

# If there is an easier way, why choose the hard way? (Case Study on the Ticketing Usage at Bogor Station)

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**Abstract**—PT. Jabodetabek Commuter Line continuous to push passengers still using Tiket Harian Berjaminan (THB) for Jabodetabek train (KRL passengers) to switch to Multitrip Card (KMT), which is more practical and efficient. However, in 2016, there were still 42% of KRL passengers who used the THB system. It is hypothesized that to obtain KMT ticket, passengers must purchase it at a relatively expensive cost of IDR 50.000 (KMT price is IDR 20.000, and the balance of the card is IDR 30.000). In addition, the provision of settling the minimum balance on the KMT of IDR 13.000, is also considered another factor that appears to make passengers more reluctant to use KMT. This study aims to analyze the policies that can encourage KRL passengers who are using THB to switch to KMT. Two policies (i.e., giving KMT for free and discounting KMT price by 50%) have been conducted by using an experimental economics study of 100 KRL passengers at Bogor station. The empirical results indicate that the policy of discounting KMT prices by 50% and giving the KMT card for free will encourage KRL passengers to use KMT effectively. However, providing KMT card free of charge will make passengers disrespect the KMT.

**Keywords**—train, ticketing system, THB card, MultiTrip card

## I. INTRODUCTION

The modernization of the Jabodetabek Commuter Line Railway (KRL-CL) ticket system that uses e-ticketing was started in 2013. Currently, there are two types of e-ticketing systems in KRL-CL, they are multitrip e-ticketing and e-money (KMT and e-Money) and guaranteed daily tickets or Tiket Harian Berjaminan (THB) using a card. Multitrip and e-money cards are refillable prepaid cards that can be used by passengers as KRL tickets with a minimum balance requirement. Passengers only need to tap the card to entry and exit the station. Meanwhile, a guaranteed daily ticket (THB) is a card for KRL-CL passengers without subscription tickets. The calculation of the tariff is in accordance with a single trip tariff scheme, but passengers are required to pay a THB deposit of IDR 10.000. The deposit can be redeemed at the destination station within 7 days or with a new THB by paying the rate for the next journey. Unlike multitrip and e-money cards, passengers using THB cards cannot get off at any station except the determined at the start.

THB is actually provided for KRL-CL passengers who do not use KRL-CL routinely. In contrast, for those who do use it frequently it will be more efficient if they switch to multitrip or e-money card. The authors have observed that many KRL-CL passengers still use THB cards even though

they are routine KRL passengers. Unfortunately using THB is quite inconvenient because the passenger must queue twice for every trip. In addition, THB may only be used for certain purposes and must be redeemed at the destination station.

The fact that there are still many routine KRL-CL passengers using a THB card proposes the questions (1) what kind of passenger characteristics are using KRL-CL THB, (2) why they still use THB, which inefficient as compared to Multitrip Card or e-money and (3) how to encourage them to switch to the Multitrip Card system. If passengers can be encouraged to use Multitrip Cards, the e-ticketing system applied by KAI Commuter Jabodetabek (KCJ) will be much more efficient. It will also be more practical for passengers in transit with KRL-CL.

This study aims to analyze why routine KRL-CL passengers still use THB rather than switching to the use of Multitrip Cards. There is also an attempt to analyze how to encourage THB users to switch their preferences. To obtain KMT, it was hypothesized that passengers must purchase it at a relatively expensive price of IDR 50.000 (KMT price are IDR 20.000 and the balance contained on it is IDR 30.000). In addition, the provision of settling money or minimum balance amount IDR 13.000 in the KMT is also a factor that makes passengers reluctant to use KMT. Meanwhile, queuing and the impractical usage of THB does not appear to encourage THB users to use KMT.

The empirical results of this study can be used in providing input to the KRL-CL e-ticketing management so that the KRL-CL e-ticketing system can increase its efficiency and passengers become more practical and comfortable in their use of KRL-CL.

## II. LITERATURE REVIEW

### A. E-Ticketing

Mohamed Mezghani [1] in his research on Electronic Ticketing in Public Transport, argued that e-ticketing is not only a payment system, but can be applied to facilitate the use of public transportation and simplify the management and operational control.

E-ticketing, in the context of travel agencies, according to Hopkin (2005, in Sulaiman et al., [2]) is an opportunity for cost savings as well as optimizing consumer convenience. In addition, e-ticketing can also reduce the cost of ticket processing, paper ticket savings and the flexibility of

customers and travel agents in terms of determining the schedule and transactions where schedule changes occur.

Currently, various countries are innovating e-ticketing technology to improve their mass transportation performance. For example, SUICA products from Japan, Hongkong's Octopus, Singapore's Ez-Link, T-Money from South Korea, USA's SmarTrip, Oyster from London, NAVIGO from France, Schwabisch Hall, and Rhein-Ruhr of Germany as well as Netherland's Chip Kaart [3]. The e-ticketing products in Indonesia include: E-Money, Brizzi, tapcash, and Flazz.

### B. Experimental Economics

Along with the development of this method of experimental economics, there emerged a theory an induced-value theory by Vernon Smith [4]. The basic idea of this theory is that the use of appropriate reward media allows experimenters or researchers to elicit certain characteristic economic actors and its innate characteristics become irrelevant. If the basic characteristics of economic actors (experimental units) are homogeneous then the researcher can conduct meaningful experiments because the basic principle of "environmental control" has been performed.

Friedman and Sunder [5] argue that experimental economics are conducted within a controlled environment. This economic environment consists of economic actors with the prevailing rules or institutions as a place of interaction between economic actors. They may be buyers or sellers, and the institutions may be a particular type of political market in the political sphere, the voters as perpetrators, and the majority rule as an institution.

## III. CONSUMER BEHAVIOR

Engel F James et al [6] define consumer behavior as a direct action involved in obtaining, consuming, and depleting products and services, including decision processes that precede and overcome these actions, while Kotler and Amstrong [7] define consumer behavior as a final consumer buying behavior for both individuals and households buying products for personal consumption.

Kotler and Kevin Lance [8] mentioned there are several factors that can influence consumer behavior, namely: a) cultural factors consisting of culture, sub culture, and social class; b) influencing social factors including reference groups, roles, and statuses; c) personal factors such as age, life cycle stage, occupation, economic condition, lifestyle, personality, and self-concept; and d) psychological factors such as motivation, perception, learning, beliefs, and attitudes, by considering all above mentioned factors how to turn buyers to consumers and how to serve the consumer more effectively can be indicated.

## IV. METHODOLOGY

### A. Research Sites

To address research questions, the authors conducted reviewed case studies at Bogor station. This station was chosen because it was a frequent destination of travelers and also for the queuing at the THB counter at Bogor station. In addition, the number of commuters at Bogor station reached 90 to 100 thousand people per day in 2017 weekdays, whereas on weekends it dropped to 80 thousand per day [9].

Many people from Bogor who work in Jakarta and use KRL daily cause this station to be crowded daily.

### B. Data Collection and Generation Method

To answer why there are still many KRL-CL passengers using THB and to analyze how encouraging them to switch to KMT, this study uses experimental methods by applying the following stages:

- In the initial stage before the experiment, the researchers conducted a preliminary survey at Bogor station to observe the trend of THB usage at Bogor station on holidays and working days. This survey calculates the percentage of THB users and the frequency of trips per month for those still using THB. Interviews were also conducted with PT KRL - CL Jabodetabek management at the early stage and secondary data relating to KRL-CL was analyzed.
- Next, the researcher selected 100 passengers who use KRL-CL THB who were willing to be the subject of research and were asked to fill out a questionnaire designed to record demographic and provide socio-economic information.
- Of the 100 passengers using KRL-CL those willing to be the subject of this research filled out the questionnaire and were then grouped into three groups at random. Group 1 consisted of 20 participants, Group 2, and Group 3 each consisted of 40.
- An economic experiment was performed using three systems that were designed to test how THB users can be encouraged to switch to the use of KMT tickets. The three systems are P0 = test of the Control group, implying that the research subject group is not given any test, P1 = test with the policy of discounting KMT price by 50%, so the original KMT price IDR 20.000 per card becomes IDR 10.000 per card, and P2 = test with the policy of free KMT.
- The next P0 was given to Group 1, P1 was given to Group 2 and P2 was given to Group 3. For example, research subjects treated as P1 since that day were passengers who already had KMT to use KRL-CL with a price of only IDR 10.000. While P2 received KMT for free. Those who received P0 were allowed to use THB only.
- After 3 weeks of being tested, each research subject was asked what kind of ticket they use to access the KRL-CL, that is, whether it was THB or KMT. For the P0 group, they stated that perhaps they would still use THB but they may also switch to the KMT system after three weeks of testing. The P1 group had two possibilities, continue to use the KMT obtained at a discounted price or switch to THB once the balance is over. For P2, after three weeks of the use of a free KMT ticket, they stated that they may continue to use the KMT or they may go back to using THB card. After three weeks the behavior of the research subjects was measured and analyzed and was considered as the dependent variable of the model.

### C. Data Analysis Method

The data obtained through the preliminary survey was processed and analyzed to illustrate the profile and behavior of the KRL-CL THB passengers. By combining survey data

with observational data on research subjects after three weeks of testing the factors were analyzed to establish the effect on the research subjects using THB to switch to KMT ticketing system. The logit model was used to analyze and test whether the policy in lowering the KMT price by 50% or giving the KMT for free are significant ideas to urge THB users to switch to KMT.

The model used is as follows:

$$E(Y_i = 1 | x_1, x_2, x_3, \dots, x_k) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots)}} \quad (1)$$

Where  $Y_i = 1$  means THB users switch to KMT

$x_1, x_2, x_3, \dots, x_k$  are explanatory variables in the form of socio-economic variables that are suspected to be influential, including the treatment provided

Description of the variables in the logit model is described in Table 1 below:

TABLE 1. VARIABLE NAME AND DESCRIPTION USED IN LOGIT MODEL

<i>Nama Variable</i>	<i>Description</i>
Y	Y= 1 or 0, Y=1 indicates that after three weeks of being tested, research subjects switch to using KMT ticket, while Y = 0 implies that after being tested research subject continued to use THB
Dummy_P1	Dummy for P1, Dummy_P1 = 1, means research subject get treatment KMT for IDR.10.000
Dummy_P2	Dummy for P2, Dummy_P2 =1 means research subject get treatment free KMT
Dummy_Gender	Gender, 1 = male, 0 = female
Age	Age of research subject, in year
Dummy_Education	Dummy education 0 = education up to senior high school/SLTA, 1 = education more than senior high school
Dummy_occupation1	Dummy occupation1, 0 = formal worker, 1 = informal worker
Dummy_occupation2	Dummy occupation2, 0 = Informal/Formal worker, 1 = college student/student
Dummy_Income	Dummy income 0 = income up to Rp 3 355 750 . 1 = income more than Rp 3.355.750
Dummy_Frequency	Dummy Frequency of using KRL 0 = 2 times or more a week, 1 = once a week
Dummy_queue of THB	Dummy queue of THB (purchase, change THB) 0 = < 20 minutes, 1 = > 20 minutes
Dummy_attitude to time	Dummy about rewards against time 0 = Bringing queued time THB, 1 = do not regret the time of queuing THB
Dummy_Minimum balance	Dummy about his objection about Minimum Balance 0 = objection to minimum balance requirement, 1 = no objection to minimum balance
Dummy_status1	Dummy marital status, 0 = not yet married; 1 = married
Dummy_status2	Dummy marital status, 0 = others; 1 = widower/widow
Dummy_objective/needs	Dummy about what to travel with KRL; 0 = routine, 1 = not routine

<sup>a</sup>. Source: survey data processed

## V. RESULTS AND DISCUSSION

### A. KRL Passenger Overview and THB Users

Commuter Line Electric Train (KRL-CL) operated by PT. KCJ currently serves route Bogor / Depok - Jakarta Kota / Jatinegara with 217 trips per day, Jakarta Kota / Jatinegara - Depok / Bogor with 204 trips per day, Bekasi - Jakarta Kota / Kampung Bandan via PasarSenen with 75 travel per day, Jakarta Kota / Kampung Bandan - Bekasi with 77 trips per day, Tanah Abang - RangkasBitung / Maja / Parung Panjang / Serpong with 96 trips per day, RangkasBitung / Maja / Parung Panjang / Serpong - Tanah Abang with 97 trips per day, Duri - Tangerang / pp with 45 trips per day, Jakarta Kota - TanjungPriok / pp with 10 trips per day, Jakarta Kota - Kampung Bandan with 22 trips per day, and Kampung Bandan - Jakarta Kota with 23 trips per day [10]. Headway KRL-CL has reached 5–10 minutes in the morning and evening peak hour and KRL-CL series plus from 8 to 10 trains per lane, to 10–12 trains per series ([11]).

The average number of KRL passengers per day in 2016 reached 850,000 users and a record number of users on one day was 931,082. The annual data indicates that PT KCJ carried approximately 280 million passengers in 2016 ([10]). PT KCJ expects to carry 1.2 million passengers per day for all routes in 2019. Currently, passenger route Bogor-Jakarta is the most dominant. In December 2016, there were nearly 10.4 million passengers on the Bogor-Jakarta route and 6.2 million on the Bogor-Jatinegara route. Thus, passengers from Bogor are 67.2% of the total passengers ([12]). This is reasonable because the Bogor-Jakarta and Bogor-Jatinegara routes serve passengers from Bogor (city and districts) and the surrounding areas, including Depok and along the outskirts of Jakarta such as Pondok China Station, Universitas Indonesia Station, Pasar Minggu Station to Jakarta Kota Station.

Based on the tickets used by KRL-CL passengers, those using THB are about 42% of the total KRL passengers, while those who use KMT or Multitrip Cards are 41% and the rest are using bank cards, such as e-Money, Tapcash, Brizzi, and Flazz. PT. KCJ has announced and conducted some socialization at each station to persuade passengers to start using KMT or a bank card so that it does not cause long delays by queuing. PT KCI has also installed a Commuter Vending Machine (CVM) at each station that will allow KRL-CL users to recharge KMT or conduct THB-related transactions such as THB purchases, collateral bills, and travel route selection

This data signifies that there are many of passengers of KRL-CL who are still using THB. Based on the preliminary survey that researchers conducted on Sunday, October 8, 2017 and Tuesday, October 10, 2017 to 100 respondents of THB users obtained research results of 100 respondents is only about 10% of those who use KRL-CL on a routine that is between 3 and 7 times a week while the rest are KRL passengers who occasionally use CL KRL but often use THB. This preliminary survey was conducted by observation and direct interviews. On Sundays or public holidays, there are many passengers who use THB for vacations and family gatherings. While on weekdays, THB respondents use KRL-CL mostly for work, they are mostly merchants who work in Pasar Tanah Abang or construction workers working in Jakarta.

Based on the survey results, most of THB users are aged between 21 and 30 years and live in Bogor. They work in the private sector and hold a high degree. Their income and expenses are between IDR 1.000.001–IDR 3.355.750. They mostly use KRL- CL to travel to work. They use KRL-CL with at a frequency between 3 and 7 times a week. Meanwhile, related to the queue time when passengers buy and swap THB, most passengers mention that they only take less than 5 minutes. When asked whether they regret not considering the time they lost, 50% of THB users said that they did not. The full description of passenger profile using THB can be seen in Table 2.

Partial analysis indicates that there are only three variables that are statistically significant influences on passengers of KRL-CL switching from THB to KMT. They are the free KMT policy and discount KMT prices, queue time behavior, and the minimum balance perspectives. The result of linkage testing of THB users to KMT with the socio-economic variable can be seen in Table 3 below.

TABLE II. PROFILE OF THB USERS

<i>Variabel</i>	<i>Deskripsion</i>
Gender	52% male, dan 48% female.
Education	17% SD-SLTP, 46% SLTA, 12% D1/D2/D3, 24% D4/S1 equal.
Age	46% age of respondent between 21 and 30 years old, 26% are under 20 years of age, 16% are over 40 years old aged between 31 and 40 years by 12%.
Occupation	Students 30% Private Employees 46% Entrepreneurial 10% PNS / TNI / Polri 4% Other 9%
Income per month	Monthly income of respondents between 0–Rp.1.000.000 by 36%. between Rp.1.000.001–Rp.3.355.750 by 36%, Rp.3.355.751–Rp.5.000.000 of 23%, Rp.5.000.001–Rp.10.000.000 of 3% Above>Rp. 10 million by 2%.
Experience using KRL	Less than 1 year with a percentage of 28% More than 5 years with a percentage of 28%. 1 to 5 years 44%
Travel needs with KRL/objective	47% use CL KRL to work 26% for school or college, 19% for holiday or streets, 7% for hospitality 1% for shopping.
Frequency of using KRL	34% use KRL with frequency 2–4x a week, 24% use CL KRL every business day, 22% use CL KRLs between one time a week to less than once a week 20% of respondents use KRL-CL every day including holidays.
Time for queue THB	The time required for the respondent to queue THB tickets between 0–5 minutes by 60%, 6–10 minutes by 24%, 11–15 minutes by 10%, 16–20 minutes by 1% and > 20 minutes by 5%. Queue to buy THB does not need to spend a lot of time because at this time as in Bogor station provided a lot of CVM that allows users to make THB transactions. Long queues occur during peak hours or working hours and holidays.
Attitude Over Time Wasted by using THB	50% of respondents regret the time wasted to queue THB while 50% of other respondents did not regret the time to queue THB.

b. Source: survey data processed

Giving free KMT policy and KMT discount of 50% offers experimental results that indicate that 40 passengers charged 50% KMT price discount all switched to KMT. This implies that KMT purchased at only 50% of the price continued to be used by passengers. Meanwhile, 40 passengers subjected to a free KMT policy, 38 of 40 passengers previously using THB switched using KMT. There were only two passengers who no longer used the KMT, and continued to use THB (See Table 4).

The analysis results also indicate that those who regret queuing time and do not mind the minimum balance will likely switch to KMT. Meanwhile, the income and education that was originally allegedly influential, was not proven. This is because most passengers of THB users earn less than IDR 3 million and are mainly from lower socio-economic groups.

To jointly analyze the influence of the policy tested with the socio-economic variables on the switching of THB users to the KMT the logit model was used. The analysis is performed using four logit models, namely model 1 and model 2, model 3 and model 4. Model 1 and model 2 are used to analyze the influence of socio-economic variables on switching THB users to KMT if policy variable is not included. Model 1 used 100 passengers' data, while model 2 used only 60 passengers' data. There were 40 passengers data issued in model 2 because they were from the 50% discount policy KMT price and all passengers THB users who were offered the policy then all switched to KMT. In the logit model, for a single category of explanatory variable that responds entirely to the same dependent variable, no analysis was performed. This is why 40 passengers data provided at 50% discount policy on KMT prices are used in this analysis. Model 3 looks at the effect of KMT's self-regulated policy on switching THB users to KMT. Model 4 looks at how policy and socio-economic variables are incorporated into the model. The predicted results of model 1, model 2, model 3, and model 4 are given in Table 5.

TABLE III. CHI-SQUARE TEST RESULTS THE RELATIONSHIP BETWEEN SWITCHING THB USERS TO KMT WITH SOCIO-ECONOMIC VARIABLES

<i>No.</i>	<i>Variabel</i>	<i>Nilai P-value</i>
1	Treatment: Price Policy KMT 50% discount and Price KMT free	0,000**
2	Gender	0,841
3	Age	0,132
4	Education	0,407
5	Occupation	0,436
6	Income	0,677
7	Objectives/needs	0,368
8	Frequency of use KRL	0,148
9	Time to queue KRL	0,833
10	Attitude toward when queued to buy THB	0,046**
11	Attitudes toward Minimum Balance	0,004**
12	Marital status	0,551

c. \*\* significant at 5% real level

d. Source: survey data processed

The results of model 1 and model 2 indicate that if the policy variables are not included, those with significant impact on the switch of THB users to KMT are

Dummy\_objective/needs (Train requirements, whether to work what is not), Dummy Frequency (dummy for frequent use of KRL), Dummy\_attitude to time (Dummy attitude to queue time), and Dummy\_minimum balance (Dummy attitude toward minimum balance condition). Those who use KRL to get to work and quite often use KRL (more than two times a day), and deplore the queuing time tend to switch to using KMT. Meanwhile, those who regret the time queuing up when purchasing THB, will also tend to switch to using the KMT.

TABLE IV. NUMBER OF PASSENGERS BY POLICY IMPOSITION WITH TICKET USAGE AFTER POLICY

	Treatment			Total
	Control Group	KMT Discount 50%	KMT Free	
use THB	18	0	2	20
Switch use to KMT	2	40	38	80
Total	20	40	40	100

<sup>c</sup> Source: survey data processed

TABLE V. RESULTS OF LOGISTIC REGRESSION

Variable	Model 1 Coef.	Model 2 Coef.	Model 3 Coef.	Model 4 Coef.
Dummy_Gender	-0.148	0.770		1.567
Age		0.029		0.051
Dummy_status1	0.844	1.089		3.047
Dummy_status2	1.270	2.802		0.070
Dummy_education	-0.154	-0.546		-0.582
Dummy_occupation1	1.124	1.019		0.548
Dummy_occupation2	-1.124	-2.454		-0.493
Dummy_Income	-0.315	-1.565		0.982
Dummy_objective/needs	-1.356 *	-2.075 *		-1.525
Dummy_Frequency	2.371 **	3.210 **		2.378
Dummy_queue of THB	-0.758	-0.675		1.211
Dummy_attitude to time	-1.114 *	-2.005 **		0.502
Dummy_minimum balance	-1.508 **	-1.506 *		1.059
<b>Dummya_P2/Treatment MTFree</b>			5.142 ***	6.5550 ***
Intercept	2.118 *	1.433	-2.197 *	-7.7450
N	100	60	60	60
Likelihood Ratio	21.98	23.33	47.5	52.73
Prob > Chi-square	0.0557	0.0379	0.0000	0.0000

<sup>a</sup> \*significant at the level of real 10%, \*\* significant at 5% real level, and \*\*\* Significant at the real level of 1%

<sup>b</sup> Source: survey data processed

Model 3 and model 4 indicate that the KMT free policy strongly encourages the use of THB to switch to using KMT. Even when the socio-economic variables are included together with the policy variables eliminating the KMT, none of the significant socio-economic variables had an effect. This implies that the current KMT price is too expensive for THB users. Therefore, when it is offered free, it will give them an opportunity to try KMT. When compared with passengers who

get 50% KMT price discount, KMT can have a boomerang effect because passengers who get free KMT are less appreciative of KMT than those who get KMT with 50% discount price. This is evident from the presence of those who get the KMT for free using THB after three weeks. KMT then becomes abandoned or not used at all but instead revert to the use of THB again. Of the passengers who get KMT at a discounted price of 50%, all (100%) switched to using KMT because they feel KMT is so valuable that it should continue to be used when using the KRL again.

## VI. CONCLUSION

Results based on the analysis can be concluded as follows:

- Most of THB users aged 21–30 years live in Bogor and work in the private sector. They have a higher education degree. Their income and expenses are between Rp.1.000.001–Rp.3.355.750. They mostly use KRL-CL to get to work. They use KRL-CL with a frequency between 3 and 7 times a week.
- Of the 40 passengers subject to a 50% discount policy on KMT prices all entirely switched to KMT. It implies that the KMT purchased at only 50% of the price continues to be used by these passengers. Out of the 40 passengers subjected to the free KMT policy, 38 switched to the use of KMT. There were only two passengers who no longer used the KMT, and continued to use THB.
- Giving KMT for free and discounting 50% KMT price proved that it will enable encouragement to THB users to switch to using KMT. Interestingly the free KMT policy will make some passengers not to appreciate the KMT and re-use THB again.

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