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Airport Rail Link Versus Economy Bus On The Solo–Madiun Corridor: Role Of Comfort And Reliability

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ABSTRACT

The Adi Soemarmo Airport Rail Link (KA BIAS) extension to Madiun shifted from airport access to a regional intercity alternative, competing with economy buses along Solo–Madiun corridor. This study identifies passenger characteristics and service attributes influencing KA BIAS versus economy-bus choice. A stated-preference survey included 179 users at Solo Balapan Station and Tirtonadi Terminal. Six attributes—travel time, fare, comfort, security, reliability, and service frequency—were assessed. Cramer's V, Chi-square, and binary logistic regression were applied. Socioeconomic factors, monthly income and transport expenditure, were significantly associated with mode choice, although weakly. Comfort and reliability significantly predicted KA BIAS choice; travel time, fare, security, and service frequency showed no significant partial effects. Model was significant (χ^2 = 14.260; p = 0.001), with Hosmer–Lemeshow fit (p = 0.841) and Nagelkerke R^2 = 0.102, indicating modest improvement over intercept-only model. With small fare differences, competitiveness depends more on passenger experience and reliability than cost. The study extends airport-rail mode-choice literature by examining an airport rail service operating simultaneously as a regional intercity transport mode.

1. INTRODUCTION

Mode choice is an important component of transportation system analysis because a traveler's decision is not determined solely by the availability of a mode, but by a combination of individual characteristics, trip characteristics, cost, time, accessibility, and service quality. In public transport services with overlapping routes and user groups, small changes in service attributes can shift the competitive position of each mode.

The literature on rail and bus mode choice in Indonesia generally identifies fare, travel time, access time, and service frequency as important determinants. Stated-preference studies on intercity and airport-related corridors have repeatedly shown that these attributes influence mode preference and willingness to shift between bus and rail alternatives (Jely Anggraini & Utomo, 2023; Rosyid et al., n.d.; Wahab & Andika, 2019). Previous research comparing the airport train with online taxis found that changes in fare, travel time, and headway affected mode-shift probability and willingness to pay. That earlier analysis still positioned the rail service primarily as an airport access mode (Mahmudah et al., 2019).

Subsequent operational developments created a different context. After its route was extended to Madiun in November 2024, KA BIAS no longer served only the Adi Soemarmo Airport–Solo connection but also provided regional Solo – Madiun trips. A service that had been institutionally and historically developed as an airport rail link began to also function as an intercity travel mode for education, work, recreation, family visits, and other trip purposes. This condition matters because the behaviour of regional travellers is not identical to that of air passengers accessing the airport.

The character of competition on this corridor is also notable. The KA BIAS fare for the Solo–Madiun trip was recorded at approximately IDR 40,000, while the economy bus fare was approximately IDR 39,000. KA BIAS had a shorter travel time, while the bus offered greater flexibility in boarding or alighting points with higher frequency. This phenomenon aligns with developments in the international literature on airport ground access. Previous studies show that reliability, waiting time, travel time, cost, transfer frequency, security, and socioeconomic conditions can influence airport-access mode choice. Recent work also reflects increasing use of more sophisticated discrete-choice specifications and greater attention to behavioral heterogeneity (Colovic et al., 2022; Jang et al., 2025; Silva et al., 2022).

Behavioral heterogeneity is increasingly recognized in airport-access research (Setiawan, 2026a). Segment-specific analyses indicate that mode preferences may differ according to socioeconomic status, trip characteristics, airport-use behavior, and passenger market segment, including cost-sensitive and convenience-oriented travellers (Gokasar & Gunay, 2021; Gunay & Gokasar, 2021;Saljoqi et al., 2024b). These findings support examining KA BIAS not only through average coefficients but also through the behavioral meaning of its service attributes. Nevertheless, most airport rail studies still examine the airport train from the perspective of access to or from the airport. Relatively few studies assess what happens when an airport rail service is extended so that it simultaneously becomes a regional transport alternative competing directly with intercity buses. This is where the present study is positioned.

This study offers three contributions. First, it evaluates the shift in the operational function of an airport rail service into a regional mode, using KA BIAS as an empirical case following the route extension to Madiun. Second, it tests whether conventional attributes fare and time remain dominant when the fare difference between the train and the bus is relatively small. The study aims to identify

the socioeconomic and trip characteristics of KA BIAS and economy bus users, analyze the association between user characteristics and mode choice, and determine the service attributes that significantly influence the choice of KA BIAS.

2. METHODS

This study used a quantitative design with a stated preference approach. The methods section covers the research design, population and sample, study variables, data collection technique, and data analysis technique.

Research Design

Data collection was conducted at two main departure nodes from Solo Balapan Station for KA BIAS users and Tirtonadi Bus Terminal for economy bus users. The target population was limited to users traveling from Solo to Madiun.

Population and Sample

A preliminary observation was carried out for one week, covering weekdays, weekends, peak hours, and off-peak hours. Manual counting recorded 3,131 KA BIAS passengers and 465 economy bus passengers, or 3,596 passengers in total during the observation period.

The study used non-probability purposive sampling. The main criterion for respondents was that they were traveling from Solo to Madiun. The underlying thesis determined the operational sample requirement using the Slovin formula with a 10% margin of error, yielding 97 respondents in the KA BIAS group and 82 respondents in the bus group, for a total of 179 respondents.

Because sampling used a purposive technique, this figure is treated in this article as the operational sample-size target, not as a basis for claiming probabilistic sampling error. The mode-choice proportion within the sample is likewise not interpreted as the market share of the entire corridor population.

Study Variables

The dependent variable was mode choice, while six independent attributes comprised travel time, fare, comfort, security, reliability, and service frequency, as summarized in Table 1.

Table 1. *Service attribute variables and levels.*

Code	Variable	More Favorable Condition	Less Favorable Condition
X1	Travel time	reduced by 30 minutes	increased by 30 minutes
X2	Fare	reduced by IDR 5,000	increased by IDR 5,000
X3	Comfort	air-conditioned, clean seats	not air-conditioned, unclean seats
X4	Security	staff and CCTV available	no staff or CCTV
X5	Reliability	on-time arrival	not on-time arrival
X6	Service frequency	increased by two trips	reduced by two trips

The six attributes initially produced $2^6 = 64$ possible combinations. Combinations with dominant positive or negative attributes were eliminated so that respondents were presented with

scenarios containing genuine trade-offs among service characteristics. This approach was used to reduce respondent cognitive burden while preserving variation across attributes.

Data Collection Technique

A pilot survey was conducted with 30 respondents. All measurement items showed correlation values higher than r-table = 0.361, and were therefore considered to satisfy the validity test used in the study.

The Cronbach's Alpha value was 0.632, slightly above the minimum threshold of 0.60 used in the thesis. This value indicates internal consistency at a level that is still minimally acceptable; interpretation in this article is therefore directed more toward the empirical model results than toward claiming very high instrument reliability.

Data Analysis Technique

Respondent characteristics were analyzed descriptively. The association between categorical socioeconomic variables and mode choice was evaluated using Cramer's V. The magnitude of Cramer's V was used to distinguish statistical significance from the strength of association.

Subsequently, the association between service attributes and mode choice was tested using Chi-square and binary logistic regression (Hosmer & Lemeshow. Stanley, 2012). The significance level for the article was set at $p < 0.05$. The general model is written as:

$$\ln[P_i/(1 - P_i)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_6 X_6 \quad (1)$$

where P_i is the probability that a respondent chooses KA BIAS. The full model results were then reduced by retaining only the significant variables. The resulting final model is:

$$\text{logit}[P(\text{rail})] = -0.051 + 0.383X_3 + 0.380X_5 \quad (2)$$

where X_3 is comfort and X_5 is reliability. The magnitude of each variable's effect was interpreted using the odds ratio ($OR = e^{\beta}$) rather than by directly converting the logit coefficient into a percentage. The conditional probability for model illustration was computed using the logistic function:

$$P(\text{rail}) = 1 / \{1 + \exp[-(-0.051 + 0.383X_3 + 0.380X_5)]\} \quad (3)$$

Post-estimation analysis was used only to illustrate the model's sensitivity to changes in comfort and reliability scores. The results are not a market-share projection, because the sample design was not simple random sampling of the entire corridor population.

3. RESULTS

The respondent composition was relatively diverse. Women accounted for 95 respondents and men 84. The largest age group was 21–30 years (74 respondents) followed by those under 21 year. The largest occupational category was civil servant/military/police personnel (32%), followed by students (22%), state-owned enterprise employees (19%), entrepreneurs (15%), and private employees (12%). The income group of IDR 4,000,000–6,999,999 per month dominated with 38%, while the majority's highest education was senior high school (53%). Monthly transport expenditure was concentrated in the IDR 100,000–200,000 range, reported by 82 respondents (46%).

In terms of trips, education was the largest trip purpose (25%), followed by visiting family (24%), recreation (23%), shopping (15%), and work/official travel (14%). Of the 179 respondents, 106 (59%) reported KA BIAS as their more frequently used mode, and 73 (41%) reported the

economy bus. Among the 179 respondents surveyed, 106 respondents (59%) reported KA BIAS as their more frequently used mode, whereas 73 respondents (41%) reported economy buses. These proportions describe the composition of the study sample and should not be interpreted as corridor-wide market shares due to the purposive non-probability sampling approach.

Table 2. *Association between respondent characteristics and mode choice*

Characteristic	Cramer's V	p-value	Interpretation
Sex	0.077	0.305	not significant
Age	0.132	0.539	not significant
Occupation	0.180	0.214	not significant
Education	0.154	0.376	not significant
Monthly income	0.247	0.028	significant; weak
Monthly transport expenditure	0.220	0.034	significant; weak

Cramer's V results show that monthly income and monthly transport expenditure were significantly associated with mode choice, while sex, age, occupation, and education were not (Table 2).

Table 3. *Chi-square screening results for service attributes*

Variable	χ^2	p-value	Result
Travel time	2.353	0.308	not significant
Fare	2.150	0.542	not significant
Comfort	8.584	0.035	Significant
Security	1.507	0.681	not significant
Reliability	6.958	0.031	significant
Service frequency	0.375	0.829	not significant

Preliminary testing of each service attribute showed that only comfort and reliability had a significant association with mode choice (Table 3). Full regression results pointed in the same direction: comfort had B = 0.640, p =0.004, OR = 1.896, while reliability had B = 0.547, p = 0.016, OR = 1.728. Travel time, fare, security, and frequency were not significant partial predictors in the full model. Preliminary Chi-square testing showed that only comfort and reliability had significant bivariate associations with mode choice (Table 3). In the full logistic regression model including all six service attributes, comfort and reliability remained significant predictors, whereas travel time, fare, security, and frequency were not significant partial predictors. The Chi-square analysis was used only as a preliminary assessment of bivariate relationships, while the logistic regression model evaluated the simultaneous contribution of service attributes. The reduced model presented in Table 4 retained only significant predictors for interpretation. Comfort (X3) and reliability (X5) were coded as binary indicators representing the more-favorable versus less-favorable condition; therefore, B and Exp(B) represent the change in log-odds and odds associated with the favorable condition relative to the reference condition, rather than a one-unit increase on a continuous scale.

Table 4. *Final binary logistic regression model*

Variable	B	Wald	Sig.	Exp(B)
Comfort (X3)	0.383	59.308	0.001	1.467
Reliability (X5)	0.380	58.383	0.001	1.462
Constant	−0.051	1.089	0.297	0.950

Model fit statistics indicated that the final logistic regression model provided a statistically significant improvement over the intercept-only model. The Omnibus Test produced $\chi^2 = 14.260$ ($p = 0.001$), indicating that the inclusion of comfort and reliability significantly improved model fit compared with the null model. The Hosmer–Lemeshow test produced $\chi^2 = 2.058$ ($p = 0.841$), suggesting no evidence of poor model calibration within the observed sample. The Nagelkerke R^2 value was 0.102. As a pseudo-R^2 measure, this value should not be interpreted in the same manner as the coefficient of determination in ordinary least-squares regression. Instead, it indicates a modest improvement in model fit relative to the intercept-only model. Therefore, although comfort and reliability were statistically significant predictors of mode choice, additional behavioural, socioeconomic, and trip-related factors not included in the model may also contribute to individual mode-choice decisions.

As an extension of the thesis analysis, the final model was used to illustrate how the tendency to choose a mode shifts with combined changes in comfort and reliability. The instrument's rating scale ranged from 1 to 5, allowing conditional probabilities to be derived from the logistic model (Table 5).

As an extension of the thesis analysis, the final model was used to illustrate how the predicted probability of choosing KA BIAS differs across the four possible combinations of comfort and reliability. Consistent with the binary coding described in the study variables subsection, each attribute takes the value 1 (more-favorable condition) or 0 (less-favorable condition).

The estimated probabilities were derived from the final binary logistic regression model using the logistic transformation. These values represent model-implied probabilities under different combinations of comfort and reliability conditions and should not be interpreted as observed market shares. Table 5 reports the model-implied probability for each of the four combinations.

Table 5. Model-predicted probability of choosing KA BIAS under different comfort and reliability conditions

Comfort	Reliability	Predicted Probability of Choosing KA BIAS (%)
20 (less favorable)	20 (less favorable)	48.7%
31 (more favorable)	30 (less favorable)	58.2%
40 (less favorable)	41 (more favorable)	58.1%
51 (more favorable)	51 (more favorable)	67.1%

4. DISCUSSION

Fare Convergence and Competitive Position

The near equal fares of the two modes are important for interpreting the results. When the fare difference is only about IDR 1,000, fare is likely to lose much of its discriminatory power in explaining user decisions. Conversely, attributes that differentiate the travel experience of the two modes can gain greater behavioral weight. Previous public-transport choice research likewise indicates that

desired service quality is heterogeneous and that non-price quality attributes can strongly shape the preferences of both current and potential users.

The relatively small fare difference between the two modes provides important context for interpreting the results. Given that the fare difference was only about IDR 1,000, the limited variation in fare may help explain why fare did not emerge as a significant predictor of mode choice in this study. In contrast, service attributes that create a clearer difference between the two modes may become more relevant in shaping passenger choices. Previous public transport choice studies have also shown that passengers may value different aspects of service quality, and that non-price attributes can influence the preferences of both existing and potential users (Bellizzi et al., 2020). Therefore, the small fare difference should be considered as a possible contextual factor contributing to the observed non-significant fare effect rather than as a demonstrated causal explanation.

This finding differs from several earlier bus–rail and airport-rail mode choice studies. Previous research reported meaningful sensitivity to cost, travel time, access time, and fare changes when bus–rail or airport-rail–taxi alternatives were compared (Rosyid et al., n.d.). In the present study, by contrast, fare was not a significant determinant once KA BIAS competed against a bus mode with an almost identical fare.

Socioeconomic Associations in Perspective

Income and transport expenditure did show significant associations, but Cramer's V values of 0.247 and 0.220 indicate that the strength of these associations is relatively weak. This means economic status remains relevant but is insufficient to dominantly explain mode choice. This finding has two implications: first, income-based segmentation is still necessary, particularly to safeguard KA BIAS fare affordability; second, because the association is weak, strategies to increase KA BIAS ridership cannot rely on pricing instruments alone.

Research on Indonesian air passengers has shown that income and occupation can help distinguish cost-sensitive users from passenger segments that place greater emphasis on comfort and convenience (Setiawan, 2026a). The Solo – Madiun findings complement this pattern: economic factors are associated with mode choice, but in a KA BIAS–bus competition with near-identical fares, the influence of service quality becomes more pronounced.

Service Quality as the Primary Determinant

The dominance of comfort and reliability, and the negligible role of fare, time, security, and frequency, indicate that user decisions on this corridor are governed less by monetary trade-offs than by the perceived quality and dependability of the travel experience. Holding other variables constant, a one-unit increase in the comfort score multiplies the odds of choosing KA BIAS by 1.931, equivalent to a 93.1% increase in odds, while a one-unit increase in the reliability score multiplies the odds by 1.692, equivalent to a 69.2% increase in odds. These are changes in odds, not direct percentage-point changes in probability. Previous research supports the importance of comfort, functionality, reliability, punctuality, information, and service dependability in shaping attractive public transport and passenger satisfaction. Service-quality effects may also be nonlinear, which supports examining combinations of service attributes rather than isolated factors . The results indicate that comfort and reliability were statistically significant attributes associated with mode choice in this sample, whereas fare, travel time, security, and frequency did not show statistically significant associations. Holding the other attributes constant, respondents in the more-favorable comfort condition had 1.467 times higher odds of choosing KA BIAS than those in the less-favorable condition. Similarly,

respondents in the more-favorable reliability condition had 1.462 times higher odds of choosing KA BIAS than those in the less-favorable condition. These odds ratios represent binary comparisons between service conditions and should not be interpreted as percentage-point changes in probability or one-unit increases on a continuous scale. Previous research has shown that passengers consider various service-quality dimensions, including comfort, functionality, reliability, punctuality, and information availability, when evaluating public transport services. Future studies may further examine how combinations of service attributes influence mode choice decisions (Ibrahim et al., 2025; Ruiz et al., 2024; Sukhov et al., 2022).

All probabilities reported in this article were obtained through the logistic transformation $P = 1/[1 + \exp(-z)]$, which constrains predicted values to the valid interval from 0 to 1. Accordingly, odds ratios are reported and interpreted separately from probabilities. In the post-estimation illustration, the conditional probabilities range from 48.7% to 67.1%. The importance of reliability is consistent with evidence from airport-access and public transport research. Reliability is commonly associated with certainty in travel time, waiting time, schedule performance, and experienced service conditions; in rail settings, train supply and up to date passenger information also contribute to perceived reliability and service quality (Colovic et al., 2022; Romero et al., 2023; Soza-Parra et al., 2022; Wang et al., 2022). In rail-based transport, schedule certainty carries particular value because users can reduce the uncertainty associated with road congestion.

However, security was not significant in the current model, whereas previous airport-access research has identified security as an attribute with importance comparable to access time (Silva et al., 2022). This difference may stem from context that the comparison study focused on airport access with air travel consequences and a different user profile, while the Solo–Madiun sample was dominated by regional mobility. In addition, security may have been perceived by respondents as a baseline attribute expected of both modes, so its variation was insufficient to differentiate choice.

Model Fit and Explanatory Power

Because the Omnibus Test p-value (0.001) is below 0.05, the null hypothesis that adding the independent variables does not improve model fit is rejected; the model incorporating comfort and reliability therefore performs significantly better than a constant-only model. The Hosmer–Lemeshow p-value (0.841) is well above 0.05, indicating no statistically detectable lack of calibration in the study sample.

Sensitivity of Mode Choice to Service Quality

This calculation is not intended as a market share estimate, but as an analysis of the model's internal response, showing how combined changes in service conditions shift the tendency to choose KA BIAS (Table 5). As both attributes move together from a score of 2 to a score of 5, the conditional probability rises from 0.118 to 0.824 (11.8% to 82.4%). The probability of choosing KA BIAS increased from 48.7% when both attributes were in less-favorable conditions to 67.1% when both attributes were in more-favorable conditions. Every modeled probability therefore remains within the mathematically valid interval $0 \leq P \leq 1$. The pattern also illustrates the nonlinear shape of the logistic function: service improvements at intermediate levels can produce a larger shift in choice tendency than changes at the lower or upper tail.

At a comfort score of 3, reliability mathematically needs to reach approximately 4.56; at a comfort score of 4, the reliability threshold falls to approximately 3.31; and at a comfort score of 5,

the threshold is approximately 2.06. This indicates a partial substitution effect between the two attributes in the model: higher comfort quality reduces the minimum reliability required to cross the 50% tendency point, and vice versa. This threshold result should be treated as a sample sensitivity analysis, not as an operational threshold ready for directly setting service standards. External validation with a probabilistic sample or revealed-preference data is required before it is used for demand prediction. Because the threshold calculation represents an algebraic relationship derived from the fitted model, it should not be interpreted as evidence of a behavioral substitution effect between comfort and reliability. The estimated coefficients indicate that the joint favorable combination produces a higher modeled probability than either single favorable condition or the unfavorable combination. The remaining distance from the 50% threshold reflects the influence of the model intercept and other factors not included in the current specification. Therefore, this threshold analysis should be treated as a sample-specific sensitivity illustration rather than an operational threshold for directly setting service standards. External validation using probabilistic samples or revealed-preference data would be required before applying the model for demand prediction.

Novelty Relative to Prior Research

The novelty of this study does not lie in the use of logistic regression—but in the context of the changing function of the airport rail service and the pattern of determinants found after the service was extended into a regional mode (Table 6). The novelty of this study does not lie in the use of logistic regression, but in its empirical examination of mode choice following the introduction of KA BIAS as a regional intercity alternative on the Solo–Madiun corridor, rather than only as an airport access mode (Table 6). Because the study design does not include a before-extension comparison, the findings describe the determinants of mode choice observed in this new operating context rather than establishing that the route extension itself caused a change in passenger preferences.

Table 6. *Comparison with previous studies and the novelty position of this study*

Study	Context	Main Focus	Distinction of This Study
Wahab & Andika (2019)	Train vs. DAMRI bus to Minangkabau Airport	time, fare, frequency, access	KA BIAS examined after serving regional trips, not only airport access
Mahmudah et al. (2020)	Adi Soemarmo Airport train vs. online taxi	WTP, fare, time, headway	compares airport rail with an economy bus after route extension
Al Muntsari et al. (2021)	Bus vs. train, Surabaya–Jakarta	cost, time, access difference	examines a train originally developed as an airport rail service
Colovic et al. (2022)	Airport access, multiple European countries	reliability, waiting time, multimodality	reliability tested within the airport train's new regional function
Silva et al. (2022)	Guarulhos Airport access	security	this study finds comfort and reliability to be more decisive
Jati et al. (2024)	Patas bus vs. train, Malang–Surabaya	stated preference, bus–rail	context is not a transformation of airport rail function

Setiawan (2026)	Soekarno–Hatta Airport access	multimodal user segmentation	examines airport rail–bus competition on non-airport regional trips

KA BIAS is a service developed as an airport rail link, but after the route extension it competes as a regional transport mode. Under this condition, comfort and reliability differentiate preference more strongly than a fare that is nearly equal. This finding indicates a shift from cost-based competition toward service-quality competition. Once fares for both modes converge, efforts to attract additional users are not always effective through price reduction. Maintaining passenger-compartment condition, cleanliness, thermal comfort, schedule punctuality, and operational consistency has greater potential as relevant service leverage.

This contribution also broadens the discussion of airport rail. Airport-access literature typically evaluates how passengers reach the airport terminal. The KA BIAS case, by contrast, shows that an airport rail investment can carry a secondary function of regional connectivity, so its benefits and performance indicators should not be assessed solely by the number of air passengers using the train.

Novelty Relative to Prior Research

For the KA BIAS operator, the findings show that maintaining a fare advantage alone is insufficient. During the study period, the fare difference between the train and the bus was only about IDR 1,000, so competition had already entered the dimension of service quality. The main priority is maintaining schedule reliability while sustaining travel comfort. For the KA BIAS operator, the findings indicate that maintaining a fare advantage alone may not be sufficient to differentiate mode choice. During the study period, the fare difference between the train and the bus was only about IDR 1,000, while the logistic model identified comfort and reliability as the service attributes significantly associated with mode choice. These two attributes are emphasized here because they showed statistically significant associations with mode choice in this study. Other suggestions, such as luggage space, transfer comfort, disruption information, and connection certainty, were not tested as separate model attributes. These aspects are therefore presented as potential service-quality considerations informed by broader transport literature rather than as direct empirical findings of this study.

Reliability should be understood more broadly than simply the percentage of on-time trips. From a regional user's perspective, reliability also includes the certainty that a scheduled trip is available when needed, consistency of travel time, clarity of disruption information, and certainty of connection with onward modes. Evidence from public-transport and suburban-rail research supports this broader interpretation by linking reliability to travel-time and waiting-time certainty, train supply, and passenger information (Romero et al., 2023; Soza-Parra et al., 2022). The airport-access literature similarly indicates that reliability becomes especially relevant when users face delay risk and uncertainty within their travel chain.

Comfort is not limited to air conditioning and seat cleanliness. Further development should also consider seating capacity, luggage space, cleanliness, ease of boarding/alighting, in-train information, and comfort during transfers. This becomes increasingly important if KA BIAS is to maintain both functions simultaneously: airport connector and regional travel mode.

For the economy bus operator, flexibility remains a structural advantage. Buses can serve more boarding/alighting points and operate at higher frequency. The bus's competitive strategy therefore

does not need to imitate the character of the train, but can retain flexibility while improving schedule consistency, vehicle cleanliness, seat quality, and travel information.

From a transport policy perspective, rail–bus competition should not always be viewed as zero-sum. Both modes can serve different trip segments and form a complementary regional system. Modern airport-accessibility research increasingly evaluates interventions by combining mode-choice analysis with network performance rather than assessing a single mode in isolation (Avogadro et al., 2024).

5. CONCLUSION

The extension of the Adi Soemarmo Airport Rail Line to Madiun has created a broader range of services beyond mere access to the airport. On the Solo–Madiun corridor, the BIAS train now operates as a regional transportation alternative that competes directly with economy-class buses. From 179 respondents, 59% reported using the BIAS train and 41% use economy buses more often. Monthly income and monthly transportation expenditures are significantly associated with mode choice, although the strength of these relationships is relatively weak. Among the six service attributes analyzed, only comfort and reliability are key determinants. Fare, travel time, safety, and frequency did not show significant partial effects in the model. The final specification is statistically significant, has been well-calibrated based on the Hosmer–Lemeshow test, and demonstrates a modest improvement in model fit relative to the null model (Nagelkerke $R^2 = 0.102$).The main finding of this study is that when airport trains and buses offer nearly identical fares, competition between modes tends to shift from price toward service quality, namely comfort and reliability.

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