



The impact of aircraft leasing strategy on fleet heterogeneity in the global airline industry

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Introduction

This project aims to analyze fleet heterogeneity and its relationship to airlines' use of leasing strategies around the globe. Using data collected primarily from Cirium, we develop Blau's index of fleet heterogeneity for both aircraft frame and engine at the manufacturer, family, and model level, covering the top 200 passenger airlines worldwide. The study covers 18,808 in-service aircraft at an average age of 11 years, including 201 aircraft models and 247 different engine types. The average leasing rate is about 70% among the sample airlines. In this study, we investigated the fleet heterogeneity across airlines of adopting different business models and across different regions such as Europe, Africa, Asia-Pacific, North America, and South America. In addition, we compared the extent of their reliance on aircraft leasing. Finally, we estimated the relationship between fleet heterogeneity and leasing strategy. The trend of low-cost carriers using a more standardized fleet was also examined. The findings from our study provide management implications for airlines and shed light on the importance of strategically integrating aircraft financing and fleet composition decisions.

Regression model

Blau's Index of Fleet Heterogeneity for Aircraft/Engine

$$= \alpha_0 + \alpha_1 * \% \text{ of Leasing Aircraft} + \alpha_2 * \text{Fleet Size} + \alpha_3 * \text{LCC} + \alpha_4 * \text{Fleet Age} + \sum_{i=6}^{10} \alpha_i * \text{Region} + \epsilon$$

Variable development

Herfindahl-Hirschman Index (HHI)

A common measure of market concentration and is used to determine market competitiveness.

$$HHI = \sum_{i=1}^n S_i^2$$

Blau's Index of Heterogeneity

Blau's Index of Heterogeneity is a statistical measure used to assess the diversity or heterogeneity within a group. 0 indicates no diversity, and 1 indicates maximum diversity

$$Bi = 1 - \sum_{i=1}^k P_i^2$$

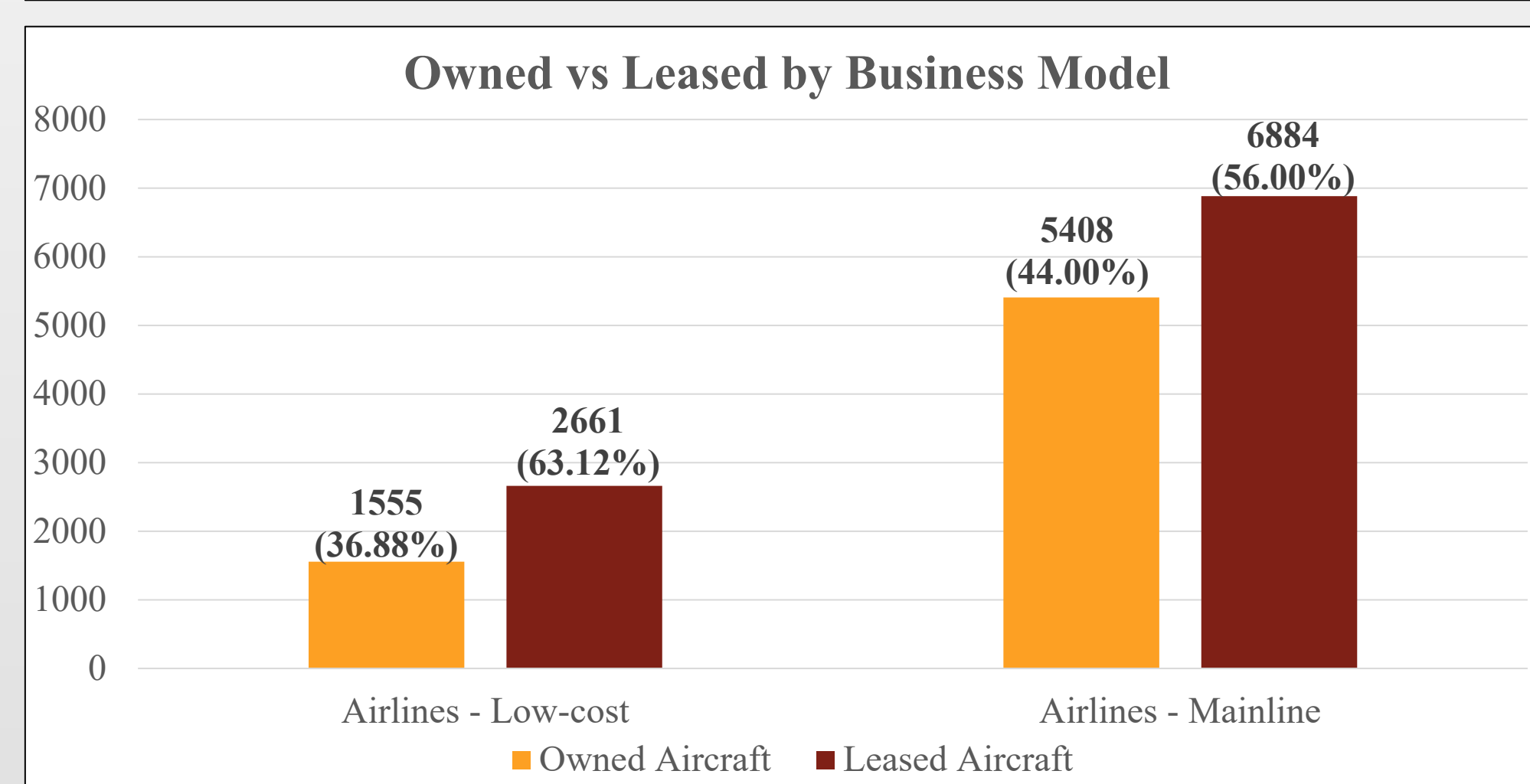
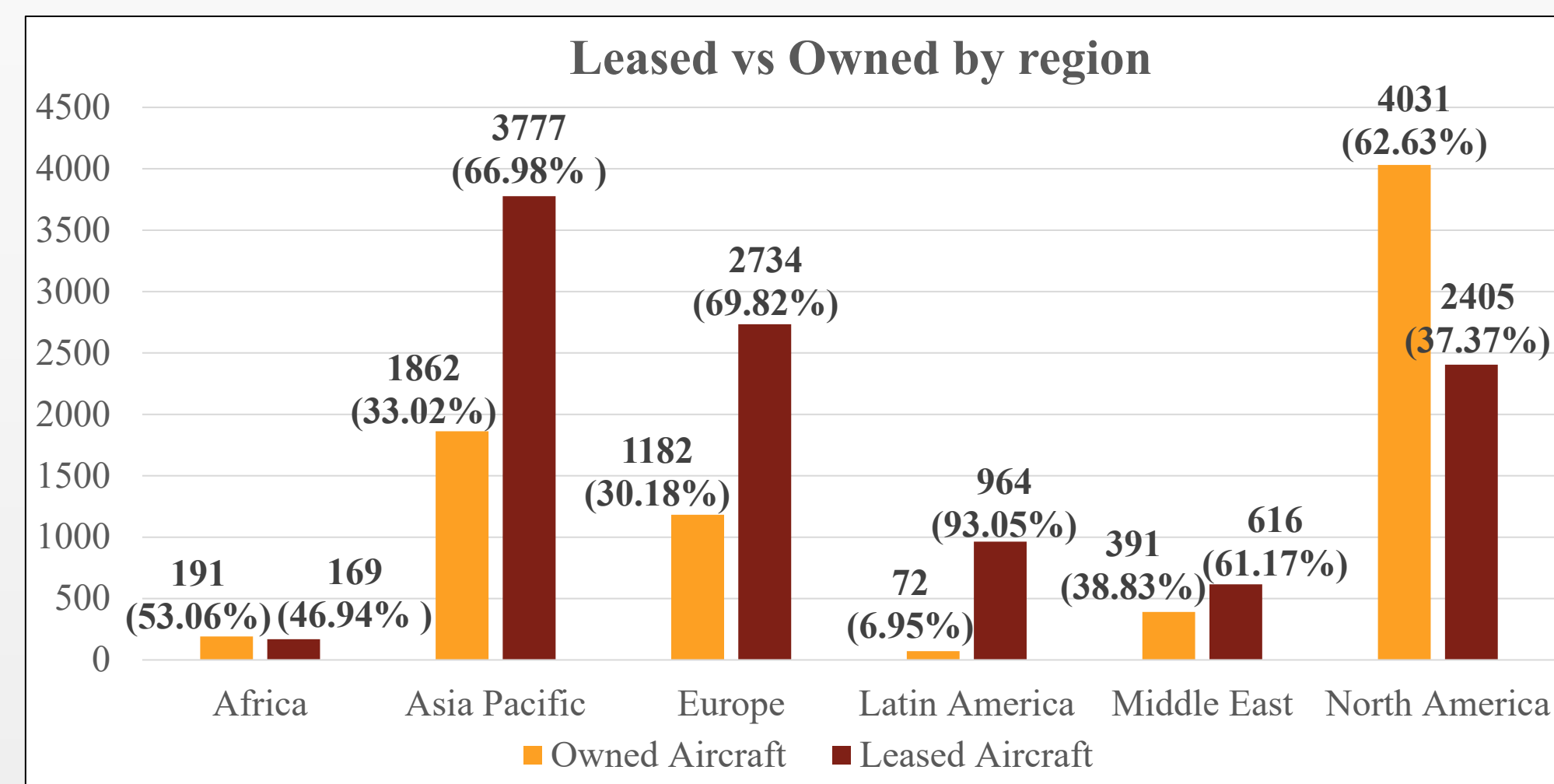
Data Source

CAPA CAPA Top 200 Airlines Business Model and Region
CENTRE FOR AVIATION

CIRIUM Cirium Top 200 Airlines Fleet Overview

IATA IATA World Air Transport Statistics
Top 200 airlines ranking (2018)

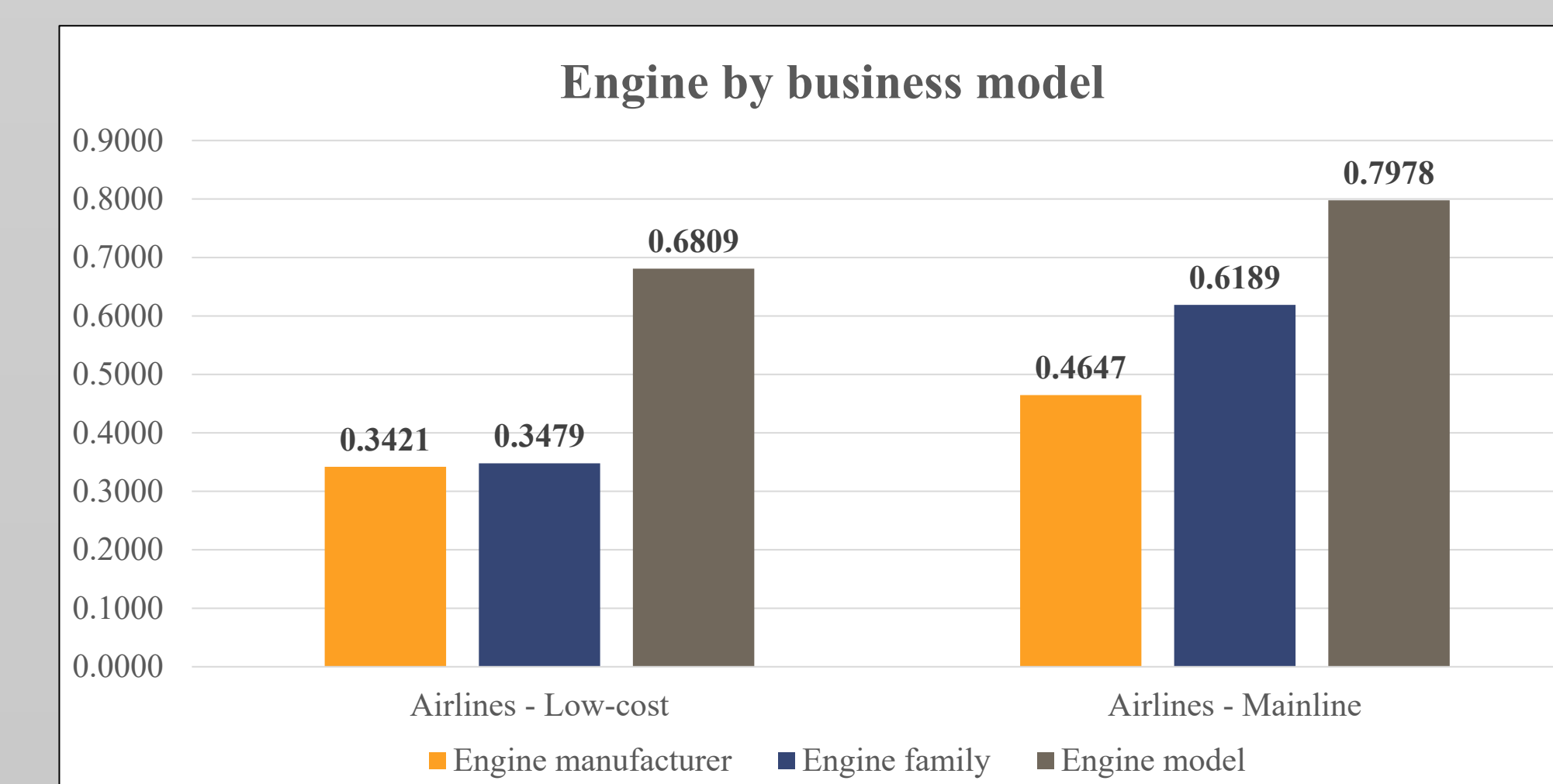
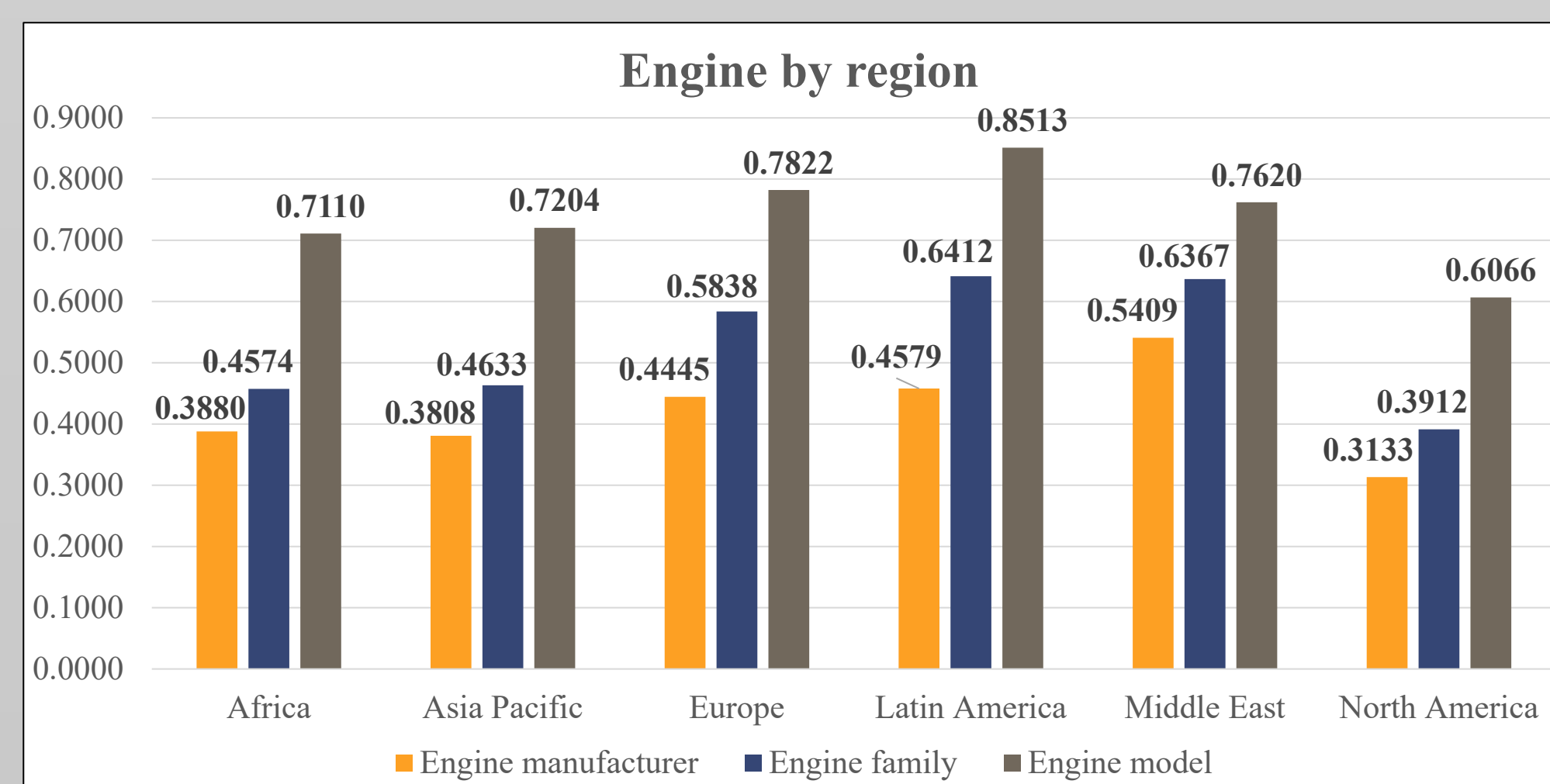
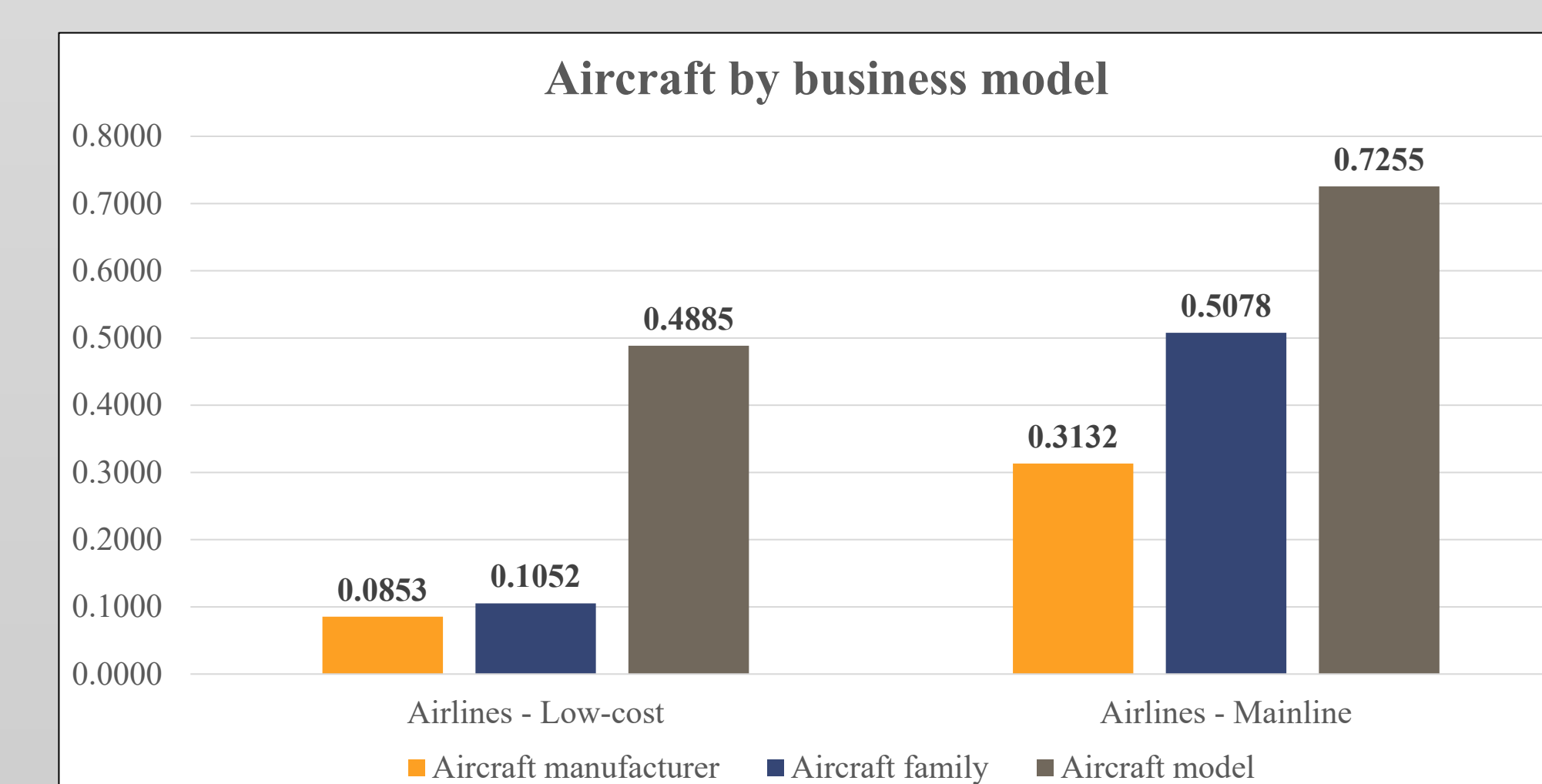
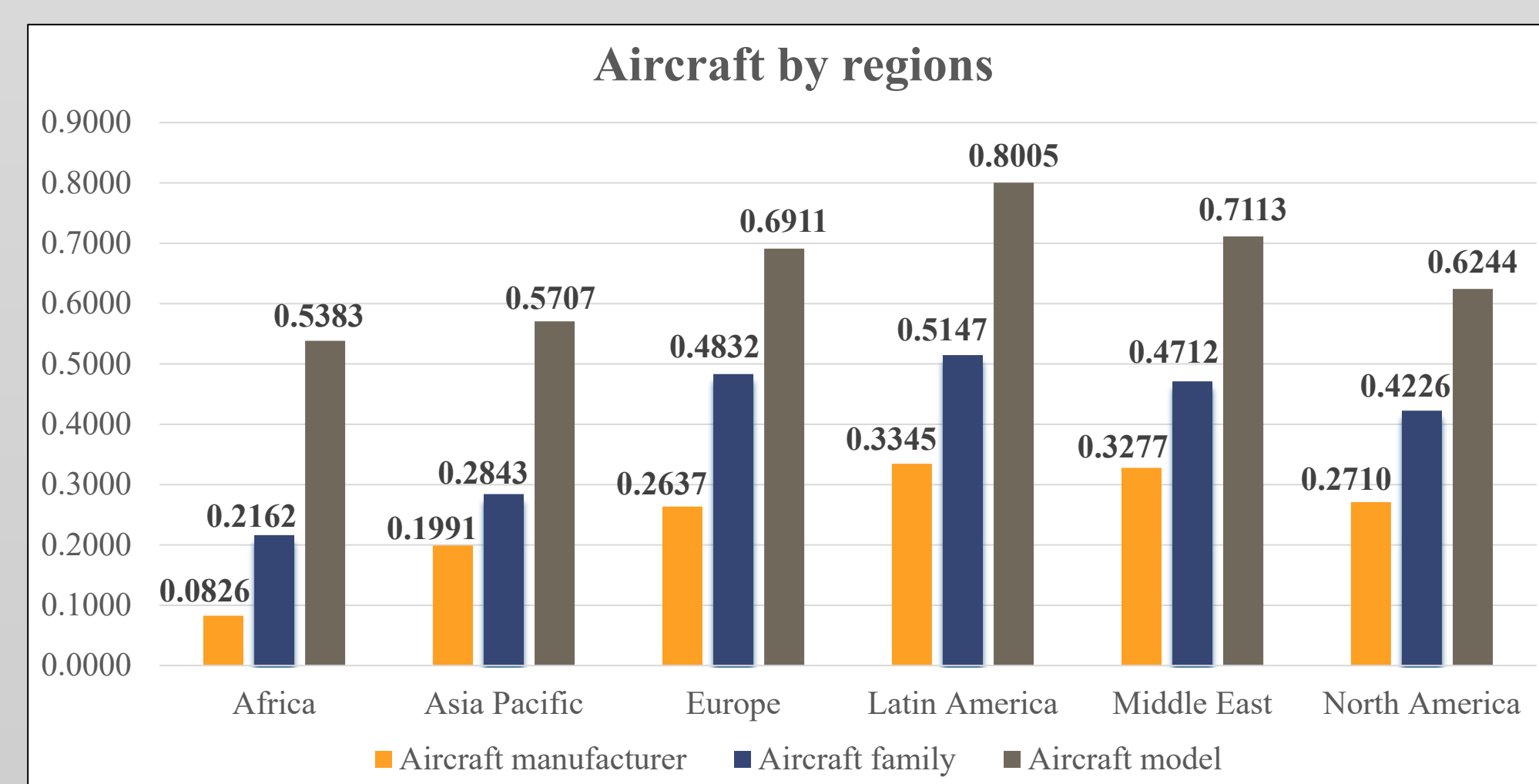
Fleets Overview



Manufacturer	Owned Aircraft	Leased Aircraft	Total Aircraft Manufacturer	Percentage Of Leased
Airbus	2612	5787	8399	68.90%
Boeing	4218	3839	8057	47.65%
Embraer	464	524	988	53.04%
Bombardier (Canadair)	261	271	532	50.94%
ATR	74	105	179	58.66%
De Havilland Canada	53	59	112	52.68%
UAC (Sukhoi)	25	48	73	65.75%
COMAC	18	25	43	58.14%
Fokker	0	6	6	100.00%
Aircraft Industries - Let	2	1	3	33.33%
Pilatus	1	0	1	0.00%
Antonov	1	0	1	0.00%
Grand Total	7729	10665	18394	

- Boeing 737-800 is the most popular aircraft model, with 1,969 (60%) leased and 1,334 (40%) owned.
- American Airlines (AA) leases the most aircraft, standing at 487 (52%).
- Asia Pacific has 3,777 (66.98%) leased and 1,862 (33.02%) owned aircraft, while North America has 4,031 owned and 2,405 leased.
- Mainline carriers rely on leasing and owning with lease 6,884 (56%) aircraft (13 years) and 5,408 (44%) (9 years)

Blau's index of Heterogeneity of Aircraft and Engine



- Low-cost carriers tend to standardize their fleet because of cost advantages and narrower route network
- The Asia Pacific region has a more homogeneous fleet composition due to the prevalence of low-cost carriers and a high demand for single-aisle aircraft in China.
- The heterogeneity of the engine is closely related to that of aircraft but with fewer engine options to choose.

Effect of Leasing Rate on Fleet Diversification

DV: Blau's Index	Model	Family	Manufacturer
Leased Aircraft %	-0.042 (0.062)	-0.150** (0.067)	-0.147** (0.059)
Fleet size	0.001*** (0.000)	0.0004*** (0.000)	0.0003*** (0.000)
LCC	-0.198*** (0.040)	-0.334*** (0.043)	-0.177*** (0.038)
Fleet age	-0.008 (0.005)	-0.003 (0.005)	-0.002 (0.005)
Asia Pacific	-0.069 (0.071)	-0.151** (0.076)	-0.117* (0.067)
Europe	-0.008 (0.074)	-0.142* (0.080)	-0.127* (0.070)
Latin America	-0.010 (0.091)	-0.197** (0.097)	-0.097 (0.086)
Middle East	0.022 (0.086)	-0.096 (0.092)	-0.088 (0.081)
North America	-0.226*** (0.081)	-0.368*** (0.087)	-0.278*** (0.077)
Intercept	0.784*** (0.093)	0.721*** (0.100)	0.507*** (0.088)
R ²	0.3146	0.4140	0.2952
# of observations	159	159	159

*** p<.01, ** p<.05, *p<.1

Summary

- The use of leasing strategies has a positive, significant effect on fleet standardization at the aircraft family and manufacture level but not at the aircraft model level.
- The use of leasing strategies has no significant effect on the degree of engine standardization across different levels.
- The fleet standardization at the model, family, and manufacturer level is higher for LCC than for non-LCC airlines.
- The LCCs have more standardized engine installation at the engine family and manufacture level but not at the engine model level.
- The fleet standardization for aircraft and engines is higher for airlines in North America than those in other regions.

References

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