

On-Us Transactions in Credit Card Market in Turkey and Rational Banks

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Abstract

From the early 21st century, network externalities and two-sided markets have been one of the important parts of economy literature. In theory of economics, payment systems and credit card markets were considered to be one of the classical examples of two-sided markets. The credit card markets of the USA and western countries have been analyzed by various economists through the models established. However, economists have not been much attracted to the analysis of the dynamics of the market by modeling the Turkish credit card market with a structure different from its western counterparts. Because the banks in Turkish credit card market carry out both the functions of issuer and acquirer, such transactions as On-Us are intensely realized. Therefore, the profit functions of Turkish banks in credit card markets were different from the models analyzing the credit card markets of the USA and western countries. In the study, the attempts of the banks in Turkish credit card market to maximize their profits and their results have been dealt with, and the factors affecting the profits of the banks have been analyzed.

Keywords: Two-sided Markets, Turkish Credit Card Market, Networks

1. Introduction

The 21st century has witnessed big changes in social, cultural and economic fields. One of these changes is that a growing number of people have started to use credit card as a means of payment instead of paying cash. Credit cards can be defined as the tool of payment provided by banks and issuers to their customers with credits of certain limits so that they can take available cash for services and shopping without paying cash (Kaya, 2009:5).

It is because credit cards offer a variety of advantages not only to card holders but also to the other actors in the market, such as issuer, acquirer and merchants, that they are increasingly used in everyday interchange fee (Kaya, 2009:118). National credit cards appeared in the aftermath of World War II, but even so they are commonly used today (Mishkin, 2007:252). While there were totally fewer than 30 million credit cards in Turkey in 2005, this figure reached beyond 51 million in 2011 (<http://www.bkm.com.tr/yillara-gore-istatistiki-bilgiler.aspx>:10.05.2012). When the data between 2005 and 2009 are examined, the number of credit cards in the USA was more than one billiard (BDDK, 2010:68). Due to the increase in the use of credit cards in payments, credit card market attracted the attention of some economists studying on the economics of industry and micro economy (Rochet and Tirole, 2003; Chakravorti, 2003; Chakravorti and Roson, 2006; Rochet and Wright, 2010). In literature, credit card markets are analyzed as two-sided markets. Credit card market of Turkey has

been analyzed in a variety of essays, but these studies have not been revealed as two-sided market model (Aysan, 2011; Karahan and Çakmak, 2011).

In this study, first of all, the studies in literature on credit cards and payment systems have been reviewed and analyzed. Then Turkish credit card market has been analyzed. It has been determined that Turkish credit card market is different from the models in the western economic literature. The main reason for this difference is that the banks in Turkey act both as issuers and acquirers (Dilek et al., 2012). Provided that the issuer and the acquirer are the same in banking, the transactions between the merchant, customer and banks are called On-Us transactions. Since On-Us and similar transactions are intensely carried out, the profit functions of the banks in Turkish credit card market are different from the models developed in the USA and the West. In this case, the interchange fees between the issuer and acquirer do not exist and the payment card associations functioning as system operator do not take place in the market as an actor (Dilek et al., 2012). The present study is an extended form of the study by Dilek et al (2012). In the later part of the study, an alternative economic model has been developed that explains the Turkish credit card market in the presence of transactions like On-Us. This model has dealt with the attempts of the banks to maximize their profits and focused on the factors that affect the profits of the banks.

2. Literature Review of Credit Cards and Two-Sided Markets

Credit card market is an example of two-sided markets, which are unlike the types of market dealt with in the classical micro-economic analyses and which have become the topic of study since the 2000s (Rochet and Wright, 2010; Rochet and Tirole, 2002; Rochet and Tirole, 2003; Armstrong, 2006; Chakravorti and Roson; 2006). Credit cards and payment systems, clubs, shopping centers, operating systems, browsers, television networks, real state agencies are shown as the examples of two-sided markets (Rochet and Tirole 2003: 993-994; Dilek et al, 2012). There are two groups of actors that interact with each other in two-sided markets and the advantage of one of the actors in these groups is directly proportional to the number of the actors in the other group (Armstrong 2006:668-669; Dilek et al, 2012). Rysman (2009:125) described as two-sided markets the markets in which there are two groups of agents interacting with each other through a mediator or platform and the decision of one group of agent affects the outcome of the other group of agent through exogeneity. Rochet and Tirole (2003:990) defined as two-sided markets the markets with network exogeneity in which there are two different groups whose advantage results from acting in a common platform. When the groups interact with each other, their network exogeneities become a part of the activity and there emerges advantage or loss, depending on the number of the opposing group. For example, the advantage of the merchants in a shopping center depends on the number of customers visiting this shopping center because the increased number of visitors increases the number of potential customers and the amount of sale for merchants, as well. Similarly, the advantage of the customers is contingent on the number of merchants offering service in this shopping center, because the increased number of merchants will enable the customers to get the chance to see more alternatives with a lower cost of business and to get the advantages caused by the competition between the merchants. The platform that brings together the customers and merchants in a place is the third actor in the market. The platform acts with the advantage function of the merchant and customer in mind and attempts to maximize its own profit.

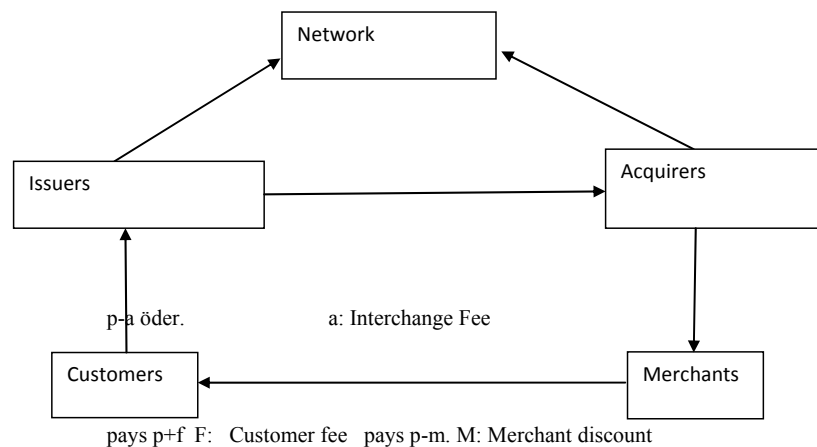
The platform that acts rationally and attempts to maximize its own profit uses one of the groups as the source of its profit at times while it may present the other group the goods or service at a price below its cost or zero price on occasions. In the sector of video games, for example, those who play the games are subsidized but those who develop the software are priced and make up the source of the firm's profit (Rochet and Tirole, 2003:992). Similarly, the newspapers may use the profit from the advertisers to subsidize their readers. Moreover, such practices as flight points and shopping points offered to those who use the credit cards enable the pricing to carry extraordinary qualities (Rysman, 2009:129). Vogelsang (2010) studied the social networks as platforms and reported that social networks do not concentrate on profit when they first enter the market and do not take registration fees

and instead, focus on marketing via technology. Therefore, the profit of the platform firms when they first enter the market may be negative values. White (2006:61) mentions that two-sided card markets generally are not full competitive because of network externalities and therefore these markets need regulations that are made by authorities.

In other two-sided markets, there are three actors – system founder, customer and merchant. However, there are five actors at work in credit card markets (Rochet and Tirole 2002:554). These actors are card holders, merchants, issuers, acquirers and payment card associations. In addition to the actors in other two-sided markets, the issuers and acquirers in the credit card market have different roles, such as coordinating between the merchants and card holders and helping the conduct of transactions in safety.

The interaction between five actors can be summarized in Figure 1

Figure 1: Credit Card Market (Rochet and Tirole 2008:1336; Dilek et al 2012).



Selling good from P prices

As can be seen in Figure 1, system foundation takes a system fee from the issuer and acquirer. The issuers take a customer fee from the customers and interchange fee from the acquirers and pay system fee to the system foundation. The acquirers, however, pay interchange fee to the issuers and system fee to the system foundation. They obtain their revenue from the member shops' commissions that they take from the merchants.

While there are studies on Turkish credit card sector (Aysan 2011, Aysan et al. 2011, Güngör and Yıldırım 2011, Karahan and Çakmak 2011, Karahan 2011), these studies have remained at a macro level and the studies fit to model the market competition have remained at a minimum level. Accordingly, there is a need for micro-based studies analyzing the market balance (except for Dilek et al. 2012).

It is observed that there has appeared an increase in the number of studies that attempt to find out the way two-sided market runs in the USA and Europe since the 2000s by analyzing their credit card markets. (Armstrong 2006, Rochet and Tirole 2002, Rochet and Tirole 2003, Chakravorti 2003, Chakravorti and Roson 2006). Academic studies on two-sided markets often seem to be a sequel to the studies on the network exogeneities (Chakravorti and Roson, 2006:119).

Rochet and Tirole (2002:555) report that payment card associations have brought three rules – interchange fee, honorall-cards rule and no-surcharge rule – and they analyze the way social welfare can be achieved in the presence of these rules. Interchange fee is the amount by the acquirers to the issuers and is valid if the issuers and acquirers are two institutions independent of each other. Honorall-cards rule is a rule towards the business accepting any card that belongs to the payment card associations. No-surcharge rule is that the business does not put the increased cost on the customer provided that the shopping is conducted with credit card. In two-sided markets, the cost inflicted on

one side may not be transferred to the other side. Rochet and Tirole (2003:990) showed that most of the markets with network exogeneities are two-sided markets.

In two-sided markets, the sides may be member of two or more platforms sometimes and this case is called multihome. For example, some merchants may accept both visa and Mastercard credit cards, or some consumers may carry both types of credit card in their pockets. Some consumers may have the browsers of both Netscape and Internet Explorer in their computers. Readers may subscribe to more than one paper. The sides that are member to one side are called singlehome.

Competitive prices in the market are affected by the multihoming dimension at the other side of the market. For example, when Visa lowers the fee paid by merchants, merchants may find it more logical and attractive to refuse the more costly American Express card (provided that the owners of American Express card are also the owners of Visa card). Various models have been established that deal with multihoming cases (Rochet ve Tirole 2003:1002). Chakravorti and Roson (2006) studied a model with networks that offer the customers and merchants differentiated products and found out that competition increases merchant's and consumer's welfare.

Armstrong (2006) made an analysis by revealing the models of monopoly and competitive bottleneck. In the model of monopoly, the agents become the member of just one platform, while in the model of competitive bottleneck, some of the agents may be member of all the platforms.

3. Actors in Turkish Credit Card Market

The actors acting in Turkish credit card markets are Interbank Card Centre (ICC), which serves as system operator, and banks, merchants and customers. In the studies by Rochet and Tirole (2002, 2003), Armstrong (2006), Chakravorti (2003), Chakravorti and Roson (2006) on the market in the USA and Europe, however, the issuer and acquirer have been taken as two separate financial agents. In Turkey, banks take over these two functions in general.

In the credit card market, the transactions are operated on a device called POS (point of Sale). When customers want to pay, credit cards are slipped through these devices. Then the merchant takes his money from the acquirer in return for the voucher. If the transactions are not On-Us, that is, if the issuer is different from the acquirer, the acquirer sends the voucher to the issuer bank through system operator and the issuer bank makes the payment to the acquirer bank through system operator. In this process, the issuer bank takes the amount of interchange fee from the payments, that is, from the acquirer bank. Lastly, the issuer bank collects the amount of spending from the consumer (Kaya, 2009:61-62). If the transactions are On-Us system operator does not get into service and not interchange fee is taken; thus, transactions are conducted with a lower cost.

Interbank Card Centre (ICC): ICC carries out the procedures by applying a predetermined interchange fee if the issuer and the acquirer are different, and earns its income in this way. Although the issuer is usually different from the acquirer in the world, banks take over these two functions in Turkey. If the issuer and the acquirer are the same, ICC does not serve and the transactions are conducted with On-Us transactions in the internal body of the bank. ICC is a monopoly in that all the issuers are members of it (Aysan 2011:13). It is the duty of ICC to determine the interchange fees. In its internet site, ICC declares its vision as follows: "To pioneer in the transition to a cashless world in the sector of payments and to establish and operate the necessary platforms for this transition in the fields considered as necessary by the sector." (<http://www.bkm.com.tr/vizyon-strateji.aspx>, date: 15. 04. 2012)

Banks: Banks take over the functions of the issuer and the acquirer in Turkey. For this reason, customers usually make the payment to businesses through the POS device of the issuer bank; in other words, they carry out On-Us transactions. If customers make payment through the POS device of a different bank, namely if two banks are different, the transactions are conducted over ICC and both banks pay to ICC in return for this service. In the competition between the issuer banks, Yapı ve Kredi, Akbank, Garanti, Finans ve Türkiye İş Bankası appear to take the lead. According to the data of the year 2010, in the credit card market, Yapı ve Kredi Bankası has a share of 18,7%; Garanti Bankası

17,5%; Akbank 15,1%; Finansbank 14,1% and Türkiye İş Bankası 12,1%; they are the first five in this amount (BDDK, 2010:34). The share of the first five banks in the market amounts to 77,5%. According to Rochet and Tirole (2002), if there are fully competitive conditions in the service offered to the consumers and merchants, interchange fees will not affect the profits of the member banks. The issuer banks collect interchange fee from the acquirer banks and membership fee from the customers. The issuer banks' high yearly fees from the customers are often criticized by the consumers. The acquirer banks pay interchange fees to the issuer banks and collect fees from the member businesses. In return, the acquirer banks deliver POS device to its members. It appears that banks issue different types of credit cards, such as gold, classic, platin, etc., depending on the qualities of customers. Another practice is that banks offer various gifts to their card holders in return for their use of them. The reason for these rewards is the network exogeneities provided by the increased number of card holders to the merchants (Rysman, 2009:128).

Consumers: While the number of credit cards was 30 million in Turkey in 2005, this number rose over 44 million in 2009, which indicates that Turkish people are quick to get accustomed to using credit cards. Turkey surpassed the Netherlands, France, Greece, Belgium, Austria and Germany in the number of credit cards per head (BDDK, 2010:68). The customers are divided into two groups; convenience user and revolver (Chakravorti, 2003). According to the results of Masterindex (2011), 77% of the Turkish people do not provide loans for their credit card debts and 17% do so sometimes, and only 7% do so usually.

In other words, credit cards are largely used in Turkey as a means of payment and a limited rate of the credit card holders use it as a means of long-term borrowing. Both groups of consumers pay yearly customer fees to the issuer banks. It is seen that customers are disturbed by the customer fees that they pay to the banks yearly. Some banks may not take customer fee from their customers under certain conditions. For example, they do not take fee from those who use their credit cards above a given limit, or they take the fee from the bonus points that they win from their use of them. Revolvers also pay interest to the banks as they do not pay the debt in time. The maximum rate of interest for those who use the credit cards as a means of long-term credit is determined and fixed by the Central Bank of Turkish Republic.

Merchants: Merchants pay merchant fee to the issuer banks. In accordance with the rule that they cannot demand extra payment from the consumers who use credit cards, they cannot impose this amount on the customers. However, the alternative of paying by credit card enables them to contact with more customers and diminished the risk of not returning in credit sale (Kaya, 2009:125). According to the data of the year 2011, 89% of the businesses in Turkey have POS devices and are included in the credit card system (<http://www.bkm.com.tr/donemsel-bilgiler.aspx>: date: 20.05.2012). The number of POS devices in Turkey was above 1.800.000 in 2010 and 93% of the POS devices belong to the deposit banks. Considering the rates of POS device concentration, Yapı Kredi Bankası's rate is 17,6%; Garanti Bankası 17,1%; İş Bankası 14,6% in the first three (BDDK, 2010:64).

4. Profit Functions of the Actors

In this part, our attempt will be to develop a model that adapts to the credit card markets in Turkey. Due to the difference between credit card markets and credit card markets abroad, a structure will appear that is different from foreign publications.

In the studies analyzing the credit card markets, the consumers' demand for credit card has been dealt with and it has been thought that consumers have assessed the choice of whether or not to use credit card. It has been assumed in this study that customers make all their payments by credit cards and do not have any means of payment other than credit cards. Rochet and Wright (2010) built a model in which monopoly card network chooses an interchange fee that is above the level maximizes consumer surplus.

To begin with, let us assume that there are two types of customers in our model. The first customer is the revolver customer who pays the money of the item he has bought by the interest rate of

(i) in a period of (n). The second type of customer is the convenience customer who pays his debt in time and who does not pay any interest. Both types of customer pay the bank the annual customer fee (f). Just for the sake of simplicity, we assume that there is just one item in the model whose price is (p). In this case, c_r is the amount that the revolver customer pays the bank just for one item and can be shown with (1a).

$$c_r = P(1+i)^n + f \quad (1a)$$

c_c^M is the payment that the revolver customer makes to the bank just for one item and can be shown with (1b).

$$c_c = P + f \quad (1b)$$

The demand of the revolver customer depends on the price of the item, the interest rate and the customer fee. The more the price of the item, the interest rate and the customer fee increase, the lower the demand function of the customer will be. Therefore, the demand function of the revolver customer can be shown with $Q_1(p, i, f) = (-ap - bi - cf) + K_0$. Here, the interest rate is expressed by (i) and customer fee by (f). However, (a) in the demand function is the positive value that gives us how much decrease one unit of increase in the price leads to in the demand. Likewise, (b) is the positive value that gives us how much decrease one unit of increase in the interest rate leads to in the demand of the revolver customer. (c) is the positive value that gives us how much decrease one unit of increase in the customer fee leads to in the demand. Rochet and Tirole (2002:9) demonstrated that the demand for card decreases with the customer fee (f). K_0 is a fixed value.

Convenience customer does not pay interest of delay because he pays his debt in good time, and so he is not concerned about the rate of interest. For this reason, convenience customer's demand is sensitive to the price and customer fee, and so it is shown with $Q_2(p, f) = (-dp - ef) + K_1$. In convenience customer's demand functions, the coefficients (a, b, c, d, e) give the elasticity of the demand functions. If these coefficients take values bigger than one, demand is elastic. If the coefficients are smaller than one, demand is inelastic. However, if the coefficients are equal to one, demand unit is elastic. For example, if $\left| \frac{\partial Q_j}{\partial p} \right| > 1$ for $j=1,2$, demand is elastic when compared with price.

One unit of change in the price causes a higher rate of decrease in the customer demand. If $\left| \frac{\partial Q_j}{\partial f} \right| < 1$ for $J=1,2$, demand is inelastic when compared with the customer fee. One unit of increase in the customer causes a lower rate of decrease in the customer demand. If $\left| \frac{\partial Q_j}{\partial i} \right| = 1$ for $J=1,2$, demand is unit elastic

when compared with the interest. One unit of increase in the interest rate causes a similar rate of decrease in the revolver customer's demand.

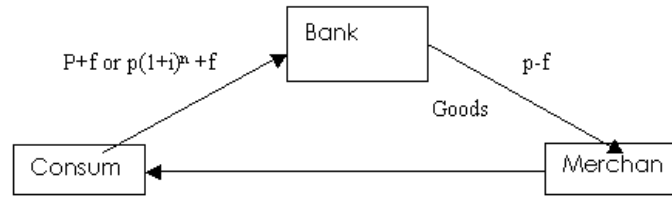
As a result, total payments of the revolver and convenience customers can be calculated with the equations (2). Total payment of the revolver customer is shown with TC_r convenience customer's total payment is shown with TC_c .

$$TC_r(p, i, f) = [(-ap - bi - cf) + K_0].p.(1+i)^n + f \quad (2)$$

$$TC_c(p, f) = [(-dp - ef) + K_1].p + f$$

In Turkey, On-Us transactions are usually conducted; in other words, the issuer banks also carry out member business agreements. Thus, the bank both places in the business in return for membership its POS device, to which customers make their payments, and issues the credit card to the consumer. Therefore, it will be assumed in the study that one bank both issues the credit card and makes a membership agreement. There are two consequences of the hypothesis in question: Firstly, the interchange fee paid by the acquirer bank to the issuer bank is eliminated. Secondly, the system operator takes place in the model. The market in which On-Us transactions are conducted can be shown with Figure 2, which is the simplified version of Figure 1 taken from Rochet and Tirole (2002:559) and it is very similar to Leinonen (2010:104).

Figure 2: Market when on-us transactions take place



Merchants collect the amount of the expenditure by the revolver and convenience customers from the bank. Because there is a difference of time between the shopping and collection of the money from the bank, merchants do not make profit on interest. That is, they do not take any share from the amount of interest paid by the revolver customer. However, merchant discount (M) is paid to the bank. The profit function of the merchant is obtained by subtracting the merchant discount (M) from the sum of revolver customer’s payment except for the interest and convenient customer’s payment, and it can be shown with (3):

$$TR_M = [(-ap - bi - cf) + K_0].p. + [(-dp - ef) + K_1].p - M \tag{3}$$

The profit of the bank is composed of the amount of interest paid by the revolver customer, customer fees paid by the revolver and convenience customers and the discount paid by the merchant, and it can be shown with (4):

$$TR_B = [(-ap - bi - cf) + K_0].p.[(1+i)^n - 1] + 2f + M \tag{4}$$

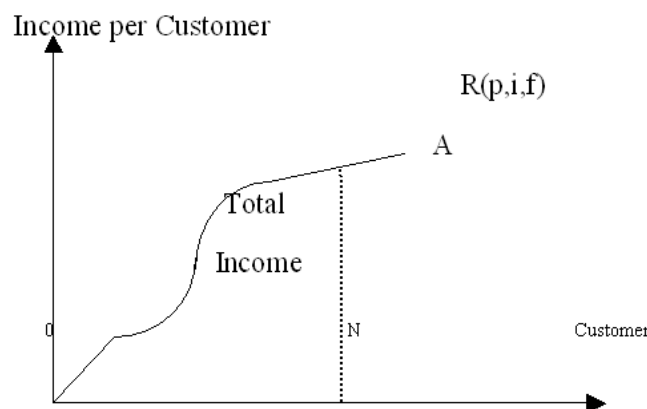
Banks do not have a right of Word over the price of the goods. Their price is determined by the mutual interaction of the customers and merchant, namely the power of supply and demand, under market conditions. Maximum interest is, on the other hand, determined by Central Bank of Turkish Republic. Turkish banks usually take these interest rates into account. (<http://www.tcmb.gov.tr/yeni/bgm/yfakk/k-kazamifaiz.html>). However, just for the sake of easiness, it will be assumed that the bank is a monopoly and is entitled to determine the interest rate. The bank can also determine the customer fee (f) and merchant discount (M). In this case, for the banks that aim to maximize their profits, first-degree conditions are created as shown in (4a):

$$\frac{\partial TR_B}{\partial i} = -bp[(1+i)^n - 1] + (-ap^2 - bip - cfp + K_0p).[n.(1+i)^{n-1}] = 0 \tag{4a}$$

$$\frac{\partial TR_B}{\partial f} = -cp[(1+i)^n - 1] + 2 = 0$$

The increase in the merchant discount increases the bank’s profit at a proportional fixed rate. Total profit of the banks is also the sum of the incomes collected from all the customers. Then, OA field will give the total income of the bank as seen in Figure 3:

Figure 3: Total Income of Banks



In this case, the profit of the banks can be shown as in (4b):

$$\int_0^N R(p, i, f) dN = TR \quad (4b)$$

Suggestion 1: If the price of the goods and revolver customer's demand elasticity in comparison with the customer fee is high enough, the increase in the customer fee may decrease the bank's profit.

Proof: Let's assume that the transaction costs of the bank are zero; if the bank makes one unit of increase in the customer fee, how will its profit be affected by it?

$$\frac{\partial TR_B}{\partial f} = -cp[(1+i)^n - 1] + 2 \quad (5)$$

The equation (5) shows us that on unit of increase in the customer fee decreases the rate of increase in the profit of the bank in proportion to the price of the goods. It is clearly seen that if $cp[(1+i)^n - 1]$ is higher than two, the equation (5) will take a negative value. The critical value of the price here is $p = \frac{2}{c \cdot [(1+i)^n - 1]}$. If the price is $p = \frac{2}{c \cdot [(1+i)^n - 1]}$, the equation (5) will be equal to zero and one unit of increase in the customer fee will not cause any change in the profit of the bank. When the customer fee is lower, the increase in it increases the bank's profit, while the increase in it decreases the bank's profit when the customer fee is higher. The reason for this can be explained as follows:

Even if the customer fee increases when the price of the goods is low enough, it does not lead to a radical change in the consumer's demand because of the diminished importance of the expenditure on any goods in the customer's budget. Thus, the increases in the customer fee also increase the revenues of the bank. However, when the price of the goods goes beyond a certain threshold ($p = \frac{2}{c \cdot [(1+i)^n - 1]}$), the amount spent on the goods begins to occupy an important place in the customer's budget and from this point on, the increased customer fee will cause the consumer's demand to decrease significantly. These decreases in the customer's demand cause the bank to have a reduced income and profit of interest from the revolver customer.

This case can be proved in a second way. Let's assume that the bank can only determine the customer fee. In this case,

The profit function of the bank given with (4) can be expressed with $TR_B(f) = (-cp[(1+i)^n - 1] + 2)f + [-ap^2 - bip + K_0p][(1+i)^n - 1] + m$. As it is seen, the profit of the bank is a linear function of the customer fee (f). In the function, one unit of increase in the customer fee leads to a change in the bank's profit as $(-cp[(1+i)^n - 1] + 2)$. If the price is high enough, this value will be negative and the increase in the customer fee will lead to a decrease in the bank's profit.

One unit of increase in the discount from the merchants increases the banks' profit at a fixed rate. This is because we assumed that the discount from the merchants depends not on the demand for the goods and the customers' expenditure, but on the number of the merchants. However much the merchants sell, their payments are fixed.

$$\frac{\partial TR_B}{\partial m} = 1 \quad (6)$$

Definition 2: When the partial derivative of the bank's profit function (TR_B) is calculated according to the customer fee (f), marginal return of the customer is found. In the same way, if we calculate the partial derivative of the bank's profit function according to the interest rate, we get the marginal return of the interest rate. If we calculate the partial derivative of the bank's profit function according to the merchant discount, the marginal return of the merchant discount is obtained.

Suggestion 2: If the banks want to obtain the same or higher profit when the interest rates have risen up (as much as Δi , let's say), the rate between the revolver customer's demand when the interest

rates are low and the revolver customer's demand when the rates are high must be at

$$\text{least } \frac{[(1+i+\Delta i)^n - 1]}{(1+i)^n - 1}.$$

Proof: No that the revolver customer's demand is $Q_1(p, i, f) = (-ap - bi - cf) + K_0$, the demand will fall down when the interest rises. Let us analyze the two cases: The interest rate in the first case is i and the interest rate in the second case is $i + \Delta i$. In the first case, the revolver customer's demand function is Q_1^1 and in the second case, it is Q_1^2 . The income of interest that the bank gains from the revolver customer will be $Q_1^1 p [(1+i)^n - 1]$ and in the second case it will be $Q_1^2 p [(1+i+\Delta i)^n - 1]$. If the bank wants to gain at least as much as before when the interest rate increases, it must carry out the condition in (7).

$$Q_1^1 p [(1+i)^n - 1] \leq Q_1^2 p [(1+i+\Delta i)^n - 1] \quad (7)$$

When we arrange the condition (7), the condition (8) must emerge.

$$\frac{Q_1^1}{Q_1^2} \leq \frac{[(1+i+\Delta i)^n - 1]}{(1+i)^n - 1} \quad (8)$$

It is clearly seen that the value of the right side of the inequality for the positive values of Δi is higher than one. When the interest rate increases, revolver customer's demand will decrease, and so the right side of the inequality will always be higher than one.

Suggestion 3: When the interest rates have increased, banks may have to lower the customer fees so that they can keep their profits at the level of the preceding period at least.

Proof: An interesting but striking point is the revolver customers' attitude if the interest rates increase. High interest rates mean higher cost for the customers. Rational revolver customers are interested in the lower costs. Total payment of the revolver customers has already been shown with the equation TC_R (2). Here, $[(-ap - bi - cf) + K_0]$ is the revolver customer's demand (Q_1). Accordingly, we can show the revolver customer's spending with $TC_R = Q_1 p (1+i)^n + f$.

The rise in the interests will lead to two effects in the revolver customers' payments. The first one is that revolver customers will reduce their demand due to the increase in the costs. The second is that the payments of interest that they will make for their payment will increase. Let us put it into mathematical terms: let us assume that the increase is as high as Δi . Firstly, the revolver customer's demand will decrease at about $b \cdot \Delta i$ and the payment of interest will increase. Let us say that the first revolver customer's expenditure is TC_R^1 , and his expenditure after the interest is TC_R^2 .

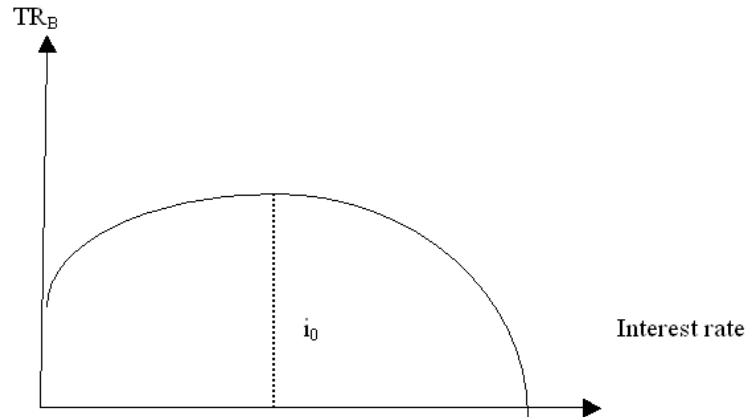
$$TC_R^1 = Q_1 \cdot p \cdot (1+i)^n + f \quad (9)$$

$$TC_R^2 = (Q_1 - b \Delta i) p (1+i+\Delta i)^n + f$$

If $(Q_1 - b \Delta i)(1+i+\Delta i) > Q_1(1+i)^n$, it means that due to the increased interest rate, revolver customer's expenditure has also increased and accordingly the bank's profit has increased, as well. However, sometimes revolver customers' demand may be quite sensitive to the interest. In the equation (2) that shows the revolver customer's demand, b may have a high value. That is to say, the increase in the interest rate decreases the revolver customer's demand so much that revolver customer's expenditure decreases and so does the bank's profit. In that case, the bank may try to bring the revolver customer's expenditure to its earlier level by decreasing the customer fee.

The relationship between the interest rate and bank's profit may be shown in Figure 4. The increase in the interest rate is due to the increased rate of interest income that the bank can get from the revolver customer. However, if the interest rate goes on increasing, revolver customers will start to reduce their demands. Accordingly, bank's profits will also begin to fall down if the interest rate goes beyond a given stage.

Figure 4: Interest Rate-Bank Profit Relationship



As seen in Figure 4, the bank’s profit is the maximum when the interest rate is i_0 . When the interest rate increases, the bank’s profits tend to decrease. Therefore, banks do not want their interest rates to be very high. To find the interest rate that maximizes the bank’s profit, we assume that the bank’s profit function given with (4) is a function with one independent variable (that customer fee and the price are determined *dışsal* olarak and are fixed) and then we differentiate it according to the interest and equate it with zero.

$$\frac{dTR_B}{di} = -bp[(1+i)^n - 1] + [-ap^2 - bip - cfp + K_0p].n.(1+i)^{n-1} = 0 \tag{10}$$

The rate of interest that can be applied to the credit cards by banks is determined by the Central Bank. Banks apply this rate of interest or a rate close to it to the revolver customers. This shows that the maximum rate of interest determined by Central Bank is not above the rate of interest that starts to decrease the banks’ profit. Central Bank of Turkish republic announced and declared on January 1, 2012 that the maximum rate of interest that could be applied to the banks’ credit cards could be 2,84% a month; and all of the 19 deposit banks determined this rate as the maximum delay interest rate of credit cards (<http://www.tcmb.gov.tr/yeni/bgm/yfakk/k-kazamifaiz.html>).

Suggestion 4: As the number of the revolver customers increases, banks may not insist on keeping the customer fees high.

Proof: For the proof of this suggestion, it will be enough to shows that in case of any increase in the number of revolver customers, banks’ profit will also increase. The bank may lower the customer fee as its profit will increase. Assume that $L = [(-ap - bi - cf) + K_0]p[(1+i)^n - 1]$. $(-ap - bi - cf) + K_0$ is the demand of revolver customers and that the demand is negative is not possible in economic terms. Likewise, the price of the good cannot be negative. Now that the rate of interest is positive, the expression $[(1+i)^n - 1]$ will be positive in mathematical terms. Thus, the multiply of the three expressions that take a positive value will be a positive value. When the number of revolver customers is n_1 , the bank’s profit (11) will be as follows:

$$TR_B^1 = L(n_1) + 2f + m \tag{11}$$

Suppose that the number of revolver customers rose to $n_1 + \Delta n_1$, the profit of the bank (12) would be as follows:

$$TR_B^2 = L(n_1 + \Delta n_1) + 2f + m \tag{12}$$

When we bring the equations (11) and (12) together, there appears $TR_B^2 - TR_B^1 = L(\Delta n_1)$. In other words, if the number of revolver customers increases, the bank’s profit will also increase as much as $L(\Delta n_1)$. If the bank consents to its former profit, it may think of lowering the customer fee. Thus, if the revolver customers increase in number, convenient customers make less payment. To avoid the confusion about mathematical terms, this situation can be explained as follows: the banks’ income in

the credit card market is composed of the gain of interest from revolver customers, customer fee from all the customers (revolver and convenience) and interchange fee from merchants.

Result

As it is in the world, credit cards are becoming more common in Turkey, as well. Credit card market is different from the classical markets in that it requires the platform managers to consider the customers and the businesses that accept the credit cards. Due to these different qualities, credit card market began to be analyzed intensively in literature in the 2000s. In the USA and Europe, the issuer bank is different from the acquirer bank. In Turkey, however, most of the banks take over and fulfill these two functions on their own. Therefore, the banks which gives the customer a credit card, namely the issuer, is not the same as the bank which makes a membership agreement with the business at which the customer does the shopping, namely the acquirer. This process is called On-Us transaction in banking. In this study, banks' profit functions have been dealt with in the presence of On-Us transactions. It has been assumed that there are two types of customers; one is the convenient customer who pays all his debts in time with no delay, and the other is the revolver customer who provides loan for his credit card debt. It has also been shown that bank's profit depends on the price of the goods, the rate of interest, customer fee and merchant discount. In general, it has been indicated that the increase in the customer fee will also increase the bank's profit, but the reverse may also be possible under given conditions; that is, the bank's profit may decrease. It has been shown that the changes in the rates for interest also affect the bank's profit.

Reference

- [1] Armstrong, Mark., 2006. "Competition In Two-Sided Markets". *Rand Journal of Economics*, 37(3), pp.668-691.
- [2] Aysan, Ahmet Faruk., 2011. "Türkiye Kredi Kartı Piyasası: Sorular-Sorunlar". *Türkiye'de Kredi Kartı Piyasası*. TCMB. http://www.tcmb.gov.tr/yeni/-evds/yayin/kitaplar/kk_piyasa.pdf
- [3] Aysan, Ahmet Faruk; Yıldırım, Levent; Kara, Gazi İshak; Müslim, Ahmet Nusret ve Dur, Umut., 2011. "Türkiye Kredi Kartı Sektöründe Yasal Düzenlemeler ve Rekabet". *Türkiye'de Kredi Kartı Piyasası*. TCMB. http://www.tcmb.gov.tr/yeni/evds/yayin/kitaplar/kk_piyasa.pdf (Tarih: 15.03.2012).
- [4] BDDK., 2010. *Bankacılıkta Yapısal Değişimler*. Sayı:5. Aralık. http://www.bddk.org.tr/WebSite/turkce/Raporlar/Bankacilikta_Yapısal_Gelismeler/9886bankacılıkta_yapısal_gelismeler_sayı5.pdf(Tarih:10.02.2012)
- [5] Chakravorti, Sujit., 2003. "Theory of Credit Card Networks: A Survey of The Literature". *Review of Network Economics*, 2(2), 50-68.
- [6] Chakravorti, Sujit and Roson, Roberto., 2006. "Platform Competition In Two-Sided Markets: The Case of Payment Networks". *Review of Network Economics*, 5(1), pp.118-143.
- [7] Dilek, Serkan and Top, Seyfi., 2012, "Is Setting Up Barriers to Entry Always Profitable For Incumbent Firms?", *8th Strategic Management Conference*, Barcelona, 21-23 June 2012
- [8] Dilek, Serkan; Uluçay, Korkmaz and Şimşek, Lütfi., 2012, "Linking Turkish Credit Card Market As Two-sided Markets", *8th Strategic Management Conference*, Barselona, 21-23 June 2012
- [9] Güngör, Gülcan Yıldırım ve Yıldırım, Ahmet., 2011. "Kredi Kartı Faiz Oranlarını Belirleyen Faktörlerin Tespiti". *Türkiye'de Kredi Kartı Piyasası*. TCMB. http://www.tcmb.gov.tr/yeni/evds/yayin/kitaplar/kk_piyasa.pdf
- [10] Karahan, Gülfem ve Çakmak, Bahadır., 2011. "Türkiye Kredi Kartı Sektöründeki Gelişmeler". *Türkiye'de Kredi Kartı Piyasası*. TCMB. http://www.tcmb.gov.tr/yeni/evds/yayin/kitaplar/kk_piyasa.pdf

- [11] Karahan, Gülfem., 2011. “Kredi Kartı Düzenlemeleri ve Düzenlemelerin Kredi Kartı Faiz Oranları Üzerine Etkisi”. *Türkiye’de Kredi Kartı Piyasası*. TCMB. http://www.tcmb.gov.tr/yeni/evds/yayin/kitaplar/kk_piyasa.pdf
- [12] Kaya, Ferudun., 2009. *Türkiye’de Kredi Kartı Uygulaması*. Türkiye Bankalar Birliği Yayınları. Yayın no:263.
- [13] Leinonen, Harry., 2010, “Transparent Price Competition or Two-Sided Subsidisation In Card Payments? Is There A Need For More Efficient Business Model For The Card Industry”, *Journal of Payments Strategy and Systems*, 4(2), pp.102-115.
- [14] Mastercard., 2011. Masterindex 2011 Aralık Sonuçları.
- [15] Mihkin, Frederic., 2007. *The Economics of Money Banking and Financial Markets*. Pearson International Edition.
- [16] Rochet, Jean-Charles and Tirole, Jean., 2002. “Cooperation Among Competitors: The Economics of Payment Card Associations”. *Rand Journal of Economics*, 33(4), pp.549-570.
- [17] Rochet, Jean-Charles and Tirole, Jean., 2003. “Platform Competition In Two-Sided Markets”. *Journal of The European Economic Association*, 1(4), pp.990-1029.
- [18] Rochet, Jean-Charles and Tirole, Jean., 2008. “Tying In Two-Sided Markets and the Honor All Cards Rule”, *International Journal of Industrial Organization*, 26, pp.1333-1347.
- [19] Rochet, Jean-Charles and Wright, Julian., 2010. “Credit Card Interchange Fees”, *Journal of Banking and Finance*, 34, pp.1788-1797.
- [20] Rysman, Marc., 2009. “The Economics of Two-Sided Markets”. *Journal of Economic Perspectives*. Vol:23 No:3. Summer. 125-143.
- [21] Vogelsang, Micheal., 2010. “Dynamics of Two-Sided Internet Markets”. *International Economics and Economic Policy*. Vol:7. No:1 129-145.
- [22] White, Lawrence J., 2006, “Market Definition and Market Power In Payment Card Networks: Some Comments an Considerations”, *Review of Network Economics*, 5(1), 61-71.
- [23] <http://www.tcmb.gov.tr/yeni/bgm/yfakk/kkazamifaiz.html> tarih:15.04.2011
- [24] <http://www.bkm.com.tr/yillara-gore-istatistiki-bilgiler.aspx> tarih:10.05.2012