MANAGEMENT

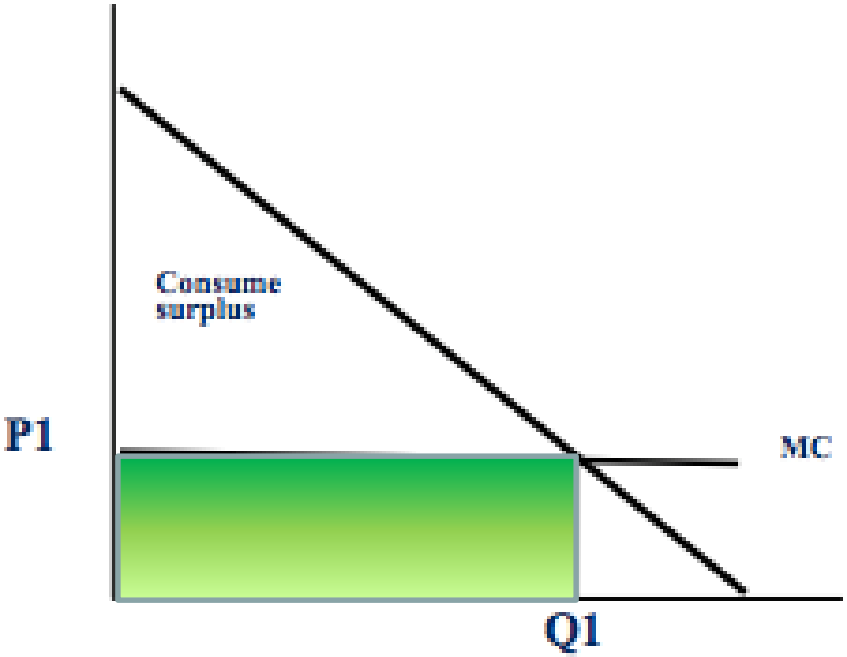
- Airlines offer low fares, at off-peak times, with advance purchase requirements and other restrictions, to attract VFR traveller, but they must avoid diversion or cross over of "must go" travellers to the low fare product

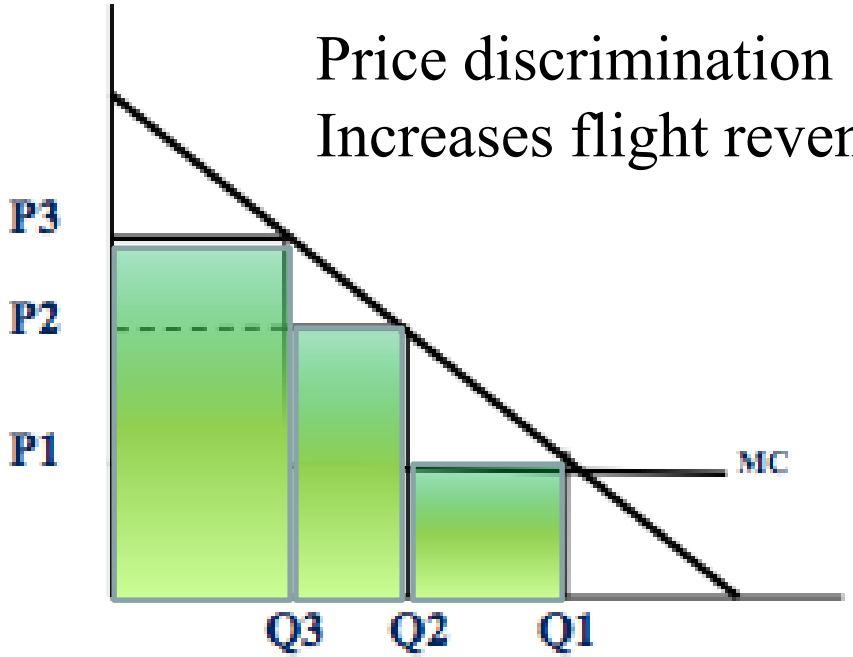
- Airlines use restrictions on tickets
  - Segment full fare market from discount fare as much as possible using *fences* on cheaper tickets

DEMAND MANAGEMENT – CONT.

- Typical conditions for cheaper tickets (fences)
  - Advance booking
  - No refund or penalty on refund
  - Penalty for schedule change
  - No stopover privileges
  - Round trip ticket
  - No interline privileges

PRICE DISCRIMINATION BY PASSENGER SEGMENT





Price discrimination
Increases flight revenue

CONSUMERS AND LARGE CARRIERS

- All other factors held constant, many consumers prefer large carriers over small carriers
- Three reasons:
  - Information costs
    - Large carriers have a large network, while many small carriers have limited service options
  - Quality of service
    - For example, connections are easier for a single airline, rather than switching airlines, as well as lower chance of lost or delayed baggage with a single airline connection
  - Frequent flyer programs
    - More destinations makes it easier to collect points

Source: Tretheway and Oum (1992)

HUBS AND PASSENGER DEMAND

- Hub disutility
  - Passengers are affected by the number of transfers
    - Passengers generally are willing to pay more to avoid transfers
    - Hub connections disutility has been estimated at $30
- Price effects
  - Both positive and negative effects
    - Increased fuel and crew costs of hub operation can be offset by increased passenger traffic
    - Can lead to viable service to smaller communities, and overall increase in demand

Source: Tretheway and Oum (1992)

OVERBOOKING

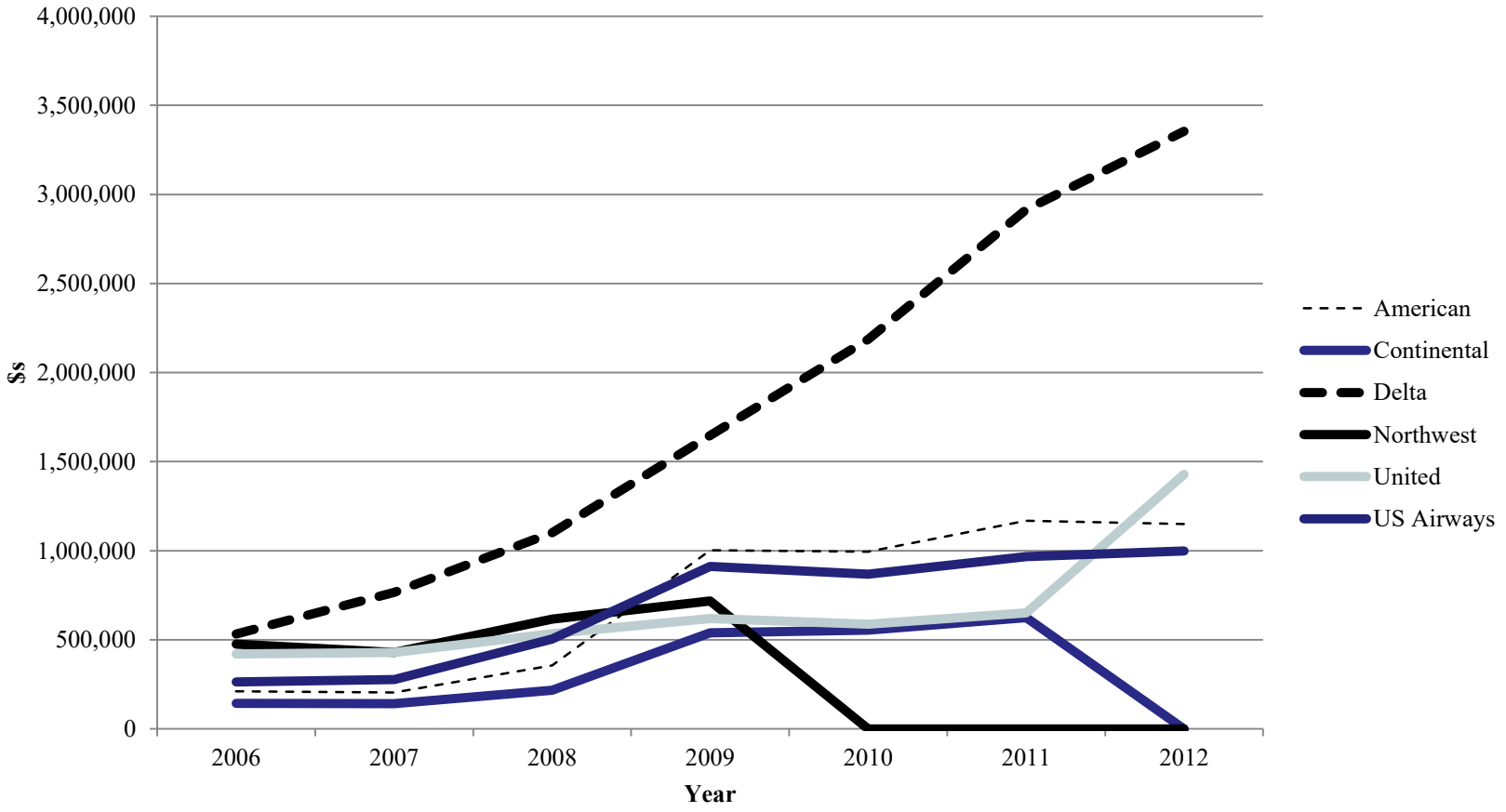
- A portion of travellers will not show up for their flight
  - Business travellers more often than leisure travellers
- Airlines may offset loss of revenue by booking more seats than available
  - Based on historic “no-show” rates
- This can be an issue when all passengers are present for the flight
  - Airlines offer incentives to passengers willing to take another flight
- Non-refundability of ticket prevents no-show revenue loss

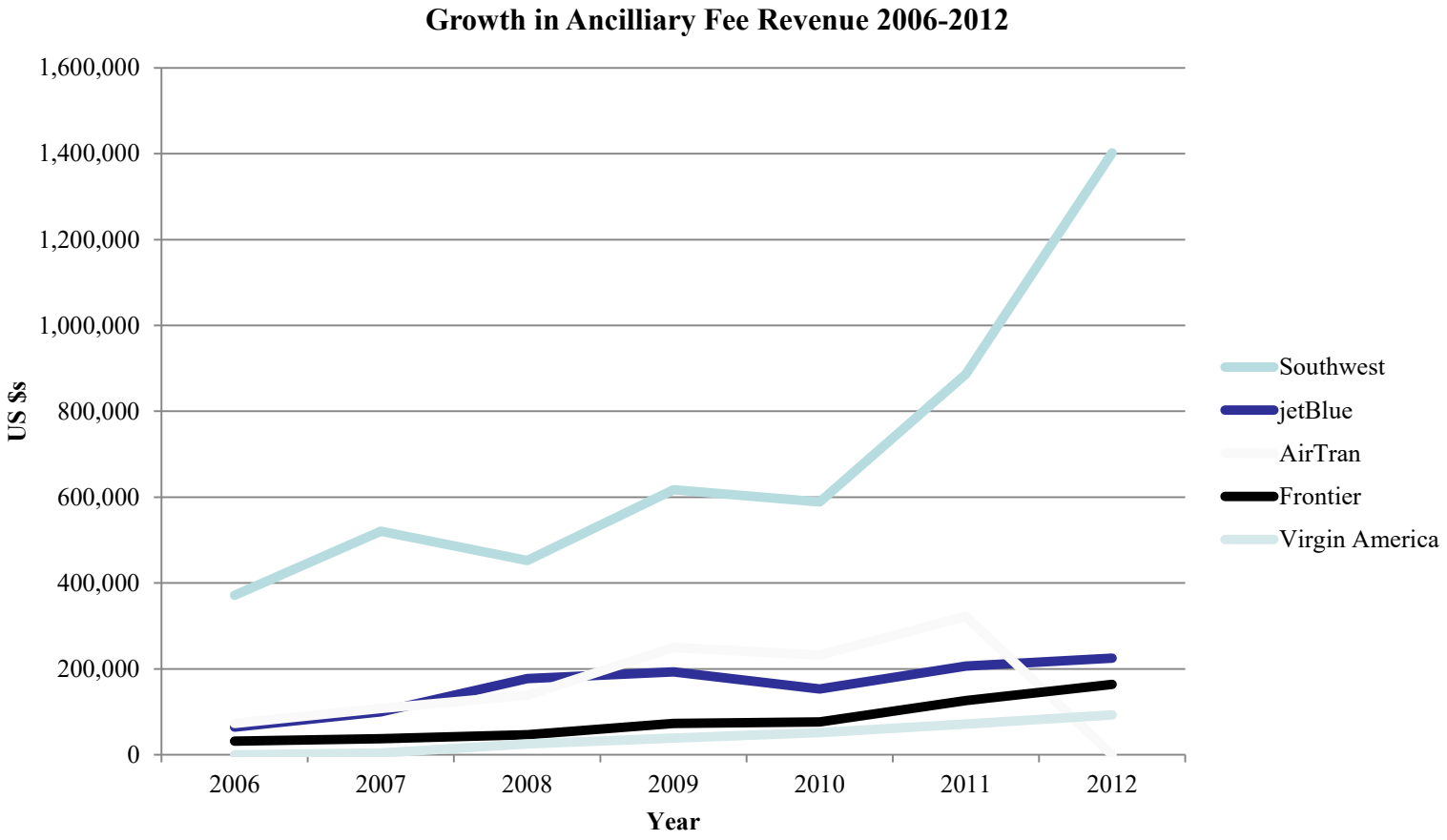
Source: Tretheway and Oum (1992)

ADD-ON PRICING (PRODUCT UNBUNDLING)

- Bundling moves people away from optimal consumption point
- Bundling requires ‘bribing’ customers to take good with bad
- Unbundling lets customer build product of choice for a given trip – create value
- Spirit (U.S. ULCC) lowers base fare when unbundling
- Airlines generating significant revenue and uncoupling from GDP

Growth in Ancilliary Fee Revenue 2006-2012




Growth in Ancilliary Fee Revenue 2006-2012
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
US $s
2006
2007
2008
2009
2010
2011
2012
Year
Southwest
jetBlue
AirTran
Frontier
Virgin America

END OF MODULE 5