Structural Differences in the US and European Systems and Their Impact on Airline Scheduling Practices

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Structural Differences in US and European Systems

Key Areas of Differences

- Slot Control Policies
- Air Traffic Management Systems
- Weather/Climate

Slot Control Policies

- Virtually all major European airports operate under slot controls (IATA system)
- Only 5 US airports have operated under slot controls (DCA, EWR, JFK, LGA, ORD)
  - Historically high density rule (HDR) employed (similar to IATA rules)
  - HDR dropped at EWR many years ago; also rescinded at JFK, LGA and ORD in the past decade; however, more recently some type of slot controls have been put in place at all 5 airports.
- Declared capacity (slot levels) at US airports generally set to be in line with VMC capacity while in Europe declared capacity set closer to IMC capacity (more on this in Amedeo Odoni's presentation).

Air Traffic Management Systems

Europe:

The principal flow management mechanism used consists of ground delays determined by the Eurocontrol central flow management unit (CFMU):

- flights are not allowed to depart until a flight path that respects all sector and airport capacity constraints is found;
- sector capacity limitations in many cases drive process.

ATC governs gate departure; "airport CDM" used to coordinate with air carriers.

US:

Ground holds issued in context of traffic management initiatives:

- ground delay programs (GDP's) for airports
- airspace flow programs (AFP's) for airspace;
- extensive CDM capabilities allow for air carrier participation.

Miles-in-trail (MIT) restrictions to prevent airspace congestion.

Other, usually dynamic, mechanisms, e.g. ground stops.

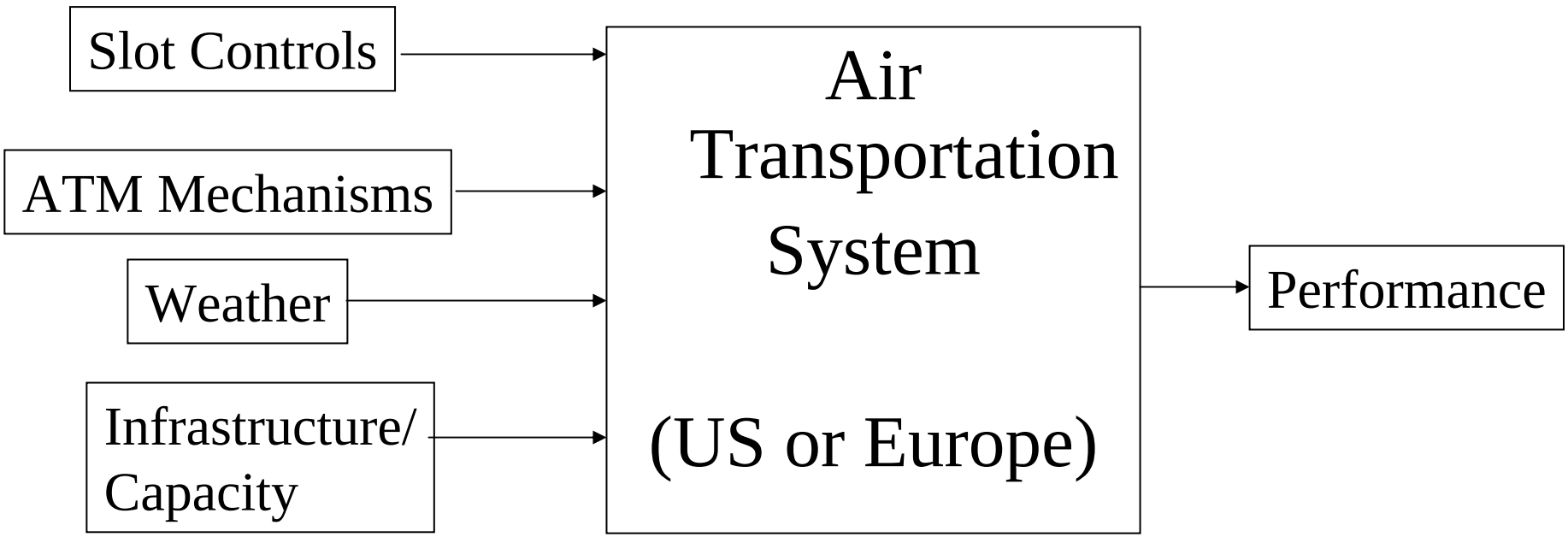
Also center-controlled local initiatives.

Airlines generally control departure from gates; ATC controls release from "spots".

Weather/Climate

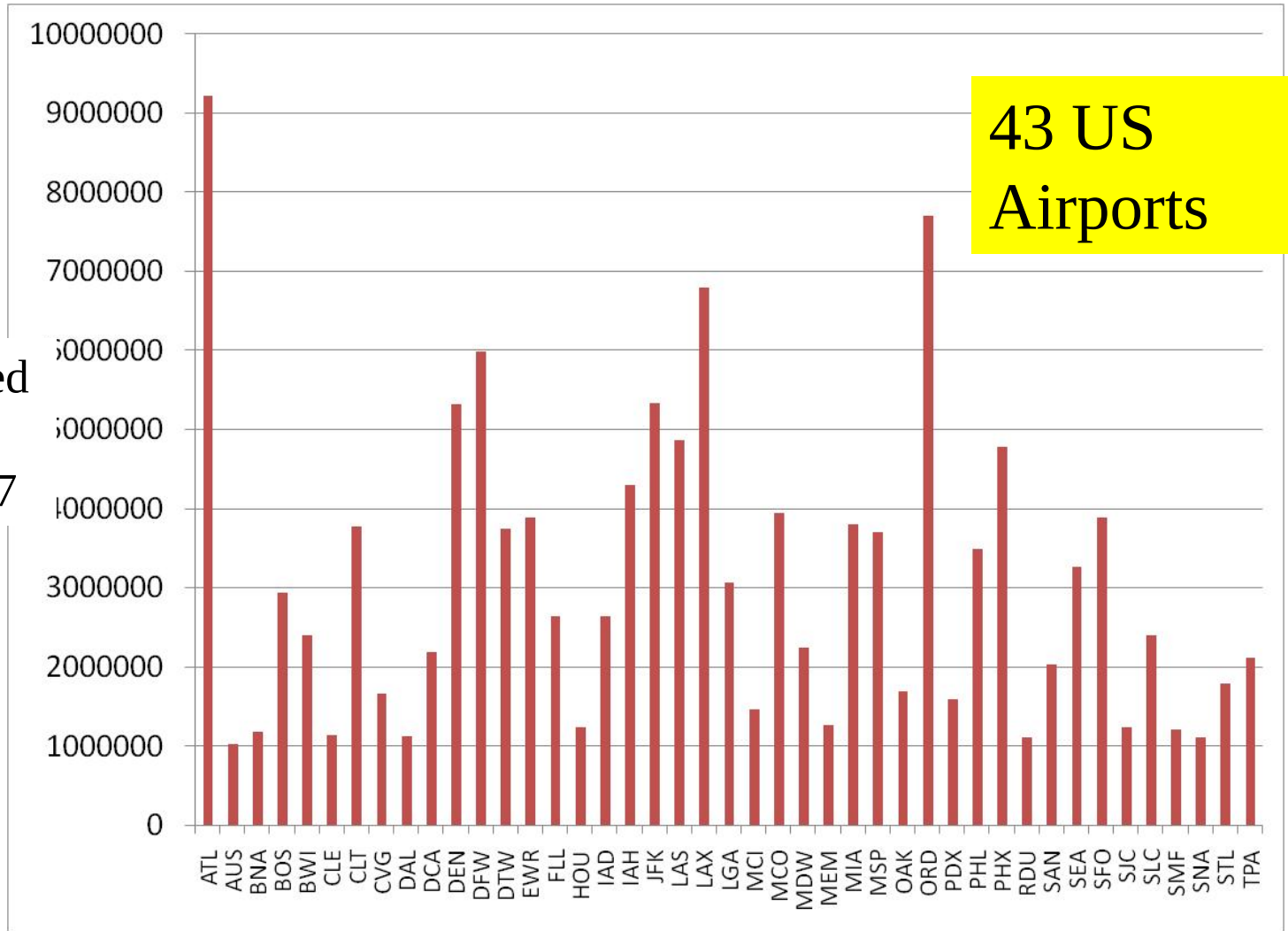
- European airports experience a higher percentage of time in instrument meteorological conditions (IMC).
- Severe convective weather has very strong impact on US system … less impact on European system.

ATM Systems Perspective



Comparison of US and European Airline Schedules

Airports for Comparison: The Million Seat per Month Club

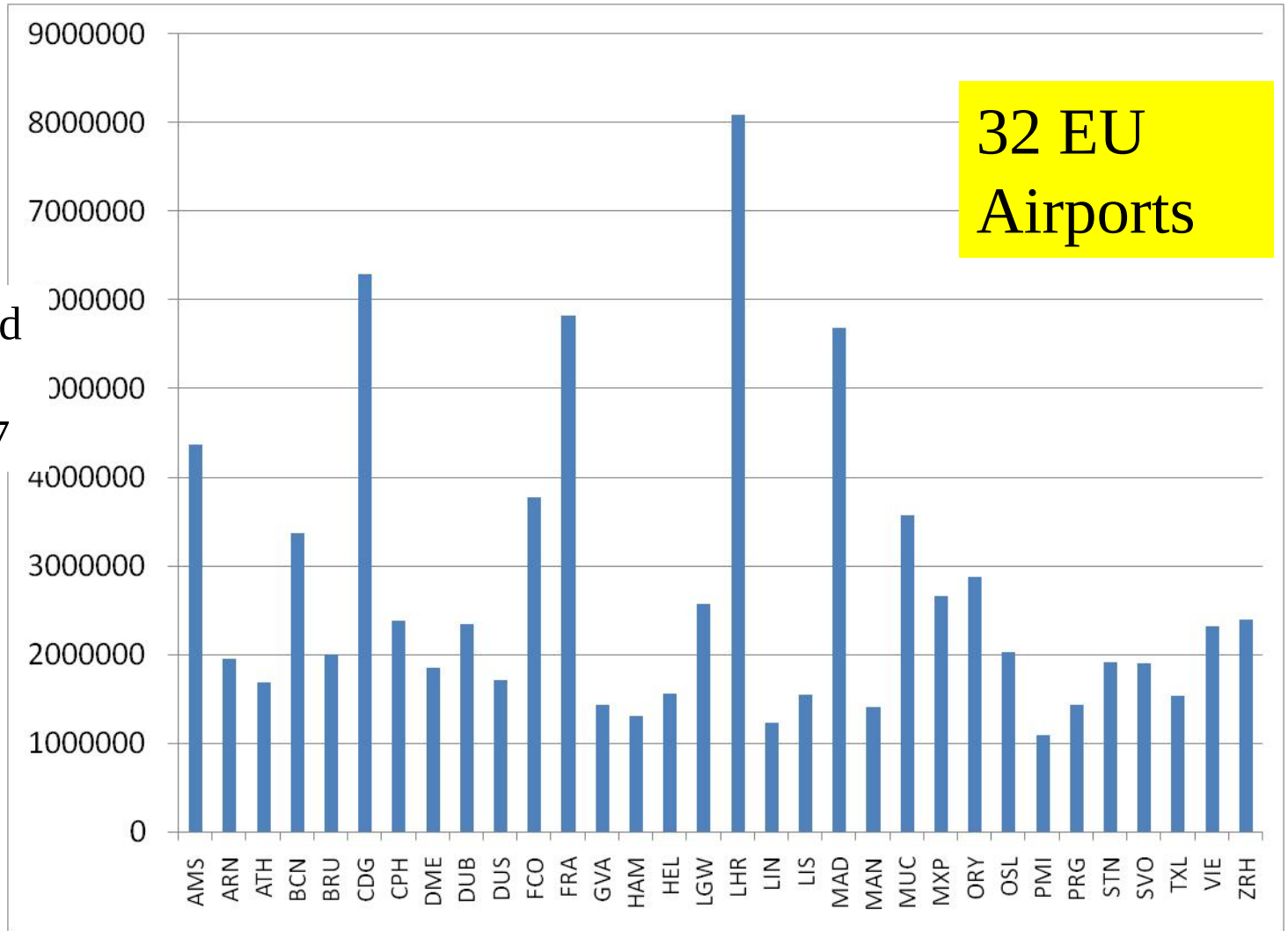


43 US Airports

Scheduled Seats in July 2007

Airports for Comparison: The Million Seat per Month Club

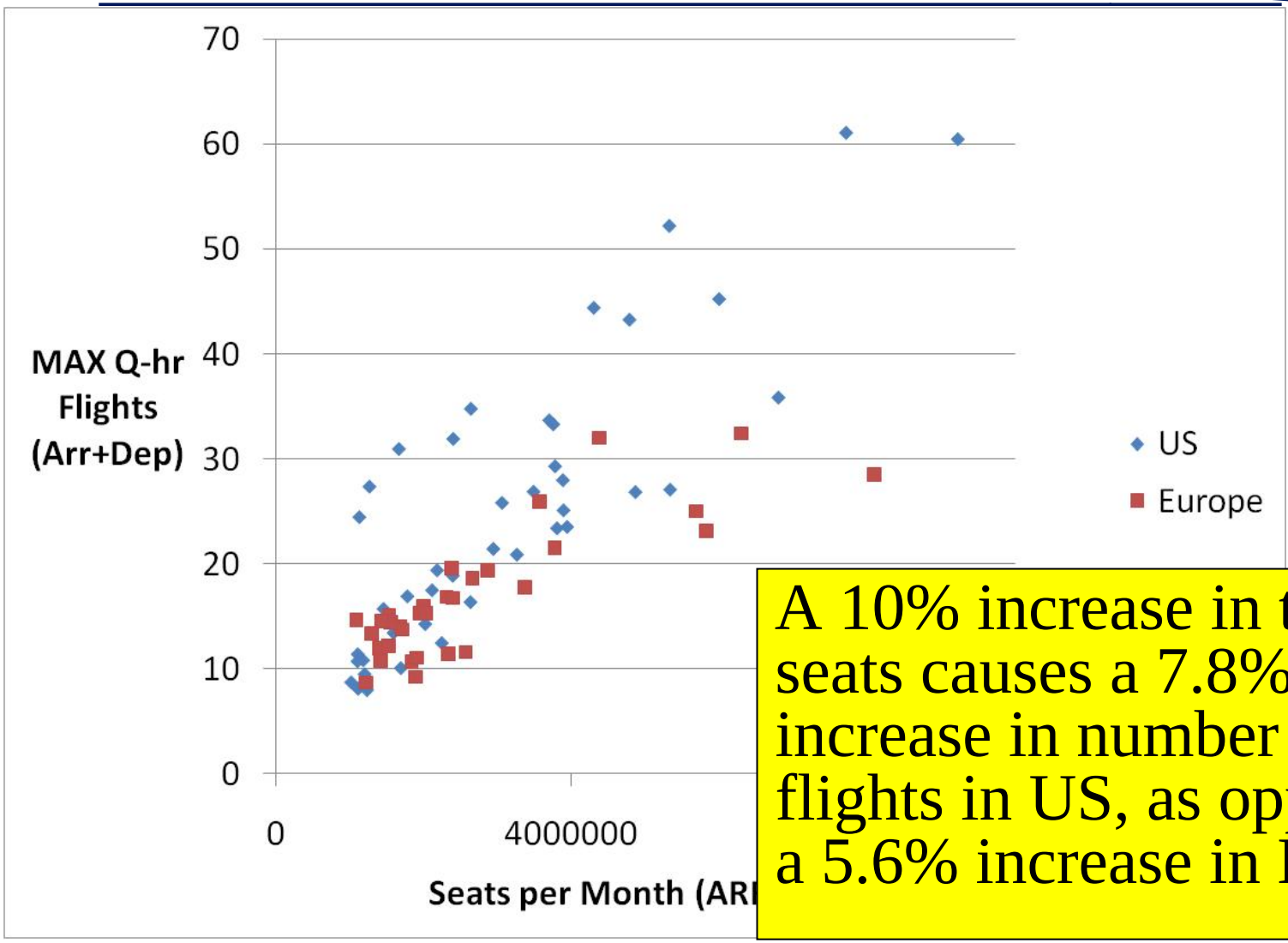
Scheduled Seats in July 2007



Schedule Peaking Analysis

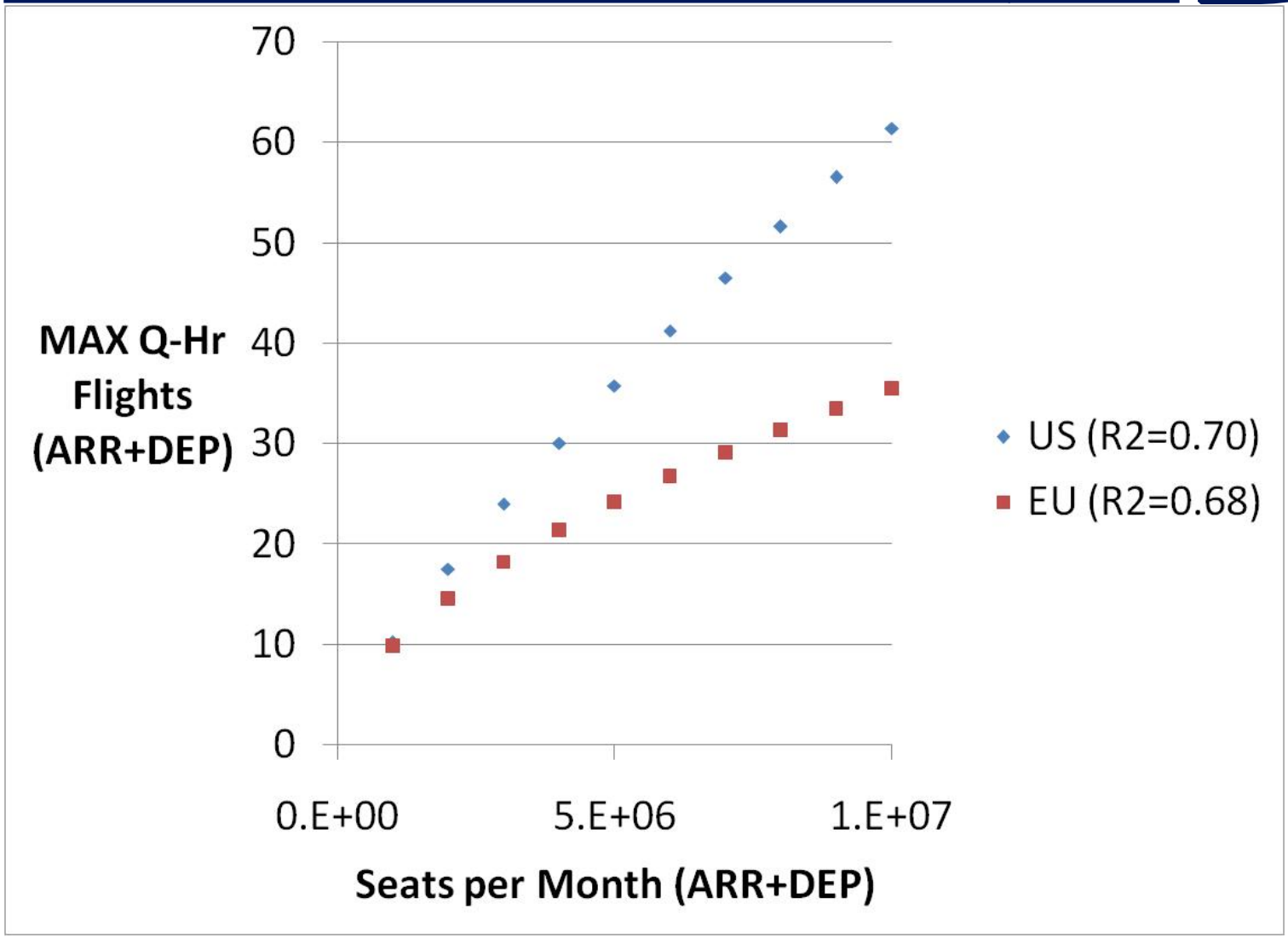
- Hypothesis: US Airports have stronger peaks then EU airports due to greater capacity and lack of slot controls
- Airport peaking metrics (dependent variable):
  - ***maximum flights scheduled in a 1-hour*** (clock-time) period beginning on the hour
  - ***maximum flights scheduled in a quarter-hour period*** (clock-time) beginning on the quarter hour
  - take maximum after summing over the days in the month
- Measure of traffic intensity (explanatory variable):
  - ***Seats*** or ***flights***
  - Log-linear model

Peak Period Flights vs Seats per Month: US vs EU

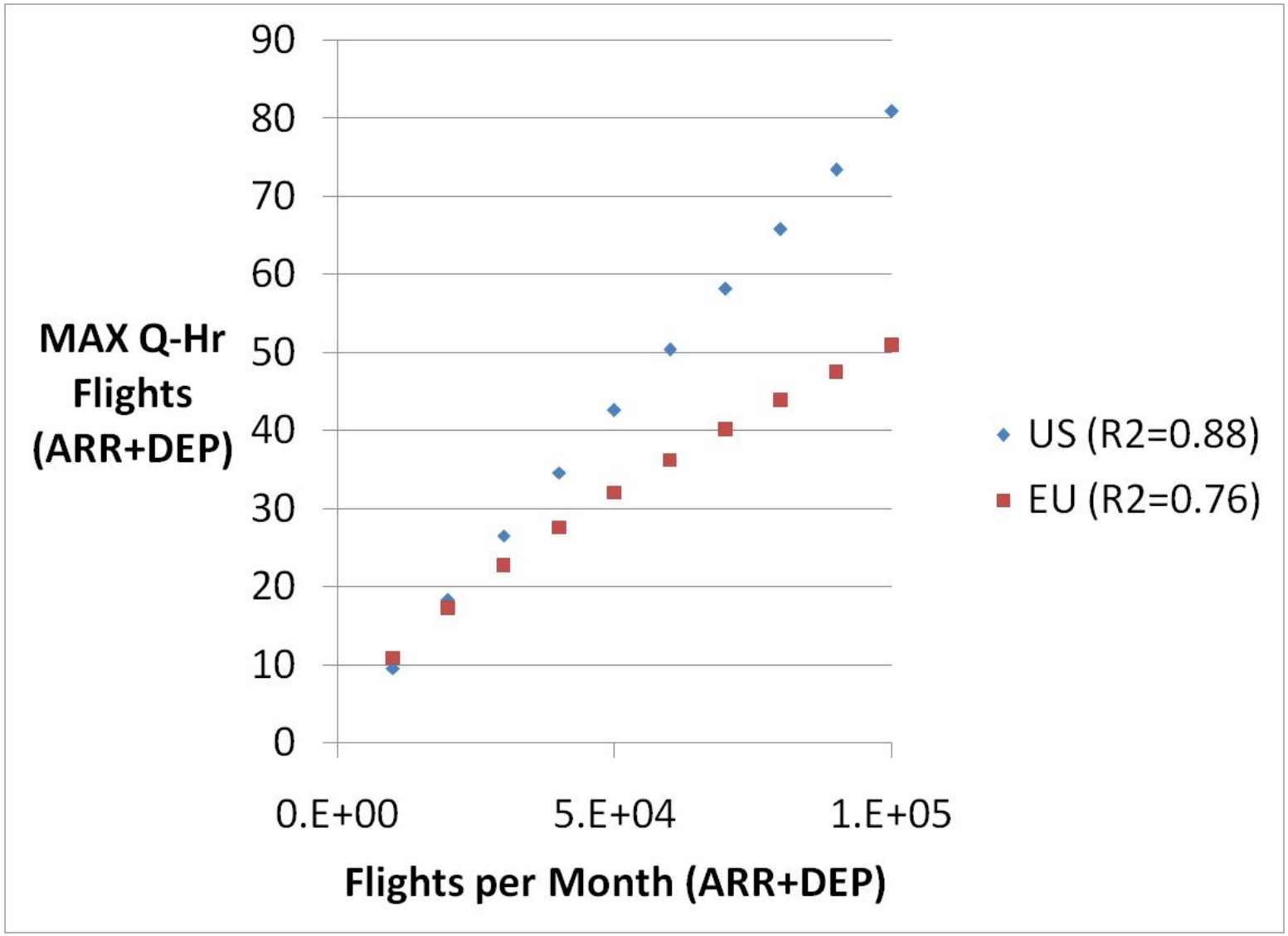


A 10% increase in total seats causes a 7.8% increase in number of peak flights in US, as opposed to a 5.6% increase in EU.

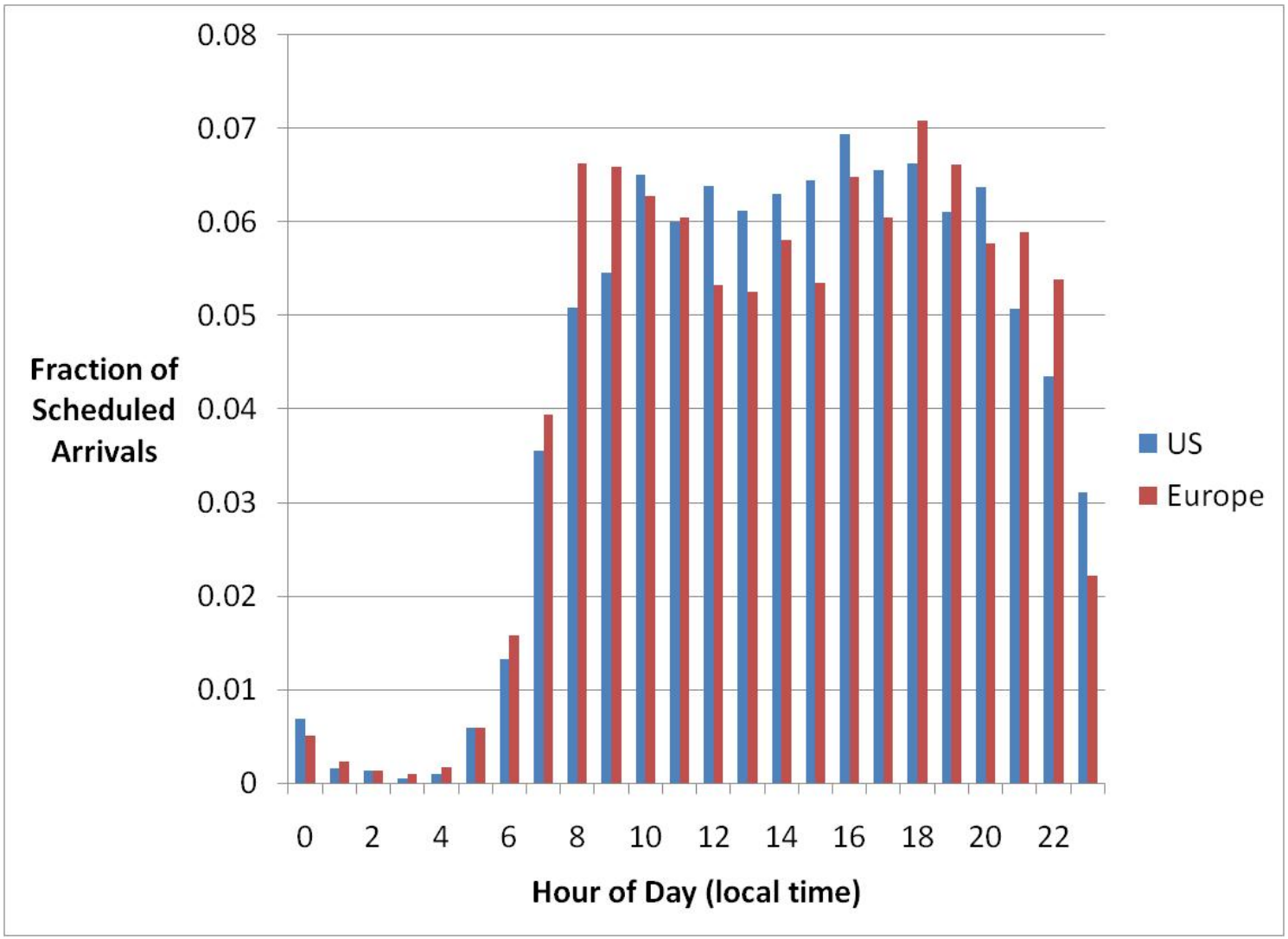
Functional Relationship (seats/month)



Functional Relationship (flights/month)



Time of Day Analysis

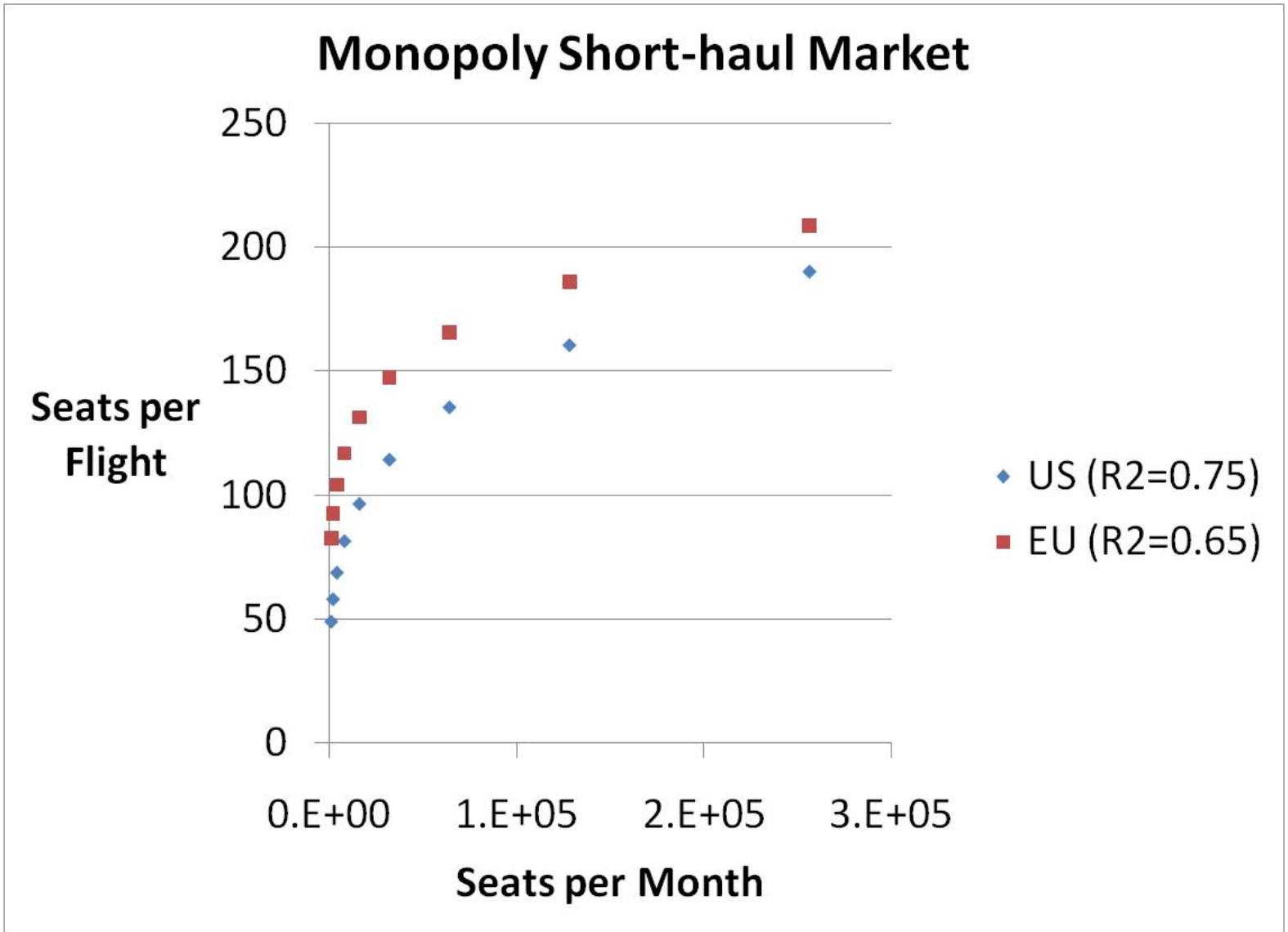


Average Gauge Analysis

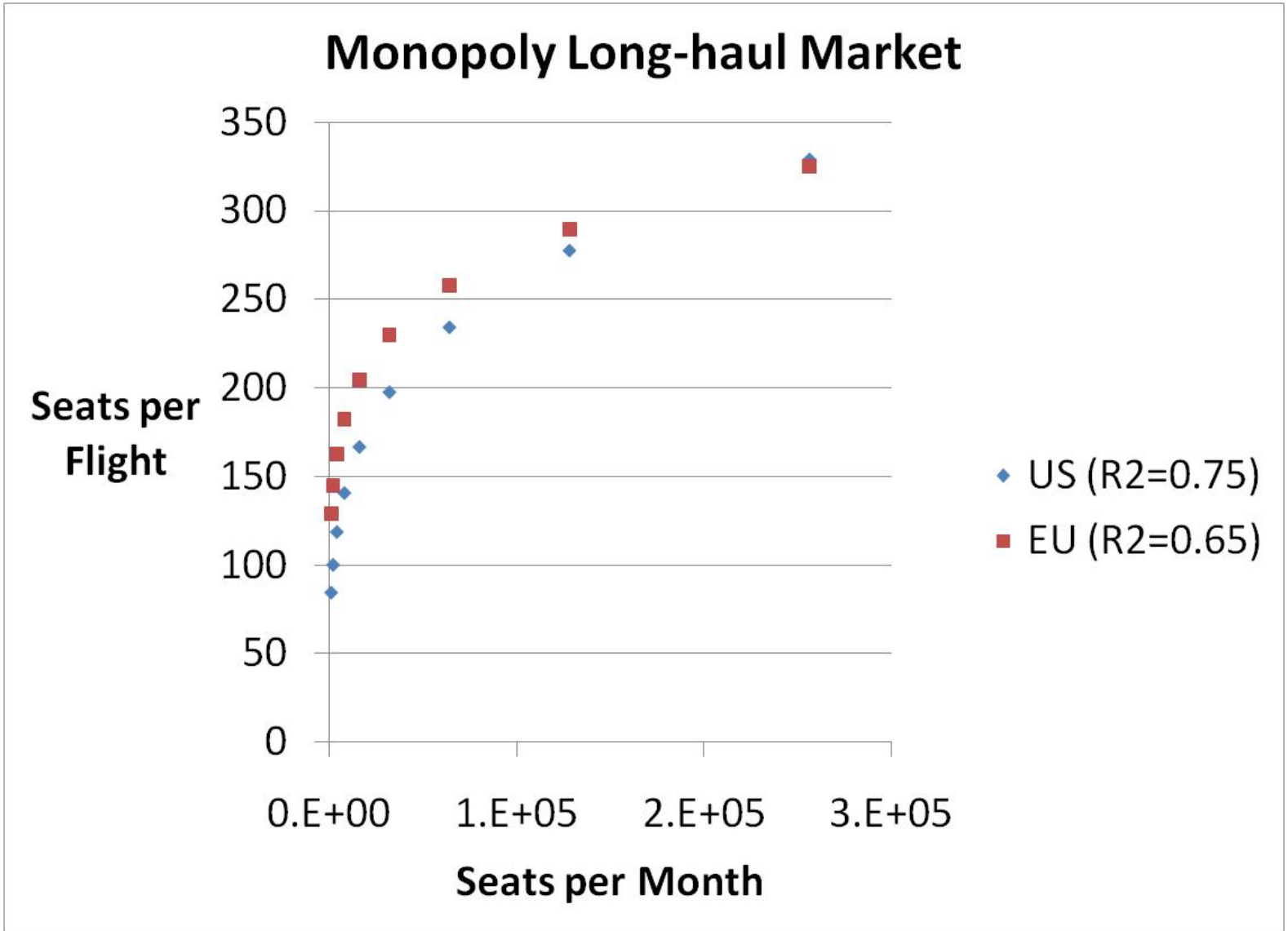
- Hypothesis: US airports have smaller aircraft than EU airports due to greater capacity and lack of slot controls (among other reasons)
- Metric (dependent variable): Average seats per flight for flight segments with arrival end in US/EU airports
- Characteristics of markets (explanatory variables)
  - Distance (+)
  - Monthly seats(+)
  - Market Concentration (HHI) (+)

Model confirmed/all variables significant for both the US and Europe .

Analysis Results



Analysis Results



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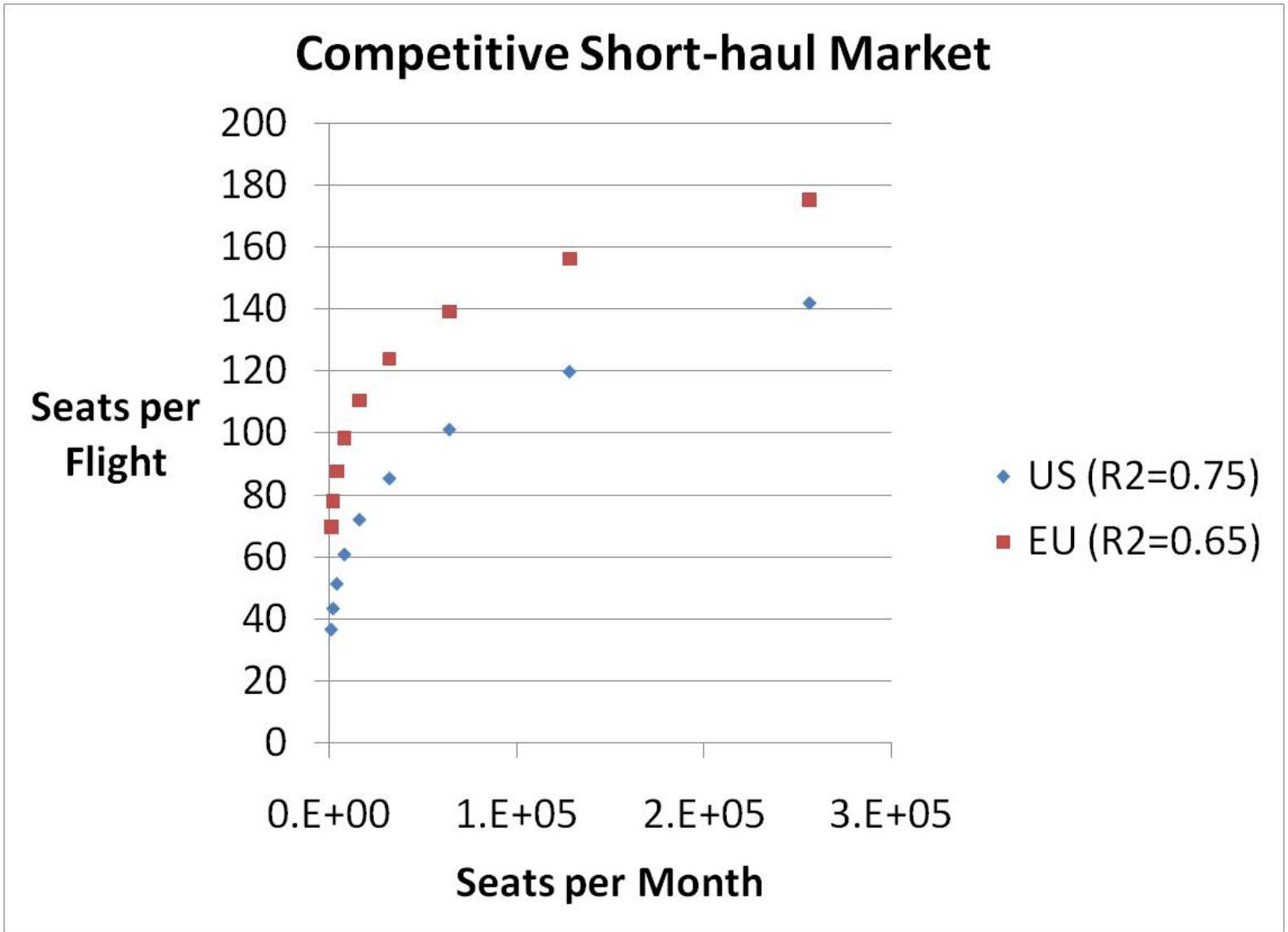

Block Time Analysis

- Hypothesis: US flights have more schedule padding due to scheduling to VMC capacities and resulting vulnerability to weather
- Metric: ***Scheduled block time*** for EU-EU and US-US flights over 100 seats
- Independent variable: ***flight distance***.

Analysis Results

	US	EU
Fixed time per flight	38.1 min	34.5 min
Cruise Speed	481 mi/hr	483 mi/hr
R^2	0.96	0.97

Conclusions

- Stronger peaking at US airports, particularly the very largest ones
- US airports have smaller average gauge, particularly in competitive short-haul markets
- US flights are scheduled with 3-4 minutes longer buffer on average
- Analysis of OAG data is useful in making US/EU comparisons