Influence of Capacity Constraints on Airline Fleet Mix

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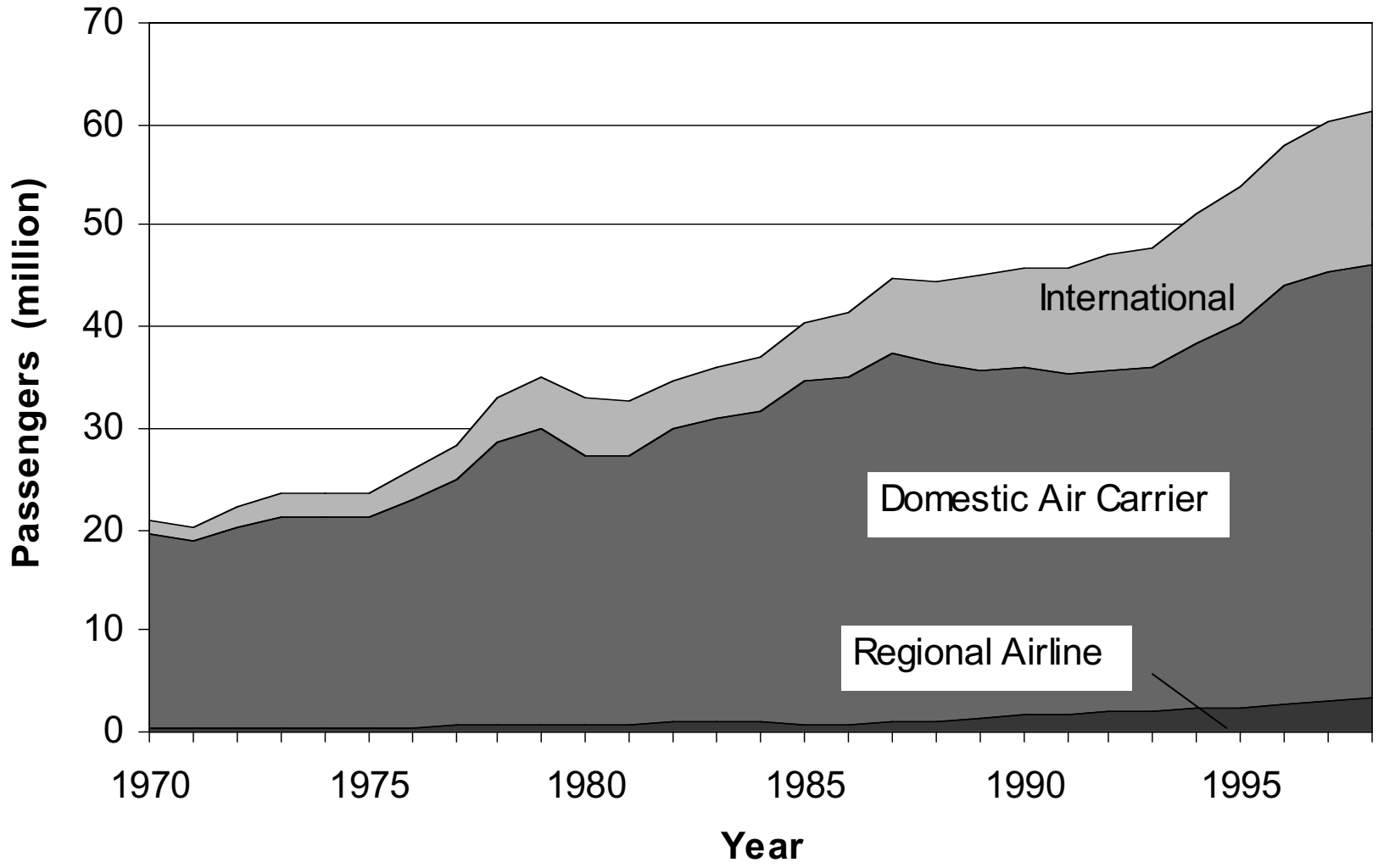
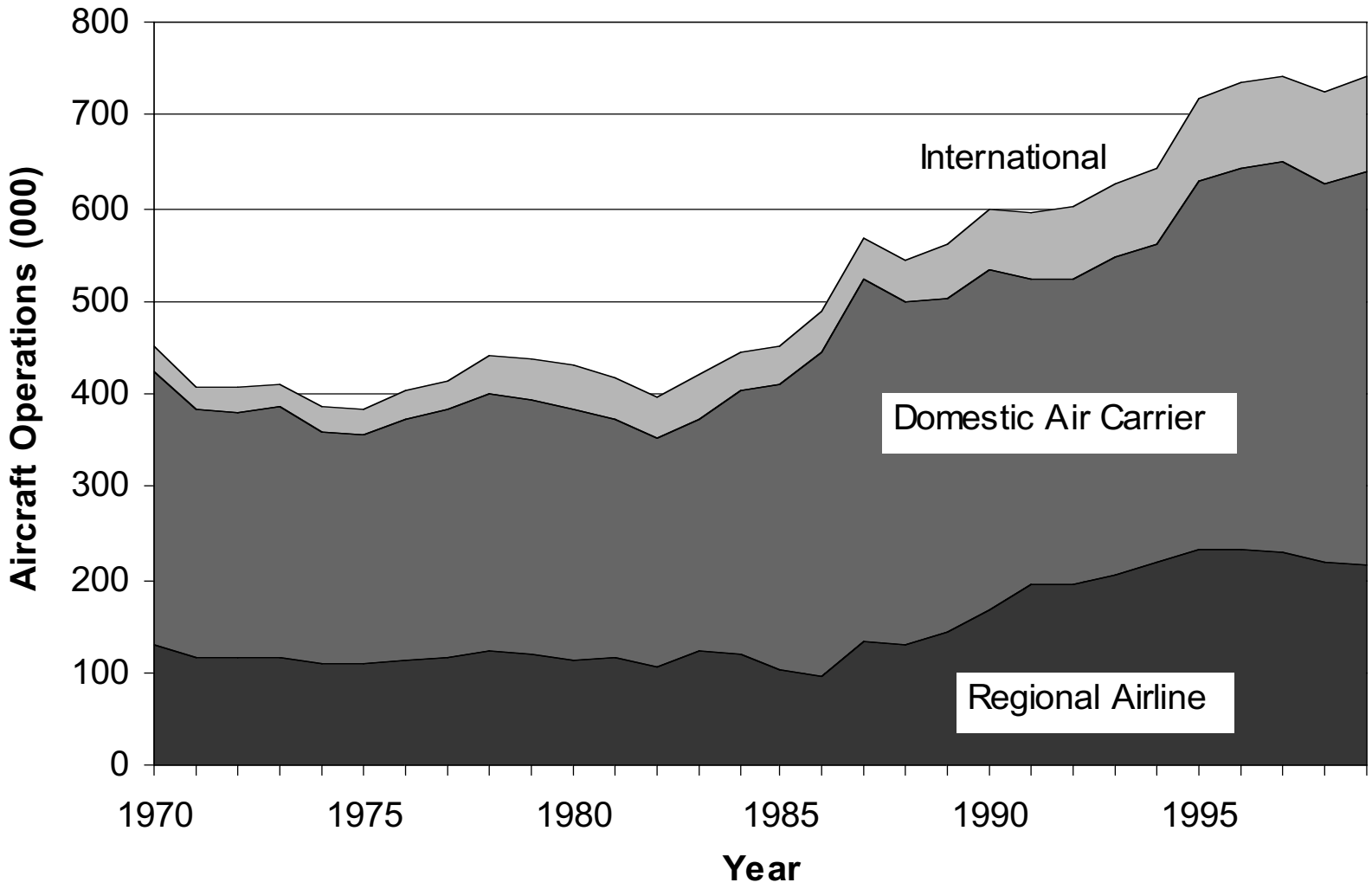
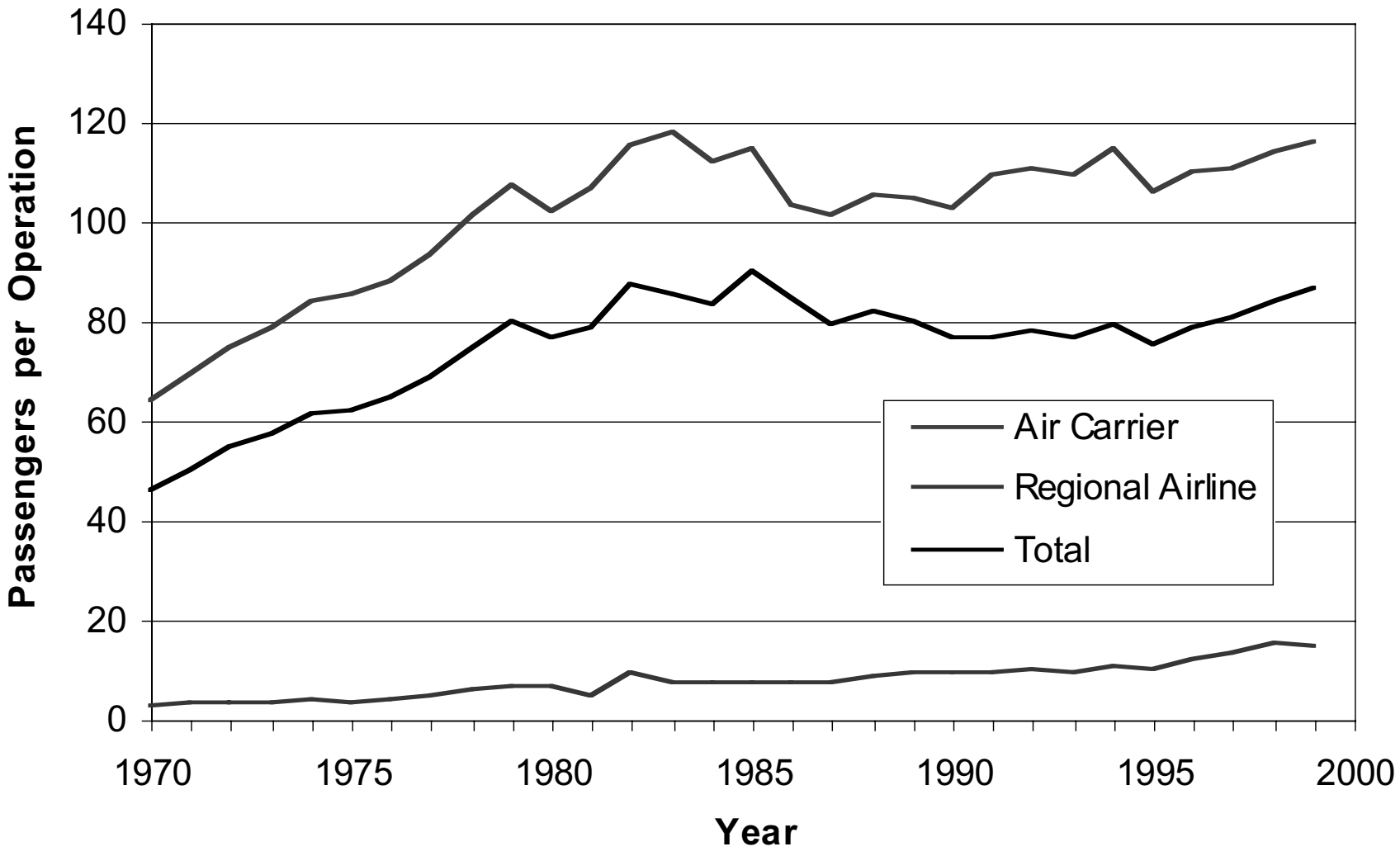
Study Objectives

- **Examine recent trends in aircraft size and market composition at LAX**
- **Assess the prospects for accommodating growth in travel demand through the use of larger aircraft**
  - **Analyze impact of delays and capacity constraints on aircraft size and loads**
  - **Analyze operational impacts of current fleet mix**
- **Assess policy implications**

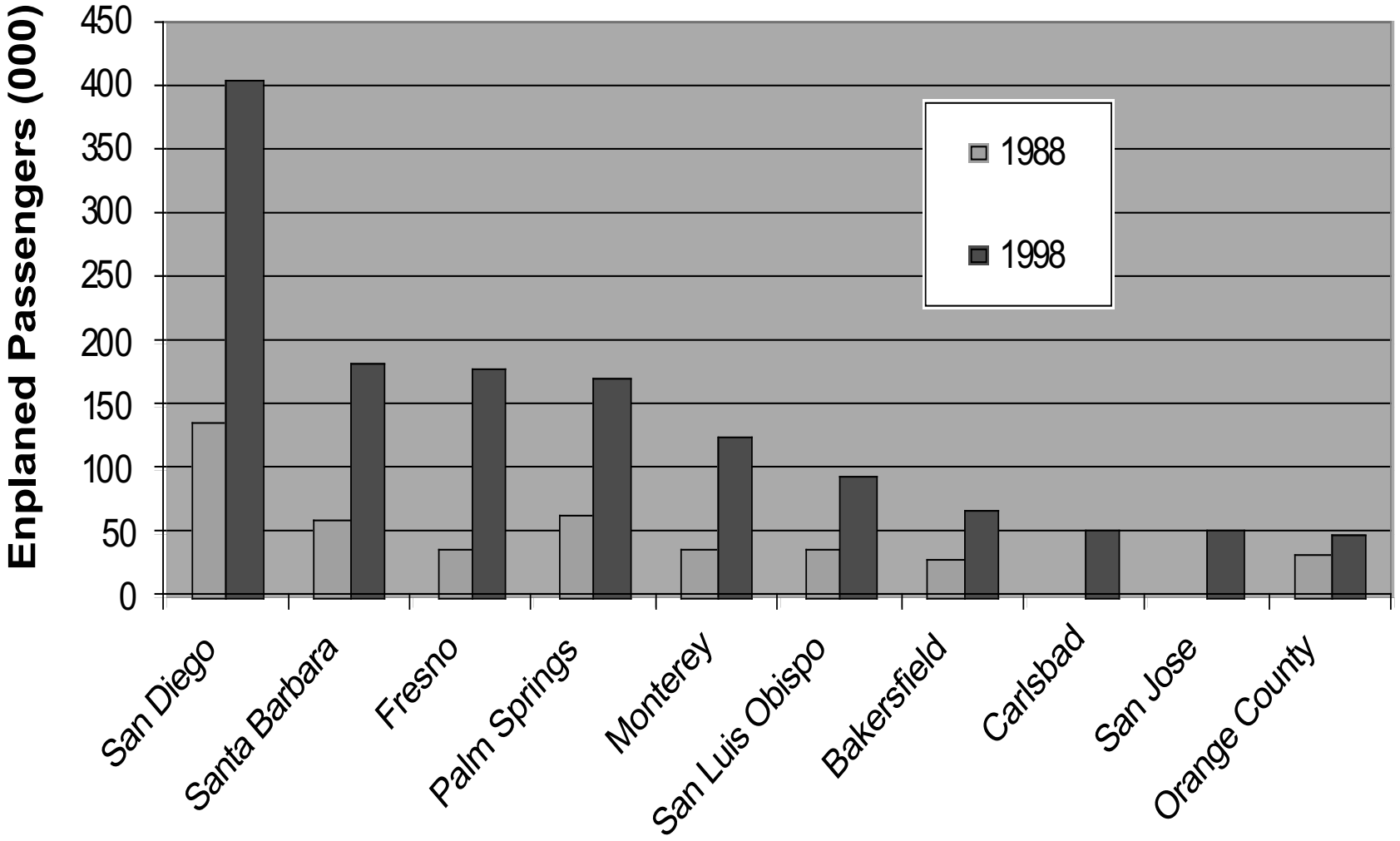

70
60
50
40
30
20
10
0
Passengers (million)
1970
1975
1980
1985
1990
1995
Year
International
Domestic Air Carrier
Regional Airline


800
700
600
500
400
300
200
100
0
Aircraft Operations (000)
International
Domestic Air Carrier
Regional Airline
1970
1975
1980
1985
1990
1995
Year

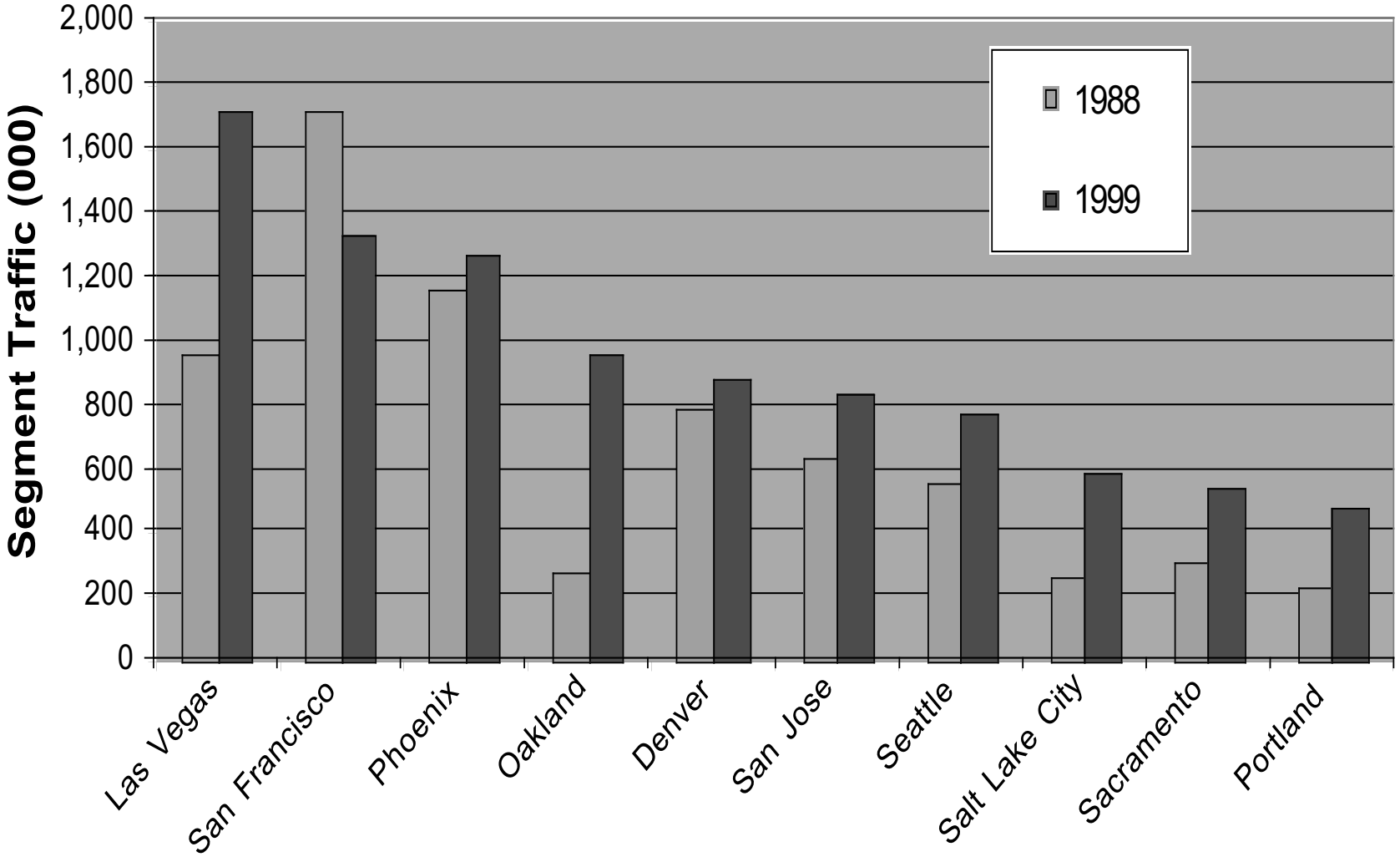

140
120
100
80
60
40
20
0
Passengers per Operation
1970
1975
1980
1985
1990
1995
2000
Year
Air Carrier
Regional Airline
Total

Regional Airline Markets

NEXTOR

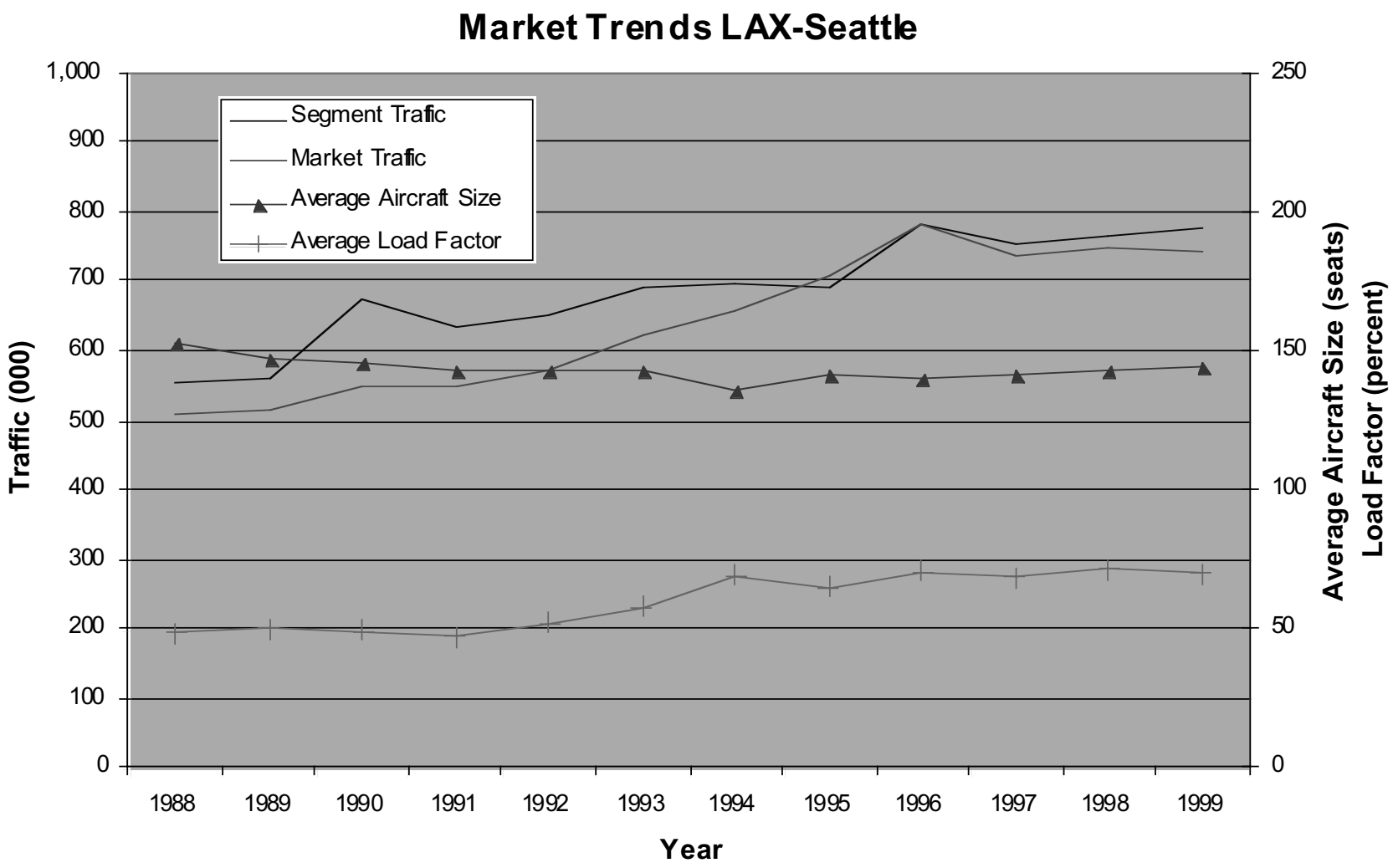

Enplaned Passengers (000)
450
400
350
300
250
200
150
100
50
0
1988
1998
San Diego
Santa Barbara
Fresno
Palm Springs
Monterey
San Luis Obispo
Bakersfield
Carlsbad
San Jose
Orange County

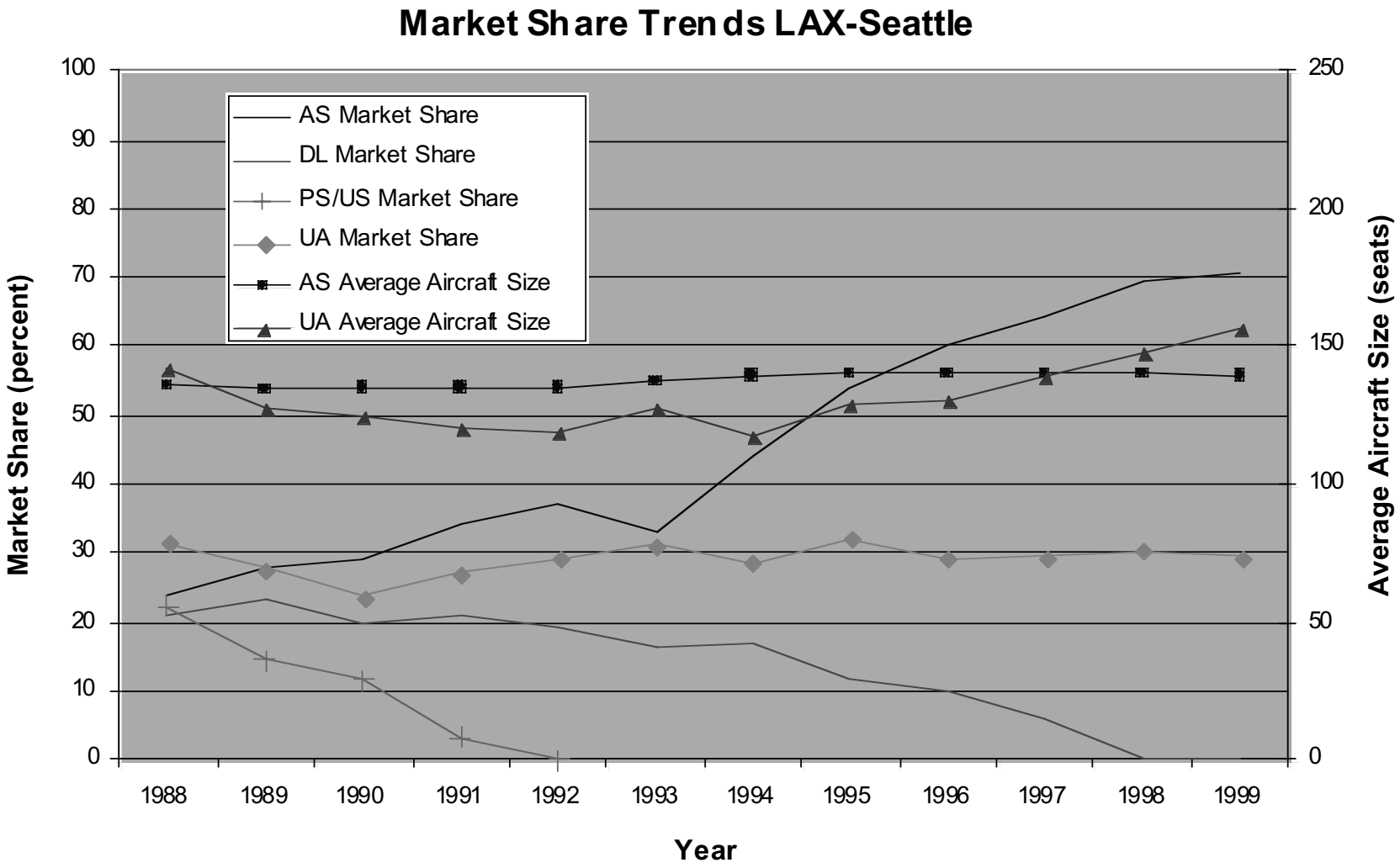
Major Western U.S. Markets


Segment Traffic (000)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1988
1999
Las Vegas
San Francisco
Phoenix
Oakland
Denver
San Jose
Seattle
Salt Lake City
Sacramento
Portland

Changes in Average Aircraft Size

Destination	Seats	
	1988	**1999**
Las Vegas	131	136
San Francisco	142	130
Phoenix	128	131
Oakland	118	132
Denver	175	187
San Jose	117	130
Seattle	152	144
Salt Lake City	166	184
Sacramento	117	132
Portland	135	136
Overall	**136**	**139**


Market Trends LAX-Seattle
Segment Traffic
Market Traffic
Average Aircraft Size
Average Load Factor
Traffic (000)
Average Aircraft Size (seats)
Load Factor (percent)
Year
1,000
900
800
700
600
500
400
300
200
100
0
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999


Market Share Trends LAX-Seattle
AS Market Share
DL Market Share
PS/US Market Share
UA Market Share
AS Average Aircraft Size
UA Average Aircraft Size
Market Share (percent)
Average Aircraft Size (seats)
Year
100
90
80
70
60
50
40
30
20
10
0
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999

Airline Response to Delay

Statistical Modeling of Average Aircraft Size and Load

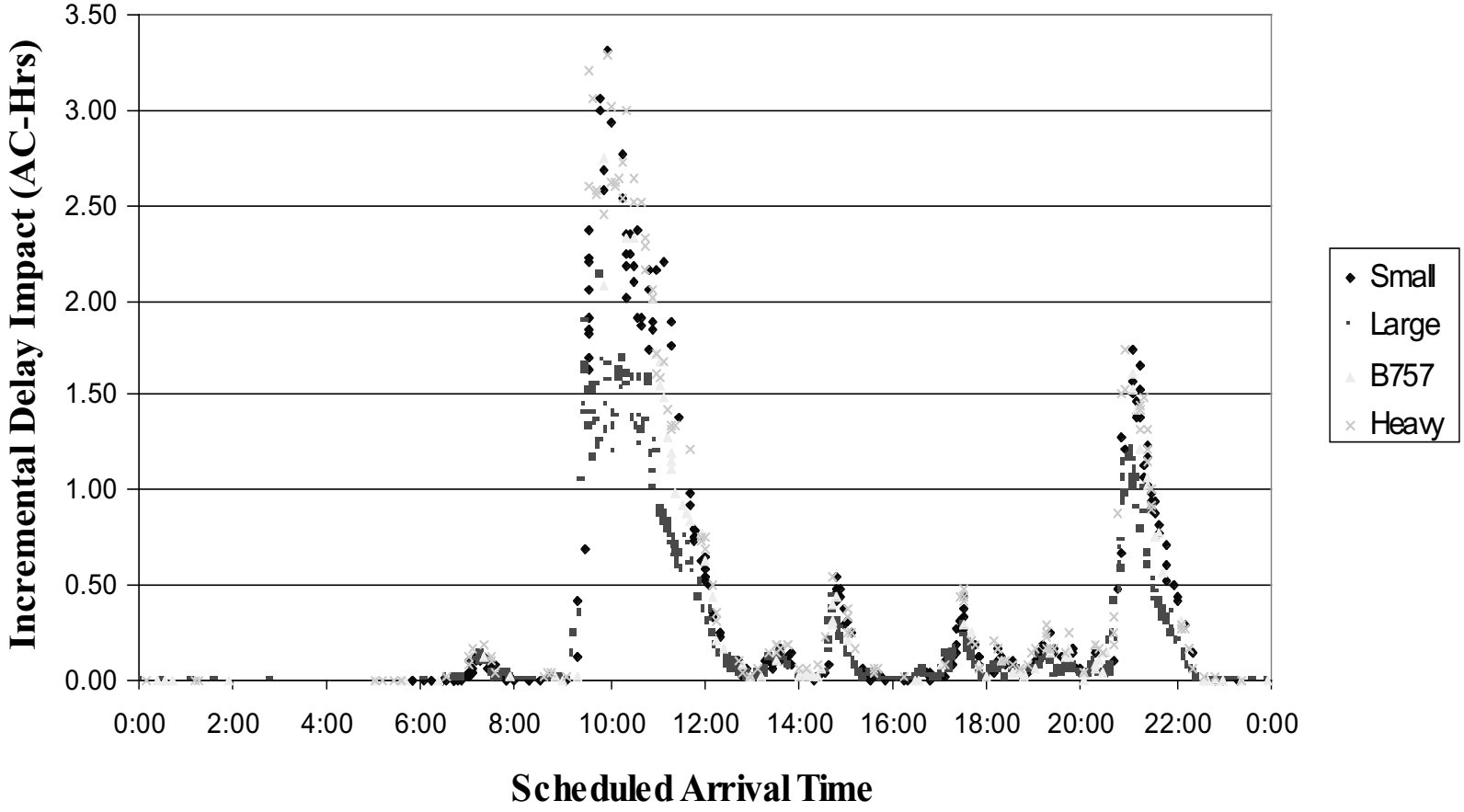
- **Studied flight segments involving 18 large East and West Coast airports**
- **Regressed average aircraft size and passenger load against**
  - **Distance**
  - **Density (pax per day)**
  - **Concentration (HHI of airline traffic shares)**
  - **Average arrival delay at endpoint airports**
  - **Slot control status**

Estimated Aircraft Size Elasticities

% Increase in A/C Size from 1% Increase in:	**High Density (>300 PPD)**			**Low Density**
	300 SM	***1000 SM***	***2500 SM***	***All***
Density	0.12	0.12	0.06	0.20
Concentration	0.13	0.19	0.21	0.12
Delay	--	0.38	0.87	--
Adj R^2	0.46	0.56	0.56	0.47

Operational Impacts of Current Fleet Mix

During Peak Periods, Flights Generate Significant Incremental Delays



Delay Impact Ratio (DIR)

- **Weighs delay impact against convenience**
- **Numerator is congestion delay impact (CDI) of a flight (in seat-hrs)**
- **Denominator is extra schedule delay if flight did not occur, and passengers had to take previous flight from same origin on same airline (SDI)**
- **Any flight with DIR>1 is of dubious social value**

Some Flights Have Very High DIRs

Flight	Type	Seats	Origin	Time of Departure	Previous Flight Number	Previous Flight Time of Departure	SDI	CDI	DIR
US3 4759	J31	18	SAN	9:50	4707	9:35	5	247	55.0
US3 4734	J31	18	FAT	9:45	4729	9:25	6	282	47.0
US3 4707	J31	18	SAN	9:35	4793	9:10	8	292	38.9
US3 4793	J31	18	SAN	9:10	4768	8:30	12	398	33.2
UA3 5218	EM2	30	SAN	9:00	5216	8:30	15	425	28.4
UA3 5220	EM2	30	SAN	9:30	5218	9:00	15	261	17.4
OE 7338	J31	18	OXR	9:55	7336	8:50	20	308	15.8
UA3 5222	EM2	30	SAN	10:00	5220	9:30	15	228	15.2
OE 7017	J31	18	SNA	9:45	7015	8:30	23	338	15.0
UA3 5224	EM2	30	SAN	10:30	5222	10:00	15	217	14.5
US3 4789	J31	18	SAN	20:10	4741	19:25	14	191	14.2
UA3 5468	EM2	30	PSP	9:05	5466	8:05	30	409	13.6

Policy Implications

- **Rationale for intervention**
  - **Economic efficiency**
  - **Airport development costs**
  - **Consumer protection**
- **Intervention strategies**
  - **Voluntary programs**
  - **Pricing**
  - **Size / frequency regulation**

Conclusions

- **No significant increase in average aircraft size in LAX markets over past ten years**
  - **Little overall increase by large airlines**
  - **Significant increase by regional airlines, offset by replacement of large airline service**
- **Modest potential for self-correction**
  - **Delay costs alone may not be enough to offset the competitive advantages of flight frequency**
- **Airport intervention should be framed in the context of long-term development strategy**

Acknowledgement

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