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Analysis of Passenger Ability and Willingness to Pay for the Surabaya–Yogyakarta Train Route

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Abstract

The Directorate General of Railways of the Ministry of Transportation has been constructing double-track railway lines along the southern route of Java since 2015, covering a distance of 694 km. This project aims to connect three major urban agglomerations, namely Jabodetabek, Joglosemar (Jogja-Solo-Semarang), and Gerbangkertosusila (Gresik-Bangkalan-Mojokerto-Surabaya-Sidoarjo-Lamongan). To improve service, Indonesian railways accelerated travel times for several trains using the southern Java double-track railway starting September 24, 2021, as part of service improvements. In line with the double-track construction and service improvements by the Directorate General of Railways and Indonesian Railways, ticket fares need to be reviewed, especially in light of possible fare increases for economy and executive classes, which include the Wijayakusuma, Sancaka, and Mutiara Selatan trains. This research aims to determine passenger characteristics, Ability to Pay (ATP), and Willingness to Pay (WTP) for these services, and to provide alternative scenarios in the event of fare increases to improve service quality. The methods used to address these issues include collecting primary data through interviews and questionnaires, analyzing respondent characteristics, and analyzing willingness and availability to pay using the Stated Preference approach. Subsequently, the Household Budget method and service user perceptions will be employed to obtain ATP and WTP values. The results of this study for the economy class show an Ability to Pay (ATP) value of IDR 307,249 and a Willingness to Pay (WTP) value of IDR 250,593. For the executive class, the ATP value is IDR 396,943, and the WTP value is IDR 277,462.

Keywords

Characteristics, ability to pay, willingness to pay, railway.

INTRODUCTION

The development of an area is characterized by diversity, increased activity, and movement of its inhabitants. The high increase in activity is directly proportional to the high demand for transportation [1]. One of these factors demands the development of transportation and causes changes in the transportation system and services to transportation service users. Transportation services continue to develop from time to time and the provision of transportation facilities and infrastructure is needed to serve the activities and movement of the population in carrying out activities. The provision of facilities and infrastructure in question is not only in terms of quantity but is also followed by quality in line with the increasing technological advances today. One form of transportation that is expected to reduce the number of attractions and travel generation within the city and outside the city is public transportation [2].

According to research [3] the city of Surabaya is a city located in East Java Province and is the second largest city after Jakarta. The city experiences increasing population growth every year. Based on [4], in 2021 the population of the city of Surabaya will reach 2,880,284 people and the population growth from 2020-2021 is 0.28%. In line with the increase in population growth in the city of Surabaya, new problems have emerged in the migration of urban residents during the day and at night. Where the population during the day will increase much more than at night. Likewise, the city of Yogyakarta, a city that maintains traditional concepts and Javanese culture has become one of the tourist cities. The population in the city of Yogyakarta is increasing from year to year [5]. The increase in population growth that occurred in the city of Yogyakarta was quite large. According to research [6], with increasing population growth, adequate transportation facilities and infrastructure are also needed to support population growth. One of the land transportation facilities and infrastructure that is very popular with people for moving from one place to another is trains, buses, and private vehicles.

According to research [7] Transportation can be defined as the effort to move, mobilize, transport, or redirect an object from one place to another, where the object is more beneficial or can be useful for specific purposes [8]. Transportation is a crucial means of supporting the success of development, especially in

fostering economic activities, including in rural areas. Existing transportation systems are aimed at improving mobility services for the population and other resources that can support economic and social growth in rural areas. [9]. The transportation network system is seen in terms of effectiveness, high accessibility, integrated, sufficient capacity, regular, timely, comfortable, affordable rates, orderly, safe, low pollution, and in terms of efficiency in the sense of low public burden and high utility. To obtain adequate and comfortable service, it is necessary to determine passenger public transport tariffs where the tariffs are also adequate for the passenger's ability to pay rent (affordability) and do not harm the transportation service provider/operator [10].

According to research [11] Calculation of public transport costs is a significant and complicated problem. This can occur as a result of differences in views between one party and related parties, namely the government as regulator, operators as suppliers of transportation services, and customers of these services [12]. In essence, understand that the way public transport fares are collected sometimes does not match our expectations of certain individuals and the current rules. The amount of public transport fares must be determined carefully and by tariff policies because they must be able to balance the interests of customers and business actors/service providers [13]. The government sets tariffs to maintain the continuity of urban public transport operations while maintaining service quality and safety requirements, and on the other hand, considering the ability and willingness of users' purchasing power [14]. Tariff determination is influenced by various elements, including the economic condition of the community, maintenance and spare parts costs, fuel prices, facilities, infrastructure, etc [15]. One type of public transportation that requires handling and tariff policies is trains [16]. Trains are a mode of land transportation that is of interest to people based on efficient and effective railroads [17]. This is proven by its carrying capacity, both in the form of people and goods, which is greater than other land transportation modes. Likewise, train fuel consumption is relatively more economical compared to other land transportation modes [18].

PT Kereta Api Indonesia has accelerated travel times for several trains using the southern double-track railway route in Java since September 24, 2021, as an improvement of their services [19]. The increase in travel time varies, from 19 minutes to 70 minutes. With a shorter time, users can use this time for various other activities because their journey is more efficient. This acceleration of travel time can be achieved through improving the infrastructure traversed by trains. This acceleration of travel time was achieved through several steps to improve infrastructure by Indonesian Railways and the Directorate General of Railways, Ministry of Transportation [20].

At the time of implementation, the services provided by PT Kereta Api Indonesia were intended for all train sets passing on the southern double-track railway route in Java. The Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train use the southern double-track railway route in Java and have almost the same characteristics: trains that serve economy class and executive class expeditions, high occupancy, and the same average speed [21]. In connection with the increase in service by PT Kereta Api Indonesia, the determination of tickets/tariffs needs to be reviewed if there is an increase in fare prices in the scenarios given to economy class and executive class trains consisting of the Wijayakusuma Train, Sancaka Train and also the Mutiara Selatan Train.

RESEARCH SIGNIFICANCE

This research aims to determine the value of Ability to Pay and Willingness to Pay for economy class and executive class train service users consisting of the Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train on the Surabaya-Yogyakarta route. Apart from that, the benefits of this research can be a reference for the Directorate General of Railways and PT Kereta Api Indonesia (Persero) in planning to determine the value of train fares, especially on the Surabaya-Yogyakarta route (Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train).

METHODOLOGY

This research focuses on "Analysis of Passenger Ability to Pay (ATP) and Willingness to Pay (WTP) for the Surabaya-Yogyakarta Train Route (Case Study: Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train)." Regional development is marked by increased population activity and mobility, resulting in greater transportation demand. Trains, as an efficient public transportation option, are expected to help manage travel both within and between cities. Since September 24, 2021, PT Kereta Api Indonesia has enhanced its services by shortening travel times for several trains on the southern route, including the Wijayakusuma, Sancaka, and Mutiara Selatan trains. In light of this service improvement, a fare evaluation may be necessary if ticket prices for these trains are adjusted.

A. IDENTIFICATION PROBLEM

The development of an area is characterized by diversity, increased activity, and movement of its inhabitants. The high increase in activity is directly proportional to the high demand for transportation. The provision of facilities and infrastructure in question is not only in terms of quantity but is also followed by quality in line with the increasing technological advances today. One form of transportation that is expected to reduce the number of attractions and travel generation within the city and outside the city is public transportation. Trains are an effective and efficient rail-based land transportation mode. This is proven by its carrying capacity, both in the form of people and goods, which is greater than other land transportation modes. Likewise, train fuel consumption is relatively more economical compared to other land transportation modes. PT Kereta Api Indonesia has accelerated travel times for several trains using the southern double-track railway route in Java since September 24, 2021, as an improvement of their services. At the time of implementation, the increase in services provided by PT Kereta Api Indonesia was intended for all trains using the southern route. The Wijayakusuma Train, Sancaka Train, and also the Mutiara Selatan Train are trains that use the southern route and have almost the

same train characteristics, namely trains that serve economy class and executive class travel, high occupancy, and the same average speed. In connection with the increase in service by PT Kereta Api Indonesia, the determination of tickets/fares needs to be re-evaluated if there is an increase in ticket prices/fares for the Wijayakusuma Train, Sancaka Train, and also Mutiara Selatan Train.

B. DATA COLLECTION

The data needed in the analysis of Passenger Ability to Pay (ATP) and Willingness to Pay (WTP) for the Surabaya-Yogyakarta Train Route (Case Study: KA Wijayakusuma, Ka Sancaka, and KA Mutiara Selatan) is as follows.

The sample is part of several characteristics possessed by the population used for research. The sampling used in this research is [13] in Stated Preference Techniques, A Guide to Practice. So this research took a total sample of 522 respondents consisting of 269 economy class train service users and 253 executive class respondents.

Primary data was obtained by distributing questionnaires through interviews with respondents who used train services. The contents of the questionnaire are divided into 3 parts, namely: respondent characteristics, Ability to Pay, Willingness to Pay, and probability of willingness to pay.

This questionnaire was created to determine the characteristics of respondents who were passengers on the Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train by asking about age, gender, occupation, monthly income, number of dependents, the origin of the trip, the purpose of the trip, purpose of the trip, cost of one trip, time travel 1 time, frequency of travel.

According to research [18] it refers to a person's ability to pay for the transportation services they use based on their ideal income level. The ability of the community to pay the costs of the trip they make. Several factors that influence Ability to Pay (ATP) are as follows:

1. Large income.
2. Transportation needs.
3. Total transportation costs.
4. Travel intensity.
5. Total expenses per month.
6. Number of family members.

According to research [11] one of the factors that people consider when choosing a mode of transportation that suits their needs is travel costs or fares. The user's willingness to pay compensation for the services they obtain. Several factors influence Willingness to Pay (WTP) as follows:

1. User earnings.
2. Ideal tariff amount.
3. Quality and quantity of services provided by entrepreneurs.
4. User utility for public transportation.

According to research [22] it describes the relationship between fare, Ability to Pay (ATP), and Willingness to Pay (WTP), specifically highlighting that in practice, there is often a conflict between the level of Ability to Pay and Willingness to Pay when determining fares.

1. ATP > WTP
   This condition indicates that the Ability to Pay (ATP) is greater than the Willingness to Pay (WTP) for the service. This occurs when users have relatively high incomes but derive relatively low utility from the service. Users in this situation are referred to as "choice riders."
2. ATP < WTP
   This condition is the opposite of the previous one, where the user's Willingness to Pay (WTP) for the service is greater than their Ability to Pay (ATP). This situation can occur for users with relatively low incomes but very high utility from the service, meaning their willingness to pay is more influenced by the utility they derive from it. In this condition, users are referred to as "captive riders."
3. ATP = WTP
   This condition indicates that the Ability to Pay (ATP) and Willingness to Pay (WTP) for the service are equal. In this situation, there is a balance between the user's utility from the service and the cost incurred to pay for it.

When reviewing the ATP and WTP parameters, user aspects are considered as the basis for determining the applicable fare values the following principles:

a. ATP is a function of the ability to pay, so the applied fare should, as much as possible, not exceed the ATP value for the target group. Government intervention, whether in the form of direct or cross-subsidies or other forms of government support, may be needed when the fare value exceeds ATP. This intervention ensures that the fare is adjusted to match the ATP value.
b. WTP is a function of the level of public transportation service. If WTP is still below ATP, it is possible to increase the fare value with improvements in service performance.

C. DATA ANALYSIS

After all the data in this research was collected. The data analysis was carried out using methods such as the following:

✓ Analysis of Passenger Characteristics

Analysis of the characteristics of passengers on the Wijayakusuma Train, Sancaka Train, and Mutiara Selatan Train will be carried out using descriptive statistical methods. Descriptive statistics are methods related to the collection and presentation of a set of data to provide useful information in the form of an overview of the percentage value of each passenger characteristic.

✓ Ability to Pay Analysis

The Ability to Pay analysis obtained from the survey results will be processed using the Household Budget method which is based on considering income, transportation needs, cost allocation, and travel intensity. Then the results of the analysis and data processing will be presented in diagram form.

✓ Willingness to Pay Analysis

The Willingness to Pay analysis uses a method based on service users' perceptions of the rates for the services they have received, such as quality, quantity of services,

and user utility. The results of analysis and data processing will be presented in diagram form.

RESULTS AND DISCUSSIONS

This chapter will discuss the analysis and research results of the data obtained. This analysis includes respondent characteristics, Ability to Pay, and Willingness to Pay.

A. ANALYSIS OF RESPONDENT CHARACTERISTICS

There are 2 types of characteristics, Economic Class and Executive Class characteristics, and for analysis of respondent characteristics consisting of age, gender, occupation, monthly income, number of members, frequency of travel, travel time, origin of travel, purpose of travel, purpose of travel, frequent transportation used for travel, expenses for one trip, and other things. To determine the characteristics of respondents who use Surabaya-Yogyakarta train services, a Descriptive Analysis was carried out. Data on respondent characteristics from Tabel 1 until Tabel 18:

Table 1 Percentage of Age Respondent Characteristics

Age	Economic	Executive
Less than 17 Years Old	0,4%	0,8%
18 - 25 Years Old	48,0%	38,3%
26 - 40 Years Old	46,1%	48,2%
More than 41 Years Old	5,6%	12,6%
Total	100%	100%

Based on Table 1 for the Age Characteristics of the Economic Class, the majority of respondents are 26 - 40 years old with a percentage of 46,1% and for the Executive Class, the majority of respondents are 26 - 40 years old with a percentage of 48,2%.

Table 2 Percentage of Respondent Characteristics Gender

Gender	Economic	Executive
Man	42,4%	45,5%
Women	57,6%	54,5%
Total	100%	100%

Based on Table 2 for the Gender Characteristics of the Economic Class, the majority of respondents are Women with a percentage of 57,6% and for the Executive Class, the majority of respondents are Women with a percentage of 54,5%.

Table 3 Percentage of Respondents' Characteristics by Job Frequency

Job Frequency	Economic	Executive
Not yet working	1,5%	0,8%
Civil servants/TNI/Polri	7,4%	13,4%
BUMN/Private Employees	39,4%	37,5%
Self-employed	10,8%	14,2%
Student/Students	31,2%	25,7%
Retired	0,4%	0,8%
Housewife	9,3%	7,5%
Total	100%	100%

Based on Table 3 for Economic Class Job Characteristics, the majority of respondents are BUMN/Private Employees with a percentage of 39,4% and for the Executive Class, the majority of respondents are BUMN/Private Employees with a percentage of 37,5%.

Table 4 Percentage of Respondents' Characteristics with Monthly Income

Monthly Income	Economic	Executive
Have no income yet	20,4%	15,4%
Less than IDR 1.500.000	7,8%	5,9%
IDR 1.500.001-IDR 2.500.000	8,9%	8,7%
IDR 2.500.001-IDR 3.500.000	11,2%	11,1%
IDR 3.500.001-IDR 4.500.000	18,2%	10,7%
IDR 4.500.001-IDR 5.500.000	11,2%	12,3%
IDR 5.500.001-IDR 6.500.000	5,2%	9,9%
IDR 6.500.001-IDR 7.500.000	7,4%	9,9%
More than IDR 7.500.001	9,7%	16,2%
Total	100%	100%

Based on Table 4 for the monthly income characteristics of the Economic Class, the majority of respondents have no income with a percentage of 20,4% and for the Executive Class, the majority of respondents are more than IDR 7.500.001 with a percentage of 16,2%.

Table 5 Percentage of Respondents' Characteristics by Number of Dependents

Dependent Family Members	Economic	Executive
There isn't any	43,9%	40,7%
1	14,5%	12,3%
2	19,3%	20,2%
More than 3	22,3%	26,9%
Total	100%	100%

Based on Table 5 For the characteristics of the number of family members covered by the Economic Class, the majority of respondents are None with a percentage of 43,9% and for the Executive Class, the majority of respondents are None with a percentage of 40,7%.

Table 6 Percentage of Respondents' Characteristics Using the Train

Trains	Economic	Executive
Sancaka Railway	34,9%	33,6%
Wijayakusuma Railway	33,1%	32,0%
Mutiara Selatan Railway	32,0%	34,4%
Total	100%	100%

Based on Table 6 for the characteristics of the trains used by the Economy Class, the majority of respondents are the Sancaka Train with a percentage of 34,9% and for the Executive Class, the majority of respondents are the Mutiara Selatan Train with a percentage of 34,4%.

Table 7 Percentage of Respondents' Characteristics Reasons for Using Trains

Reasons for Using Trains	Economic	Executive
Cheaper	29,7%	6,3%
Faster	21,2%	26,5%
More comfortable	39,0%	54,9%
Safer	10,0%	12,3%
Total	100%	100%

Based on Table 7 for the Characteristics of Reasons for Using Economy Class Trains, the majority of respondents were More Comfortable with a percentage of 39,0% and for Executive Class, the majority of respondents were More Comfortable with a percentage of 54,9%.

Table 8 Percentage of Respondents' Characteristics by Travel Origin

Travel Origin Respondent	Economic	Executive
City of Surabaya	61,3%	48,2%
City of Yogyakarta	12,3%	18,2%
Regency Nganjuk	3,0%	4,0%
City of Mojokerto	8,6%	11,5%
City of Madiun	5,6%	5,5%
City of Solo	5,6%	7,9%
Regency Jombang	3,7%	4,7%
Total	100%	100%

Based on Table 8 for the Travel Origin Characteristics for Economy Class, the majority of respondents were the City of Surabaya with a percentage of 61,3% and for Executive Class, the majority of respondents were the City of Surabaya with a percentage of 48,2%.

Table 9 Percentage of Respondents' Characteristics by Travel Destination

Travel Purpose	Economic	Executive
City of Surabaya	14,5%	18,2%
City of Yogyakarta	41,6%	39,9%
Regency Nganjuk	5,6%	5,5%
City of Mojokerto	8,2%	5,5%
City of Madiun	10,4%	11,5%
City of Solo	13,4%	15,0%
Regency Jombang	6,3%	4,3%
Total	100%	100%

Based on Table 9 for Travel Destination Characteristics for Economy Class, the majority of respondents were Yogyakarta City with a percentage of 41,6% and for Executive Class, the majority of respondents were Yogyakarta City with a percentage of 39,9%.

Table 10 Percentage of Respondents' Characteristics Travel Intent

Travel Intent	Economic	Executive
Work	9,3%	17,8%
School/College	13,8%	12,6%
Business	11,2%	15,0%
Holiday	34,2%	34,0%
Homecoming	30,5%	20,2%
Other	1,1%	0,4%
Total	100%	100%

Based on Table 10 for the Economy Class Travel Intent Characteristics, the majority of respondents were Holiday with a percentage of 34,2% and for Executive Class, the majority of respondents were Holiday with a percentage of 34,0%.

Table 11 Percentage of Respondents' Characteristics of Transportation Frequently Used for Travel

Transportation Frequently Used for Travel	Economic	Executive
Train	45,0%	43,1%
Car	17,1%	31,2%
Motorcycle	29,4%	19,0%
Bus	6,3%	2,8%
Aircraft	2,2%	1,2%
Other	0,0%	2,8%
Total	100%	100%

Based on Table 11 for the characteristics of transportation frequently used for economy class travel, the majority of respondents are trains with a percentage of 45,0% and for Executive Class, the majority of respondents are trains with a percentage of 43,1%.

Table 12 Percentage of Characteristics of Cost Respondents' in 1 Trip (Round-Return)

Cost of 1 trip	Economic	Executive
Less than IDR 250.000	39,4%	24,5%
IDR250.001-IDR 750.000	58,0%	65,2%
IDR750.001-IDR 1.250.000	2,6%	7,1%
IDR1.250.001-IDR1.750.000	0,0%	2,4%
More than IDR 1.750.001	0,0%	0,8%
Total	100%	100%

Based on Table 12 for cost characteristics for 1 trip (round trip) for Economy Class, the majority of respondents were IDR 250.001 - IDR 750.000 with a percentage of 58,0% and for Executive Class, the majority of respondents were IDR 250.001 - IDR 750.000 with a percentage of 65,2%.

Table 13 Percentage of Respondents' Characteristics Travel Time in 1 Trip (Round-trip)

Travel Time in 1 Trip (Round-trip)	Economic	Executive
Less than 2 hours	10,8%	20,2%
2 hours 1 minute - 5 hours	47,6%	42,7%
5 hours 1 minute - 8 hours	24,2%	28,1%
8 hours 1 minute - 11 hours	11,9%	5,9%
More than 11 hours 1 minute	5,6%	3,2%
Total	100%	100%

Based on Table 13 for the characteristics of travel time in 1 trip (round trip) for Economy Class, the majority of respondents were 2 hours 1 minute - 5 hours with a percentage of 47,6% and for Executive Class, the majority of respondents were 2 hours 1 minute - 5 hours with a percentage of 42,7 %.

Table 14 Percentage of Respondents' Characteristics Frequency of Traveling per Month

Travel frequency	Economic	Executive
1-2 times/month	90,7%	81,0%
3-4 times/month	9,3%	16,6%
5-6 times/month	0,0%	1,6%
More than 6 times/month	0,0%	0,8%
Total	100%	100%

Based on Table 14 for the characteristics of frequency of travel per month for Economy Class, the majority of respondents are 1-2 times/month with a percentage of 90,7% and for Executive Class, the majority of respondents are 1-2 times/month with a percentage of 81,0%.

Table 15 Percentage of Respondents' Characteristics Costs incurred for One Trip to the Station

Travel to the station	Economic	Executive
Less than IDR 25.000	29,0%	30,8%
IDR 25.001-IDR 75.000	56,5%	38,3%
IDR 75.00-IDR 125.000	6,7%	19,4%
IDR 125.001-IDR 175.000	4,1%	5,5%
More than IDR 175.001	3,7%	5,9%
Total	100%	100%

Based on Table 15 for the characteristics of the costs you incur for one trip to the station for Economy Class, the majority of respondents are IDR 25.001 - IDR 75.000 with a percentage of 56,5% and for Executive Class, the

majority of respondents are IDR 25.001 - IDR 75.000 with a percentage of 38,3%.

Table 16 Percentage of Respondents' Characteristics Allocate funds for transportation costs per month

Transportation costs per month	Economic	Executive
Less than IDR 250.000	14,9%	6,7%
IDR 250.001-IDR 750.000	81,4%	80,6%
IDR 750.000-IDR 1.250.000	2,6%	9,5%
IDR 1.250.001-IDR 1.750.000	1,1%	2,4%
More than IDR 1.750.001	0,0%	0,8%
Total	100%	100%

Based on Table 16 for the characteristics of allocating funds for monthly transportation costs for Economy Class, the majority of respondents are IDR 250.001 - IDR 750.000 with a percentage of 81,4% and for Executive Class, the majority of respondents are IDR 250.001 - IDR 750.000 with a percentage of 80,6%.

Table 17 Percentage of Respondents' Characteristics Allocate funds for travel costs per month

Travel costs per month	Economic	Executive
Less than IDR 250.000	37,5%	24,5%
IDR 250.001-IDR 750.000	59,9%	64,8%
IDR 750.000-IDR 1.250.000	2,2%	7,5%
IDR 1.250.001-IDR 1.750.000	0,4%	2,4%
More than IDR 1.750.001	0,0%	0,8%
Total	100%	100%

Based on Table 17 for Characteristics, allocate funds for travel costs per month for Economy Class, the majority of respondents are IDR 250.001 - IDR 750.000 with a percentage of 59,9% and for Executive Class, the majority of respondents are IDR 250.001 - IDR 750.000 with a percentage of 64,8%.

Table 18 Percentage of Respondents' Characteristics Ideal Tarif for Trains

Ideal Tariff for Trains	Economic	Executive
Less than IDR 250.000	61,7%	56,1%
IDR 250.001-IDR 750.000	38,3%	43,1%
IDR 750.000-IDR 1.250.000	0,0%	0,8%
IDR 1.250.001-IDR 1.750.000	0,0%	0,0%
More than IDR 1.750.001	0,0%	0,0%
Total	100%	100%

Based on Table 18 for the characteristics of the ideal fare for the train you use if there is an increase in economy class services, the majority of respondents are less than IDR 250.000 with a percentage of 61,7% and for the Executive Class, the majority of respondents were Less than IDR 250.000 with a percentage of 56,1%.

Overall, there are many similarities in characteristics between economy and executive class train users, especially in preferences such as age, gender, occupation, number of members, reasons for using the train, travel origin, and ideal fare. However, there are differences in the characteristics between the economy and executive classes, specifically in the monthly income of train passengers in the economy and executive classes.

B. ABILITY TO PAY (ATP) AND WILLINGNESS TO PAY (WTP)

The Ability to Pay value is obtained based on the value of the respondent's income, allocation of transportation funds per month, percentage of allocation for travel costs, allocation of funds for travel per month, percentage of allocation of funds for one trip to the station, and frequency of travel. The results of the calculation analysis for the Ability to Pay value reveal the minimum and maximum values. The Willingness to Pay value is obtained based on the respondent's perception. The following are the results of the Ability to Pay value for economy class trains and executive class trains below:

✓ Analysis of Ability To Pay (ATP) of Economy Class Trains

The average ATP value obtained for economy class trains consisting of Sancaka Railway, Wijayakusuma Railway, and Mutiara Selatan Railway is IDR 307.249. With the largest ATP value of IDR 1.300.000 and the lowest ATP value is IDR 33.333. And the ATP value is in Table 19.

Table 19 Percentage of Ability to Pay Value for Economy Class Trains

ATP	Amount	%	Cumulative %
33.333,33	6	2,2%	100,0%
66.666,67	6	2,2%	97,8%
100.000,00	28	10,4%	95,5%
133.333,33	5	1,9%	85,1%
150.000,00	1	0,4%	83,3%
166.666,67	2	0,7%	82,9%
200.000,00	65	24,2%	82,2%
300.000,00	72	26,8%	58,0%
400.000,00	38	14,1%	31,2%
500.000,00	27	10,0%	17,1%
600.000,00	10	3,7%	7,1%
700.000,00	3	1,1%	3,3%
900.000,00	2	0,7%	2,2%
1.200.000,00	3	1,1%	1,5%
1.300.000,00	1	0,4%	0,4%

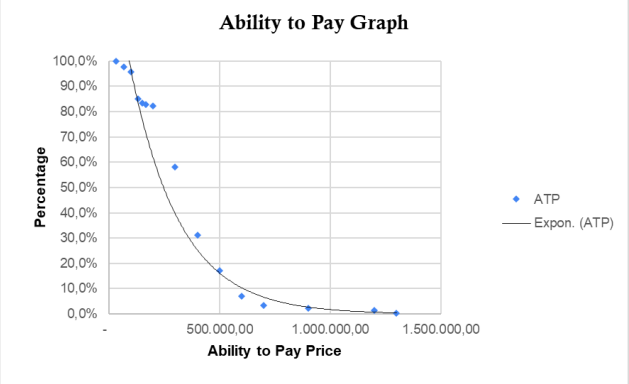

Figure 1 Economy Class Ability to Pay Chart

Based on the table above, it is known that there are 3 ATP values with the largest number of respondents assessed ATP IDR 300.000 with a cumulative percentage of 58,0% as many as 72 respondents, then assessed ATP IDR 200.000 with a cumulative rate of 82,2% as many as 65 respondents, and ATP value IDR 400.000 with a cumulative percentage of 31,2% as many as 38 respondents. The relationship between the Ability to Pay price value and the rate of respondents can be seen in Figure 1.

Based on the image above, the percentage of respondents is inversely proportional to the value of Ability to Pay, which means that the higher the price of ability to pay, the lower the percentage of respondents' ability to pay.

✓ Analysis of Willingness to Pay (WTP) for Economy Class Trains

The average WTP value for economy class trains consisting of Sancaka Railway, Wijayakusuma Railway, and Mutiara Selatan obtained is IDR 250.593. With the largest WTP value of IDR 700.000 and the lowest WTP value is IDR 10.000. And the WTP value is in Table 20.

Table 20 Percentage of Willingness to Pay (WTP) Value for Economy Class Trains

WTP	Amount	%	Cumulative %
10.000,00	1	0,4%	100,0%
14.500,00	1	0,4%	99,6%
30.000,00	1	0,4%	99,3%
40.000,00	1	0,4%	98,9%
50.000,00	2	0,7%	98,5%
75.000,00	1	0,4%	97,8%
90.000,00	1	0,4%	97,4%
100.000,00	4	1,5%	97,0%
120.000,00	1	0,4%	95,5%
130.000,00	1	0,4%	95,2%
140.000,00	1	0,4%	94,8%
145.000,00	1	0,4%	94,4%
150.000,00	31	11,5%	94,1%
160.000,00	2	0,7%	82,5%
170.000,00	2	0,7%	81,8%
175.000,00	2	0,7%	81,0%
180.000,00	5	1,9%	80,3%
185.000,00	1	0,4%	78,4%
190.000,00	2	0,7%	78,1%
200.000,00	44	16,4%	77,3%
210.000,00	1	0,4%	61,0%
220.000,00	5	1,9%	60,6%
225.000,00	1	0,4%	58,7%
230.000,00	2	0,7%	58,4%
235.000,00	1	0,4%	57,6%
240.000,00	2	0,7%	57,2%
250.000,00	49	18,2%	56,5%
260.000,00	2	0,7%	38,3%
270.000,00	3	1,1%	37,5%
275.000,00	1	0,4%	36,4%
280.000,00	5	1,9%	36,1%
300.000,00	51	19,0%	34,2%
350.000,00	14	5,2%	15,2%
375.000,00	1	0,4%	10,0%
400.000,00	14	5,2%	9,7%
450.000,00	4	1,5%	4,5%
500.000,00	6	2,2%	3,0%
550.000,00	1	0,4%	0,7%
700.000,00	1	0,4%	0,4%

Based on the table above, it is known that there are 2 WTP values with the largest number of respondents assessed WTP IDR 200.000 with a cumulative percentage of 85,8% as many as 54 respondents, then assessed WTP IDR 250.000 with a cumulative rate of 62,5% as many as 47 respondents. The relationship between the Willingness to Pay price value and the percentage of respondents can be seen in Figure 2.

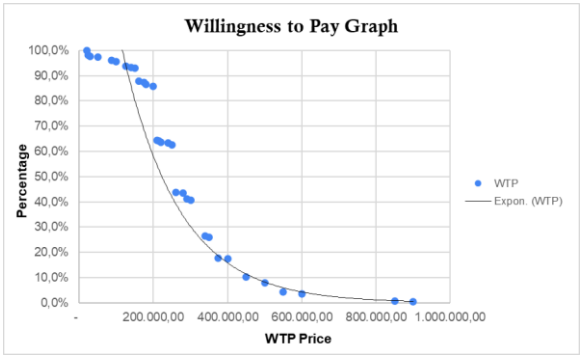

Figure 2 Economy Class Willingness to Pay Graph

Based on the image above, the percentage of respondents is inversely proportional to the value of Willingness to Pay, which means that the higher the willingness to pay, the lower the percentage of respondents' willingness to pay.

Based on the analysis of respondents' Ability to Pay (ATP) and Willingness to Pay (WTP) values, it can be seen that ATP is greater than WTP. From the average calculation results, the average ATP is Rp. 307,249 and the average WTP is Rp. 250,593. These values are above the ticket fare of Rp. 170,000. The ATP-WTP relationship obtained from this study aligns with the fare determination range based on ATP-WTP, where the train ticket fare is far below both ATP and WTP. This provides flexibility in proposing a new fare with improved service levels. This ATP-WTP relationship falls into the category where ATP > WTP, indicating that users have relatively high incomes but derive relatively low utility from the service. Users in this condition are referred to as "choice riders."

✓ Analysis of Ability To Pay (ATP) of Executive Class Trains

The average ATP value obtained for economy class trains consisting of Sancaka Railway, Wijayakusuma Railway, and Mutiara Selatan is IDR 396.943. With the largest ATP value of IDR 1900.000 and the lowest ATP value is IDR 33.333. And the ATP value is in Table 21.

Based on the table 21, it is known that there are 3 ATP values with the largest number of respondents assessed ATP IDR 200.000 with a cumulative percentage of 80,2% as many as 41 respondents, then assessed ATP IDR 400.000 with a cumulative percentage of 49,4% as many as respondents, and ATP value IDR 300.000 with a cumulative rate of 63,2% as many as 34 respondents. The relationship between the Ability to Pay price value and the percentage of respondents can be seen in Figure 4.

Based on the Figure 4, the percentage of respondents is inversely proportional to the value of Ability to Pay, which means that the higher the ability to pay, the lower the percentage of respondents' ability to pay.

Table 21 Percentage of Ability to Pay (ATP) Value for Executive Class Trains

ATP	Amount	%	Cumulative %
33.333,33	6	2,4%	100,0%
40.000,00	1	0,4%	97,6%
66.666,67	7	2,8%	97,2%
100.000,00	25	9,9%	94,5%
120.000,00	1	0,4%	84,6%
133.333,33	4	1,6%	84,2%
166.666,67	6	2,4%	82,6%
200.000,00	41	16,2%	80,2%
233.333,33	1	0,4%	64,0%
266.666,67	1	0,4%	63,6%
300.000,00	34	13,4%	63,2%
366.666,67	1	0,4%	49,8%
400.000,00	40	15,8%	49,4%
500.000,00	26	10,3%	33,6%
566.666,67	1	0,4%	23,3%
600.000,00	27	10,7%	22,9%
633.333,33	1	0,4%	12,3%
700.000,00	7	2,8%	11,9%
800.000,00	7	2,8%	9,1%
900.000,00	4	1,6%	6,3%
1.100.000,00	5	2,0%	4,7%
1.200.000,00	1	0,4%	2,8%
1.400.000,00	4	1,6%	2,4%
1.600.000,00	1	0,4%	0,8%
1.900.000,00	1	0.,4%	0,8%

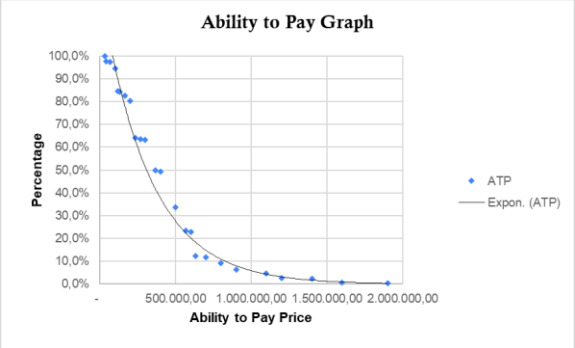

Figure 4 Executive Class Ability to Pay Chart

✓ Analysis of Willingness to Pay (WTP) for Executive Class Trains

The average WTP value for executive class trains consisting of Sancaka Railway, Wijayakusuma Railway, and Mutiara Selatan obtained is IDR 277.462. With the largest WTP value of IDR 900.000 and the lowest WTP value is IDR 20.000. And the WTP value is in Table 22.

Based on the table above, it is known that there are 2 WTP values with the largest number of respondents assessed WTP IDR 300.000 with a cumulative percentage of 34,2% as many as 51 respondents, then assessed WTP IDR 250.000 with a cumulative rate of 56,5% as many as 49 respondents. The relationship between the Willingness to Pay price value and the percentage of respondents can be seen in Figure 5.

Based on the image, the percentage of respondents is inversely proportional to the value of Willingness to Pay, which means that the higher the willingness to pay, the lower the percentage of respondents' willingness to pay.

Based on the analysis of respondents' Ability to Pay (ATP) and Willingness to Pay (WTP) values, it can be seen that ATP is greater than WTP. From the average calculation results, the average ATP is Rp. 396,943 and the average WTP is Rp. 277,462. These values are above the ticket fare of Rp. 220,000. The ATP-WTP relationship obtained from this study aligns with the fare determination range based on ATP-WTP, where the train ticket fare is far below both ATP and WTP. This provides flexibility in proposing a new fare with improved service levels. This ATP-WTP relationship falls into the category where ATP>WTP, indicating that users have relatively high incomes but derive relatively low utility from the service. Users in this condition are referred to as "choice riders."

Table 22 Percentage of Willingness to Pay (WTP) Value for Executive Class Trains

WTP	Amount	%	Cumulative %
20.000,00	5	2,0%	100,0%
25.000,00	1	0,4%	98,0%
30.000,00	1	0,4%	97,6%
50.000,00	3	1,2%	97,2%
88.000,00	1	0,4%	96,0%
100.000,00	5	2,0%	95,7%
125.000,00	1	0,4%	93,7%
140.000,00	1	0,4%	93,3%
150.000,00	13	5,1%	92,9%
160.000,00	1	0,4%	87,7%
175.000,00	2	0,8%	87,4%
180.000,00	2	0,8%	86,6%
200.000,00	54	21,3%	85,8%
210.000,00	1	0,4%	64,4%
215.000,00	1	0,4%	64,0%
220.000,00	1	0,4%	63,6%
240.000,00	2	0,8%	63,2%
250.000,00	47	18,6%	62,5%
260.000,00	1	0,4%	43,9%
280.000,00	6	2,4%	43,5%
290.000,00	1	0,4%	41,1%
300.000,00	36	14,2%	40,7%
340.000,00	1	0,4%	26,5%
350.000,00	21	8,3%	26,1%
375.000,00	1	0,4%	17,8%
400.000,00	18	7,1%	17,4%
450.000,00	6	2,4%	10,3%
500.000,00	9	3,6%	7,9%
550.000,00	2	0,8%	4,3%
600.000,00	7	2,8%	3,6%
850.000,00	1	0,4%	0,8%
900.000,00	1	0,4%	0,4%

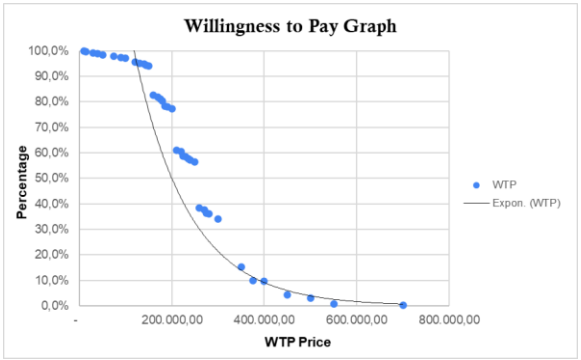

Figure 5 Executive Class Willingness to Pay Chart

CONCLUSIONS

It can be concluded that several characteristic variables are used to calculate the ability to pay (ATP) value and the willingness to pay (WTP) value. The variables used include the monthly income variable, variable reasons for using trains, frequency of trips per month, allocated funds for one trip to the station, allocated funds for transportation costs per month, allocated funds for monthly travel costs, and the ideal train fare. Use it if there is a service improvement. The calculation results for the economy class show that the Ability To Pay (ATP) value is IDR 307.249 and the Willingness To Pay (WTP) value is IDR 250.593. Meanwhile, for the executive class, the Ability To Pay (ATP) value is IDR. 396.943 and a Willingness To Pay (WTP) value of IDR 277.462.

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REFERENCES

[1] Papacostas.C.S, and P. P. . (2005). Transportation Engineering and Planning. Singapore: Pearson/Prentice Hall. Universitas Indonesia
[2] Nasution, M. N. (2008). Manajemen Transportasi.
[3] Sonhaji, A. I. (2023). Profil Perkembangan Kependudukan Kota Surabaya 2021. Profil Perkembangan Kependudukan Kota Surabaya 2021, 3(1), 1–86.
[4] Badan Pusat Statistik Surabaya. (2021). Kota Surabaya Dalam Angka (Surabaya Municipality In Figures) 2021. BPS Kota Surabaya, 1–290.
[5] Harjana. (2021). Kota Yogyakarta Dalam Angka 2021. In BPS Kota Yogyakarta. https://jogjakota.bps.go.id/publication/2021/02/26/4c85e0454525ceebd064473a/kota-yogyakarta-dalam-angka-2021.html
[6] Andriansyah. (2015). Manajemen Transportasi Dalam Kajian dan Teori.
[7] Salim, H. A. A. (1993). Manajemen Transportasi.
[8] Bruton, M. J. (1985). Introduction to Transportation Planning. Routledge. https://doi.org/10.4324/9781003155690
[9] Faisal. (2015). Analisis Pemilihan Moda Angkutan Penumpang Antara Kereta Api Dan Bus/Minibus Studi Kasus : Rute Lhokseumawe-Banda Aceh.
[10] Tamin, O. Z. (2000). Perencanaan dan Pemodelan Transportasi. In Perencanaan dan pemodelan transportasi.
[11] Permata. (2012). Analisis Ability To Pay Dan Willingness To Pay Pengguna Jasa Kereta Api Bandara Soekarno Hatta-Manggarai.
[12] Valero, M. F., Arencibia, A. I., & Román, C. (2016). Analyzing discrepancies between willingness to pay and willingness to accept for freight transport attributes. Transportation Research Part E, 151-164.
[13] Pelayanan, Kinerja. 2002. "(A Study on Service Performance and Tariff of Ketapang and Gilimanuk Ferry Ports) Aulia Rizki Fauzi, M. Arief Munandar, Achmad Wicaksono, Rahayu Kusumaningrum Jurusan Teknik Sipil Teknik Universitas Brawijaya Jalan Mayjen Haryono 167 Malang 65145-Te."
[14] Washington, S. K., & Mannering, F. (2003). Statistical and Econometric Methods for Transportation Data Analysis, Chapman & Hall, USA.
[15] Hess, S., Rose, J. M., & Hensher, D. A. (2008). Asymmetric preference formation in willingness to pay estimates in discrete choice models. Transportation Research Part E, 847 - 863.
[16] Sugiyono. (2013). Metodologi Penelitian Kuantitatif, Kualitatif dan R & D.
[17] Nyga, A., Minnich, A., & Schlüter, J. (2020). The effects of susceptibility, eco-friendliness and dependence on the Consumers' Willingness to Pay for a door-to-door DRT system. Transportation Research Part A, 540-558.
[18] Winaya, A., Caroline, J., Adhi, I. T., & Surabaya, T. (2019). Analisis Tarif Kereta Komuter Surabaya-Porong Ditinjau Dari Kemampuan Dan Kemauan Membayar (Atp Dan Wtp) Pengguna Jasa.
[19] Rachmadi. (2009). Keunggulan Moda Kereta Api.
[20] Persero, K. A. I. (2021). Percepatan Waktu Tempuh KA sebagai Peningkatan Pelayanan KAI. https://www.kai.id/information/full_news/5098-percepatan-waktu-tempuh-ka-sebagai-peningkatan-pelayanan-kai
[21] Pearmain, D dan Swason, J. (1991). Stated Preference Techniques: A Guide to Practice, Steer Devies. Gleave anda Haque Consulting Grup.
[22] Tamin, dkk., (1999). Evaluasi Tarif Angkutan Umum dan Ability to Pay (ATP) dan Willingness to Pay (WTP) Di DKI Jakarta.