TURKISH AVIATION ACADEMY

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Aviation Economics & Finance

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OUTLINE

- **Cost classification**
  - Variable
  - Fixed
  - Short run vs long run
- **Cost relationship with:**
  - Distance
  - Traffic levels
  - Network size and scope

OUTLINE – CONT.

- **Cost Structure**
  - Fuel
  - Labour
  - Marketing & distribution
  - Taxes
  - Air navigation
  - Airport fees
  - Other costs
- **Economies of scale, scope and density**

A. Cost Classification

VARIABLE, FIXED AND TOTAL COSTS

- **Variable costs are costs that change with the level of production**
  - i.e., fuel costs for aircraft is higher if more flights are performed with an aircraft
- **Fixed costs do not vary with the level of production**
  - i.e., the ownership costs of an aircraft (lease payment, interest payment, insurance) are the same whether the aircraft flies or is parked
- **Total costs" the sum of variable and fixed costs**

Source: Vasigh et al. (2008)

AVERAGE AND MARGINAL COSTS

- **Average costs are obtained by dividing costs by total output**
  - Average costs per passenger
    - Flight cost: $5000
    - Pax = 100
    - Average cost = $50
- **ATC = Total Costs/Total Output**
- **AVC = Total Variable Costs/Total Output**

Source: Vasigh et al. (2008)

AVERAGE AND MARGINAL COSTS

- **Marginal cost (incremental cost) is the change in total costs by adding one more unit of output**
  - Marginal cost
    - Flight cost: $5000 for 100 passengers
    - Flight cost: $5025 for 101 passengers
      - Perhaps extra fuel, an extra drink, a bit more time for cleaning aircraft
    - Marginal cost = $25

Source: Vasigh et al. (2008)

AVERAGE AND MARGINAL COSTS

- **Marginal cost (incremental cost)is the change in total costs by adding one more unit of output**
  - Marginal cost of 101st passenger may be different from the marginal cost of 110th passenger
    - E.g., extra flight attendant may be required
    - Pilot might add more fuel for 10 pax, but not for one

Source: Vasigh et al. (2008)

LONG RUN VS. SHORT RUN COSTS

- **In the short run, costs can be variable or fixed**
  - There are costs that are obligations for a period of time
    - e.g., lease payments might be ‘locked in’ for 3 years for a given aircraft
    - Labour contracts last a fixed period

Source: Vasigh et al. (2008)

LONG RUN VS. SHORT RUN COSTS

- **In the long run, costs eventually become variable**
  - Lease may have option to return the aircraft after 3 years
    - Hence the lease cost now becomes variable
  - Even with a given aircraft on a long term lease, lease costs may be variable
    - A320 frame numbers 15-37 may be on a 20 year lease
    - But if aircraft #5 has its lease expiring this year, the size of the fleet can be changed by returning that aircraft

Source: Vasigh et al. (2008)

Outputs in a Multi-Output Industry

- **Airlines produce many outputs**
  - Scheduled passenger services, cargo services, charter services
  - Standard metric of output is Available Seat Kilometer (ASK)
- **Airlines are in Many Product Markets**
  - Business travel, leisure travel, vacation packages
  - Is each route a different product market? We have seen these in our study of demand (Module 2)

B. **CASM, RASM AND BELF**

COSTS AND REVENUES

- **Costs and revenues are compared in unit terms:**
  - CASM = Cost per available seat mile

$$\frac{\text{Total operating costs}}{\text{(total seats available for purchase * total miles flown)}}$$

  - RASM = Revenue per available seat mile

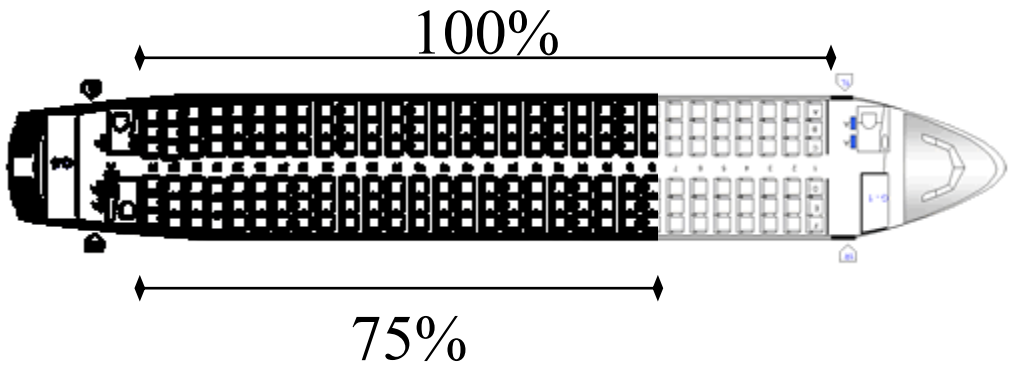
$$\frac{\text{Total operating revenues}}{\text{(total seats available for purchase * total miles flown)}}$$

RASM > CASM, good/profitable

RASM < CASM, not so good/not profitable

LOAD FACTOR

- **Load Factor:**
  - Measure of how full a plane is, by percentage



  - Passengers ÷ Total Available Seats = Load Factor
  - Load factor can also be computed as
    - Revenue passenger miles ÷ Available seat miles
    - Or as a weight load factor
      - Revenue ton miles ÷ Available ton miles

Break Even Load Factor

- **BELF = load factor where flight costs are covered**
  - BELF = CASM/RASM
  - Ex) CASM = 5 cents
    RASM = 7 cents
    BELF = 71%
  - Ex) CASM = 5 cents
    RASM = 4.8 cents
    BELF = 104%
    - I.e., even if the aircraft is full, flight will lose money (NW in 2003)

YIELD VS. RASM

- RASM = Revenue per ***available*** seat mile

  Total operating revenues

  (total seats available for purchase * total miles flown

- Yield = Revenue per ***occupied*** seat mile

  Total operating revenues

  (number of seats sold * total miles flown)

  - Ex) 120 seat aircraft, 100 are sold
    flight distance = 1000 miles
    Flight revenue = $7500

Seats	Pax	dist	ASM	RPM	Revenue	RASM	Yield
120		1000	120,000		$ 7,500	$ 0.063	
	100	1000		100,000	$ 7,500		$ 0.075

YIELDS

- **Comparisons of revenue earned on routes of different lengths.**

$$\text{ORD-JFK}\ \frac{\$109}{740\ \text{mi}} = 14.7¢$$

$$\text{ORD-LAX}\ \frac{\$109}{1{,}745\ \text{mi}} = 6.2¢$$

WHAT ARE THE KEY DRIVERS OF AIRLINE COSTS?

- **Operating expenses (IATA, 2008)**
  - Fuel (32%)
  - Labor – wages and benefits (20%)
  - Depreciation and amortization (6%)
  - Aircraft Rentals (4%)
  - Everything else (38%)

C. **COST MANAGEMENT**

FUEL COSTS

- **Greatest share of an airlines operating costs**
- **Fuel cost per available seat mile is affected by**
  - Fuel price
  - Fuel efficiency
- **Airlines can create fuel efficiencies through**
  - Right sizing aircraft to demand on route
  - Use of fuel-efficient aircraft
  - Effective flight planning
  - Longer stage lengths have lower fuel cost per mile
  - Lower engine use while taxiing/ grounded at airports

Source: Vasigh et al. (2008)

LABOUR COSTS

- **Second largest operating cost**
- **Can be difficult to alter costs**
  - Generally a unionized labour force
    - Difficult to change contracts to match changes in demand
  - Government regulations on work rules
- **Bankruptcy has been used to achieve lower labour costs**
  - Improved productivity (ex 2 vs 3 pilots on 737-200)
  - Lower wages or benefits
  - Changes to work rules

Source: Vasigh et al. (2008)

MAINTENANCE COSTS

- **A high costs**
  - But safety is more important than cutting costs
    - Huge costs of safety failure
    - Lower revenues if pax perceive safety problems
- **Airlines manage maintenance costs by:**
  - Outsourcing maintenance to third-parties
    - Varies amongst airlines
  - Having a younger fleet
    - Older aircraft require more maintenance/checks
  - Having a common fleet
    - Requires less spare parts inventory

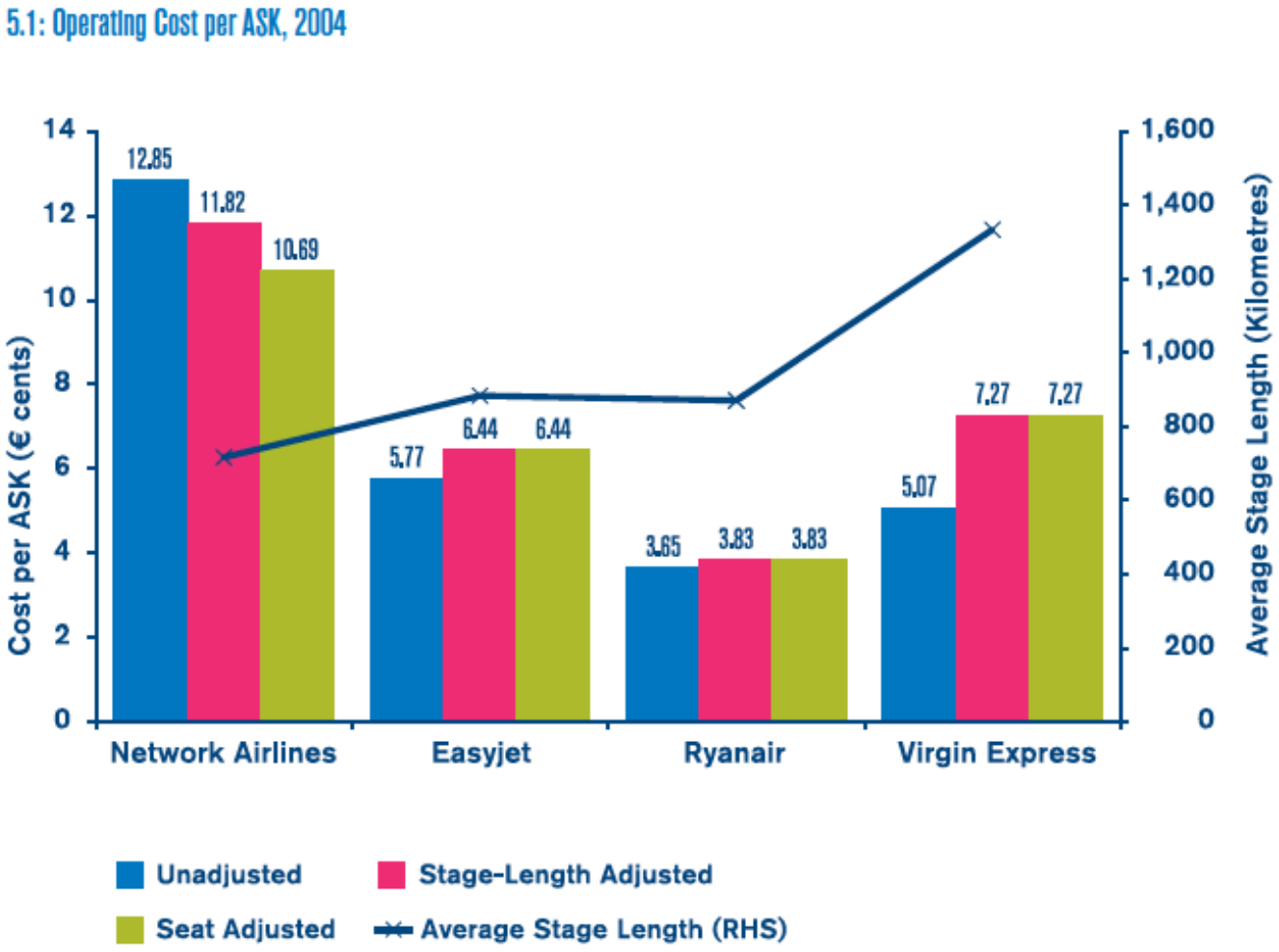
Source: Vasigh et al. (2008)

OTHER OPERATING COSTS

- **Examples:**
  - Airport costs
  - Catering costs
  - Distribution costs
  - Administrative expenses

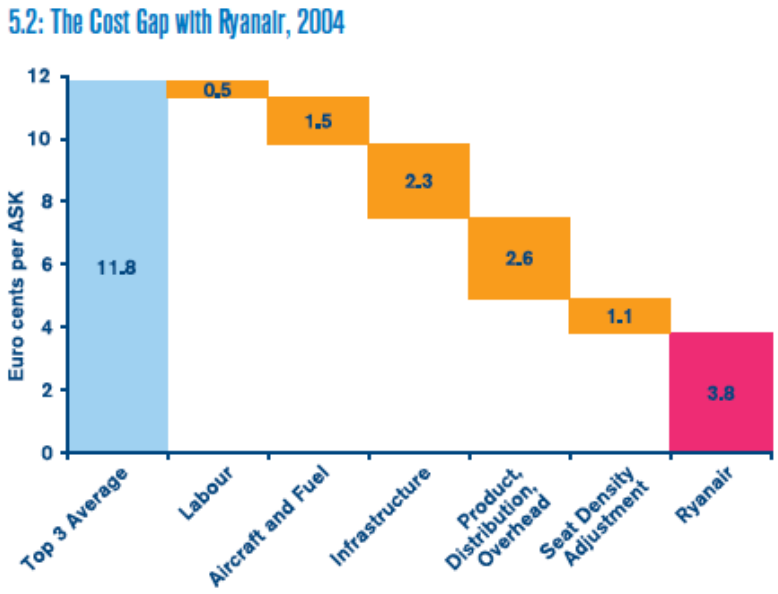
Source: Vasigh et al. (2008)

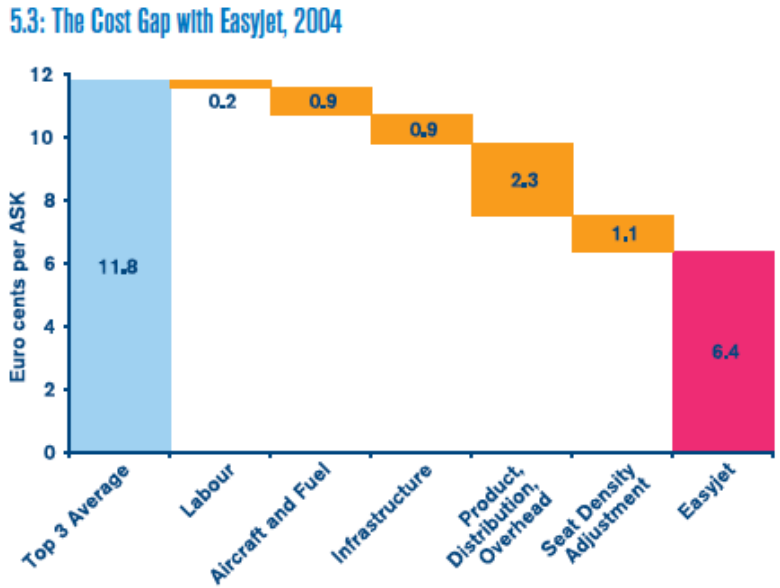
How Different are Costs Among



Source: Airline Cost Performance IATA Economics Briefing No. 5 (July, 2006)

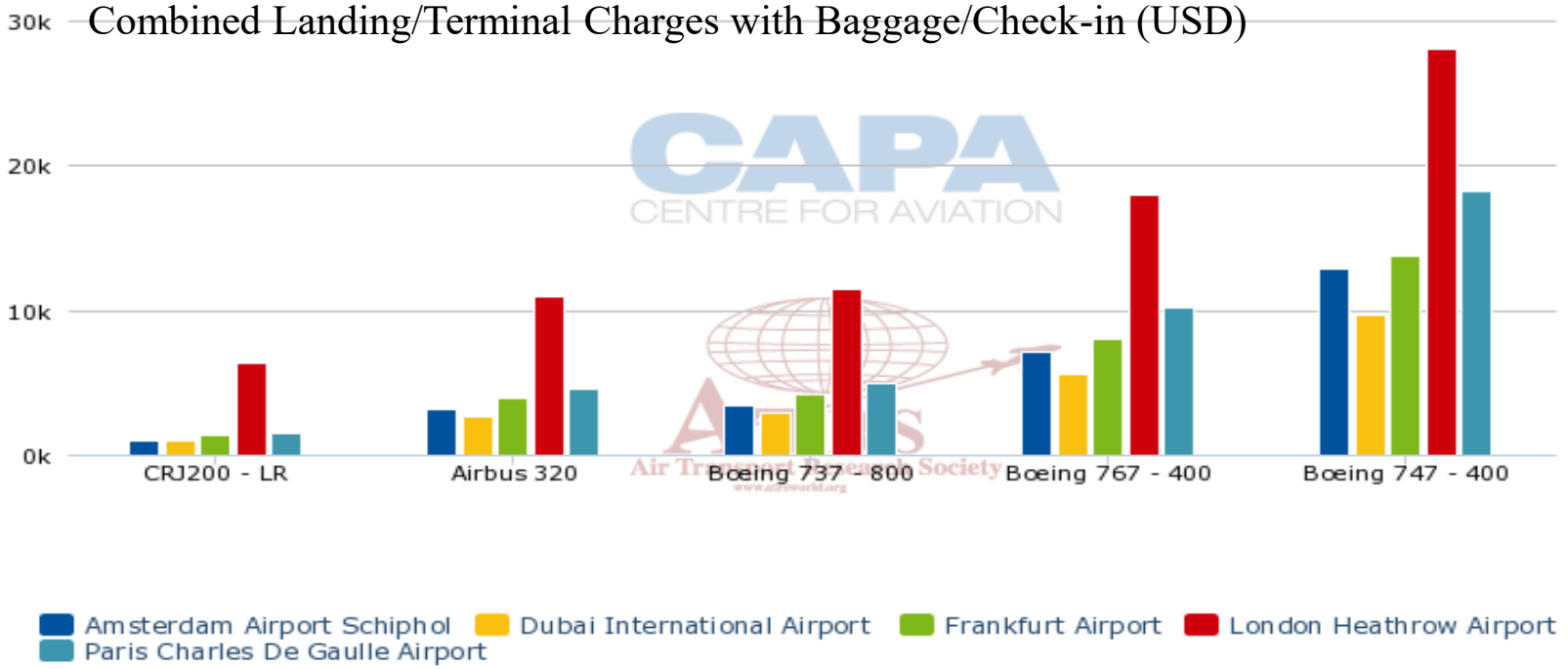
COST GAPS-EXPLAINING THE DIFFERENCE





Source: Airline Cost Performance IATA Economics Briefing No. 5 (July, 2006)

Cost Differences Across Airports



Source: CAPA, Aviation Analysis, Unit cost analysis of Emirates, IAG & Virgin; about learning from a new model, not unpicking it, 11th January, 2014

November 23-28

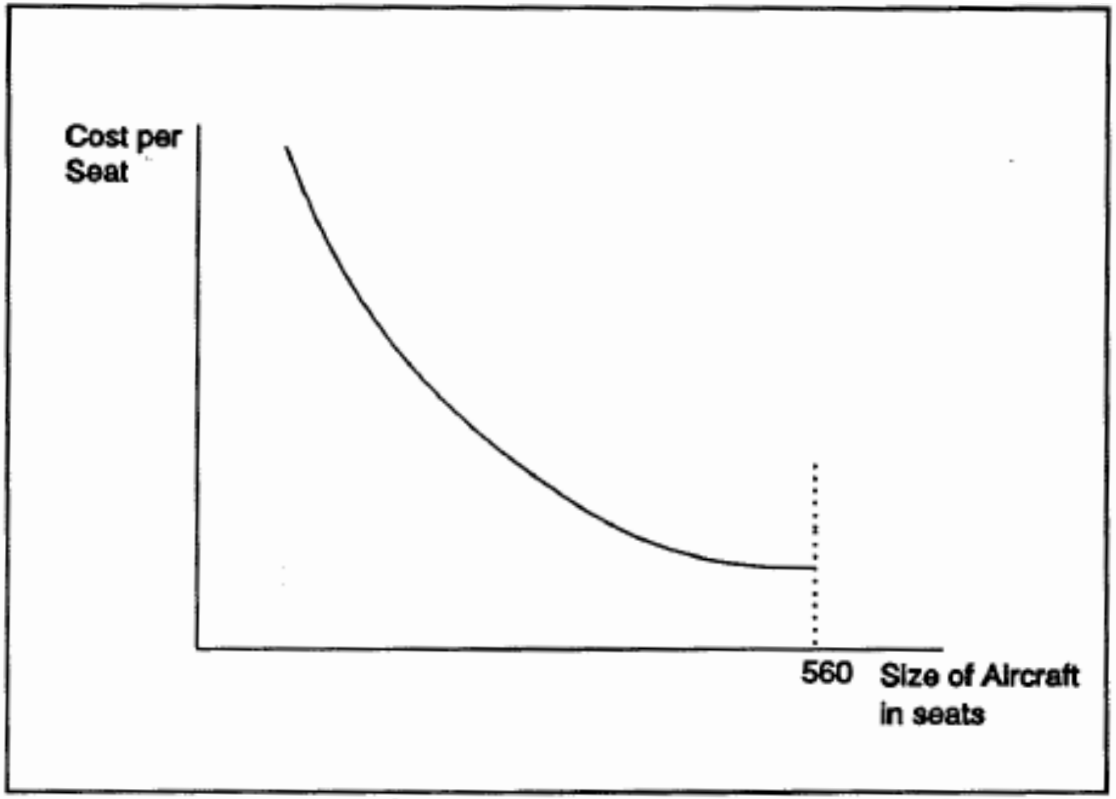
D. **COST RELATIONSHIPS**

COST CHARACTERISTICS

- **Larger aircraft tend to have lower CASM than smaller aircraft**
- **Longer distance flown tends to lower CASM**
- **Higher load factors reduce costs per passenger**
- **Adding more flights or more seats on a flight reduces per seat costs**
- **Higher flight frequency on a route lowers costs**
  - Ex) station manger costs, advertising costs do not increase

COST PER SEAT AND AIRCRAFT SIZE

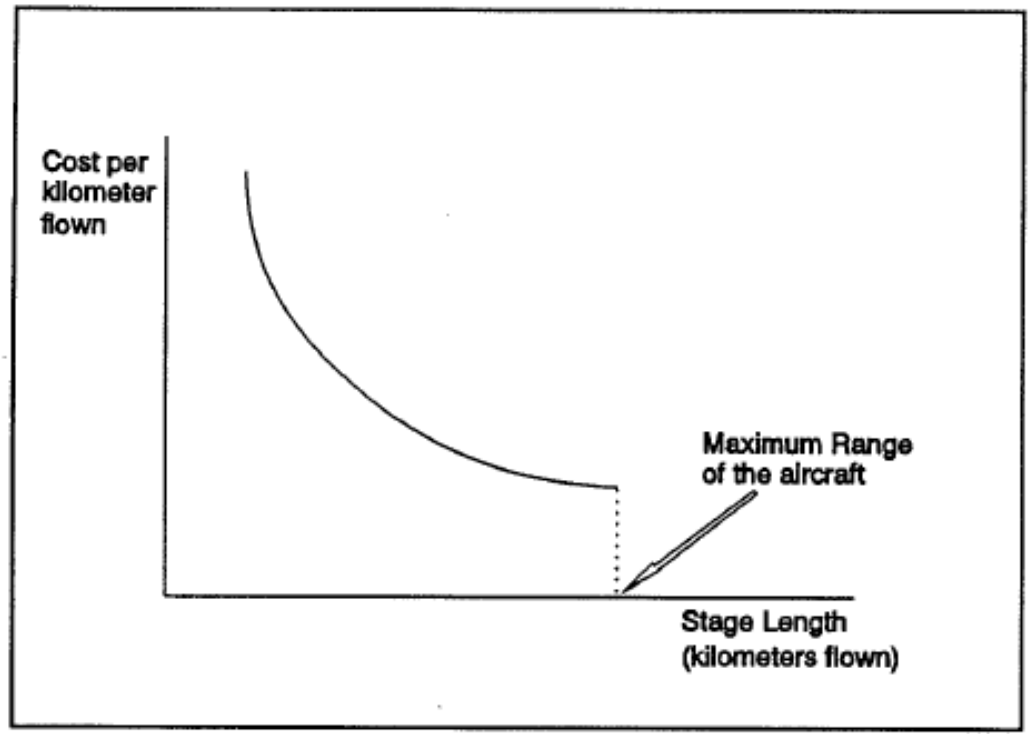
- **Decline in cost per seat generally represents technology**



Source: Tretheway and Oum (1992)
November 23-28

RELATIONSHIP BETWEEN COST AND DISTANCE FLOWN

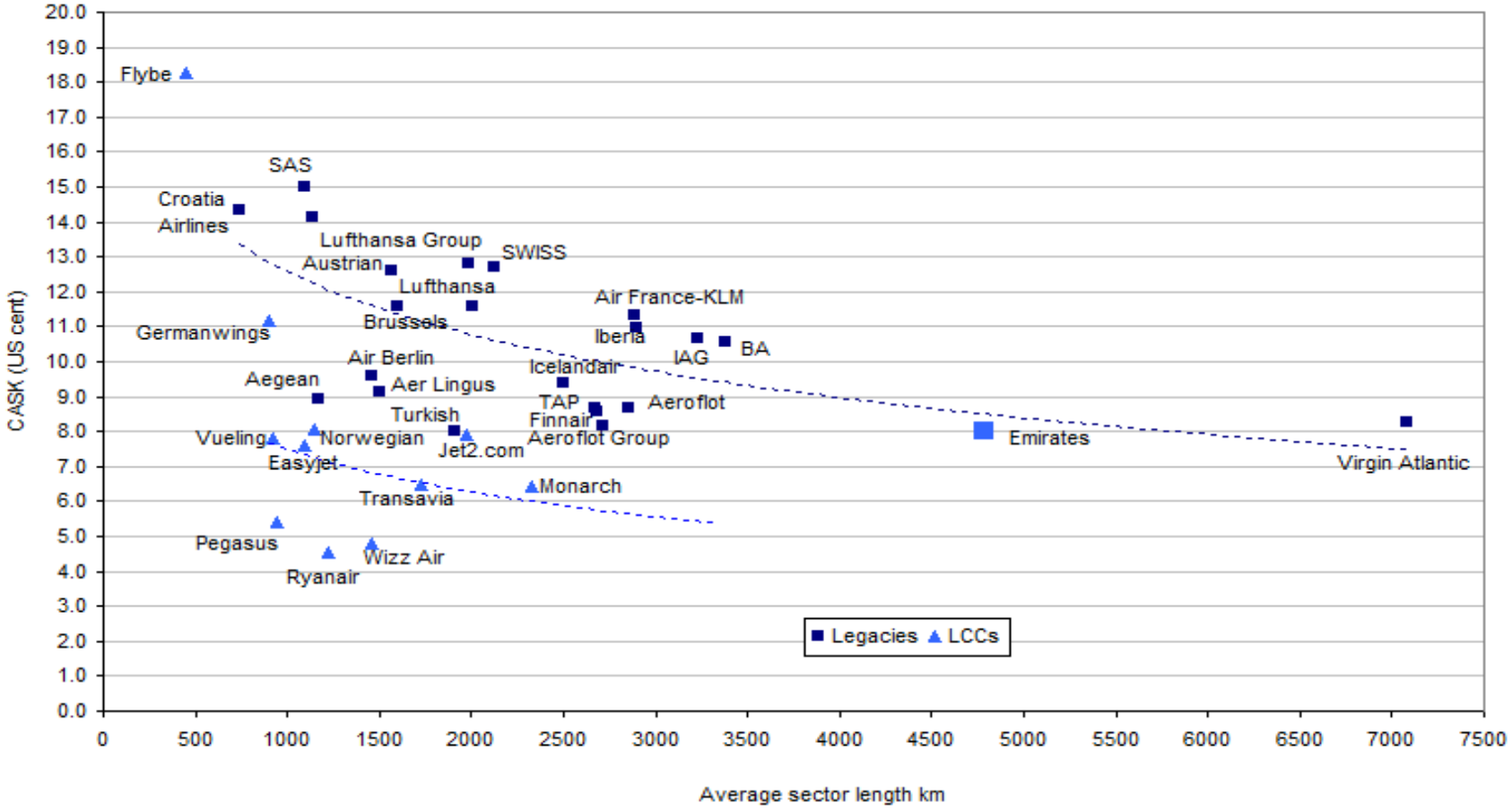
- **Many costs are the same across distance flown, so cost per kilometer flown decreases with distance**



Source: Tretheway and Oum (1992)

November 23-28

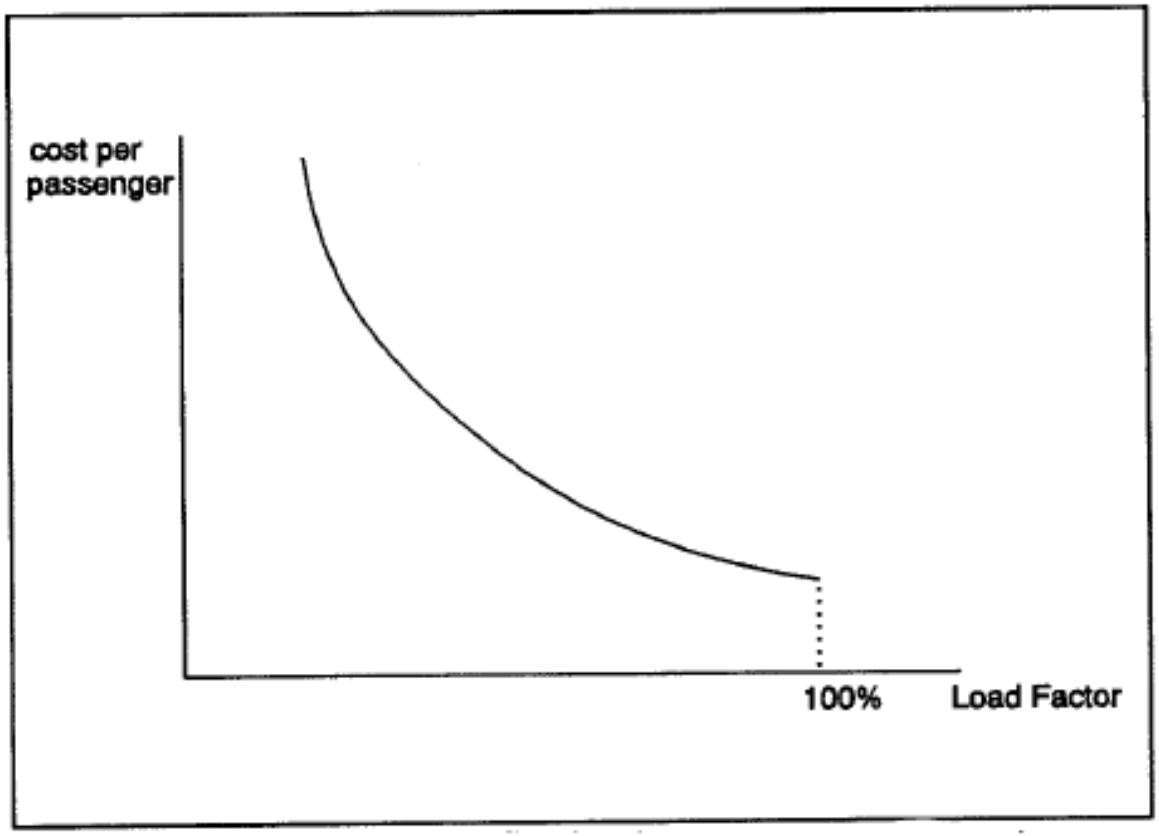
COST RELATIONSHIPS



Source: CAPA, Aviation Analysis, Unit cost analysis of Emirates, IAG & Virgin; about learning from a new model, not unpacking it, 11th January, 2014

COST PER PASSENGER AND LOAD FACTOR

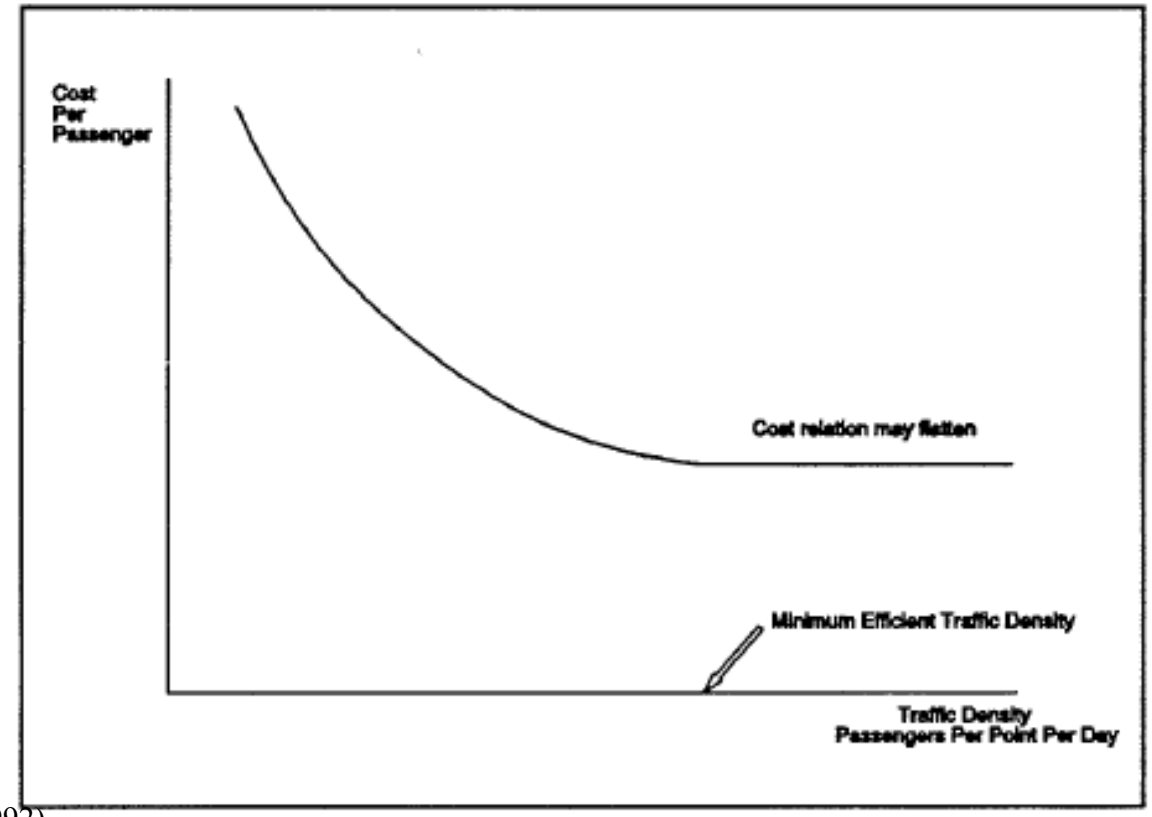
- **A large portion of the cost of a flight is fixed**
  - The cost per pax will fall as more seats are sold



Source: Tretheway and Oum (1992)

TRAFFIC DENSITY

- **Adding more flights or more seats on a flight for a given route reduces per seat costs**



Source: Tretheway and Oum (1992)
November 23-28

OPERATING LEVERAGE

- **Ratio between growth in operating profit and growth in sales**
  - Elasticity showing relationship between financial health and sales growth
- **Can also be viewed as the percentage of fixed costs**
- **Higher operating leverage results in income being more affected by changes in sales**

Source: Vasigh et al. (2008)

ECONOMIES OF SCALE AND SCOPE

- **Economies of scale**
  - Occur when average cost decreases with increased quantity produced
    - Common in high fixed cost industries (aircraft manufacturers, electric power)

- **Economies of scope**
  - Cost-efficiencies from running multiple projects or processes together rather than separately
    - It is cheaper to produce TVs in a factory that also produces other electronic goods

Source: Vasigh et al. (2008)

AIRLINE ECONOMIES

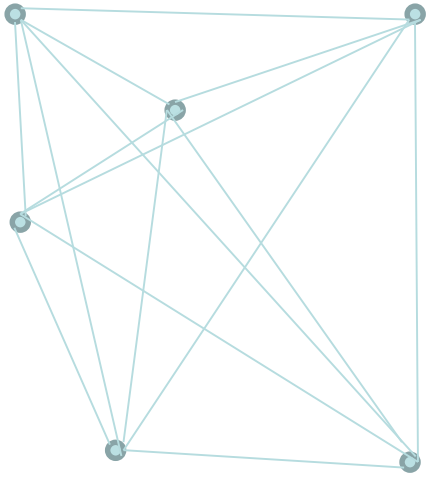
- **Economies of Network size**
  - Adding more points to the network does not necessarily reduce the cost per passenger
    - Adding points simply replicates costs add a station manager, sales team, flight costs for daily flight
- **Economies of Traffic Density**
  - Serving more passengers on a give route has lower costs per passenger
    - Can use larger aircraft
    - Seat managers call sell a higher share of the seats while still protecting some seats for late booking high fare pax

ECONOMIES OF DENSITY

- **Economies of density**
  - Consolidating operations to create cost efficiencies
    - Hub-and-spoke systems for airlines
      - Hub-and-spoke systems require fewer flights to connect Origin – destination airport pairs than point-to-point systems
        - » $(n-1)$ flights for hub-and-spoke systems
        - » $\frac{n \times (n-1)}{2}$ flights for point-to-point systems
      - This is a cost savings from reduced use of resources
      - Although average pax trip distances are longer and flight costs may be higher due to shorter stage length

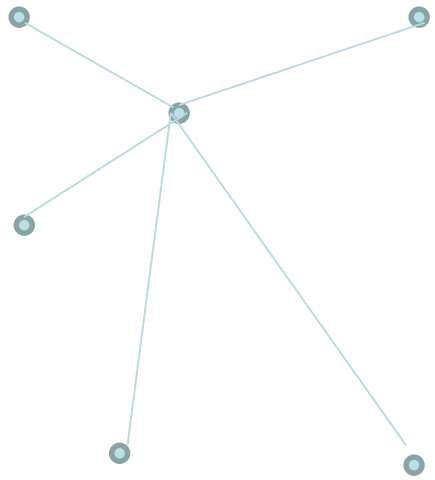
Source: Vasigh et al. (2008)

HUBS VS POINT TO POINT



Point to Point
15 routes for 6 points

HUBS VS POINT TO POINT



Hub & Spoke
5 routes for 6 points

END OF MODULE 6