SUSTAINABILITY-ORIENTED COMPETITIVE MARKETING STRATEGIES IN THE AIRLINE INDUSTRY: A GAME-THEORETIC MARKET SIMULATION

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ABSTRACT

The airline industry is characterized by intense competition, concentrated market structures, and strategic interdependence. This study applies zero-sum game theory to examine how airlines formulate and respond to pricing, promotional, and loyalty strategies. A mixed-method, simulation-based approach integrates public airline data, payoff matrices, market simulations, sensitivity analysis, and industry case studies.

The findings indicate that unilateral strategic actions may generate temporary competitive advantages, but these are often neutralized when competitors imitate or retaliate. The study demonstrates that zero-sum game theory provides a useful framework for analysing relative competitive positioning, while sustainable advantage depends more on differentiated and difficult-to-replicate value propositions than isolated price or promotional actions.

Keywords: game theory, airline industry, marketing strategy, competitive dynamics, oligopoly.

1. INTRODUCTION

As competition intensifies through globalization and technological advancement, marketing strategy increasingly incorporates competitor analysis, industry dynamics, and predictive modelling alongside consumer preferences. Game theory provides a mathematical framework for interactive decision-making, where one player's actions influence others' strategies and outcomes. The airline industry represents a highly competitive oligopolistic market in which pricing, promotions, and loyalty programmes are central to gaining market share. Zero-sum game theory offers a useful perspective on these dynamics, as a relative gain in one airline's market share corresponds to a loss for its competitor within a defined competitive market. This study examines airline competitive dynamics through game theory, focusing on pricing and promotional strategies to identify equilibrium outcomes, retaliation, and competitive behaviour.

2. LITERATURE REVIEW

2.1 Arguments in favor of using Game Theory for marketing decisions

Several scholars establish the relevance of game theory to marketing strategy. Di Benedetto (1986) links marketing objectives, competitor interactions, marketing-mix decisions, and information to game-theoretic decision-making. However, rationality and perfect-information assumptions present limitations. Chatterjee and Lilien (1986), Herbig (1991), and Kreps and Wilson (1982) suggest incorporating bluffs, threats, and reputation to account for potentially irrational behaviour. Where complete information is unavailable, Chatterjee and Lilien (1986), Di Benedetto (1986), and Cho and Kreps (1987) propose using incomplete-information models. Qualitative interviews, surveys, and market signals can provide information about competitors' intentions and preferences, thereby supporting empirical testing and equilibrium analysis (Dominici, 2011; Patel, 2021).

2.2 Analysis of the competitive dynamics of the airline industry through the lens of game theory

Previous research has applied game theory across competitive industries, with the airline industry providing a relevant context for examining strategic interaction. Fudenberg and Tirole (1991) emphasize interdependent decision-making in oligopolistic markets. Airline studies by Borenstein (1992) and Berry (1994) highlight the influence of pricing, capacity constraints, and market entry on competitive behaviour. Marketing research has also examined airlines' use of loyalty programmes, frequent-flyer benefits, and promotional discounts for differentiation (Gabaix & Laibson, 2006). However, limited research has formally integrated these marketing strategies into a zero-sum game-theoretic framework, representing the research gap addressed by this study.

3. RESEARCH METHODOLOGY: APPLYING ZERO-SUM GAME THEORY

This study employs a mixed-method, simulation-based design to examine competitive and cooperative dynamics in the airline industry using zero-sum game theory. The methodology integrates quantitative analysis of secondary industry data with qualitative evidence from semi-structured interviews and industry case studies. A two-player zero-sum game models strategic interactions between competing airlines, focusing on pricing, promotional activity, and loyalty programmes as key marketing variables. These strategies reflect airlines' efforts to attract and retain customers, increase market share, and respond to competitors. Within the defined competitive market, a gain for one airline is represented as a corresponding loss for its rival, allowing the model to evaluate relative competitive advantage rather than absolute industry-wide profitability.

3.1 Pricing Strategy in the airline industry as a Zero-Sum Game

In the airline industry, pricing is often seen as a zero-sum game. For example, when one airline lowers its ticket prices, it can attract customers from a competitor, leading to a loss in market share for the latter. The payoff matrix can be constructed to reflect how changes in pricing impact both airlines' profits and market share. The Nash equilibrium, a key concept in game theory, can be used to determine the pricing strategies where neither airline can improve their outcome by unilaterally changing their strategy.

3.2 Promotions and Loyalty Programs

Another significant aspect of airline marketing is the use of promotions, discounts, and loyalty programs. These marketing tactics often serve to attract price-sensitive customers or reward frequent travelers. In a zero-sum game scenario, one airline's successful promotion or loyalty program results in capturing customers from competitors. The competition thus revolves around outdoing each other's offerings. The strategic interplay of these actions can be modeled to predict outcomes and to identify the equilibrium where both airlines engage in promotions or loyalty programs that balance their market shares.

3.3 Detailed Methodology

This study employs a mixed-method, simulation-based approach combining quantitative industry data with qualitative evidence from relevant case studies. Data are used to construct

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payoff structures for pricing, promotions, and loyalty strategies. Findings are triangulated with airline case studies and market simulations to assess the applicability and robustness of the proposed game-theoretic framework.

The detailed analytical procedure consists of the following stages:

(i) identification of the players and competitive market;

(ii) specification of strategic alternatives;

(iii) operationalization of competitive payoffs;

(iv) construction of payoff matrices;

(v) identification of dominant and dominated strategies;

(vi) pure-strategy analysis using maximin and minimax criteria;

(vii) mixed-strategy analysis where no saddle point exists;

(viii) calculation of the value of the game;

(ix) scenario-based market simulation;

(x) sensitivity analysis; and

(xi) validation through executive interviews and case studies.

3.4.1 Identification of Players and Competitive Environment

The model considers two competing airlines, Airline A and Airline B, represented as: $N = \{A, B\}$

The airlines are selected based on their direct competitive interaction within a defined route, geographic market, or customer segment. The market is deliberately narrowed so that the **zero-sum assumption** is meaningful, whereby a relative improvement in one airline's competitive position corresponds to a relative decline in that of its competitor.

Both airlines are treated as strategic players because each airline's marketing decisions influence both its own outcomes and those of its competitor. For airline i, the available strategy set is represented as$Ai = \{a_{i1}, a_{i2}, \dots, a_{im}\}$

where aij represents an available strategic action. The complete strategy space is the Cartesian product of the two airlines' strategy sets: $A = A_A \times A_B$

Finally, the payoff function for each airline is defined as: $u_i : A \rightarrow R$

indicating that an airline's payoff depends not only on its own chosen strategy but also on the strategy selected by its competitor. Thus, the model captures the strategic interdependence that characterizes marketing decisions in oligopolistic airline markets.

3.4.2 Application of the Zero-Sum Assumption

The study applies a **two-player zero-sum framework**, where the competitive gain of one airline corresponds to an equivalent loss for the other. The fundamental condition is: $u_A(a_A, a_B) + u_B(a_A, a_B) = 0$

Therefore: $u_B(a_A, a_B) = -u_A(a_A, a_B)$

where u_A and u_B denote the payoffs of Airlines A and B, respectively.

The zero-sum assumption is applied specifically to the **defined competitive market or route**, rather than to the airline industry as a whole. This is because the overall airline market

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may expand or contract, and airlines may simultaneously create new demand. The model instead examines **relative competitive outcomes between directly competing airlines**.

When the competitive market is restricted to the two airlines under investigation, their combined market share is normalized as: $MS_A + MS_B = 100\%$

Consequently, a relative increase in one airline's market share corresponds to a proportional decline in the competitor's share within the defined two-airline market. This provides the basis for representing **competitive market-share gains and losses within the zero-sum framework**.

3.4.3 Operationalization of Strategic Variables

Three marketing variables identified in Sections 3.2 and 3.3 are operationalized as three separate strategic games: pricing, promotions, and loyalty programmes. Treating each variable as an independent game enables the study to examine whether different marketing tactics generate different strategic equilibria.

Pricing game

The pricing strategy set is: $S_P = \{P_M, P_R\}$ where P_M represents the **prevailing market price** and P_R represents a **price reduction**. Where sufficient empirical evidence is available, the strategy set may be expanded to include moderate and aggressive price reductions.

Promotional game

The promotional strategy set is: $S_{Pr} = \{P_{rM}, P_{rE}\}$ where P_{rM} denotes **maintaining existing promotional activity**, while P_{rE} denotes **enhancing promotional activity**. Promotional actions may include fare discounts, limited-period offers, advertising campaigns, and other customer-acquisition initiatives.

Loyalty Programme Game

The loyalty strategy set is: $S_L = \{L_M, L_E\}$ where L_M represents **maintaining the existing loyalty programme** and L_E represents **enhancing loyalty incentives**.

3.4.4 Operationalization of Payoffs

Payoffs represent the **relative competitive advantage or disadvantage** resulting from the strategies selected by the two airlines. Under the zero-sum framework, payoffs are expressed in relative rather than absolute terms. Change in market share is the principal indicator: $\Delta MS_i = MS_{i,t+1} - MS_{i,t}$

For Airline A: $P_A = \Delta MS_A - \Delta MS_B$ and for Airline B: $P_B = -P_A$

Thus: $P_A + P_B = 0$

Where reliable data are available, passenger volume and revenue may supplement market share. A composite payoff can be expressed as: $P_i = w_1 Z(\Delta MS_i) + w_2 Z(\Delta R_i) + w_3 Z(\Delta V_i)$

subject to: $w_1 + w_2 + w_3 = 1$ where the Z terms represent standardized changes and w_1, w_2, w_3 represent indicator weights. Where multiple reliable measures are unavailable, market-share change remains the primary payoff measure.

3.4.5 Construction of the Payoff Matrix

For each strategic variable, a payoff matrix will be constructed in which the rows represent the strategies of Airline A and the columns represent the strategies of Airline B.

A general two-by-two payoff matrix is represented as:

	B1	B2
A1	a	b
A2	c	d

where a,b,c,d represent the payoffs to Airline A.

Because the game is zero-sum, the corresponding payoff matrix for Airline B is:

	B1	B2
A1	-a	-b
A2	-c	-d

Thus, for every possible combination of strategies:

$u_A + u_B = 0$, the numerical values of a,b,c,d will be derived from the empirical competitive outcomes established through industry data and validated, where applicable, through executive interviews and case-study evidence. The numerical payoffs will therefore not be assigned arbitrarily.

Separate payoff matrices will be constructed for pricing, promotions, and loyalty programmes. This enables the equilibrium outcomes of the three marketing tactics to be compared systematically.

3.4.6 Identification of Dominant and Dominated Strategies

Prior to equilibrium analysis, each payoff matrix will be examined for dominant and dominated strategies.

For Airline A, strategy A1 dominates strategy A2 if: $uA(A1, Bj) \geq uA(A2, Bj)$

for every possible strategy Bj with strict inequality for at least one strategy of Airline B.

Weak dominance is represented as: $A1 \succeq A2$

while strict dominance is represented as: $A1 \succ A2$

Where a dominated strategy is identified, it may be eliminated from the matrix before proceeding with equilibrium analysis. This reduces the complexity of the game and identifies strategies that are inferior regardless of the competitor's decision.

3.4.7 Pure Strategy Analysis: Maximin and Minimax

The first stage of equilibrium analysis determines whether the game contains a saddle point and can therefore be solved using pure strategies.

For Airline A, the minimum payoff associated with each row is identified. The maximum of these minimum values represents the maximin value:

$$V_{maximin} = max_i [min_j (a_{ij})]$$

For Airline B, the maximum payoff associated with each column is identified. The minimum of these maximum values represents the minimax value:

$$V_{minimax} = min_j\,[max_i\,(a_{ij})]$$

The relationship between the two values is:

$V_{maximin} \leq V_{minimax}$

If: $V_{maximin} = V_{minimax} = V$, then a saddle point exists.

The corresponding strategies represent the optimal pure strategies for the two airlines, while V represents the value of the game. At the saddle point, neither player can improve its payoff through a unilateral change in strategy.

3.4.8 Mixed Strategy Analysis

If: $V_{maximin} \neq V_{minimax}$, then no saddle point exists and an optimal solution cannot be obtained through pure strategies alone. In such circumstances, mixed strategies are employed.

3.4.9 Calculation of the Value of the Game

Once the equilibrium probabilities have been established, the expected value of the game is calculated.

Using Airline A's mixed strategy: $V = pa + (1 - p)c$

Alternatively, the value may be obtained using Airline B's mixed strategy: $V = qa + (1 - q)b$

At equilibrium: $pa + (1 - p)c = qa + (1 - q)b$

The resulting value is interpreted as the expected relative competitive advantage of the maximizing player under equilibrium conditions.

If: $V > 0$ Airline A possesses a relative strategic advantage.

If: $V < 0$ Airline B possesses a relative strategic advantage.

If: $V = 0$ neither player possesses a systematic advantage under the specified conditions.

3.4.10 Market Simulation

Following the construction and solution of the payoff matrices, market simulations will be developed to test the application of the game-theoretic models in dynamic airline market environments. This directly extends the simulation component already specified in the paper.

The simulations will reproduce alternative competitive scenarios involving combinations of strategic actions by Airlines A and B.

The scenarios may include:

1. Both airlines maintaining their prevailing prices.
2. Airline A reducing price while Airline B maintains its price.
3. Airline B reducing price while Airline A maintains its price.
4. Both airlines reducing prices.
5. One airline increasing promotional activity while the competitor maintains existing promotional activity.
6. Both airlines increasing promotional activity.

7. One airline enhancing loyalty incentives while the competitor maintains its existing programme.
8. Both airlines enhancing loyalty incentives.

For each scenario, the analytical sequence is: Strategy Combination→Competitive Outcome→Payoff→Equilibrium Status

The simulation will therefore examine whether a strategic advantage obtained through an initial marketing action persists after the competitor's response or is neutralized through competitive retaliation.

3.4.11 Sensitivity Analysis

Sensitivity analysis will be conducted to examine the robustness of equilibrium outcomes to changes in the estimated payoff values. This is particularly important because competitive responses may vary according to demand conditions, competitor capacity, customer preferences, and managerial expectations.

The baseline payoff matrix is represented as:

$$M = \begin{matrix} a & b \\ c & d \end{matrix}$$

The payoff parameters will then be varied within plausible ranges:

$a \in [a_{min}, a_{max}]$; $b \in [b_{min}, b_{max}]$; $c \in [c_{min}, c_{max}]$; $d \in [d_{min}, d_{max}]$

The equilibrium will be recalculated under alternative payoff assumptions.

The analysis will determine whether changes in payoff assumptions affect:

1. the existence of a saddle point;
2. the optimal pure strategy;
3. the probabilities associated with mixed strategies;
4. the value of the game; and
5. the direction of strategic advantage.

If the equilibrium remains stable across alternative payoff assumptions, the corresponding finding will be considered robust. If the equilibrium changes substantially, the finding will be interpreted as sensitive to market conditions and competitor responses.

3.4.12 Case Study Validation and Triangulation

Selected airline industry case studies will be reviewed to compare game-theoretic predictions with observed strategic behaviour. The existing methodology establishes case studies as a means of examining real-world instances where strategic interactions align with game-theoretic predictions and validating the empirical findings.

4. FINDINGS AND DISCUSSION

4.1 Empirical Basis for the Game-Theoretic Analysis

The empirical analysis uses publicly available U.S. Bureau of Transportation Statistics (BTS) data, published research, and airline-industry cases. The principal source is the BTS Origin and Destination Survey (DB1B), supplemented by airport-level passenger data. In 2023, American carried approximately 16.04 million passengers at Miami International Airport, compared with 3.09 million for Delta (BTS, 2025).

For the purposes of the two-player model, the competitive share of each airline is normalized within the American-Delta subset rather than treating the other airlines at Miami as part of either player's payoff. Thus:

$MS_A = \frac{16{,}042.14}{16{,}042.14+3{,}094.79} \times 100 \Rightarrow MS_A = 83.83\%$

And: $MS_B = \frac{3{,}094.79}{16{,}042.14+3{,}094.79} \times 100 \Rightarrow MS_B = 16.17\%$

Therefore: $MS_A + MS_B = 100\%$ within the defined two-airline competitive subset.

This normalization is important because the zero-sum framework is not being applied to the entire Miami aviation market. Instead, it represents **relative competitive position between the two selected players**.

4.2 Finding 1: Pricing Competition Produces a Strategic Interdependence

The pricing model provides the clearest quantitative demonstration of the zero-sum framework.

BTS reports that the average U.S. air fare was **$381.53 in 2023**, increasing to $383.15 in 2024 and $387.74 in 2025. However, these are national averages and are not treated as the actual American or Delta fare at Miami. They are used only as a benchmark for the magnitude of a plausible fare adjustment.

A **5% price reduction** is therefore used as a scenario rather than as an assertion about an actual fare change: $P_R = 381.53(1 - 0.05) \Rightarrow P_R = \$362.45$

The demand response to the price change is estimated using the empirically estimated airline price elasticity of **−1.157** reported by Perera and Tan. Their study found that correcting for price endogeneity using instrumental variables changed the estimated elasticity from −0.148 to −1.157, indicating substantially more price-sensitive demand than a simple OLS model suggested. (Perera & Tan, 2019)

The demand multiplier associated with a 5% price reduction is therefore: $D = (1 - 0.05)^{-1.157} \Rightarrow D \approx 1.0611$

Thus, the model estimates approximately a **6.11% increase in quantity demanded**, ceteris paribus, following a 5% fare reduction.

The resulting relative share of American is: $MS'_A = \frac{16{,}042.14(1.0611)}{16{,}042.14(1.0611)+3{,}094.79} \times 100 \Rightarrow MSA' \approx 84.62\%$

The relative gain is therefore: $\Delta MS_A = 84.62 - 83.83 \Rightarrow \Delta MS_A \approx +0.79\ percentage\ points$

The corresponding relative change for Delta is: $\Delta MS_B \approx -0.79\ percentage\ points$

The resulting zero-sum payoff is: $P_A = +0.79$; $P_B = -0.79$

Table 1. Modelled pricing outcomes

Strategy combination	American payoff	Delta payoff
Maintain / Maintain	0.00	0.00

Reduce / Maintain	+0.79	−0.79
Maintain / Reduce	−0.79	+0.79
Reduce / Reduce	0.00	0.00

Note: The values are model-derived relative market-share payoffs, not directly observed profit changes. The 5% fare reduction is a counterfactual scenario calibrated using BTS passenger data and published price elasticity.

The resulting payoff matrix for American is:

$$M_{P} = 0 \quad -0.79$$

$$+0.79 \quad 0$$

where the rows correspond to American's **Maintain** and **Reduce** strategies and the columns correspond to Delta's **Maintain** and **Reduce** strategies.

4.2.1 Maximin-Minimax Analysis

For American: $V_{maximin} = max[min(0,-0.79), min(0.79,0)] \Rightarrow V_{maximin} = 0$

For Delta: $V_{minimax} = min[max(0,0.79), max(-0.79,0)] \Rightarrow V_{minimax} = min[0.79,0]$

Therefore: $V_{maximin} = V_{minimax} = 0$

A saddle point exists in the broad sense of the value of the game being zero, but the matrix has **two equivalent pure-strategy outcomes**, namely both airlines maintaining their prices and both airlines reducing their prices.

The more meaningful interpretation emerges from the mixed-strategy formulation. With$a = 0, b = -0.79, c = 0.79, d = 0$

the optimal probability for American to choose a price reduction is: $p = \frac{a-b-c+d}{d-c} \Rightarrow p = \frac{0-0.79}{0-(-0.79)-0.79+0} \Rightarrow p = 0.50$

Similarly: $q = \frac{d-b}{a-b-c+d} \Rightarrow q = \frac{0-(-0.79)}{0-(-0.79)-0.79+0} \Rightarrow q = 0.50$

Thus, under the simplified model, each airline would have a **50% equilibrium probability of choosing either pricing strategy**.

DISCUSSION

The result demonstrates a key characteristic of oligopolistic airline competition: **a unilateral price reduction can create a relative advantage, but this advantage disappears when the competitor matches the action**. This is consistent with evidence from Southwest–AirTran competition, where incumbent airlines adjusted fares in response to the threat and entry of low-cost competitors (Aydemir, 2012). Delta's experience also illustrates the risks of competing primarily on lower fares when such actions may weaken premium differentiation (Black, 2024). Thus, the model reflects a **prisoner's-dilemma-like pressure**, in which airlines have incentives to reduce prices when rivals maintain them, but mutual price reductions eliminate relative gains. However, the zero-sum model captures **relative competitive position rather than absolute profitability**, as both airlines may experience reduced margins during a price war.

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4.3 Finding 2: Promotional Competition Encourages Strategic Imitation

Promotional competition can generate a temporary competitive advantage, but its effects extend beyond simple price reductions. Southwest Airlines' 2024 "Wanna Get Away Week" offered fares of up to 50% off, alongside Rapid Rewards incentives and sweepstakes (Southwest Airlines, 2024). Its broader "The Big Flex" campaign also emphasized free checked bags, flexible booking policies, flight credits, and loyalty benefits. These initiatives demonstrate that airline promotions increasingly operate through **bundled value propositions**, combining price incentives with flexibility, loyalty rewards, and customer benefits rather than relying solely on fare reductions.

For the game-theoretic model, the promotional game can therefore be represented using ordinal competitive payoffs: $P_{rM} = Maintain\ promotional\ activity$; $P_{rE} = Enhance\ promotional\ activity$

A positive payoff represents a relative customer-acquisition advantage, while a negative payoff represents a relative disadvantage.

The case evidence supports the following normalized strategic structure:

$$M_{Pr} = \begin{matrix} 0 & -1 \\ +1 & 0 \end{matrix}$$

Table 2. Promotional strategy payoff matrix

	Competitor: Maintain	**Competitor: Maintain**
Airline: Maintain	0	−1
Airline: Enhance	+1	0

The interpretation is straightforward.

When Airline A enhances its promotional activity while Airline B maintains its existing activity: $P_A = +1$

When Airline B responds by enhancing its own promotional activity: $P_A = 0$

The original relative advantage is therefore neutralized.

The mixed-strategy solution produces: $p = q = 0.5$

And $V = 0$

DISCUSSION

The promotional model indicates that promotional activity can generate a **temporary competitive advantage**, but this advantage may disappear when competitors imitate the strategy. Southwest's campaign illustrates how airline promotions increasingly combine fares with loyalty rewards, brand positioning, and ancillary benefits (Southwest Airlines, 2024). Therefore, sustainable competitive advantage may depend more on **differentiating promotional value** than on increasing promotional intensity. This supports the shift from pure price competition toward **value-based competition**, where flexibility, loyalty benefits, ancillary services, and customer experience contribute to the overall competitive offering.

4.4 Finding 3: Loyalty Programmes Create a More Persistent Strategic Lock-In

The loyalty-programme game differs from pricing because loyalty programmes can create **switching costs and long-term customer attachment**, extending their competitive impact beyond individual transactions. Delta's SkyMiles changes introduced in 2024 altered qualification requirements and elite benefits, but the airline subsequently revised aspects of the programme following customer feedback. Competitors such as JetBlue, Alaska Airlines, and Southwest responded by strengthening their loyalty offerings to attract dissatisfied Delta customers (Koenig, 2023). This case illustrates how changes in loyalty strategy can trigger **competitive retaliation**, reinforcing the strategic interdependence represented in the game-theoretic model.

The loyalty strategy set is: $L_M = Maintain\ existing\ loyalty\ programme$; $L_E = Enhance\ loyalty\ incentives$

The resulting ordinal payoff matrix can be represented as:

$$M_L = \begin{matrix} 0 & -1 \\ +1 & 0 \end{matrix}$$

Table 3. Loyalty programme payoff matrix

	Competitor: Maintain	Competitor: Enhance
Airline: Maintain	0	−1
Airline: Enhance	+1	0

The model produces: $V_{maximin} = V_{minimax} = 0$

and: $p = q = 0.5$

DISCUSSION

The important difference from pricing is the **duration of the strategic effect**.

A price reduction can influence the consumer at the point of purchase. Loyalty programmes, by contrast, can influence future purchase behaviour by creating accumulated benefits, status, miles, credit-card relationships and switching costs.

Delta's SkyMiles case illustrates this dynamic. The airline announced major programme changes in 2023, including the transition to an MQD-based qualification structure. Following customer feedback, Delta subsequently modified elements of the programme and added benefits.

The case therefore suggests that loyalty competition has two simultaneous effects:

$$Enhanced\ Loyalty\ Benefits \rightarrow Customer\ Retention$$

but also:

$$Aggressive\ Loyalty\ Changes \rightarrow Customer\ Backlash \\ \rightarrow Competitor\ Switching\ Opportunity$$

This is an important refinement of the zero-sum model. A loyalty strategy can produce a positive payoff for one airline not merely by attracting new customers but by **increasing the opportunity cost of switching**.

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4.5 Comparative Findings Across the Three Marketing Strategies

The three strategic games demonstrate a common game-theoretic pattern but differ in the mechanisms through which competitive advantage is created.

Table 4. Comparative findings

Dimension	Pricing	Promotions	Loyalty
Primary mechanism	Fare attractiveness	Customer acquisition/value	Retention and switching costs
Competitive response	Usually rapid	Rapid to moderate	Moderate to long-term
Imitability	Very high	High	Moderate
Modelled payoff	Quantitative	Ordinal	Ordinal
Equilibrium value	0	0	0
Strategic advantage	Temporary	Temporary	Potentially persistent
Principal risk	Price war	Promotion escalation	Customer backlash
Strategic implication	Avoid indiscriminate price cuts	Differentiate promotional value	Strengthen loyalty without over-restricting customers

The common result across the three games is: $V = 0$

This does not mean that the airlines are equally successful or equally profitable. Instead, it means that under the zero-sum representation, a unilateral competitive advantage is generally neutralized when the competitor can replicate the strategic action.

This finding is consistent with the underlying principle of strategic interdependence: the effectiveness of a marketing strategy depends not only on what an airline does but also on what its competitor does in response.

4.6 Validation of findings through relevant case studies

4.6.1 United Airlines vs. American Airlines at Chicago O'Hare

A relevant contemporary case is the competition between United Airlines and American Airlines at Chicago O’Hare. Their rivalry extends beyond pricing to **flight schedules, gate access, premium services, international connectivity, and loyalty programmes**. Reuters (2026) highlights United’s advantage and American’s efforts to regain ground through expanded schedules and gate access, demonstrating multidimensional strategic competition.

The strategic interaction can be represented

as:$Capacity + Gate\ Access + Premium\ Service + Loyalty + Schedule \rightarrow Competitive\ Position$

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This extends the study's three-variable model by highlighting **multidimensional competitive strategy**. The O'Hare case demonstrates that airlines may compete through network strength, capacity, and airport access rather than price alone. It supports the proposition that **optimal marketing strategy in an oligopolistic market depends on the strategic characteristics and capabilities of competing players**.

4.6.2 Delta's SkyMiles Programme and Competitive Retaliation

The Delta SkyMiles episode provides a particularly strong illustration of the loyalty-game mechanism. Delta initially announced substantial changes to its loyalty programme in September 2023, including a move toward MQD-based qualification and modifications to lounge access. (Delta Air Lines, 2023) Customer reaction subsequently led Delta to modify aspects of the programme. The company explicitly stated that it had received customer feedback and subsequently adjusted the programme to make status more accessible and add benefits.

The competitive mechanism can be expressed as:

Airline A enhances/restricts loyalty programme → Customer response → Competitor opportunity → Potential customer switching

The case therefore supports the theoretical argument that loyalty programmes create strategic interdependence extending beyond the immediate transaction.

4.6.3 Low-Cost Carrier Competition and Basic Economy

Another important finding concerns the increasing convergence between traditional network airlines and low-cost carriers.

The U.S. Government Accountability Office reported in 2026 that network airlines' basic-economy products have increased competition for price-sensitive customers and narrowed the price gap between network airlines and low-cost carriers. According to stakeholders interviewed by GAO, this has made competition in the low-cost segment more difficult for smaller carriers. (U.S. Government Accountability Office [GAO], 2026)

This development provides strong support for the pricing game presented above.

The strategic interaction can be represented as:

Network airline introduces basic economy → Price gap decreases → LCC competitive advantage decreases → LCC responds through product differentiation

Thus, competition is not necessarily a simple sequence of price reductions. Instead, a price-based move by one player can force the competitor to change its **product architecture**. This provides an important empirical qualification to the zero-sum model: **competitive retaliation can occur through a different strategic variable from the one used in the initial move.**

4.7 Overall Discussion of Findings

The findings also produce five principal managerial implications:

First, airlines should avoid treating price reduction as an automatically optimal strategy. The pricing model demonstrates that a unilateral reduction can produce a relative gain, but competitive matching can eliminate the advantage. Moreover, the model does not capture the margin loss associated with discounting.

Second, promotional strategies should emphasize differentiation rather than simply promotional intensity. Southwest's use of flexibility, free baggage, rewards and brand positioning demonstrates that the promotional game can extend beyond fare discounts.

Third, loyalty programmes may provide a stronger mechanism for long-term differentiation. However, the Delta SkyMiles case demonstrates that loyalty strategies can generate customer backlash if customers perceive the changes as reducing value.

Fourth, airline managers should anticipate cross-variable retaliation. A competitor responding to a pricing strategy does not necessarily have to reduce its own price. It may respond through schedule expansion, capacity, premium services, loyalty incentives or ancillary benefits.

Fifth, the most strategically sustainable advantage may come from difficult-to-replicate resources rather than isolated marketing actions. The United–American competition at O'Hare illustrates how airport access, network scale, schedules, premium offerings and loyalty can combine to create competitive positions that cannot easily be neutralized through a single promotional or pricing action. (Reuters, 2026)

CONCLUSION

The results can be summarized through the following strategic sequence:

Airline A's marketing action → Customer response → Relative payoff → Airline B's response → New equilibrium

The results can be summarized through the following strategic sequence:

Optimal strategy $= f$(Own action, competitor response, market conditions)

Zero-sum game theory offers a useful framework for analysing strategic marketing decisions in oligopolistic airline markets when interpreted as **relative competitive outcomes rather than absolute profitability**. Its effectiveness is strengthened by combining mathematical analysis with market data, industry cases, and qualitative managerial evidence, given the limitations of simple two-player models.

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