

Determinants of ancillary revenue strategies and passenger willingness to pay: Evidence from the airline industry

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ABSTRACT

The airline industry faces persistent profitability pressure stemming from high fixed costs, intense competition, and macroeconomic volatility. Since the entry of low-cost carriers (LCCs), ancillary revenue—defined as income generated from services and products supplementary to the core ticket—has evolved from a peripheral activity into a strategic financial pillar for both full-service and low-cost airlines. This study investigates the determinants of passenger willingness to pay (WTP) for à la carte ancillary services and identifies behavioural and demographic profiles that predict purchase frequency. Using a survey of 254 air travellers and a multi-method statistical approach (Chi-square tests, Mann–Whitney U tests, and Kruskal–Wallis with Bonferroni-corrected pairwise comparisons), six hypotheses are tested. The results demonstrate that (i) passengers familiar with à la carte services allocate significantly larger travel budgets to such services ($p < .05$); (ii) frequent travellers (>5 flights/year) are significantly more likely to purchase à la carte services ($\chi^2 = 8.44$, $p < .01$); (iii) frequent-flyer programme (FFP) members purchase ancillary services at substantially higher rates ($\chi^2 = 9.70$, $p < .01$); and (iv) contrary to common managerial intuition, short-haul passengers purchase à la carte services more frequently than long-haul passengers ($\chi^2 = 4.51$, $p < .05$). Wi-Fi access is valued across all age cohorts without statistically significant differences. The findings extend the revenue management literature by empirically validating familiarity and loyalty-programme membership as the strongest behavioural predictors of à la carte WTP, and offer actionable guidance for targeted personalisation, segmentation, and dynamic pricing strategies. Implications for machine-learning-driven ancillary recommendation systems are also discussed in light of recent advances in offer management (2022–2025).

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Introduction

The airline industry occupies a unique and strategically vital position within the global economy, simultaneously enabling international trade, tourism, and human mobility while operating on some of the thinnest profit margins of any major service industry. According to the International Air Transport Association (IATA), the global airline sector has historically generated a net profit margin of only 2–3% in favourable years, with this figure deteriorating sharply during periods of economic uncertainty, geopolitical instability, or external shocks such as the COVID-19 pandemic (Bockelie, 2019; IATA, 2023). The structural drivers of this profitability challenge are well documented: extraordinary capital intensity, volatile jet-fuel prices, intense price-based competition, labour-cost rigidity, regulatory complexity, and the perishable nature of seat inventory all combine to create an environment in which airlines must continually innovate to remain solvent (Wensveen, 2016; Dempsey, 2011).

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Within this environment, the rise of the low-cost carrier (LCC) business model since the 1978 deregulation of the United States airline market has fundamentally altered the competitive landscape. Pioneered by carriers such as Southwest Airlines, Ryanair, and easyJet, the LCC model rejected the traditional bundled-fare approach in favour of an unbundled 'à la carte' pricing strategy in which the base ticket covers only the seat itself, and every additional service—checked baggage, seat selection, in-flight catering, priority boarding, lounge access, Wi-Fi, and others—is offered as a separately priced option (O'Connell & Williams, 2005; Klopheus, 2013). Industry data compiled by IdeaWorks/CarTrawler indicates that worldwide ancillary revenue grew from approximately 4.8% of total airline revenue in 2010 to an estimated US\$117 billion by 2019 (CAPA, 2018; Babić et al., 2019). By 2023, post-pandemic recovery had pushed global ancillary revenues to new highs, with major carriers reporting ancillary shares exceeding 25% of total revenue, and emerging reviews confirm that offer management and dynamic pricing have become the dominant research frontier (Mumbower, 2025; Liu et al., 2024; Ozmec-Ban et al., 2022).

Despite the strategic and financial significance of ancillary revenue, two substantive research gaps persist. First, the majority of academic work has focused on macro-level financial outcomes and industry trends (Babić et al., 2019; Baş & Aksoy, 2022) rather than on the micro-foundations of consumer purchase behaviour. Second, the existing micro-level evidence is geographically concentrated in North American and Western European markets (Leon & Uddin, 2017; Chiambaretto, 2021), with limited empirical investigation of passenger willingness to pay (WTP) in emerging-market contexts such as Türkiye, where domestic carriers such as Turkish Airlines and Pegasus Airlines have become significant regional players (Şengur et al., 2017). These gaps matter because effective ancillary-revenue strategies must be calibrated to specific passenger segments.

A third gap, recently identified by Liu et al. (2024) and Mumbower (2025), concerns the underintegration of machine-learning-based WTP prediction and dynamic offer creation into the empirical passenger-behaviour literature. This study partially addresses this gap by identifying the behavioural features—familiarity, FFP membership, flight frequency, and route type—that constitute viable inputs for production-grade ancillary recommendation engines (Wang et al., 2022; Wang, Wittman, & Fiig, 2023).

This study addresses the identified gaps by empirically examining the behavioural and demographic determinants of à la carte WTP among air travellers using a primary-data survey of 254 respondents. Drawing on the conceptual foundations of revenue management, consumer-choice theory, and segmentation strategy, the research formally tests six pre-registered hypotheses concerning (i) the effect of passenger familiarity with à la carte services on purchase behaviour, (ii) the role of flying frequency, (iii) generational differences in Wi-Fi valuation, (iv) the contribution of frequent-flyer programme membership, (v) flight-duration effects on purchase frequency, and (vi) the influence of employment status. The analysis applies a multi-method statistical approach combining Chi-square tests of independence, Mann–Whitney U tests, and Bonferroni-corrected pairwise comparisons appropriate for ordinal and non-normally distributed data.

The contributions of this study are threefold. Theoretically, the paper extends the revenue-management literature by providing empirical evidence that familiarity with the à la carte concept and loyalty-programme membership, rather than demographic variables alone, are the strongest predictors of ancillary purchase. Methodologically, the study integrates non-parametric inference with a structured hypothesis-testing framework. Managerially, the findings provide airline executives with actionable guidance for personalised offerings, sales-staff training, FFP architecture design, and dynamic-pricing strategies that align the right service with the right passenger at the right price point.

Literature Review

Ancillary Revenue in the Airline Industry: Concept and Classification

Ancillary revenue is broadly defined as income derived from products and services outside an enterprise's primary value proposition. In the airline context, IdeaWorks (2018) formalises the concept as revenue from any source other than the base airfare, encompassing baggage fees, seat selection, in-flight food and beverages, lounge access, advertising, frequent-flyer programme sales, and commission-based partnerships (Dufour, 2010; Warnock-Smith et al., 2016). Ancillary revenue is organised under five headings: (i) à la carte sales revenues, (ii) unbundled product-package revenues, (iii) commission-based product revenues, (iv) advertising revenues, and (v) loyalty-programme revenues (IdeaWorks, 2018; Babić et al., 2019). The à la carte category—the focal interest of this study—consists of separately priced services historically bundled into the ticket: in-flight catering, excess-baggage fees, seat selection, priority boarding, in-flight internet, and premium entertainment (IdeaWorks, 2018; O'Connell & Warnock-Smith, 2016).

According to industry estimates, à la carte revenues account for approximately 69% of total ancillary income worldwide, equivalent to US\$57 billion of the US\$82.2 billion ancillary market reported in 2017 (CAPA, 2018). More recent industry data indicate that global ancillary revenues reached US\$102.8 billion in 2022 and are projected to exceed US\$130 billion by 2026, driven by post-pandemic demand recovery and expanded digital distribution channels (Mumbower, 2025; Ozmec-Ban et al., 2022). The evolution of the ancillary-revenue model has been shaped by two parallel developments. First, LCCs pioneered radical unbundling to support ultra-low base fares (Klopheus, 2013; O'Connell & Williams, 2005). Second, full-service carriers, facing margin compression, progressively adopted unbundling strategies through fare-family architectures (Tomova & Strmiskova, 2014; Vinod, 2015), resulting in a hybrid competitive landscape in which the boundaries between LCCs and FSCs continue to blur (Mumbower et al., 2023).

Passenger Willingness to Pay and Choice Behaviour

Understanding passenger WTP is central to the optimal design of ancillary offerings. Stated-preference and discrete-choice experiments have been the dominant methodologies in this literature (Espino et al., 2008; Balcombe et al., 2009; Chen & Wu, 2009; Wittmer & Rowley, 2014). These studies consistently identify a small set of services—checked baggage, seat assignment, and in-flight food and beverage—as the most highly valued by passengers, while priority boarding and onboard entertainment exhibit more variable WTP profiles (Leon & Uddin, 2017; Wittmer et al., 2012).

Several behavioural and contextual factors modulate WTP. Ren, Pan, and Jiang (2022) demonstrate that personal demographic characteristics such as gender and age have limited explanatory power for WTP, whereas trip purpose (business vs. leisure), flight duration, baggage load, and seat preference exert significant effects. Leon and Uddin (2017) report that frequent travellers (five or more flights per year) demonstrate substantially higher willingness to purchase Wi-Fi and extra legroom, and propose that targeted offerings to high-frequency segments can materially improve revenue per passenger. Chiambaretto (2021), focusing on long-haul flights, finds that millennial and non-millennial passengers exhibit no significant difference in WTP for ancillary services, suggesting that generational cohort alone is an inadequate segmentation criterion.

Recent studies have substantially refined the understanding of WTP determinants. Jou, Kuo, and Chiu (2022) found that passengers' WTP for seat upgrades equates to roughly 25–30% of the class fare difference, with route length, education, income, and personality traits as significant determinants of seat-bidding participation. Kuo, Jou, and Chiu (2023) further reported that long-haul passengers' WTP for premium-class upgrades is considerably higher ($\approx 55\%$ of the reference price) than short-haul passengers ($\approx 24\%$), providing nuanced evidence on the route-length–WTP relationship. Mandal, Chatterjee, and Upadhyay (2024), using choice-based conjoint analysis, found that full-service carrier passengers exhibit higher WTP than LCC passengers for identical ancillary bundles, and identified seat properties and luggage/priority services as the key attributes driving ancillary WTP. For in-flight meals specifically, Hwang, Kim, and Song (2023) found that menu variety and online reservation convenience significantly increase ancillary meal revenue, with student travellers showing particularly high WTP for meal upgrades when variety is offered.

Machine Learning and Predictive Approaches to WTP

A rapidly growing strand of research employs machine learning (ML) to predict ancillary purchase propensity and WTP at the individual passenger level. Wang et al. (2022) introduced a BCR-LightGBM ensemble model that outperformed 12 benchmark classifiers for predicting seat-selection WTP, identifying ticket fare, trip length, and customer value tier as the most important predictive features. A complementary study (2022) applied a PSO-XGBoost triple-layer method to high-dimensional incomplete passenger data, achieving an AUC of 0.9879 for predicting additional-services purchase intention, enabling precise ancillary marketing targeting. Hong et al. (2022) proposed an improved XGBoost approach for imbalanced WTP classification data, demonstrating that algorithmic resampling combined with gradient boosting can reliably identify high-WTP passengers even in datasets where purchasers are a minority. These ML advances are directly relevant to the present study's findings: the behavioural signals identified here—familiarity, FFP membership, flight frequency, and route type—constitute viable input features for production-grade ancillary recommendation engines (Wang, Wittman, & Fiig, 2023; Mumbower, 2025).

Dynamic Pricing and Offer Management

Recent technological advances have opened new frontiers in ancillary-revenue management. Shukla et al. (2019) and Kummara et al. (2021) describe machine-learning-driven dynamic-pricing systems that adjust ancillary prices in real time based on passenger context, demonstrating revenue uplift of 5–15% in controlled deployments. Kolbeinsson et al. (2022) report similar results from a large-scale field deployment, achieving statistically significant gains in ancillary revenue through personalised price recommendations.

Industry forecasts suggest that by 2030, the majority of ancillary transactions at major carriers will be priced and recommended algorithmically (Michelmann et al., 2019; Wang et al., 2021). Wang, Wittman, and Fiig (2023) formalised this direction through a Markov-chain choice model for dynamic offer creation that tailors ancillary offer sets to shopping context, achieving measurable ancillary revenue uplift while reducing customer choice overload. Mumbower (2025), in a comprehensive review of the offer-management literature, identifies customer segmentation, WTP estimation, ML, and optimisation as the five core themes defining the frontier of ancillary revenue research—confirming the strategic importance of the behavioural determinants investigated in the present study. Pardo González et al. (2024) extended this line of work by demonstrating that operationally aware seat-assignment recommendations, incorporating weight-and-balance constraints, can further stimulate ancillary seat-change purchases and total revenue.

Strategic Implications of À la Carte Pricing

À la carte pricing offers airlines a powerful mechanism for increasing revenue per passenger without raising the base fare, thereby preserving the visible 'headline' price that drives initial booking decisions (Papatheodorou & Arvanitis, 2018; Lebeau, 2017). Empirical analyses document substantial improvements in Ancillary Revenue per Available Seat Kilometre (ARASK) for carriers that systematically unbundle their services (O'Connell & Williams, 2005; Babić et al., 2019). Beyond the immediate revenue effect, à la carte strategies enable airlines to differentiate through personalised offerings (Zhang & Liu, 2014; Kim et al., 2017). However, the literature also identifies risks: customer frustration from opaque pricing, perceptions of unfairness when fees appear 'hidden,' and the potential for choice overload (Baker, 2010; Chung & Petrick, 2013). Ozmec-Ban et al. (2022) review the literature showing that

legacy revenue management systems rarely incorporate personalised ancillary pricing and call for integration work to capture the full revenue potential. Liu et al. (2024), in a comprehensive review, highlight personalisation, pricing transparency, and technological enablers as the priority future directions for ancillary strategy—providing a direct theoretical foundation for the managerial recommendations offered in Section 5.

Hypothesis Development

Building on the literature reviewed above, this study formulates six testable hypotheses that connect specific behavioural and demographic antecedents to à la carte purchase outcomes:

Table 1: Hypotheses of the Study

Hyp.	Statement	Key Literature
H1	Passengers familiar with the available à la carte services are more likely to purchase them and to allocate a larger share of their travel budget to ancillary services than unfamiliar passengers.	Baker (2010); Wensveen (2016); Liu et al. (2024)
H2	Frequent travellers (>5 flights/year) are more likely to purchase à la carte services than occasional travellers.	Leon & Uddin (2017); Jou et al. (2022)
H3	Younger passengers (aged 18–24) are more likely to value Wi-Fi access in flight than older age cohorts.	Chiambaretto (2021); Ren et al. (2022); Hwang et al. (2023)
H4	Passengers who are members of an airline's frequent-flyer or loyalty programme are more likely to purchase ancillary services than non-members.	Wittmer et al. (2012); Bockelie (2019); Mandal et al. (2024)
H5	Passengers on long-haul flights are more likely to purchase ancillary services (extra baggage, premium seating, meals) than passengers on short-haul flights.	Wittmer & Rowley (2014); Kuo et al. (2023)
H6	Employment status influences both annual flight frequency and the frequency of à la carte service purchases.	Leon & Uddin (2017); Ren et al. (2022)

Figure 1 presents the conceptual framework integrating these hypotheses with the relevant contextual controls (age, occupation, travel budget, and sustainability sensitivity) employed in the analysis.

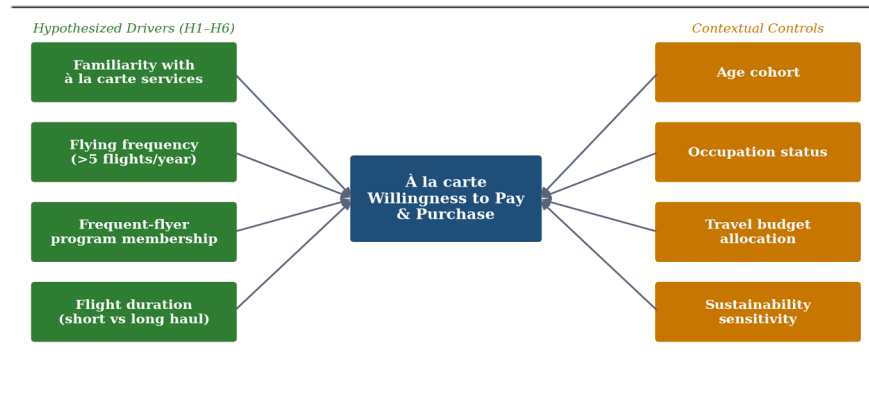


Figure 1: Conceptual Framework of A la Carte Purchase Drivers (*Source: Authors' construction based on the literature and the six pre-registered hypotheses*)

Research Methodology

Research Design and Survey Instrument

This study employs a quantitative, cross-sectional survey design to investigate the behavioural and demographic antecedents of à la carte ancillary purchase behaviour. The survey instrument was designed in alignment with prior validated questionnaires (Baker, 2010; Chen & Liu, 2019; Leon & Uddin, 2017; Lebeau, 2017; Warnock-Smith et al., 2016) and was distributed online via the Google Forms platform between July and October 2024. The questionnaire contained 13 substantive items covering: (i) demographics (age, occupation); (ii) ancillary-service preferences (five-point importance scale); (iii) ancillary-purchase frequency (always, sometimes, rarely, never); (iv) annual flight frequency; (v) booking channel preferences; (vi) FFP membership; (vii) preferred cabin class; (viii) typical flight duration; (ix) importance of in-flight entertainment; (x) percentage of travel budget allocated to ancillary services; (xi) social-media engagement; and (xii) sustainability sensitivity. The complete questionnaire is available in Appendix A.

Sample and Data Collection

A non-probability convenience-sampling approach was adopted, recruiting respondents from heterogeneous social and professional networks of the corresponding author to capture variation across age, occupation, and flying frequency. Eligible respondents were adults who had taken at least one commercial flight in the preceding three years. Data collection yielded 254 completed responses; after listwise deletion of responses with critical missing data, the analytic sample comprised 254 valid observations, providing sufficient statistical power (>0.80) to detect medium effects (Cohen's $w \geq 0.20$) at $\alpha = 0.05$ in chi-square tests with degrees of freedom up to 4.

Table 2: Sample Demographic and Behavioural Composition (N = 254)

Variable / Category	n	%
Age (years)		
18–24	33	13.0%
25–34	79	31.1%
35–44	74	29.1%
45–54	46	18.1%
55+	22	8.7%
Occupation		
Employed full-time	175	68.9%
Student	30	11.8%
Self-employed	20	7.9%
Retired	15	5.9%
Employed part-time	6	2.4%
Other	8	3.1%
Annual flight frequency		
Less than 1 flight	12	4.7%
1–2 flights	46	18.1%
3–5 flights	54	21.3%
More than 5 flights	142	55.9%
Frequent-flyer programme		
Member	178	70.1%
Non-member	76	29.9%

Source: Survey data (N = 254). Percentages may not sum to 100 due to rounding.

Statistical Estimation Strategy

All analyses were conducted in IBM SPSS Statistics version 26. Three considerations governed the choice of statistical procedures. First, the principal outcome variables—frequency of ancillary purchases and percentage of travel budget allocated to ancillaries—are measured on ordinal scales. Continuous parametric techniques are therefore inappropriate, and non-parametric alternatives were adopted throughout. Second, the normality of any continuous variables was formally tested using the Shapiro–Wilk procedure, and in all cases the null hypothesis of normality was rejected ($p < 0.001$). Third, several explanatory variables are dichotomous or categorical, which lend themselves naturally to Chi-square (χ^2) tests of independence.

The principal inferential procedures employed are: (i) Chi-square (χ^2) tests of independence for associations between two categorical variables; (ii) Mann–Whitney U tests for comparison of an ordinal outcome between two independent groups; (iii) Kruskal–Wallis H tests for comparison across three or more groups; and (iv) Bonferroni-corrected post-hoc pairwise comparisons to identify which group pairs drive any significant omnibus result while controlling the family-wise error rate at $\alpha = 0.05$. All inferential tests use a two-tailed $\alpha = 0.05$ significance threshold. Effect sizes are reported alongside test statistics whenever the underlying procedure supports them.

Findings

Descriptive Findings

Of the 254 respondents, 58% reported being familiar with à la carte services, while 42% were unfamiliar, providing a balanced split for between-group comparisons. The most preferred à la carte services were seat selection (63%), extra legroom (47%), onboard meals (41%), Wi-Fi access (38%), priority boarding (26%), and airport lounges (23%) (Figure 2). These rankings align with prior international evidence indicating that travellers value a narrow set of 'tangible' services—particularly those linked to comfort and personal space—more highly than commission-based or third-party offerings (Leon & Uddin, 2017; Ren et al., 2022; Mandal et al., 2024; Hwang et al., 2023).

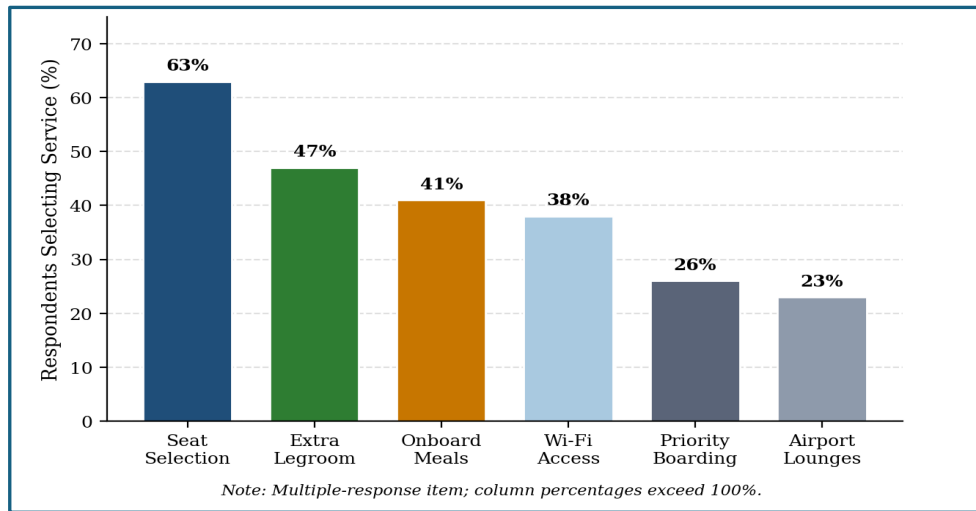


Figure 2: Preferred A la Carte Services Among Survey Respondents (N=254)

Regarding annual flight frequency, 55.9% of respondents reported more than five flights per year, reflecting the over-representation of business travellers and frequent leisure travellers in the convenience sample. Frequent-flyer programme membership was reported by 70.1% of respondents. With respect to cabin class, 86% typically travelled in economy class. Preferred flight duration was short-haul (54%), medium-haul (32%), and long-haul (14%). Sustainability sensitivity was substantial: 41% of respondents indicated they actively consider airlines' sustainability practices when booking.

Hypothesis Tests

H1: Familiarity and à la carte budget allocation. A Mann–Whitney U test was conducted to compare the percentage of travel budget allocated to à la carte services between familiar and unfamiliar respondents. Familiar respondents allocated a significantly higher share (mean = 23.49%, SD = 14.59; median = 20%) compared with unfamiliar respondents (mean = 20.09%, SD = 13.53; median = 10%), U-test $p < .05$. H1 is supported. The result confirms that informational familiarity is a behavioural prerequisite for higher ancillary-spending propensity, consistent with Baker (2010). This finding also aligns with the ML-based evidence of Wang et al. (2022), who identified customer engagement history and prior purchase behaviour as among the strongest predictors of seat-selection WTP in ensemble learning models.

Table 3: Familiarity and À la Carte Budget Allocation (Mann–Whitney U)

Familiarity Group	Budget % (Mean ± SD; Median, range)	U-stat	p
Familiar (n = 147)	23.49 ± 14.59; 20 (10–60)	—	< .05
Not familiar (n = 107)	20.09 ± 13.53; 10 (10–60)		

Note: Mann–Whitney U test. Two-tailed significance.

Table 4: Familiarity and Purchase / Flight Frequency

Familiarity	Ancillary purchase freq. Median (range)	p	Flights per year Median (range)	p
Not familiar	1 (0–3)	< .001	1 (0–3)	< .001
Familiar	2 (0–3)		2 (0–3)	

Note: Mann–Whitney U tests. Ordinal scale coding: 0 = Never; 3 = Always (purchase) / >5 (flights).

H2: Flying frequency and purchase frequency. A Chi-square test of independence confirms that frequent travellers (>5 flights/year) purchase à la carte services significantly more often than less-frequent travellers ($\chi^2 = 8.44$, $df = 1$, $p < .01$). H2 is supported. Among 'always' purchasers, 63.97% are frequent travellers, versus 45.37% among 'never' purchasers. This finding is consistent with Jou et al. (2022), who similarly identified flight frequency as a significant determinant of seat-upgrade WTP, and with Wang et al. (2022), who ranked customer value tier (a proxy for flying frequency) as a top predictor in their ML model.

Table 5: Flying Frequency and À la Carte Purchase Frequency

Flying frequency	Always purchase n (%)	Never purchase n (%)	χ^2 (p)
Less than 5 flights/year	49 (36.0)	59 (54.6)	8.44 (< .01)
More than 5 flights/year	87 (64.0)	49 (45.4)	

Note: Chi-square test of independence (df = 1).

H3: Age and Wi-Fi importance. A Chi-square test examining the relationship between age cohort and Wi-Fi importance returned $\chi^2 = 1.04$ ($p > .05$), failing to reject the null hypothesis. H3 is not supported. Across all three age cohorts (18–24, 25–44, 45+), the majority rated Wi-Fi as 'important' (59.4%, 68.7%, 67.7% respectively). This finding aligns with Chiambaretto (2021) and Hwang et al. (2023), who found no significant generational difference in WTP for connectivity-related ancillary services.

Table 6: Age Cohort and Wi-Fi Access Importance

Age (years)	n	Not important n (%)	Important n (%)	χ^2 (p)
18–24	32	13 (40.6)	19 (59.4)	1.04 (> .05)
25–44	147	46 (31.3)	101 (68.7)	
45+	65	21 (32.3)	44 (67.7)	

Note: Chi-square test of independence (df = 2).

H4: Frequent-flyer programme membership and ancillary purchase. FFP members purchase à la carte services at significantly higher rates than non-members ($\chi^2 = 9.70$, df = 1, $p < .01$). H4 is supported. Among 'always' purchasers, 77.7% are FFP members, versus 59.5% among 'never' purchasers. The result is consistent with the broader literature on loyalty-induced engagement (Wittmer et al., 2012; Bockelie, 2019) and with the finding of Mandal et al. (2024) that FSC passengers—who are more likely to hold FFP memberships—exhibit higher ancillary WTP than LCC passengers.

Table 7: Frequent-Flyer Programme Membership and Purchase Frequency

FFP membership	Always purchase n (%)	Never purchase n (%)	χ^2 (p)
Member (Yes)	108 (77.7)	66 (59.5)	9.70 (< .01)
Non-member (No)	31 (22.3)	45 (40.5)	

Note: Chi-square test of independence (df = 1).

H5: Flight duration and ancillary purchase. Contrary to expectations, short-haul passengers purchase à la carte services significantly more often than long-haul passengers ($\chi^2 = 4.51$, df = 1, $p < .05$). H5 is not supported in the originally hypothesised direction. Among 'always' purchasers, 82.7% are short-haul flyers, while only 17.3% are long-haul flyers. A plausible explanation is the dominance of LCCs on short-haul routes, which routinely strip the base fare of nearly all amenities; long-haul travellers, by contrast, often book bundled fares that include amenities by default, reducing the marginal need for à la carte purchases. This finding is consistent with Kuo et al. (2023), who found that while long-haul passengers exhibit higher WTP for premium-class upgrades, short-haul passengers in LCC-dominated markets are more frequent purchasers of base ancillary services precisely because fewer services are included in the standard fare.

Table 8: Flight Duration and À la Carte Purchase Frequency

Flight duration	Always purchase n (%)	Never purchase n (%)	χ^2 (p)
Short-haul	115 (82.7)	102 (91.9)	4.51 (< .05)
Long-haul	24 (17.3)	9 (8.1)	

Note: Chi-square test of independence (df = 1). Direction of effect opposite to H5.

H6: Occupation and flight / purchase frequency. Kruskal–Wallis H-tests indicate statistically significant differences across occupational groups for both purchase frequency ($p < .05$) and annual flight frequency ($p < .001$). Students plus part-time-employed respondents purchase more frequently (Mdn = 2) than other groups, yet fly less frequently (Mdn = 1) than full-time-employed, self-employed, and retired respondents (Mdns = 2–3). H6 is partially supported.

Table 9: Occupation and Purchase / Flight Frequency

Occupation	Purchase freq. n; Median (range)	p	Flights/year n; Median (range)	p
Student + part-time	34; 2 (0–3)	< .05	34; 1 (0–3)	< .001
Full-time employed	175; 1 (0–3)		175; 3 (0–3)	
Self-employed	18; 1 (0–3)		19; 3 (1–3)	
Retired	15; 2 (0–3)		15; 2 (1–3)	
Other	8; 1 (1–3)		8; 3 (2–3)	

Note: Kruskal–Wallis H with Bonferroni-corrected pairwise comparisons (limit $p = .005$).

Discussion

The empirical findings of this study contribute four substantive insights to the literature on ancillary revenue and consumer behaviour in the airline industry.

First, familiarity is the most consistent and powerful predictor of à la carte engagement. Respondents who reported being familiar with the à la carte concept (i) allocated significantly larger shares of their travel budget to ancillary services, (ii) purchased ancillaries with significantly higher frequency, and (iii) flew significantly more often per year. The implication is that the marketing channel matters as much as the offering itself: airlines that invest in clear, transparent, and educational communication of their à la carte portfolios are likely to convert a higher proportion of bookings into ancillary upsells. This finding extends Baker (2010) by quantifying the budget-allocation gap (mean 23.5% vs 20.1%). It also connects directly to the ML-based WTP prediction literature: Wang et al. (2022) found that customer engagement history—a proxy for familiarity—is the third most important predictor in their LightGBM model, confirming that familiarity-building through pre-booking communication creates measurable and algorithmically detectable purchase signals.

Second, loyalty-programme membership and flying frequency reinforce each other as twin drivers. Frequent flyers and FFP members purchase ancillaries at significantly higher rates ($\chi^2 = 8.44$ and $\chi^2 = 9.70$, both $p < .01$). These findings are consistent with Wittmer et al. (2012) and Bockelie (2019) and extend their generalisability to a Turkish/regional sample. Airlines should consider tiering ancillary discounts within FFP status levels as an incentive mechanism that simultaneously increases loyalty depth and unit-revenue contribution. Mandal et al. (2024) provide complementary evidence that FSC passengers—who are more likely to hold FFP memberships—exhibit higher WTP than LCC passengers for identical ancillary bundles, suggesting that the FFP–WTP relationship is partly mediated by carrier type and the associated service expectations.

Third, Wi-Fi importance is universal rather than age-segmented. The non-significant χ^2 for the age $\times$ Wi-Fi test ($p > .05$) contradicts the widely held managerial assumption that younger passengers are the primary market for in-flight connectivity. This finding triangulates with Chiambaretto (2021) and Hwang et al. (2023), suggesting that the digitalisation of travel demand has progressed across all adult cohorts and that connectivity should be positioned as a universal offering with a broad demand curve.

Fourth, the counter-intuitive short-haul versus long-haul pattern signals the structural dominance of LCC unbundling on short-haul routes. Short-haul flights in the Turkish/regional context are disproportionately operated by LCCs where the base fare excludes nearly all amenities. Long-haul travel, by contrast, increasingly occurs on premium-economy or business-class fares that bundle amenities, suppressing marginal à la carte demand. Kuo et al. (2023) provide corroborating international evidence showing that long-haul passengers' higher WTP for upgrades does not translate into higher frequency of base ancillary purchases.

Theoretical Implications

From a theoretical perspective, the study refines the consumer-choice literature on ancillary services in three ways. First, by demonstrating that familiarity and information asymmetry materially shape WTP, it extends the choice-modelling framework of Espino et al. (2008) and Martin et al. (2008) beyond the conventional assumption of fully informed consumers. Second, by documenting the dominance of behavioural over demographic predictors, it provides empirical support for segmentation strategies grounded in revealed rather than ascribed customer characteristics. Third, by reporting a counter-intuitive short-haul vs. long-haul pattern, it adds to the growing body of evidence that route-level competitive structure mediates ancillary-purchase behaviour. A fourth theoretical contribution, enabled by the 2022–2025 literature, is the identification of this study's behavioural signals—familiarity, FFP membership, flight frequency, and route type—as viable and theoretically grounded input features for ML-based ancillary recommendation systems (Wang et al., 2022; Wang, Wittman, & Fiig, 2023; Mumbower, 2025). This bridges the traditional consumer-choice literature with the emerging offer-management paradigm.

Managerial Implications

The findings translate into six concrete and immediately actionable recommendations for airline managers, revenue analysts, and ancillary-strategy leaders:

- i. Invest in pre-booking education. The strong effect of familiarity on budget allocation implies that brief, transparent, and visually engaging explanations of à la carte options during booking can lift conversion rates and average ancillary revenue per passenger.
- ii. Tier ancillary benefits within FFP architectures. Since FFP members are nearly twice as likely to be frequent purchasers, integrating ancillary-related perks (e.g., free seat selection, complimentary first checked bag, lounge access discounts) into membership tiers can simultaneously deepen loyalty and accelerate purchase.
- iii. Treat Wi-Fi as a universal, not generational, offering. Marketing campaigns and pricing structures for in-flight connectivity should target broad audiences rather than narrowly defined youth segments.
- iv. Prioritise ancillary strategy on short-haul routes. The disproportionate concentration of ancillary purchasing on short-haul flights suggests that route managers should integrate à la carte revenue forecasts directly into route-profitability models.
- v. Train frontline staff in personalised cross-selling. Gate agents and flight attendants can play a meaningful role in ancillary upsell when equipped with behavioural-segmentation insights and customer-context indicators (Leon & Uddin, 2017).
- vi. Leverage machine-learning personalisation. Consistent with Shukla et al. (2019), Kummara et al. (2021), and Wang et al. (2022), the behavioural signals identified in this study constitute viable features for production-grade ancillary-recommendation engines. Airlines should invest in ML infrastructure that operationalises these signals at scale (Wang, Wittman, & Fiig, 2023; Mumbower, 2025).

Conclusion

Ancillary revenue has emerged as a strategic financial pillar of the global airline industry, with à la carte services accounting for nearly 70% of total ancillary income worldwide. Despite this commercial significance, granular evidence on the behavioural and demographic determinants of passenger WTP for à la carte services has remained limited, particularly in regional contexts beyond the dominant North American and Western European literatures. This study addressed this gap by analysing primary survey data from 254 Turkish-region air travellers through a multi-method statistical framework grounded in non-parametric inference.

The findings yield four headline results. First, familiarity with à la carte services significantly predicts both the budget share and the frequency of ancillary purchases, confirming the central role of customer education in revenue-management strategy. Second, frequent flyers and FFP members exhibit significantly higher ancillary-purchase rates, validating the long-recognised loyalty–ancillary nexus. Third, Wi-Fi importance is universal across age cohorts, challenging the conventional generational-segmentation assumption. Fourth, the counter-intuitive finding that short-haul passengers purchase à la carte services more frequently than long-haul passengers points to the structural dominance of LCC unbundling practices on short-haul routes.

The contribution of the study is both academic and practical. Academically, the paper refines the theoretical understanding of ancillary purchase behaviour by emphasising the primacy of behavioural and contextual predictors over demographic ones, and extends the geographic scope of the WTP literature to the Turkish/regional setting. Practically, the findings furnish airline executives with actionable guidance for personalised ancillary offerings, loyalty-programme architectures, customer-education programmes, route-level revenue forecasts, and dynamic-pricing systems. Crucially, the behavioural signals identified—familiarity, FFP membership, flight frequency, and route type—constitute theoretically grounded and empirically validated features for ML-based ancillary recommendation engines, bridging the consumer-behaviour and offer-management literatures in a direction called for by Mumbower (2025) and Liu et al. (2024). Together, these contributions advance the goal of helping the airline industry build resilient, customer-aligned, and financially sustainable revenue models through behaviourally-informed segmentation and pricing.

Limitations and Avenues for Future Research

Several limitations should be acknowledged. First, the study employs a convenience sample of 254 respondents, which constrains external generalisability; future research should replicate the analysis on probability samples representative of national or regional travel populations. Second, the questionnaire relies on self-reported WTP and recalled purchase frequency rather than observed transactional data; integration with airline-side booking and ancillary-purchase logs would enhance ecological validity. Third, the cross-sectional design precludes causal inference; longitudinal panels or natural experiments could provide stronger identification of behavioural drivers. Fourth, the study does not distinguish between specific ancillary categories at the multivariate level; future work could employ discrete-choice experiments or latent-class models to separately estimate WTP for each service.

Fifth, airlines' commercial confidentiality around true transactional ancillary data remains a persistent limitation, as noted by Şengür et al. (2017) and Chiambaretto (2021); industry-academic data-sharing partnerships would be a valuable next step. Finally, the rapid integration of artificial intelligence and dynamic-pricing systems is changing the ancillary landscape in real time. Future studies should examine the consumer-perception implications of algorithmic price personalisation, including fairness perceptions and trust effects (Mumbower, 2025). Additionally, replication in non-Turkish emerging-market contexts—where LCC penetration, digital literacy, and FFP adoption rates differ substantially—would test the generalisability of the behavioural patterns documented here. The green-fee WTP dimension identified by Hui, Itani, and O'Connell (2024) also represents a promising ancillary category for future

investigation, as sustainability-related ancillaries (e.g., SAF surcharges, carbon offset options) become increasingly relevant to airline revenue strategy.

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References

- Babić, R. Š., Ban, M. O., & Bajić, J. (2019). A review of recent trends in airline ancillary revenues. *EMC Review—Economy and Market Communication Review*, 17(1), 67–82.
- Baker, D. M. (2010). The effect of airline ancillary services on customer loyalty: The case of Southwest Airlines. *Journal of Air Transport Management*, 16(3), 134–138. <https://doi.org/10.1016/j.jairtraman.2009.10.001>
- Balcombe, K., Fraser, I., & Harris, L. (2009). Consumer willingness to pay for in-flight service and comfort levels: A choice experiment. *Journal of Air Transport Management*, 15(5), 221–226. <https://doi.org/10.1016/j.jairtraman.2008.12.005>
- Baş, O., & Aksoy, T. (2022). Examining the impact of cargo and ancillary revenues on net profit for full-service carrier airlines. *International Journal of Business Ecosystem & Strategy*, 4(3), 48–72. <https://doi.org/10.36096/ijbes.v4i3.330>
- Bockelie, A. (2019). Ancillary services in the airline industry: Passenger choice and revenue management optimization (Doctoral dissertation, Massachusetts Institute of Technology).
- CAPA – Centre for Aviation. (2018). Airline outlook: Unbundling, fare families and ancillaries. CAPA/IdeaWorksCompany/CarTrawler.
- Chen, C.-F., & Wu, T.-F. (2009). Exploring passenger preferences in airline service attributes: A note. *Journal of Air Transport Management*, 15(1), 52–53. <https://doi.org/10.1016/j.jairtraman.2008.06.002>
- Chen, M., & Liu, Y. (2019). Dynamic pricing in airline industry: Opportunities and challenges in ancillary revenue. *Journal of Revenue and Pricing Management*, 18(2), 158–169.
- Chiambaretto, P. (2021). Air passengers' willingness to pay for ancillary services on long-haul flights. *Transportation Research Part E: Logistics and Transportation Review*, 147, 102234. <https://doi.org/10.1016/j.tre.2021.102234>
- Chung, J. Y., & Petrick, J. F. (2013). Price fairness of airline ancillary fees: An attributional approach. *Journal of Travel Research*, 52(2), 168–181. <https://doi.org/10.1177/0047287512457253>
- Dempsey, P. S. (2011). The airline industry. In C. Lovelock & J. Wirtz (Eds.), *Services marketing: People, technology, strategy* (7th ed., pp. 45–60). Prentice Hall.
- Dufour, J. (2010). Ancillary revenues: The new frontier of airline profitability. *IATA Economics Briefing*.
- Espino, R., Martín, J. C., & Román, C. (2008). Analysing the effect of preference heterogeneity on willingness to pay for improving service quality in an airline choice context. *Transportation Research Part E*, 44(4), 593–606. <https://doi.org/10.1016/j.tre.2007.03.004>
- Hong, B., Ma, X., Tang, W., & Shen, Z. (2022). Recognition of air passengers' willingness to pay for seat selection for imbalanced data based on improved XGBoost. *International Journal of Cognitive Informatics and Natural Intelligence*, 16(1), 1–18. <https://doi.org/10.4018/ijcini.312249>
- Hui, T. H., Itani, N., & O'Connell, J. F. (2024). Examining air travellers' willingness to pay for non-voluntary environment-related fees: The case of SAF surcharge and carbon taxes. *Highlights of Sustainability*, 3(1), 55–72. <https://doi.org/10.54175/hsustain3010005>
- Hwang, E., Kim, Y.-S., & Song, H. G. (2023). Airline passengers' willingness to reserve inflight meals online and their willingness to pay for meal upgrades. *Sustainability*, 15(10), 8071. <https://doi.org/10.3390/su15108071>
- IATA. (2023). Annual review 2023. International Air Transport Association.
- IdeaWorks. (2018). CarTrawler yearbook of ancillary revenue 2018. IdeaWorksCompany.
- Jou, R.-C., Kuo, C.-W., & Chiu, Y.-C. (2022). Bidding behaviors for international airline seats in short/long distance flights. *Transportation Research Part A: Policy and Practice*, 163, 68–84. <https://doi.org/10.1016/j.tra.2022.06.014>
- Kim, W., Lim, H., & Brymer, R. A. (2017). Determinants of airline loyalty program members' ancillary service purchases. *Journal of Hospitality Marketing & Management*, 26(2), 141–160.
- Klophaus, R. (2013). Airline ancillary revenues: Perspectives for European low-cost carriers. In *Proceedings of the German Aviation Research Society (DGLR) Annual Conference*.

- Kolbeinson, A., Otwell, K., & Yellepeddi, K. (2022). Personalized dynamic pricing for airline ancillaries: A field experiment at Galactic Air. *Journal of Revenue and Pricing Management*, 21(3), 288–302. <https://doi.org/10.1057/s41272-021-00350-9>
- Kumara, V., Kolbeinson, A., & Yellepeddi, K. (2021). Dynamic pricing for airline ancillaries with machine learning. *Journal of Revenue and Pricing Management*, 20(5), 497–510
- Kuo, C.-W. (2022). Taiwan passengers' willingness to pay for air sleeper seats. *Journal of Advanced Transportation*, 2022, Article 5294377. <https://doi.org/10.1155/2022/5294377>
- Kuo, C.-W., Jou, R.-C., & Chiu, Y.-C. (2023). The factors affecting people's willingness in participating in and paying for upgrading their seats from the economy class to the premium class. *Humanities & Social Sciences Communications*, 10, 724. <https://doi.org/10.1057/s41599-023-02160-5>
- Lebeau, N. (2017). Ancillary revenues in the airline industry: Strategic and operational perspectives. *Journal of Air Transport Management*, 60, 1–8.
- Leon, S., & Uddin, N. (2017). Airline ancillary services: An investigation into passenger purchase behavior. *Journal of the Transportation Research Forum*, 56(1), 41–62. <https://doi.org/10.5399/osu/jtrf.56.1.4411>
- Liu, H., Abdullah, N. H. B., & Lee, S. Y. (2024). A review of ancillary services in the airline industry. *Cogent Business & Management*, 11(1), 2322018. <https://doi.org/10.1080/23311975.2024.2322018>
- Mandal, S. K., Chatterjee, S., & Upadhyay, A. (2024). Role of type of aircraft in the decision of ancillary services for medium haul flights during international travel. In *Proceedings of the IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*. <https://doi.org/10.1109/ieem62345.2024.10857220>
- Martin, J. C., Román, C., & Espino, R. (2008). Willingness to pay for airline service quality. *Transport Reviews*, 28(2), 199–217. <https://doi.org/10.1080/01441640701577007>
- Michelmann, J., Paul, A., Becker, A., Schneider, C., Tay, G., & Hornung, M. (2019). Airline revenues 2035: Revenue generation and business models in commercial aviation. *Bauhaus Luftfahrt*.
- Mumbower, S. (2025). Emerging research on airline ancillaries: A review of offer management and dynamic pricing literature. *Journal of Revenue and Pricing Management*. Advance online publication. <https://doi.org/10.1057/s41272-025-00526-9>
- Mumbower, S., Hotle, S., & Garrow, L. A. (2023). Highly debated but still unbundled: The evolution of US airline ancillary products and pricing strategies. *Journal of Revenue and Pricing Management*, 22(4), 276–293. <https://doi.org/10.1057/s41272-023-00410-2>
- O'Connell, J. F., & Warnock-Smith, D. (2016). An exploratory analysis of evolving ancillary revenue strategies among full-service network carriers. *Journal of Air Transport Management*, 56, 56–66. <https://doi.org/10.1016/j.jairtraman.2016.04.013>
- O'Connell, J. F., & Williams, G. (2005). The evolution of the low-cost carrier model: The case of Ryanair. *Journal of Air Transport Management*, 11(5), 239–246. <https://doi.org/10.1016/j.jairtraman.2005.01.005>
- Ozmec-Ban, M., Škurla Babić, R., Vidović, A., & Bračić, M. (2022). A review of ancillary services implementation in the revenue management systems. *Promet—Traffic & Transportation*, 34(4), 567–580. <https://doi.org/10.7307/ptt.v34i4.4065>
- Papatheodorou, A., & Arvanitis, A. (2018). Ancillary services and their role in the financial performance of low-cost airlines. *Tourism Economics*, 24(1), 128–141. <https://doi.org/10.1177/1354816617717980>
- Pardo González, G., Tabares Pozos, A., Quiroga, C., & Álvarez-Martínez, D. (2024). Seat assignment recommendation in airlines purchase flow to increase ancillary revenue considering weight and balance constraints. *Journal of Air Transport Management*, 117, 102582. <https://doi.org/10.1016/j.jairtraman.2024.102582>
- Ren, X., Pan, N., & Jiang, H. (2022). Differentiated pricing for airline ancillary services considering passenger choice behavior heterogeneity and willingness to pay. *Transport Policy*, 126, 292–305. <https://doi.org/10.1016/j.tranpol.2022.08.001>
- Shukla, N., Kolbeinson, A., Otwell, K., Marla, L., & Yellepeddi, K. (2019). Dynamic pricing for airline ancillaries with customer context. In *Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining* (pp. 2174–2182). <https://doi.org/10.1145/3292500.3330746>
- Tomova, A., & Strmiskova, Z. (2014). Explanatory analysis of ancillary revenues: Case study of three European airlines. *Communications—Scientific Letters of the University of Zilina*, 16(2), 36–40.
- Vinod, B. (2015). The expanding role of revenue management in the airline industry. *Journal of Revenue and Pricing Management*, 14(6), 391–399. <https://doi.org/10.1057/rpm.2015.40>
- Wang, K. K., Wittman, M. D., & Bockelie, A. (2021). Dynamic offer generation in airline revenue management. *Journal of Revenue and Pricing Management*, 20(6), 1–15. <https://doi.org/10.1057/s41272-021-00349-4>
- Wang, K. K., Wittman, M. D., & Fiig, T. (2023). Dynamic offer creation for airline ancillaries using a Markov chain choice model. *Journal of Revenue and Pricing Management*, 22(1), 1–14. <https://doi.org/10.1057/s41272-022-00398-3>
- Wang, Z., Han, X., Chen, Y., Ye, X., & Hu, K. (2022). Prediction of willingness to pay for airline seat selection based on improved ensemble learning. *Aerospace*, 9(2), 47. <https://doi.org/10.3390/aerospace9020047>
- Warnock-Smith, D., O'Connell, J. F., & Maleki, M. (2016). An analysis of ongoing trends in airline ancillary revenues. *Journal of Air Transport Management*, 64(A), 42–54. <https://doi.org/10.1016/j.jairtraman.2017.06.023>
- Wensveen, J. G. (2016). *Air transportation: A management perspective* (8th ed.). Routledge.
- Wittmer, A., & Rowley, E. (2014). Customer value of purchasable supplementary services: The case of a European full network carrier's economy class. *Journal of Air Transport Management*, 34, 17–23. <https://doi.org/10.1016/j.jairtraman.2013.07.005>

- Wittmer, A., Boksberger, P., & Gerber, A. (2012). The future of ancillary service fees in air travel: An exploratory investigation of budget air travelers. *International Journal of Aviation Management*, 1(4), 231–241. <https://doi.org/10.1504/IJAM.2012.050474>
- Zhang, Z., & Liu, L. (2014). A competitive analysis of the airline industry: The role of ancillary services. *Journal of Air Transport Research*, 10(2), 215–230
- Şengur, F. K., Ustaömer, T. C., & Uzgör, M. (2017). Research on ancillary product buying intentions of domestic airline passengers in Turkey. *PressAcademia Procedia*, 4(4), 456–464. <https://doi.org/10.17261/Pressacademia.2017.733>

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