



The Determinants of Consumer Cash Usage in Turkey

Saygın Çevik
Dilan Teber

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Address:

Central Bank of the Republic of Turkey
Head Office
Structural Economic Research Department
Hacı Bayram Mah. İstiklal Caddesi No: 10
Ulus, 06050 Ankara, Turkey

Phone:

+90 312 507 80 04

Facsimile:

+90 312 507 78 96

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Saygın evik*

Dilan Teber**

Abstract

This paper investigates the determinants of consumer cash usage in daily transactions in Turkey using a probit model. In doing so, we use the results of the Methods of Payment Survey conducted by the Central Bank of the Republic of Turkey in 2020. The survey results indicate that cash is still the most common form of payment in Turkey, despite recent technological innovations in payment systems. The results show that the likelihood of cash usage increases for the amounts that match currency denominations and convenient prices, while it decreases for the amounts for which the consumer receives a coin change. Also, the likelihood of cash usage decreases with education and income level and increases with age and being a paid employee. As for the transaction characteristics, we find that the likelihood of cash usage decreases with an increase in transaction size and that cash is more frequently used for low-value transactions. It is also worth noting that having greater cash balances at the beginning of the day increases the probability of using cash for all transaction amounts.

JEL classification: C25; E42; E58

Keywords: Cash; Payment Behavior; Convenient Prices; Probit Model

*Central Bank of the Republic of Turkey, Issue Department, Ankara, Turkey. E-mail: saygin.cevik@tcmb.gov.tr

**Central Bank of the Republic of Turkey, Issue Department, Ankara, Turkey. E-mail: dilan.teber@tcmb.gov.tr

Non-Technical Summary

Acting as the authority responsible for the currency, central banks meet the public demand of cash as a medium of exchange or a store of value, and closely monitor cash usage developments. As the sole responsible bodies for the issuance and distribution of banknotes, they require accurate cash usage data to meet public demand efficiently. In this respect, many central banks conduct surveys to study consumers' choice of payment instruments. In this regard, the Central Bank of the Republic of Turkey (CBRT) carried out its first Methods of Payment Survey in 2020 to obtain a thorough comprehension of cash and alternative payment methods usage.

Notwithstanding the recent technological innovations in payment systems in introducing alternative payment methods, cash maintains its strength in payment points. Although the share of cash payment follows a declining trend in some developed countries, it continues to be the most common payment method in developing countries. Turkey is a good example of this, as a recent payment diary survey unravels that 89% of daily transactions are done in cash. Turkey, which is predominantly a cash economy, is becoming very important in revealing behavioral changes in cash payments. In this respect, a complete understanding of cash usage reasons is vital for the CBRT to efficiently maintain cash cycle operations and develop policies and strategic decisions regarding cash management.

Using the results of Methods of Payment Survey, we investigate the extent to which currency denomination and convenient prices affect consumers' cash payment choice. Results show that cash usage is strongly related to the transaction amount, cash holding, and convenient prices. Consumers' cash usage decreases with increased transaction amount, which shows that cash is preferred mostly in low-value transactions. However, the likelihood of consumers' cash usage increases with the amounts that match the currency denomination.

Non-convenient prices that do not match the currency denomination cause the burden of holding coins and significantly affect consumers' cash payment preference. According to the survey results, cash payment is less likely for transaction amounts that require coin exchange. Hence, consumers may switch from cash payment to card payment to curb the coin burden.

Alongside the transaction characteristics, survey results outline the crucial importance of a consumer's characteristics, such as age, income, and education. An increase in age results in an increase in the likelihood of cash payments. Furthermore, an increase in the household income decreases the probability of cash payments.

The evidence presented in this paper shows that there is a significant relationship between the denominational mix, convenient price, and cash payment realization. Ultimately, setting efficient currency denomination and convenient prices increases the cash usage in the payment points and enables consumers to have a more efficient payment experience.

1. Introduction

A thorough understanding of the patterns and determinants of cash usage is vital for central banks since they act as the sole responsible bodies for the issuance and distribution of banknotes. Central banks meet the public demand of cash as a medium of exchange or a store of value, and closely monitor cash usage developments.

Although the share of cash payments follows a declining trend in some developed countries, it continues to be the most common payment method in developing countries. In the decision to use cash instead of an alternative payment method, quite a few factors influence consumers' choice and there is a growing body of literature exploring the possible reasons behind it. Some explain it in the light of the structure of currency denomination and inconvenient prices that causes the burden of holding banknotes and coins, resulting in an inefficient payment. Convenient prices are prices that either match currency denominations or are simple combinations of them. When the transaction amount and the consumers' cash holding do not match at the time of payment, the possibility of exchanging coins and banknotes significantly affects consumers' cash payment preferences. As one might expect, prices that require only bills may lead to faster transactions than those requiring coins. Thus, consumers may prefer to minimize the total coin exchange they would receive from each payment. Shy (2020) puts forward that the currency denomination is crucial in determining the payment method, as he finds that the probability of paying with cash in the US increases at amounts close to 20 US dollars and its multiples. Bouhdaoui et al. (2014) examine the relationship between convenient prices and cash usage through French consumers' payment diary data and conclude that the share of cash payments increases with the convenient prices. Knotek (2008, 2011) reveals that firms may wish to set convenient prices for items that are typically purchased with cash, and convenient prices are used in locations where making rapid transactions is important. Chen et al. (2019) examine the payment method preference for Canada and find that switching from cash to card payments is associated with exchanging coins.

Alongside the association with the currency denomination, the transaction amount and cash holdings are also important factors for the cash payment preference. Many studies in the literature have shown that an increase in transaction amount decreases the probability of cash payment (Boeschoten, 1998; Bounie and François, 2006; Ching and Hayashi, 2010). Although the share of cash used in transactions differs across countries, it maintains its strength as a payment instrument and is particularly prevalent in low-value transactions (Bagnall et al., 2016). Boeschoten and Fase (1989), through the Dutch household budget survey data, show that approximately 90% of the payments for amounts below 50 guilders are made in cash, while this ratio falls below 15%

for the amounts above 300 guilders. In addition, they emphasize the importance of the personal characteristics of the payer alongside the transaction amount in the decision of payment instrument.

Another factor influencing the cash payment preference is cash holdings, which refers to the money consumers have in their hands or pockets at the beginning of the day. The studies conducted by Arango et al. (2012) and Eschelbach and Schmidt (2013) reveal that the probability of cash payment increases with the increase in consumer cash holdings.

Many central banks conduct surveys to have a broad perspective on consumers' payment instrument preferences. In this regard, the Central Bank of the Republic of Turkey (CBRT) carried out its first Methods of Payment Survey (MPS) in 2020 to obtain a thorough comprehension of cash and alternative payment methods usage. The survey comprises two parts: a questionnaire in which respondents are asked to give a self-assessment of their payment habits, and a payments diary completed by the participants in the specific four days following the questionnaire. The survey questionnaire consists of seven sections to collect information about consumers' cash holdings, payment habits, and their perceptions and attitudes toward different payment attributes. On the other hand, in the payment diaries, participants record all their financial transactions during the specific four days.

The survey results show that cash is the primary payment instrument in Turkey, accounting for 89% of all transactions recorded in the payment diaries in terms of volume. In this respect, a complete understanding of cash usage reasons is vital for the policymakers to efficiently maintain cash cycle operations and develop policies and strategic decisions regarding cash management. The objective of this paper is to deepen our understanding on the drivers of cash usage in Turkey. In doing so, we estimate a probit model by using the results of the MPS. The results indicate that cash is more frequently used for low-value transactions, and the likelihood of the cash usage increases with an increase in the cash holdings at the beginning of the day. The results also show that the likelihood of cash usage decreases with education and income levels and increases with age and being a paid-employee. To the best of the authors' knowledge, this study is the first extensive study that explores the factors underlying the likelihood of cash usage in Turkey.

This paper is organized as follows. The next section presents a brief description and the descriptive statistics of the MPS. Section 3 discusses the methodology used and the empirical results. Section 4 concludes.

2. Methods of Payment Survey

The CBRT conducted¹ its first Methods of Payments Survey between September and October 2020 to study the households' payment habits and perceptions toward different payment instruments. The sample was drawn using a random sampling of 16 to 75-years old Turkish residents in the selected provinces in 26 sub-regions of Turkey. The survey is structured in two parts: a questionnaire and a payment diary. The questionnaire consists of seven sections to collect information about individuals' demographic characteristics, awareness of payment instruments, their access to cash, cash holding habits, payment habits, their perceptions and attitudes toward different payment attributes and the effects of coronavirus pandemic on their cash payment habits. The questionnaire was conducted in the form of face-to-face interviews on a representative sample of 2,400 Turkish individuals. In the payment diaries, participants record all aspects of their financial transactions, including the amount of the transaction, the type of establishment in which the transaction took place (in 18 categories), and the type of payment instrument used (cash, debit card, credit card, etc.) with several questions about their cash on hand during the specific four days. Out of 2,400 questionnaire participants, 1,537 individuals completed the diaries.

In this study, we focus on cash payments at the point-of-sale. Therefore, we exclude recurrent payments and other transactions where the cash option is not always available in the payment diaries. As shown in Table 1, the average number of daily transactions and cash withdrawals is 1.2 and 0.2, respectively. The average daily spending per person is 51 TL and the average withdrawal amount is 239 TL. The average cash transaction is 43 TL, whereas it is 108 TL and 119 TL for the debit and credit card transactions. Out of 7,185 transactions, on average, 89% are paid in cash. The difference in the average transaction amount between cash and card payments shows that cash dominates in the low-value amounts. Besides, credit and debit cards are the preferred payment methods at higher-transaction amounts compared to cash payments. The lowest amount the consumer decides to pay with a debit card is 5 TL, whereas it is 10 TL for a credit card.

¹ The CBRT commissioned a private research firm to conduct this survey.

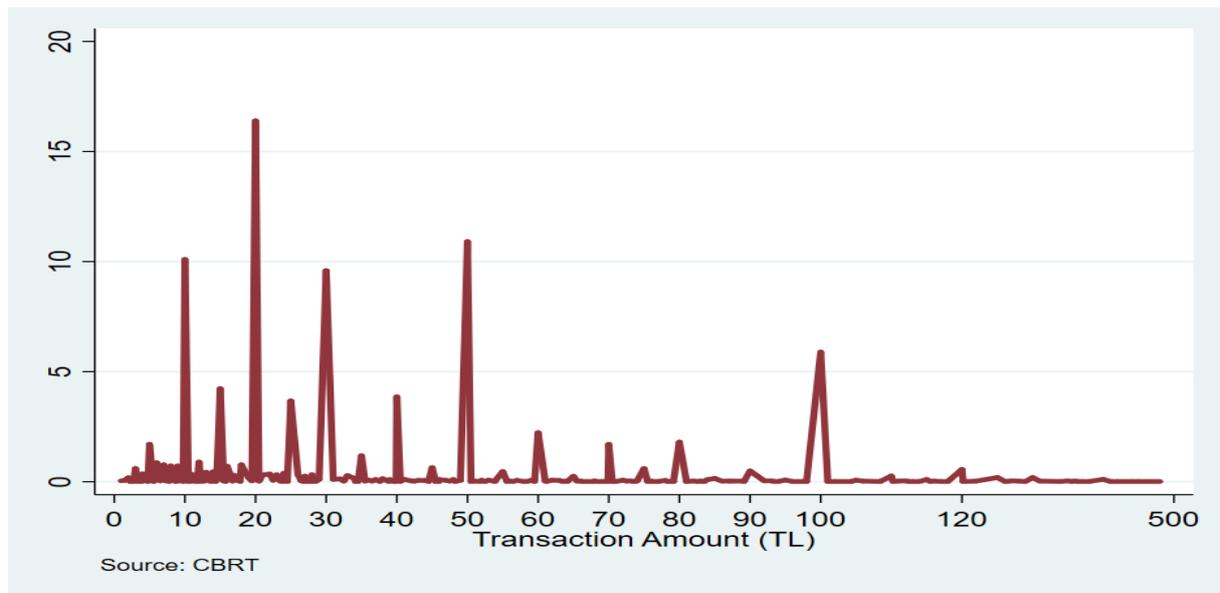
Table 1: Surveys' Descriptive Statistics*				
Percentiles of Transaction Amounts	Total	Method of Payment		
		Cash	Credit Card	Debit Card
10th	10 TL	10 TL	25 TL	20 TL
25th	18 TL	15 TL	39 TL	40 TL
50th	30 TL	25 TL	70 TL	60 TL
75th	50 TL	50 TL	120 TL	100 TL
90th	100 TL	100 TL	220 TL	150 TL
95th	150 TL	120 TL	340 TL	200 TL
99th	400 TL	290 TL	1,000 TL	2,000 TL
Average Transaction Amount	51 TL	43 TL	119 TL	108 TL
Average number of daily transaction per person	1.2			
Average of daily spending per person	51 TL			
Average amount of a withdrawal	975 TL			
Average number of daily withdrawals per person	0.2			
Average cash holdings	239 TL			

* Based on 7,185 transactions from the 4-day diaries.

Source: CBRT

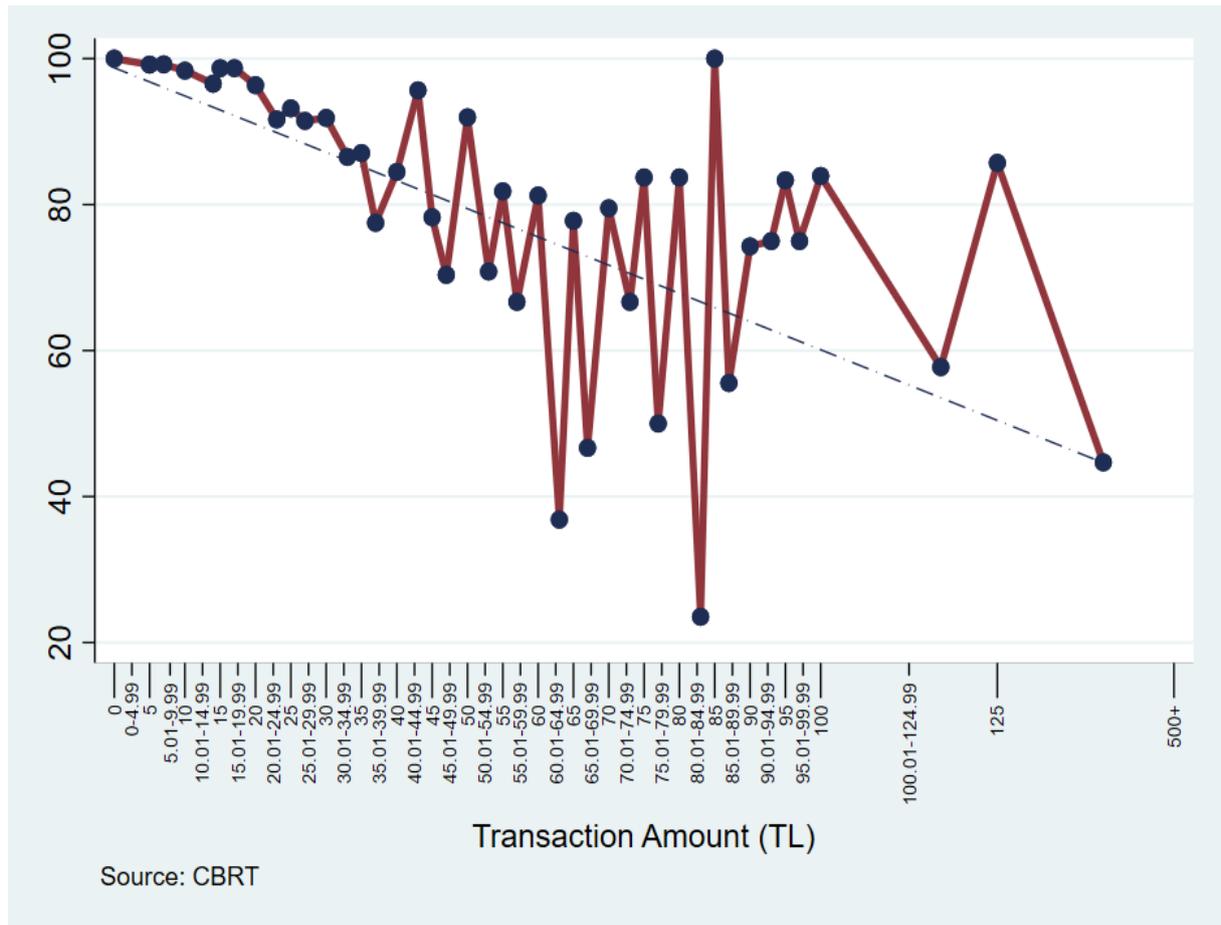
The frequency distribution of all transactions is plotted in Figure 1. A glance at this figure suggests that the largest part of transactions is composed of low-value purchases; 50% of all transactions are at amounts lower than 30 TL. Of the transactions, 16.4% are at the exact amount of 20 TL, which is the mode of the distribution. What is remarkable is that we observe a higher frequency of transactions at the convenient prices (prices that either match denominations or are simple combinations of them such as 10 TL, 15 TL, 20 TL, 25 TL, 30 TL, 40 TL, 50 TL, etc.).

Figure 1: Frequency Distribution of Transactions (%)



Consumers usually prefer to minimize the total coins of change they receive from each payment. In Turkey, banknotes are in denominations of TRY 5, 10, 20, 50, 100, and 200. Thus, if the transaction amount is not a multiple of 5, the payment amount in the range of $(x).01 - (x + 4).99 TL$ will leave the consumer with coin changes. From this part on, we will call the prices in the range of $(x).01 - (x + 4).99 TL$ as “non-convenient” and the remaining as “convenient” prices. Figure 2 depicts the share of cash payments as a function of the transaction size. To examine the cash usage differences between convenient and non-convenient prices, the transaction sizes in Figure 2 are given as multiples of 5 and in ranges where the consumer receives a coin change. As shown in this figure, for the transaction sizes greater than 35, cash payments are less frequent in the transaction amounts where consumers receive a coin change. The share of transactions at the non-convenient prices is 18.5% of all transactions. Thus, when a consumer faces a non-convenient price, using an alternative payment is more likely to avoid cash transaction costs.

Figure 2: The Share of Cash Payments (%)



3. Methodology and Empirical Results

In this section, we use a probit model to investigate the main determinants of the cash usage in transactions. For this purpose, we use the consumers' payment choices in the diaries. Since the actual use of cash is a latent variable that is not directly observable, cash payments in the diaries (y_i) is assumed to be related to the latent variable (y_i^*) in the following manner.

$$y_i^* = \sum_{j=1}^k \beta_j x_{ij} + v_i \quad (1)$$

We define a binary variable for the dependent variable that takes the value 1 for cash payments and 0 for the card payments using the transactions in the payment diaries.

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

$$\begin{aligned}\Pr(y_i = 1) &= \Pr(y_i^* > 0) = \Pr\left(\sum_{j=1}^k \beta_j x_{ij} + v_i > 0\right) = \Pr(v_i > -\sum_{j=1}^k \beta_j x_{ij}) \\ &= 1 - \Phi(-\sum_{j=1}^k \beta_j x_{ij}) \quad (3)\end{aligned}$$

where x_{ij} is an independent variable for each consumer i . The results are estimated relative to the base outcome, the use of debit or credit cards in the transaction.

In order to interpret the coefficients on a probit model, we also calculate the marginal effects (i.e. the change in the probability of dependent variable given a change in an explanatory variable). For a continuous variable in a probit model, the marginal effect of a change in the j th explanatory variable is calculated as follows.

$$\frac{d\Pr(y_i = 1|x_j; \beta)}{dx_j} = \varphi_i(\sum_{j=1}^k \beta_j x_{ij}) \beta_j \quad (4)$$

For a binary variable, which takes only the value 1 or 0, the marginal effect is

$$\Pr(y_i = 1|x_j = 1; \beta) - \Pr(y_i = 1|x_j = 0; \beta) \quad (5)$$

which shows the difference between the model-predicted probabilities of dependent variable when the binary variable is "1" versus "0", keeping all other variables constant.

In the model, we include explanatory variables related to transactions. First of all, we include the transaction amounts. To examine whether the probability of a cash payment varies for different transaction amounts, we also include transaction amount interval variables which are dummy variables in 10 TL increments from 0.01 TL to 100.00 TL. Since 90% of the transactions are made for the transaction amounts below 100 TL, we include transaction amount interval dummies up to 100 TL. As a proxy for non-convenient prices, we construct a dummy variable that takes value 1 if a consumer receives a coin in the transaction when he pays with cash and value 0 otherwise.

The day of the transaction is also used to control the transaction environment's specific features. Finally, several demographic characteristics such as gender, marital status, age, income level, education level, and employment status are also included in the model as control variables. Table I in the Appendix gives detailed information about the variables used in the model.

The results of the estimations are reported in Table 2. Consistent with the literature on payment choices (Hayashi and Klee, 2003; Bounie and François, 2006; Klee, 2008; Ching and Hayashi, 2010), we find a positive and statistically significant relationship between cash payments and transaction amounts. Results also show that the probability of using cash decreases homogeneously with the transaction amount intervals.

Table 2: Probit Regression Results

Transaction characteristics	dy/dx	
Transaction value	-0.00007**	(-0.00003)
Transaction amount variables		
Amount 0-10 TL	0.22***	(0.016)
Amount 10-20 TL	0.18***	(0.014)
Amount 20-30 TL	0.11***	(0.013)
Amount 30-40 TL	0.07***	(0.015)
Amount 40-50 TL	0.10**	(0.013)
Amount 50-60 TL	0.04**	(0.017)
Amount 60-70 TL	0.01	(0.017)
Amount 70-80 TL	0.03*	(0.018)
Amount 80-90 TL	-0.02	(0.024)
Amount 90-100 TL	0.06***	(0.014)
Non-convenient price	0.04***	(-0.008)
Cash holdings	0.00001**	(0.000)
Day of transaction (Sunday comparison group)		
Friday	-0.009	(0.009)
Saturday	-0.006	(0.009)
Monday	0.0003	(0.01)
Socioeconomic factors		
Female	-0.008	(0.007)
Married	0.007	(0.007)
Age (age between 25-39 comparison group)		
Age between 16-24	0.04***	(0.01)
Age between 40-54	0.02**	(0.008)
Age between 55-64	0.04***	(0.012)
Age 65 and over	0.05**	(0.019)
Job status (self-employment comparison group)		
Unemployed	0.02	(0.012)
Paid employee	0.02**	(0.01)
Retired	-0.00004	(0.02)
Household income (0-25% comparison group)		
Household income 25-50%	-0.03***	(0.010)
Household income 50-75%	-0.05***	(0.010)
Household income 75-100%	-0.02**	(0.010)
Education (medium level comparison group)		
Low level	0.013*	(0.008)
High level	-0.05***	(0.009)
Pseudo R ²	0.1931	
Observation	5.838	

Robust standard errors in parentheses.

*** denotes significance at 1% level, ** denotes significance at 5% level, * denotes significance at 10% level.

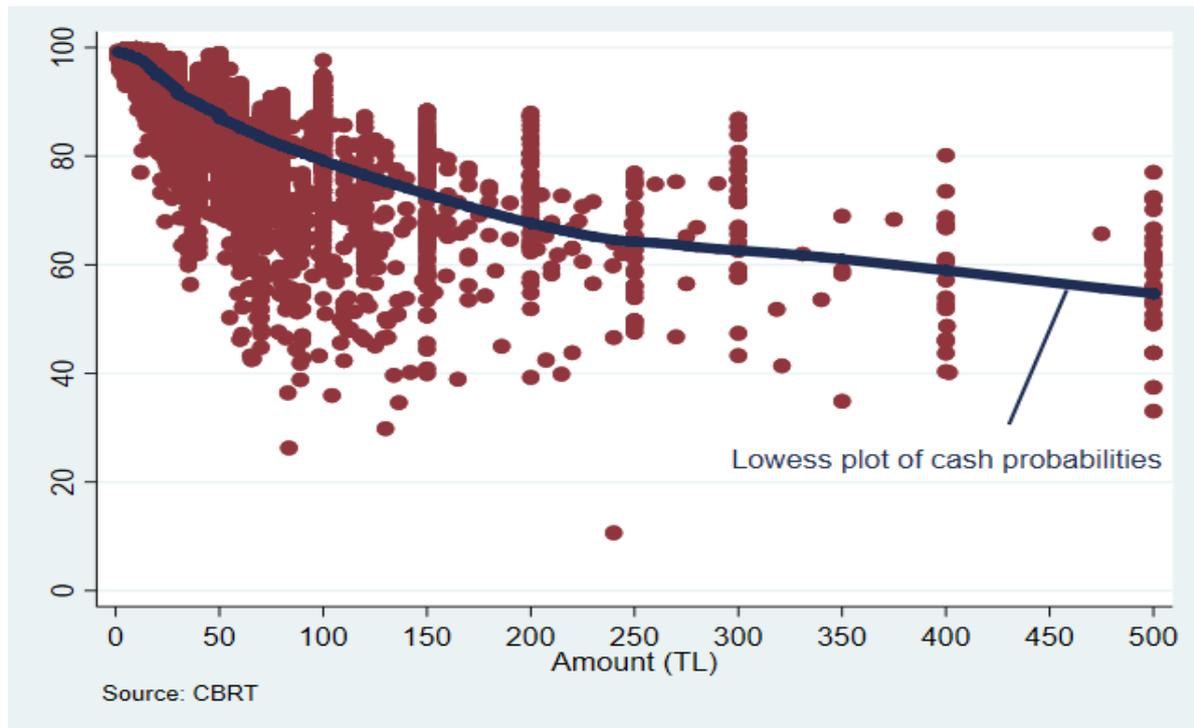
Furthermore, the transaction amounts that match the currency denomination increase the likelihood of cash usage. Ultimately, consumers tend to curb their burden of receiving coins and make efficient payments at the payment points. As expected, we find a negative and statistically significant effect of the non-convenient prices on the likelihood of cash usage. Our findings support the previous research by Bouhdaoui et al. (2014), which stated that the probability of cash usage in transactions increases with convenient prices.

The results show a positive relationship between cash usage and cash balance on hand at the beginning of the day. Arango et al. (2012), Bouhdaoui and Bounie (2012), and Eschelbach and Schmidt (2013) also found that higher cash holdings are correlated with higher use of cash in transactions. In addition, estimation results indicate that the probability of using cash is not influenced by the transaction day.

Regarding demographic characteristics, estimation results show that cash usage increases with the age level but decreases with the educational and income level. While marital status and gender do not influence the likelihood of cash usage, it is more probable that a paid-employee will pay with cash.

Figure 3 shows the predicted probabilities by the transaction amount. In the figure, each dot represents the predicted probability for a specific transaction. Lowess plot of cash probabilities line is a locally weighted scatterplot smoothing line that averages ± 5 predicted values to produce the weighted probabilities by amount. It follows from the figure that the probability of a cash payment is about 91% for purchases of 20 TL or less, and about 60% for purchases greater than 100 TL. The cash probability line shows that its slope for cash purchase is quite steep for amounts less than 20 TL. As the transaction amount increases, the probability of cash payment falls below up to 60%. Consumers prefer paying with cash in low-value amounts, but at a decreasing rate as the amount increases. It is quite clear that although the cash transaction dominates the lower value amount, it is also preferred by consumers for high-value payments.

Figure 3: Probability of a Cash Payment



4. Conclusion

Identifying the factors affecting the consumers' payment choice is essential for stakeholders in the payment system. Acting as a system operator in the payment system and the authority to print and issue banknotes, central banks closely monitor payment method preferences as they affect the payment system's cost and seigniorage revenues. To this end, the CBRT conducted its first Methods of Payment Survey in 2020 to gain a comprehensive understanding of consumers' payment behavior. The survey results show that cash is the most common payment method in Turkey despite all the technological developments in payment systems.

Using the results of this survey, we investigate the determinants of consumer cash usage in Turkey. The results show that cash usage is strongly related to the transaction amount, convenient prices, and cash holding. Consumers' cash usage decreases with an increase in transaction amount, which shows that cash is preferred mostly in low-value transactions. However, the likelihood of consumers' cash usage increases with the amounts that match the currency denomination. Non-convenient prices that do not match the currency denomination cause the burden of holding coins and significantly affect consumers' cash payment preference. According

to the results, cash payment is less likely for transaction amounts that require coin exchange. Hence, consumer may switch from cash payment to card payment to curb the coin burden. Another factor affecting the cash payment preference is the amount of cash the consumer has on hand at the beginning of the day. Consumers with higher cash balances are more likely to make their payments with cash.

Alongside the transaction characteristics, results outline the crucial importance of consumers' characteristics, such as age, income, and education. An increase in age results in an increase in the likelihood of cash payments. Furthermore, an increase in the household income decreases the probability of cash payments. However, the results show that gender, marital status, and the transaction day do not affect the consumers' choice of cash payment.

A limitation of this study is that it uses the Methods of Payment Survey data, which was implemented for the first time in 2020. It will be essential to conduct follow-up household surveys to understand the reasons behind the cash preferences and compare the results regarding changes in households' payment preferences.

To conclude, the results of the survey on consumers' preferences and attitudes toward payment methods are crucial to gain foresight and deepen our understanding regarding why cash maintains its strength despite the technological advancement in alternative payment methods. Do specific features such as anonymity and accessibility give this power to cash, or high cash usage a coincidence to developing countries? Except for the status quo controversies, could it be a Covid-19 pandemic effect? Following the household surveys, researchers can answer these questions and develop a structure to elaborate on the reasons.

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APPENDIX

Table I: Definition of Variables

Transaction characteristics:

Transaction amount	Defined as the payment TL value of expenditures.
Transaction amount variables	10 dummy variables; 1 if the transaction value is in the specified payment amount interval, 0 else.
Cash holdings	The amount of cash the respondent has on hand at the beginning of the diary.
Non-convenient price	Dummy variable that equals 1 if an consumer receives a coin in the transaction when he pays with cash, 0 else.
Day of the transaction	3 dummy variables; 1 if the transaction is on the specified day, 0 else.

Socioeconomic Factors:

Gender	Dummy variable that equals 1 if gender is female, 0 else.
Marital status	Dummy variable that equals 1 if the respondent is married, 0 else.
Age	5 dummy variables; 1 if the respondent's age is between 16-24, 25-39, 40-54, 55-64, or above 65; 0 else.
Job status	3 dummy variables; 1 if the respondent is currently not employed, currently employed full-time, or working for oneself; 0 else.
Household income	4 dummy variables; 1 if the respondent's income is in the first quintile income group (lowest), second quintile income group (medium lowest), third quintile income group (medium highest), or fourth quintile income group (highest); 0 else.
Education	3 dummy variables; 1 if the respondent holds a degree up to high school (low), if the respondent graduated from high school (medium), if the respondent has a university or graduate school degree (high); 0 else.

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