

Two-sided markets: Empirical analysis of demand elasticities for the Portuguese Payment Cards Market¹

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Resumo

Este projecto analisa o papel da elasticidade-preço da procura na definição da estrutura de preços no mercado português de cartões de débito, verificando se as plataformas de dois lados consideram as condições da procura na definição da sua estrutura de preços.

A análise da concorrência entre as plataformas de débito Visa e Multibanco é realizada de acordo com as premissas do modelo Rochet e Tirole de modo a determinar a estrutura de preços considerando as condições da procura nas duas plataformas.

Embora com algumas limitações, os resultados da aplicação do modelo teórico indicam que, se as plataformas considerarem as condições da procura, deveriam cobrar mais aos comerciantes do que aos consumidores no que respeita à taxa de transacção. Como os resultados da aplicação do modelo teórico são semelhantes aos observados

¹ Trabalho de projecto apresentado como requisito para a obtenção do grau de Mestre em Economia pela Faculdade de Economia da Universidade Nova de Lisboa. Trabalho de projecto elaborado sob a orientação de Professor STEFFEN HOERNIG.

na estrutura de preços, as plataformas poderiam considerar as condições da procura na definição de uma estrutura de preços que garantisse que houvesse equilíbrio para os lados (aquisição e de emissão), o que permitiria o melhor desenvolvimento da plataforma.

Palavras-chave: duplo mercado; cartões de pagamento; elasticidade da procura; tipos de cartão.

Abstract

This project analyses the role of demand elasticity on definition of price structure in the Portuguese debit cards market, investigating whether two-sided platforms take into account demand conditions when defining their price structure.

Competition between the Multibanco and Visa debit platforms is analysed, following a framework based on a Rochet and Tirole model, in order to determine a price structure taking into account demand conditions in both platforms.

Although with some limitations, the theoretical model results indicate that, if platforms take into account demand conditions, then they should charge more to merchants than to consumers as far as transactional fees is concern. As the results from the theoretical model are similar to the actual observed price structure, platforms could be taking into account demand conditions in defining a price structure that guarantees that both sides (acquiring and issuing) are balanced, hence allowing for the optimal development of the platform.

Keywords: two-sided market; payment cards; demand elasticity; card schemes.

1. Purpose

In the context of the course's theoretical background, this work project tries to provide empirical evidence on the Portuguese payment cards market as a two-sided market, with special focus on demand elasticities on each side – issuing, i.e. cardholders, and acquiring, i.e. merchants. The specific aim of the project was to estimate demand elasticities to each side of the market and analyze their implications for the definition of price structures by platform, commonly referred to as schemes². Special focus is given to debit cards market, this being the large majority of transactions in the Portuguese payment cards market.

The payment cards market is a two sided market. On one side, issuers provide cards to consumer, while on the other side acquirers provide card acceptance (acquiring) services to merchants. As such, this market evidences the externalities associated with two-sidedness: it is expected that more cardholders will attract more merchants and vice-versa, creating more value for the whole system. In this context, the efficiency of payment cards market depends on the price structure for a given value of payments, as this price structure interacts with demand elasticity on each side, and influence decisions of agents on continuing in the market using and accepting cards.

A particular characteristic of this market is the existence of a fee paid by acquirers to issuers, which in some extent balances costs between these two parties. This fee is called interchange fees and is defined within each scheme. Nowadays, interchange fees seem to be set in a way where merchants pay most of the cost of the system to the acquirer, who then transfer most of this payment to issuers, who, in turn, use it in benefits for cardholders. A relevant question rising

² In this Project, the term “platform” refers to the set of rules that regulate the operating and economical conditions under which the relationships between issuers, cardholders, acquirers and merchants are established in order to allow for financial movements, namely payments, to be conducted with the use of a card of the said platform. Multibanco, Visa and MasterCard are the more visible platforms in the Portuguese market.

from this common sense evidence is whether there is a rationale for charging merchants more, “subsidizing” consumers. Are there reasons related with optimality of the system which explain the observed price structure? Two sided markets theory indicates that an optimal price structure has to take into account different aspects of the market, such as demand elasticity, split of costs between issuers and acquirers and intensity of competition on each side of the market. In this project attention is centred on the role of demand elasticity on the definition of price structure. With a model of competition between platforms developed by Rochet and Tirole ^[7], this project tries to analyse empirically if cards schemes are taking into account demand conditions when defining their respective price structure for the debit cards market.

2. Fit in course content

Analyzing specific aspects of the market such as demand elasticity may provide some knowledge and insight about the optimal structure of fees in the Portuguese payment cards market as a two-sided market.

As one of the contents of the course of Conduct in Imperfectly Competitive Markets are two-sided markets, this project seems to be a good opportunity to apply theory to a specific market trying to understand, in an empirical way, the role of demand elasticity’s on payment cards market.

3. Literature review

Although literature about Payment Cards market is yet in its early stages, it has been matter of research by several authors in two last decades. Baxter ^[1] brought the issue to light by providing an economic analysis of the market. He concluded that collective

determination of interchange fees is necessary to maintain stability of the system, while common knowledge condemns this practice based on a perspective which views this process as a horizontal price fixing.

Rochet and Tirole ^[7-11] have given significant contribution to the knowledge about two-sided markets, with particular focus on the payment cards market.

In Rochet and Tirole ^[7] they exploit the specific context of payment card associations to analyse platforms in two-sided markets with network externalities. Developing a normative framework for the determination of an interchange fee and letting the model endogenize consumer and merchant behaviour, they conclude that an increase in the interchange fee increases usage of payment cards as long as the interchange fee does not exceed a threshold level at which merchants no longer accept payment cards. In their analysis they consider that issuers have market power, acquirers are in a perfect competitive environment and consumers and merchants decide rationally.

In a more general paper in terms of two-sided markets ^[8] these authors develop a different model of platform competition. The main conclusion related to payment card market is that monopoly and competitive platforms design their price structure so as to get both sides on board. In fact, they show that while socially optimal and privately optimal interchange fees differ, there is no systematic bias between them. Actually they found that in some circumstances, such as linear demands and constant prices, they coincide.

In Rochet and Tirole ^[9] the authors provide a significant contribution for the knowledge of payment cards market, demonstrating that regulation of interchange fees in a cost-based method is a mistake, as it relies on a vertical organized model which does not apply in the context of a two-sided market such as payment cards. The authors consider that demands of two sides of the market have to be appropriately balanced. Taking this into account they defend that interchange fees are the only mechanism through which the system can perform a balance between demands in both sides.

Schmalensee ^[12] investigates the determinants of interchange fees and argues that the main role of interchange fee is not to exploit system market power but to allocate costs between issuers and acquirers and consequently shift charges between merchants and consumers to enhance the value of the payment system as a whole. He shows that interchange fee is not an ordinary market price and proves that in an imperfect competitive environment, with issuers and acquirers having market power, interchange fees are established efficiently. For this reason, Schmalensee ^[12] considers that there is no support for regulation of interchange fees and that, if it is done, proprietary (or three party) schemes, such as American Express³, will have competitive advantage relative to fourth-party schemes.

Wright ^[13] has another point of view on interchange fees. He defends that privately optimal interchange fees may be too high if merchant service charge increase with interchange fee but issuers do not pass-through the additional interchange fee revenue back to cardholders. Wright ^[13] constructs a theoretical framework to analyze determinants of interchange fees in payment card associations, which considers heterogeneity of merchants and imperfect competition in acquiring and issuing. With this model, the author demonstrates that interchange fees set privately can be higher or lower than the socially optimal one (which can involve more or fewer card transactions).

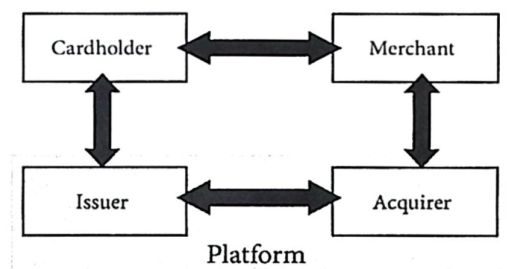
4. Discussion

4.1. Payment cards market: A two sided market

The payment cards market is a two-sided market in which there are two agents, the cardholder and the merchant, connected by a platform that facilitates transactions between them – Figure 1.

³ There are two types of schemes in payment cards market: cooperatives where issuers and acquirer belong to associations such as Visa and Mastercard ; and there are other schemes such as American Express, where the same entity is both issuer and acquirer.

Figure 1 – Market for payment cards as a two sided Market



An interesting aspect of this market comes from configuration of the platform which connects both sides. This platform is formed by card schemes and involves two entities⁴: issuers of payment cards and acquirers of payment card transactions⁵. Thus, this is a market where issuers offer cards to one side of the market and acquirers offer services of payment card acceptance to the other side.

The key aspect of this market is the increasing value of the system with the number of cardholders and merchants which accept cards. In a simple way: the system has more value to merchants the greater the number of cardholders on it; and has more value to cardholders the greater the number of outlets accepting cards. This externality imply that a crucial point for the maximization of the value of the system is to maintain both agents in it, since more agents in one side will attract agents to join the other side⁶.

In the presence of such externalities, the definition of price structure in the market plays a major role for its efficiency. If the total cost is placed on the side of the market with more sensitiveness to price, then the number of agents on this side could reduce, thus affecting the number of agents on the other side. In this context, a particular

⁴ In fact there are three entities: issuers, acquirers and processors.

⁵ This is a platform for a system with cooperative association like Visa or MasterCard. There are other systems, such as AMEX, where the same entity is both the issuer and the acquirer. In this project the focus will be on the first type of platform.

⁶ Rochet and Tirole [7, p. 2].

issue arises, as competition between schemes may occur only in one side. Transfer of fees from one side to the other, subsidizing one type of end-users, may help in obtaining critical mass (which in turn encourages participation of users on the other side).

The system is financed by their users: merchants pay fees to acquirers and consumers pay fees to issuers. Prices paid by consumers and merchants are defined in the market by members of schemes-issuers and acquirers. Nevertheless schemes have an important role the definition of price structure, as they define interchange fee paid by the acquirer to the issuer.

The level of competition between schemes depends on several factors, the more relevant ones, as mentioned by the European Commission [4, p. 9 and p. 143], being: the level of *multihoming*, the extent of *blending* practices.

Prices which result from competition between schemes depend on the extent of *multihoming*⁷. Rochet and Tirole [8, p. 993] argue that *multihoming* is an important force, which enhances market competition. The basic idea is that if a scheme reduces its interchange fee, and this decrease is partially passed on in the fees paid by merchants (merchant service charge) the latter may be more tempted to turn down a costlier competitor scheme, as cardholders are *multihoming* i.e., have cards from multiple schemes.

Nevertheless, there is one aspect that could reduce price competition between schemes. In its Interim Report I on Payment Cards, European Commission [4, p. 43] had demonstrated concern about *blending* practices by card schemes, as the Commission found that such practices could weaken competition between schemes. This is a common practice on European Countries, consisting of charging the same fees to merchants for accepting cards issued by different schemes⁸. Nonetheless, on its final Report on retail banking sector inquiry [4, p. 108], the European Commission argues that if price

⁷ Multihoming is a situation where many cardholders carry cards from several schemes and most merchants accept cards from several schemes.

⁸ This practice is common when one entity acquirers transactions of different schemes.

the difference charged in two networks is insignificant, *blending* may be done in an efficient way, as it could reduce accounting and reporting requirements. In this report is also argued that when there is a market with schemes which have significant differences on competitive positions, blending could have a positive effect as it promote acceptance of the scheme with low presence in the market.

In recent years different agents became concerned about definition of interchange fees by platforms. Generally, merchants began to fight against merchant service charges and system subsidisation of cardholders, and policymakers, such as European Commission and Australian Central Bank, became worried about high merchant service charges which could ultimately be passed on to customers who pay with cash⁹. Suspicions of market power exercise lead, in some cases, to regulation of interchange fees, although different authors argue that schemes could not be acting in an anti-competitive way. Rochet and Tirole^[8], for example, conclude that monopoly and competitive platforms design their price to get both sides on board and so, even with perfectly competitive downstream markets, prices can be different from socially optimal price levels.

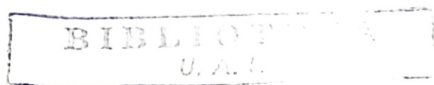
4.2. Portuguese payment cards market

The Portuguese payment cards market is mature when compared to other European countries. In Portugal each person holds on average 1,88 cards and the total value of payments with cards in 2005, was about 18% of the GDP . Debit cards are largely widespread thus debit payments representing about 61% of total payments¹⁰.

Different schemes act in Portuguese market. The most relevant are the domestic scheme Multibanco (debit), Visa (debit and credit)

⁹ Costumers who pay with card are subsidizes by taxing cash-paying costumer resulting in excessive usage. This result from a no surcharge rule which forbid merchants from charge higher prices to costumers who pay with card.

¹⁰ Blue Book^[2].



and MasterCard (debit and credit). The domestic scheme results from the synergies created by Portuguese banks when developing Portuguese cards market. It is, thus, this is the most widely used scheme as it is a brand present in almost all debit cards and in 79% of credit cards issued in Portugal (Appendix 1).

Acquiring of international brands Visa (credit), Visa Electron (debit), MasterCard (credit) and Maestro (debit) is done by Unice, Banco Português de Negócios and other residual international players in Portuguese market such as Royal Bank of Scotland, Barclays Bank, JPMorgan and Citibank. In Portugal, acquiring of these schemes is mainly done by the same acquirers which constitute a situation of blending as far as international bands are concerned¹¹. Acquiring of Multibanco is done by several bank institutions acting in the Portuguese banking industry (Appendix 2). The domestic scheme has 69% of total point of sale terminals placed which reveals a prevalence of acceptance of domestic scheme relative to international brands (Appendix 4).

Multibanco and International cards schemes are issued by several banks in the Portuguese market (Appendix 5). In terms of debit cards it is evident a prevalence of issuing of Multibanco and Visa Electron¹². The majority of international branded cards are co-badge with domestic scheme (97% for debit and 79% for credit – Appendix 1). In this way a large number of cardholders are *multihoming*. In consequence of the high level of co-badging almost 92% of all cards are accepted in all networks (Appendix X). Therefore, cardholders can use their cards on almost all terminals of card acceptance and so, demand faced by merchants has a high degree of independence from the scheme which is accepted. In this way, merchants

¹¹ In the way that Visa as a more relevant positions in the market, i.e. more issuers of Visa than MasterCard, this is a situation that may have a positive effect on promotion of MasterCard. Otherwise, merchants may not contract one different acquirer for MasterCard which have less cards placed in the market.

¹² Maestro is only issued by CGD and Millennium BCP. CGD only sell this brand to a the students and young people segment. Millennium BCP only place this brand on a specific card "Millennium BCP Free" which is a pre-paid card.

can choose between different schemes to accept without significantly losing access to potential consumers.

Taking the characteristics of the Portuguese market into account, the next sections will focus their attention on the role of debit cards applying the specific context of the Portuguese debit cards market to a model of competition between platform from Rochet and Tirole^[8]. From the description of Portuguese payments card market above it is patent that the relevant schemes for a model of competition between platforms in debit cards are Visa Electron and Multibanco. They are the most widespread in the country and seem to compete directly. In this context, competition in the acquiring side is enhanced by the existence of different entities acquiring these brands¹³ and by the large level of *multihoming* observed on the cardholder's side.

4.3. A model of competition between platforms

Rochet and Tirole^[8] developed a model of competition between platforms which reflects influence of demand elasticity of end user's – cardholders and merchants – on definition of prices by schemes.

The price structure defined in Rochet and Tirole^[8] is quite different from the observed in Portuguese market, as they assume that in downstream markets, members of platforms have only marginal costs and charge only fees per transaction to its users¹⁴. In this way, all analysis will focus on definition of transactional fees by platforms

¹³ In Portugal, tying is common in acquirers of international schemes. Acquirers of Visa Electron (Debit) acquirer also Visa (Credit) which could constitute a competitive advantage reducing competition between schemes. However in the specific context of Portuguese market 79% of credit cards are co-badge with domestic scheme and in this way a merchant can contract multibanco scheme without lost of scope which reduce competitive advantage of acquirers of international schemes.

¹⁴ As far as pricing is concern, in Portuguese debit cards market, cardholders commonly pay annual fees and merchants are charged with monthly fees, joining fees and merchant service charges.

assuming that there are no fixed costs for members of platforms and that users only pay transactional fees¹⁵.

The model define that the net marginal costs for members of platform i of serving a merchants (Seller – S) and a cardholders (Buyer – B) respectively, are $c^B - a_i$ and $c^S + a_i$ where c^B and c^S represent the gross marginal costs incurred by the members on each side of the market and a_i represents the interchange fee defined by platform. They assume that margins on each side are constant¹⁶ and equals to m^B and m^S . In this way equilibrium prices are:

$$P_i^B = c^B - a_i + m^B \quad (1)$$

$$P_i^S = c^S + a_i + m^S \quad (2)$$

Profits of all members are defined as proportional to the volume of transactions on the association's platform. In this way, association chooses interchange fee a_i so as to maximize its total volume. Thus the total price on each platform is constant:

$$P_i^S + P_i^B = c + m \quad (3)$$

where, $m = m^S + m^B$ is total margin on downstream markets and $c = c^S + c^B$ is total cost on downstream markets

¹⁵ This is the same as assume that, on each side, fixed costs are paid by fixed fees charged to users, and thus allocation of fees between the two sides is only done through transactional fees. In the way that this market is balanced by definition of interchange fee by platforms, which is a fee per transaction, this assumption does not seem to be strong in terms of the analysis.

¹⁶ Rochet and Tirole consider margins on downstream markets constant. For Portuguese market, there is no information about margins available, and so the effect of this assumption is not possible to preview.

The two price vectors (P_i^B, P_i^S) , to $i=1,2$, are the outcome of competition between two platforms which maximize total volume of system Q_i . Thus FOC for a symmetric equilibrium are given by:

$$P^S + P^B = c + m \quad (4) \text{ and } \frac{\partial Q_i}{\partial p_i^B} = \frac{\partial Q_i}{\partial p_i^S} \quad (5)$$

The total price as to be equal to marginal cost plus total margin. On the other hand demand elasticities on each side have to be taken into account. Condition (5) imposes that marginal price increase on each side has to have the same impact on total volume of platform i . The symmetric equilibrium of the competition between platforms achieved by Rochet and Tirole^[8] is:

$$(4) \text{ and } \frac{P^B}{\sigma \eta_o^B} = \frac{P^S}{\eta^S} \quad (6)$$

where σ measures loyalty of consumers to platform i i.e. proportion of them who stop trading when platform i ceases to be available¹⁷, η_o^B is the ratio of own-brand demand elasticity for cardholders¹⁸ and η^S is quasi-demand elasticity of merchants.

Rewriting equation (6) is obtained:

¹⁷ This parameter is equal to 0 when cardholder demand faced by merchant is independent of whether the seller is affiliated with platform i . When multi-homing on issuer side is widespread it is close to zero.

¹⁸ η_o^B represents the variations on the proportion of issuers who are willing to trade on

platform when the buyer is multihome relative to transactional price: $\eta_o^B = -\frac{p^B}{d^B} \frac{\partial d^B}{\partial p^B}$, where d^B represents the proportion of buyers who are willing to trade on platform when the seller multihomes. Differently η^B refers to the variations on the proportion of issuers who are willing who trade on platform when the buyer is affiliate to only one scheme.

$$\frac{P^B}{P^S} = \sigma \frac{\eta_o^B}{\eta^S} \quad (7)$$

Equation (7) states the relation between relative prices and demand conditions which results from competition in a two sided market. If the ratio of prices is greater than 1, price charge to cardholders P^B must be higher than price charge to merchants P^S . If the ratio is lower than 1, price charge to cardholders P^B should be lower than price charge to merchants P^S . For the Portuguese debit cards market parameter σ must be close to zero as *multihoming* is very large and demand faced by merchants is nearly independent of the type of scheme accepted, as explained in section 4.2. However, this does not translate into a ratio (7) greater or below one. To attain the magnitude of relative downstream prices which result from competition, it is necessary to obtain the demand elasticities on each side of the market, in order to substitute in equation (7).

4.4. Demand elasticities: Methodology and data

Price demand elasticity for each side of the market was estimated based on two enquiries done for Unicre by PRM International, SA.¹⁹ in 2005. In each enquiry there was one question which is related to prices and to preferences of the agents. Based on these questions this work tries to apply a methodology of estimation of demand elasticities which reflects the particular structure of the data available.

4.4.1. Merchants' demand elasticity

¹⁹ The survey used to obtain demand elasticities also has more information about fees paid by users than those used by Rochet and Tirole in the model described. The authors only used transactional fees and this survey contain also information about fixed fees charged to users. In this way not all demand elasticities calculate in this section will be applied to the model.

Demand elasticity on the merchant's side was estimated for three different elements of price: monthly fee, joining fee and average discount rate.

In the mentioned enquiry, merchants answered a question were they had to indicate the probability of applying for acceptance of cards of a given payment cards scheme based on its type and pricing. Each merchant had to attribute probabilities to 9 different hypotheses of price structure and type of network (a-i). The different hypotheses are identified in Table 1.

This question was answered by 1159 merchants (N_m) and, given that each merchant attributed probabilities to 9 different hypotheses (a-i), the total number of observations is $10.431 (N_m \times 9)^{20}$.

Table 1 – Hypothesis of payment cards acceptance network.

	Type of card accepted by network	Joining fee and automatic terminal installation	Monthly Fee	Average Discount Rate
		Price paid for signing an agreement (one time fee)	Fixed monthly cost for terminal maintenance, stationery and calls	Percentage deducted from total sales paid with cards
a	Credit Cards	250 €	15 €	3%
b	Credit Cards	200 €	25 €	1%
c	Debit Cards	200 €	20 €	3%
d	Debit Cards	250 €	25 €	2%
e	Credit and Debit Cards	150 €	25 €	3%
f	Credit and Debit Cards	250 €	20 €	1%
g	Credit and Debit Cards	200 €	15 €	2%
h	Debit Cards	150 €	15 €	1%
i	Credit Cards	150 €	20 €	2%

An econometric approach was applied to the described panel data structure, in order to calculate demand elasticity for networks of payment cards acceptance, related to the different components of

²⁰ The survey was done only to small merchants. Large merchant (retail chains) were not included. This can result on a higher elasticity than the one that is really verified in the market. Large chains should have higher logistical cost when not accepting payment card as mean of payment and as such their demand is likely be more inelastic.

price and type of network. An OLS linear model²¹ was constructed, taking into account characteristics of each merchant (8)²².

$$Pr_{ij} = c_i + \beta_1 cc_{ij} + \beta_2 dc_{ij} + \beta_3 mf_{ij} + \beta_4 jf_{ij} + \beta_5 adv_{ij} + \theta_{ij} \quad (8)$$

i – Merchant

j – Observation

Pr – Probability of applying for the network of payment cards acceptance

cc – Dummy which identifies a network which accepts only credit cards

dc – Dummy which identifies a network which accepts only debit cards

mf – Monthly fee

jf – Joining fee

adv – Average discount rate.

The model was estimated including fixed effects for each merchant²³ so the constant differs across merchants. As the dependent variable includes observations equal to zero a log-log model could not be applied²⁴. In this context, the coefficients of this model do not reflect the elasticity of dependent variable to independent one. To attain demand elasticity for each component of price-joining fee, monthly fee, and average discount rate-based on estimated coefficients, some calculations had to be done. First, using the average value of independent variables monthly fee, joining fee and average discount rate implicit in questions posed to merchants, the average probability of a merchant contracting a debit network, credit network or a network for credit and debit cards was calculated:

²¹ With error terms independent and normally distributed.

²² In the enquiry probabilities were attributed from 0 to 100. One limitation of this model comes from the fact that it will estimate probabilities which can be above 100% and below 0%.

²³ Fixed effects with dummy for each merchant.

²⁴ An alternative would be to establish criteria based on top answers. A log-log model estimates coefficients not statistically significant even considering only the top 4 or 5 answers different from zero. This happens because the number of zero answers is high. About 218 merchants answered zero to all options. Only 617 merchant have top 5 answers different from zero and in case of top 4 answers this number decreases to 556 merchants.

$$\hat{Pr}_k = \bar{c} + \hat{\beta}_1 cc + \hat{\beta}_2 dc + \hat{\beta}_3 \overline{mf} + \hat{\beta}_4 \overline{jf} + \hat{\beta}_5 \overline{adv} \quad (9)$$

with $k=cc$, $k=dc$ or $k=cc$ and dc

After these, it was possible to achieve demand elasticity of merchants relative to each component of price and distinguish them by type of network:

$$\eta_k^{S/mf} = \overline{mf} * \frac{\hat{\beta}_3}{\hat{Pr}_k} \quad (10) \quad \eta_k^{S/jf} = \overline{jf} * \frac{\hat{\beta}_4}{\hat{Pr}_k} \quad (11) \quad \eta_k^{S/adv} = \overline{adv} * \frac{\hat{\beta}_5}{\hat{Pr}_k} \quad (12)$$

4.4.2. Consumers' demand elasticity

Demand elasticity on the side of consumers was calculated with a method similar to that applied to merchants. A similar question had been answered by consumers, where they had to attribute probabilities to applying for a card taking into account different characteristics of the card. The possible choices are described in Table 2.

This question was answered by 1518 consumers (N_c) and, as each consumer attribute probability to 8 different hypotheses (a-h), the total number of observations is 12144 ($N_c \times 8$).

In this case, in order to obtain coefficients to estimate demand elasticity relative to annual fee, an OLS linear model was estimated²⁵, based on the panel data structure described, taking into account characteristics of each consumer (13)²⁶.

²⁵ Error terms independent and normally distributed.

²⁶ In the enquiry, probabilities were attributed from 0 to 100. One limitation of this model comes from the fact that it will estimate probabilities which can be above 100% and below 0%.

Table 2 – Hypothesis of payment cards

	Type of card	Annual Fee
a	Credit Card	0 €
b	Credit Card	35 €
c	Credit Card	40 €
d	Credit Card	50 €
e	Debit Card	0 €
f	Debit Card	35 €
g	Debit Card	40 €
h	Debit Card	50 €

$$Pr_{ij} = c_i + \phi_1 cc_{ij} + \phi_2 annu_{ij} + \theta_{ij} \quad (13)$$

i – Consumer

j – Observation

Pr – Probability of applying for a card

cc – Dummy which identifies a credit card

annu – annual fee paid to hold the card

As with merchants, the model was estimated including fixed effects for each consumer²⁷ and constant differing across consumers. The dependent variable here also includes observations equals to zero and a log-log model could not be applied either. In this context, estimation of demand elasticity for cards relative to annual fee required the same steps followed on the merchant side. First the average probability of a consumer applying for a credit or a debit card, considering the average annuity implicit in his or her choices, was estimated:

²⁷ Fixed effects with dummy for each consumer.

$$\hat{Pr}_k = \bar{c} + \hat{\phi}_1 cc + \hat{\phi}_2 \overline{annu} + \hat{\theta} \quad (14)$$

with $k=cc$ or $k=dc$

Afterwards was possible to achieve demand elasticity of consumers relative to annual fee and distinguish it by type of network:

$$\eta_k^{B/annu} = \overline{annu} * \frac{\hat{\phi}_2}{\hat{Pr}_k} \quad (15)$$

4.5. Demand elasticities: Results

4.5.1. Merchants' demand elasticity

The estimates for coefficients of equation (8) were done in E-views 5.0 and are presented in Table 3, with statistical significance being evaluated. All coefficients are statistically significant at one per cent level.

Table 3 – Estimated coefficients of equation (8)

Dependent Variables	Constant	Credit Card	Debit Card	Monthly fee	Joining Fee	Average Discount Value
		cc	dc	mf	jf	adv
Coefficients	c	$\hat{a}^1$	$\hat{a}^2$	$\hat{a}^3$	$\hat{a}^4$	$\hat{a}^5$
Estimated coefficients*	67,992	-12,245	-1,318	-0,809	-0,055	-7,716
P-Value	{0,000000}	{0,000000}	{0,000001}	{0,000000}	{0,000000}	{0,000000}

* Equation was estimated with fixed effects for 1159 cross-sections (number of merchants which answer question). For each cross-section there is one fixed effect constant estimated in the model which is not presented here. Constant presented is the average of all constants.

With the estimated coefficients, it was possible to apply the steps described by equations (9), (10), (11) and (12) which yielded the results described on Table 4.

Table 4 – Estimation of merchants demand elasticities based on Estimated coefficients for equation (8)

Value of Variable			
Average monthly fee	200 €		
Average joining fee	20 €		
Average of average discount rate	2%		
Type of Network			
	Debit	Credit	Debit and Credit
Average Probability Estimations	24%	13%	25%
Demand Elasticity relative to:			
Monthly fee	-0,67	-1,23	-0,64
Joining fee	-0,45	-0,83	-0,43
Average discount rate	-0,64	-1,17	-0,61

4.5.2. Consumers' demand elasticity

The estimates for the coefficients of equation (13) were done in E-views 5.0 and are presented in Table 5, with statistical significance being evaluated. All coefficients are statistically significant at one per cent level.

Table 5 – Estimated coefficients of equation (13)

Dependent Variables	Constant	Credit Card	Annual Fee
		cc	anu
Coefficients	c	$\hat{\alpha}^1$	$\hat{\alpha}^2$
Estimated coefficients*	90,130	-16,731	-1,053
	$\{(1), (10), (11)\}$	$\{(1), (10), (11)\}$	$\{(1), (10), (11)\}$

* Equation was estimated with fixed effects for 1518 cross-sections (number of consumers which answer this question). For each cross-section there is one fixed effect constant estimated in the model which is not presented here. Constant presented is the average of all constants.

With the coefficients estimated for equation (13) it was possible to estimate demand elasticity of consumers based on equations (14) and (15). Estimation is described in Table 6.

Table 6 – Estimation of consumers demand elasticity based on Estimated coefficients for equation (13)

Value of Variable		
Average Annual Fee	37,5 €	
Type of card		
	Debit	Credit
Average Probability Estimations (%)	51%	34%
Demand Elasticity relative to:		
Annual Fee	-0,78	-1,17

4.6. Demand elasticities and definition of price structure on Portuguese market

According to the estimated demand elasticities for debit market, and applying those to equation (7), the expected result from platform competition was that merchants should be charged higher transactional fees than those charged to consumers. When demand elasticity on merchant side and demand elasticity on consumers²⁸ side is applied to equation (7) the results are:

²⁸ In the sense that in Portugal do not exist charge of transactional fees to consumers it was not possible to achieve demand elasticity relative to fees per transaction to apply in the model, as no information was available in the survey. Although there is no information available about the relation between sensibility of consumers to fixed fees and to transactional fees, the only alternative was to apply demand elasticity relative to the estimated fixed annual fee, which can constitute a weakness of the analysis, but gives a measure of consumers sensibility to the price paid to use a card. On the other hand, the demand

$$\frac{P^B}{P^S} = \sigma \frac{0,78}{0,64} \quad (17)$$

Nevertheless, as explained in section 4.3, as the Portuguese payment cards market has a high level of *multihoming* cardholders, given a parameter σ measuring “loyalty” of consumers to platforms, it is expected that this parameter takes a value close to zero. Applying values of σ close to zero the above ratio would seem to be lower than 1.

The price structure which results from applying demand elasticities and specific aspects of Portuguese debit card market to the theoretical result of Rochet and Tirole^[8] seems to be similar to the actually observed. Nowadays merchants pay on average 0,36€ per each debit transaction²⁹ (Appendix 6) while consumers do not pay any transactional fee³⁰. Indeed, as far as debit cards are concern, consumers are charged only with annual fees which are priced at between 4€ and 7,5€³¹.

Making the inverse analysis and applying to the equation (7) the observed prices and the estimations of demand elasticities is obtained a *multihoming* parameter zero:

$$\frac{0}{0,36} = \sigma \frac{0,78}{0,64} \quad (18)$$

This result is reasonable as the level of *multihoming* in Portuguese market is large, as explained before, and so, the utilization of a

elasticity presented in the model of Rochet and Tirole is the own brand demand elasticity η^B , explicit on note 18. As the survey do not have information about sensibility of buyers to transactional fees, it was also not possible to achieve too.

²⁹ This estimation assumes an average discount rate of 1,12% (Appendix 6) and an average debit transaction value of 32,12€ Blue Book^[2]: $1,12\% \times 32,12\text{€} = 0,36\text{€}$ per transaction.

³⁰ RBR [6, Portugal p. 17].

³¹ RBR [6, Portugal p. 17].

model of competition between platforms seems to be reasonable on the context of portuguese debit cards market.

From this framework seems to result evidence that the transactional price structure defined by platforms may be taking into account the demand on each side, charging more to merchants than to consumers in order to guarantee that both side are on board.

5. Limitations of the analysis

Although the results seem to go in one direction, the analysis has some weaknesses that should be mentioned.

The model by Rochet and Tirole^[8] considers only transactional costs for the users of the platform, an aspect which is not in accordance with the prices observed in Portuguese market. Extensions of this model to fixed fees consider only single-homing, which also do not apply to the Portuguese market. In this context, one of the models was chosen, acknowledging that this can cast some doubts on the analysis. As far as the model is concern, the consideration of constant margins can also constitute a weakness of the analysis, as no information about margins in the market is available.

Another important point relates to the demand elasticity on the consumer side, in the way that it is assumed that the demand elasticity relative to the annual fee is equal to demand elasticity relative to a the transactional price, which in fact could not be truth. However, as no information about sensibility of consumers to transactional fees is available, it was necessary to do this assumption which may weak results.

In terms of demand elasticity on the merchant side, there is one aspect which can affect results to some extend. Demand elasticity estimated could be higher than the really observed given that the survey was conducted only to small merchants. A larger merchant is likely to have high logistic costs when not accepting payment cards

as mean of payment, and its demand should be more inelastic. In this way, the inclusion of information about demand elasticity of large merchants may lower total demand elasticity on merchant side might enforce the results achieved.

6. Conclusions

The aim of this project was to analyse the implications of demand elasticities on the definition of the price structure of the Portuguese payment cards market, with special focus on the market for debit cards. The question arising was whether card schemes were taking into account demand conditions on defining their price structure in the market, as this is a crucial point in two-sided markets.

The project applies different evidences from Portuguese debit cards market and estimations of demand elasticities on both sides to a model by Rochet and Tirole ^[8]. From these applications it is concluded that, theoretically, the price structure resulting from competition between Multibanco and Visa Electron should yield higher transactional fees charged to merchants than to consumers – if demand conditions are being taking into account. Given that the results from the theoretical model are similar to the actually observed price structure in the market, platforms seem to be taking into account demand conditions, when establishing their transactional price structure in the market. Nonetheless the analysis has some relevant limitations that may possibly weaken the results.

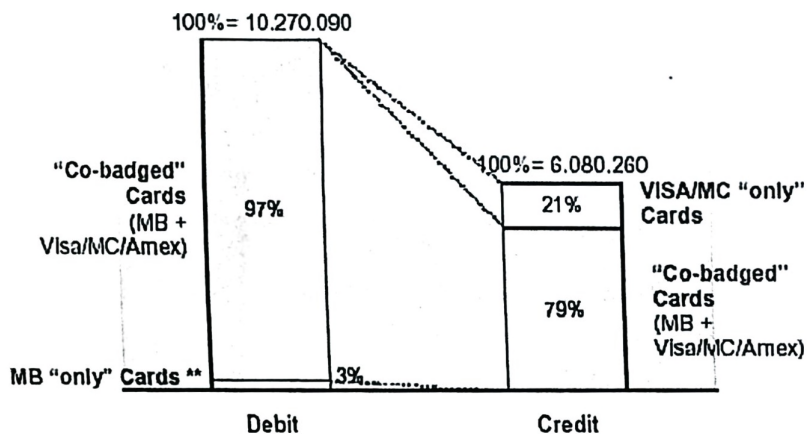
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Appendices

1. Distribution of cards by scheme in Portugal*

December 2005. Percentage. Number of cards.



* Includes only information related to the cards present in the SBS Database.

** Includes cards of reduced functionalities.

Source: SBS

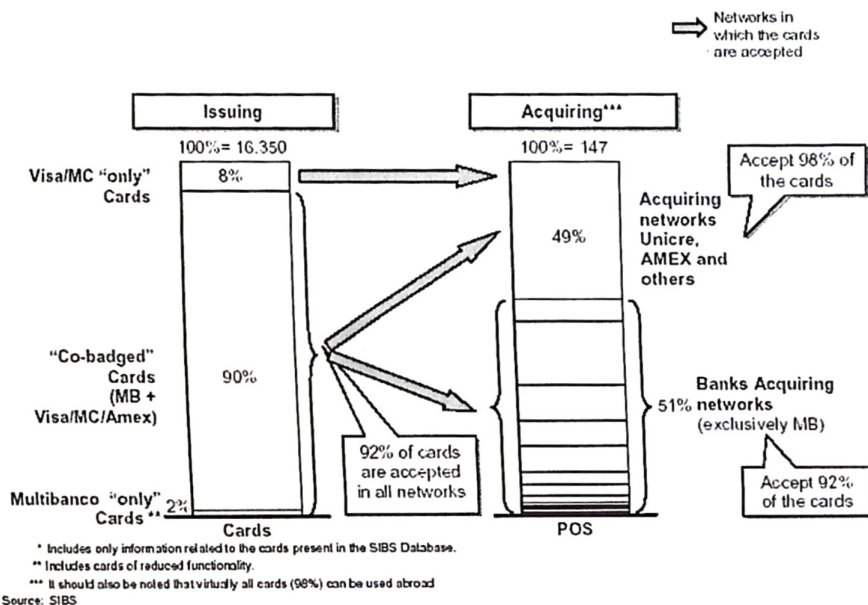
Source: Graphic extracted from CISP – Interbank coordination committee for payment systems – I, "Comments on the European Commission's Interim Report I – Payment Cards" Portugal June 20, 2006, p. 9.

2. Acquirers of Multibanco Scheme

Acquirers of Domestic Scheme Multibanco
Banco Português de Investimento
Banco Espírito Santo
Banco Português de Negócios
Banco Santander Totta
Banif
Barclays Bank
BBVA
CCCAM
Montepio Geral
Caixa Geral de Depósitos
Millennium BCP
Deutsche bank
Banco Comercial dos Açores
Banco Popular
Finibanco

Source: Visa Portugal, Sibs, Sites of financial institutions quoted and Bank of Portugal.
<http://www.visaurope.com/personal/choosing/getacard/main.jsp?country=Portugal&submit=Go>

3. Market Structure in issuing and Acquiring of payment cards in Portugal*



December 2005. Thousands.

Source: Graphic extracted from CISP – Interbank coordination committee for payment systems – I, "Comments on the European Commission's Interim Report I – Payment Cards" Portugal June 20, 2006, p. 9.

4. Point of sale terminals by scheme

Major Schemes in Acquiring , Number of Point of sale terminals	Percentage of Total
Multibanco Scheme	69 %
International Schemes	31 %
Total	100 %

Source: Unicre, BPN, SIBS.

Note: There is no information available about number of point of sale terminals of residual acquirers of international schemes http://www.unicre.pt/index.php?id_categoria=7&id_item=146 , <http://www.sibs.pt/> , <http://www.bpn.pt/eportal/v10/PT/aspx/oBpn/noticias/noticiasBPN/detalhe/index,7351.aspx>

5. Issuers of different schemes in Portuguese payment cards market

Issuers	Schemes				
	Visa		Mastercard		Multibanco
	Visa	Visa Electron	Mastercard	Maestro	
Banco Português de Investimento	✓	✓	✓		✓
Banco do Brasil	✓	✓			✓
Banco Espírito Santo	✓	✓			✓
Banco Português de Negócios	✓	✓			✓
Banco Santander Totta	✓	✓	✓		✓
Banif	✓	✓			✓
Barclays Bank	✓	✓			✓
BBVA	✓	✓			✓
CCCAM	✓	✓			✓
Montepio Geral	✓	✓			✓
Caixa Geral de Depósitos	✓	✓	✓	✓	✓
Millennium BCP	✓	✓	✓	✓	✓
Deutsche bank	✓	✓			✓
Banco Comercial dos Açores	✓	✓			✓
Banco Actiobank	✓	✓	✓		✓
Banco Popular	✓	✓	✓		✓
BPN Paribas	✓	✓			
Finibanco	✓	✓			✓
Banco BEST	✓	✓			✓
Unibanco	✓		✓		
Cetelem			✓		
Santander Consumer Finance			✓		
Banco Mais	✓				
Citibank	✓				

Source: Visa Portugal, Sites of financial institutions quoted and Bank of Portugal.
<http://www.visaeurope.com/personal/choosing/getacard/main.jsp?country=Portugal&submit=Go>

6. Acquiring Pricing

	Fixed Fees			Transactional Fees	
	Monthly Fee	Joining Fee	Average debit discount rate	Average credit discount rate	Communication costs per transaction
BPN	23,00 €	150,00 €	1,13%	2,03%	-
Unicre	22,00 €	165,00 €	1,74%	1,93%	-
Millennium BCP	22,45 €	0,00 €	0,90%	-	0,07 €
Montepio	21,25 €	30,00 €	1,00%	-	0,12 €
CGD	20,00 €	0,00 €	1,00%	-	0,06 €
BES	21,00 €	0,00 €	1,10%	-	0,10 €
BPI	22,00 €	30,00 €	1,10%	-	-
Santander	23,10 €	0,00 €	1,10%	-	-
Banco Popular	25,00 €	0,00 €	1,00%	-	0,12 €
Average	22,20 €	41,67 €	1,12%	1,98%	0,09 €

Source: Author research. Sites and branches of different financial institutions.

