Retail Payment Systems: What can we Learn from Two-Sided Markets?

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Abstract: Some retail payment systems can be modelled as two-sided markets, where a payment system facilitates money exchanges between consumers on one side and merchants on the other. The system sets rules and standards, to ensure usage and acceptance of its payment instruments by consumers and merchants respectively.
Some retail payment systems exhibit indirect network externalities, which is one of the main criteria used to define two-sided markets. As more consumers use the payment platform, more merchants are encouraged to join it. Conversely, the value of holding payment instruments increases with the number of merchants accepting them. The theory of two-sided markets contributes to a better understanding of these retail payment systems, by showing that an asymmetric allocation of costs is needed to maximise the volume of transactions. It also starts to offer results that could explain competition between payment platforms.
However, this theory entails some limits to a thorough understanding of retail payment systems. Firstly, we show that some retail payment systems, such as credit transfer or direct debit systems, do not necessarily fulfil all the theoretical criteria used to define two-sided markets. Moreover, this theory does not take into account specific features of the payment industry, such as risk management or fraud prevention. This leads us to propose new research directions.
Key words: payment systems, two-sided markets, platform competition, payment cards.

On December 4th 2004 a failure in the Belgium payment card system paralysed merchants' card transactions for over two hours. According to the local newspaper *Le Soir*, retailers sustained losses of an estimated EUR 20 million [1]. The consequences of this failure show the economic importance of payment systems for commercial exchanges. Over 231 billion transactions worth EUR 52,000 billion are processed each year in European payment systems, totalling between 2-3% of European GDP [2].

(*) I wish to thank "le Groupement des cartes bancaires" CB for its helpful support.

1 Source : www.silicon.fr, Thursday, December 9th 2004.

2 Study conducted by McKinsey in 2005, cited by the European Commission in its directive proposal for payment services in the internal market. Directive COM(2005)603.

These transactions can be routed through several payment systems: payment systems for interbanking transfers, payment systems for securities traded on financial markets, and retail payment systems (for cash, checks, card payments, credit transfers, direct debits etc.). All these payment systems, whether for retail or wholesale transactions, share a clearly defined set of rules [3], processes, and instruments that enable their members to exchange money.

It is increasingly difficult to understand how financial systems work, because money exchange mechanisms now involve complex competitive interactions between payment institutions on the one hand, and payment systems on the other. In fact, private payment systems organised as networks compete to offer services to payment institutions, so as to ease and expand their money exchanges, while meeting the cautious constraints defined by Central Banks. It is now possible to claim that there is a real payment service industry because monetary authorities do not wholly control the competitive game anymore. This trend is likely to escalate in years to come, notably in Europe, where there is a project to liberalise payment services [4]. This ongoing revolution in the organisation of the European financial system encourages us to think about the contributions of industrial organization to the field of payment economics. The literature on networks is a good starting point for understanding how payment systems are organised [5]. Indeed, this literature analyses the way a payment system prices access to its infrastructure and usage of its services, in the presence of network externalities [6]. However, we will see that the theory on two-sided markets provides us with new elements to explain the way retail payment systems work, because it formalises the existence of indirect network externalities between two distinct groups of users, consumers and merchants. The payment system acts as an intermediary, which facilitates the interactions between end-users, trying to get both sides of the market on board by choosing appropriate prices.

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[3] The rules specify which payment instruments are accepted by the system, the characteristics of acceptance points, risk management, the clearing mechanism and the proceeding of funds transfers.

[4] For further information about the directive proposal on a "New Legal Framework" for payment services, see: http://europa.eu.int/comm/internal_market/payments/framework/index_en.htm

[5] DAVID (1985), KATZ & SHAPIRO (1985), FARRELL & SALONER (1985), *et alii*.

[6] The value of a payment system increases with the number of its users. Network economics also deal with a number of essential issues for payment systems, such as standard setting, compatibility among service providers, and the role of an installed base of network facilities.

The purpose of this article is to underline that some private retail payment systems fit in well with the theory of two-sided markets. Our analysis goes beyond payment card systems. Our aim is also to highlight the limits of this theory in its analysis of the payment industry, due to its failure to take into account some of its peculiarities. The paper begins by discussing the two hypotheses provided by ROCHET & TIROLE (2004) to characterise two-sided markets, namely the presence of indirect network externalities and the impact of price structure on transaction volume. We show that, unlike wholesale payment systems, retail payment systems fit in well with the first hypothesis, because they act as intermediaries between two distinct groups of users, consumers on the one hand, and merchants on the other. We subsequently draw a distinction between closed-loop and open-loop payment systems, which is necessary to discuss the second hypothesis. This typology enables us to show that two-sided market theory contributes to a better understanding of the asymmetric prices chosen by payment platforms. Meanwhile, we point out that it is less obvious to define direct debit and credit transfer systems as two-sided markets. This is followed by a discussion of the results provided by previous research on platform competition. We show that it is difficult to apply these results to competition between payment systems because the models do not take platform differentiation sufficiently into account. Finally, we try to propose some research perspectives. Indeed, the theory of two-sided markets could be developed to account for specific features from the payment industry.

■ Contributions of two-sided market theory to retail payment systems economics

Why does two-sided market theory contribute to a better understanding of retail payment systems? Do all retail payment systems meet the criteria used to define two-sided markets? In this section, we discuss the two hypotheses provided by ROCHET & TIROLE (2004) to characterise two-sided markets. Then we try to identify the retail payment systems that fit in with these assumptions.

Definition chosen for two-sided markets

The two-sided markets theory starts from the following observation: in many markets, a platform intervenes to facilitate the interactions between

two distinct groups of users (say group B for buyers and S for sellers) [7]. This platform chooses its prices (denoted a^B and a^S respectively) so as to attract the two groups of agents in the market, and in order to internalise the indirect network externalities that each group causes to the other. Indeed, the number of agents from a given group willing to trade on the platform depends on the number of agents on the other side of the market. The presence of indirect network externalities between two distinct groups of users builds a first criterion to define two-sided markets.

However, ROCHET & TIROLE (2004) consider that the first criterion is not sufficient to conclude that a market is two-sided. They suggest a more precise definition, whereby the transaction volume depends not only on the total price $a^S + a^B$, but also on the price structure (a^B, a^S). For instance, the transaction volume should be sensitive to a small reduction in the price paid by one group of users, if the aggregate price level remains constant. According to Rochet and Tirole, the failure of the Coase theorem is the key feature that links transaction volume to price structure. In other words, end-users should not be able to pass interaction costs on from one side to the other, and bargain to internalise indirect network externalities. This situation may arise when transaction costs are high or when the platform sets up rules that prevent end-users from bargaining [8].

Indirect network externalities in retail payment systems

The rising number of transactions carried out using paper money accelerated the development of private retail payment systems. We show that these systems meet the first criterion used to define two-sided markets. The specificity of retail payment systems is to deal with a great number of creditors and debtors for small or average transaction volumes. Retail payment platforms act as intermediaries between two distinct groups of users, consumers on the one hand and merchants on the other. By contrast, wholesale payment systems only work with financial institutions, which can be seen as a homogenous group of users.

[7] We assume that sellers and buyers are homogenous.

[8] We will see for instance that a payment platform can forbid surcharges. A merchant is said to surcharge when he charges a higher retail price to a consumer using a specific payment instrument.

The development of retail payment systems is closely related to the existence of indirect network externalities in retail banking markets. For instance, in joining a payment platform, consumers take into account the number of merchants accepting the payment instruments marketed by the system. Conversely, the merchants' benefits from membership will increase with the number of consumers holding the payment instruments of the system. As a result, demands from consumers and merchants are heavily inter-dependent. That is why new retail payment systems often face what is referred to as, "the chicken-and-egg problem". These payment systems must use appropriate prices to attract both groups of users in the market, and to balance demands. This creation of incentives for two distinct groups of users is not an issue for wholesale payment systems, because the latter only involve relatively homogenous financial institutions [9]. Thus, retail payment systems meet a specific logic, which seems to correspond to the first criterion used to define two-sided markets.

Typology of retail payment systems

There are two types of retail payment systems: closed-loop and open-loop systems. At this point in our analysis, it is important to understand this typology, because the results presented by economic literature on platform pricing are heavily influenced by the type of system considered.

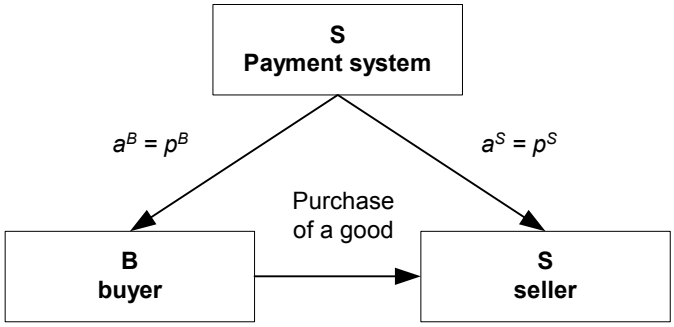
In a closed-loop system [10], the platform is managed by a single company, which signs all contracts directly with cardholders and merchants. Amex, Diners Club, and private label cards like the "Pass" card issued by the French retailer Carrefour are often referred to as closed-loop retail payment systems. Amex issues cards that can only be accepted by merchants affiliated with its platform and charges both consumers and retailers directly. The system used by Carrefour for its "Pass" card is very similar, except that its acceptance network is limited to Carrefour stores. Those systems are not necessarily specific to payment cards: for example, the issuance of gift checks accepted by a group of shops corresponds to a three party system [11].

[9] Two banks can play different roles during the settlement of a transaction, but these roles may be switched during the following deal.

[10] Also referred to as "three-party" systems.

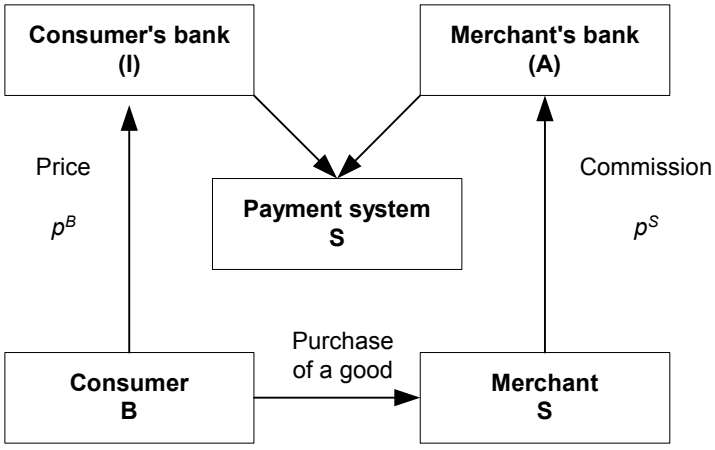
[11] In many countries, gift checks are not legally considered as payment instruments.

Figure 1 - Closed-loop system



The organisation of open-loop payment systems is more complex, for its members act as intermediaries between the platform and its end-users, consumers and merchants. Two levels of pricing must be taken into account: the pricing of the services provided by the platform to banks, and the pricing of services provided by banks to end-users. In this case, the impact of the prices chosen by the platform on end-users depends on the degree of competition between banks [12]. The Visa and MasterCard payment card systems are examples of open-loop systems. Banks pay fees to become members, but remain free to choose their pricing policy as regards cardholders and merchants.

Figure 2 - Open-loop system



[12] For instance, if retail-banking markets are perfectly competitive, banks' costs are completely passed on to consumers and merchants.

Examples of indirect network externalities in retail payment systems

In this section, we show that card and check payment systems meet the first criterion used to define two-sided markets. However, it less obvious to define indirect usage network externalities between end-users for distant payment systems, such as direct debit and credit transfer systems.

ROCHET & TIROLE (2002) first used card payment systems to illustrate the two-sided markets theory. Indeed, these payment systems exhibit indirect network membership and usage externalities. To build a card payment system, banks have to sign up merchants to acquire cards, and to provide incentives for cardholders to use them. The launching of the payment card "Carte Bleue" in France aptly illustrates the issue of membership externalities. To overcome merchants' resistance to card acceptance, the French banks decided to provide them with new services, such as payment guarantee and partnerships with international networks like BankAmericard and BarclayCard in 1973 [13].

The existence of network externalities in the payment card industry was first underlined by Baxter in 1983, a long time before the emergence of literature on two-sided markets.

	Benefit from a transaction	*Price of a transaction*
Consumer, Bank I, "issuer"	b^B	c_I
Merchant, Bank A, "Acquirer" (*)	b^S	c_A

(*) In a closed-loop system, I and A are identical.

Baxter noticed that each user will be willing to proceed to a transaction if, and only if, the benefit of that transaction exceeds its price, which is equal to the bank's marginal cost under perfect competition. Baxter assumes that the merchant cannot discriminate according to the payment instrument [14]. Therefore, a consumer will be able to use his payment card if at the same

13 For more details about the launching of the payment card in France, see: "La carte bleue: la petite carte qui change la vie", Patricia Kapferer and Tristan Gaston-Breton, édition le cherche midi. The payment garantee was a good way of competing with cheques, which were not garanteed.

14 Otherwise, there is no externality associated to card usage, because the merchant can always charge a higher price for this instrument. This rule is called "Non Discrimination Rule" (NDR).

time $b^B \geq c_I$ and $b^S \geq c_A$. Consequently, socially optimal transactions [15] are sometimes refused either by the consumer if $b^B < c_I$, or by the merchant if $b^S < c_A$ [16].

Economic literature has provided an in-depth analysis of payment card networks, which is discussed in greater detail below. However, let us first examine if there are other retail payment systems that also share this first characteristic of two-sided markets. Cheque payment systems also entail externalities of the same kind as payment card systems. There are retailers who do not accept cheques at all, or set an upper limit (often at EUR 15 in France) for cheque payments [17], resulting in a negative externality for the consumer. The issue is not similar for cash payments, because this instrument of payment is universal. There is no acceptance network for cash, which proves that this system does not meet the criteria used to define two-sided markets. The existence of usage externalities is also less obvious for distant payment systems, such as direct debit and credit transfer systems. Indeed, when a consumer transfers funds on a merchant's account, s/he transmits a payment order to his bank that cannot be refused by the merchant [18]. Furthermore, credit transfer and direct debit systems do not need to be supported by specific investments and equipment from banks' clients. Consequently, those systems do not need to provide incentives for end-users to participate in these platforms [19].

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15 Socially optimal transactions verify $b^S + b^B \geq c_A + c_I$.

16 Several factors can account for this negative externality. Merchants' resistance to card acceptance can be high, or there may be an imbalance between issuers' and acquirers' costs, generating a higher price on one side of the market

17 Cheque payments are not guaranteed in France for payments exceeding EUR 15.

18 This analysis is based on the French direct debit and credit transfer systems. Systems in Germany are very different. For further information, please refer to the study conducted by Bogaert&Vandemeulebrooke at:
http://europa.eu.int/comm/internal_market/payments/directdebit/index_en.htm.
At the same time, one could argue that there are indirect membership externalities between banks in these payment systems

19 This does not mean that both banks in direct debit and credit transfer systems offer the same services for the settlement of a transaction.

Relation between pricing and transaction volume in retail payment systems

This section of the paper tries to identify the conditions under which card and cheque payment systems meet the second criterion used to define two-sided markets. How does the pricing chosen by the platform affect the volume of transactions processed via the platform? We distinguish between closed-loop and open-loop payment systems, and assume that merchants cannot charge consumers different prices according to the type of payment instrument used.

Case of closed-loop payment systems

Closed-loop systems using a linear tariff fall perfectly into line with the theoretical framework built by ROCHET & TIROLE (2003b) to analyse platform pricing. To begin with, they assume that a monopoly platform chooses its prices a^B and a^S for buyers and sellers, respectively, to maximise its profits. They show that two conditions must be satisfied to achieve an optimal outcome:

The total price $a^T = a^S + a^B$ is given by the Lerner formula $\frac{a^T - c}{a^T} = \frac{1}{\eta}$ where c represents the platform's marginal cost and h the sum of merchants' and consumers' demand elasticities.

The price structure must reflect the ratio of the elasticity of consumers' and merchants' demands: $\frac{a^B}{\eta^B} = \frac{a^S}{\eta^S}$ [20].

In reality, the price structures of payment systems are often skewed towards one side of the market [21]. For example, EVANS (2003) shows that the credit card system Diners Club developed thanks to the asymmetric prices it charged consumers and merchants: two years after its creation in

[20] If the platform chooses its prices to maximise the social surplus, the price structure also reflects the difference between the average surplus generated on each side of the market (see Rochet and Tirole 2003 for further information).

[21] In reality, payment card platforms also charge fixed membership fees, but this does not modify the results obtained by Rochet and Tirole substantially. The platform uses per-interaction prices p^B and p^S which take into account usage pricing and fixed costs, which are incurred on a transaction by transaction basis.

1949 Diners Club was deriving over three quarters of its revenues from merchants. Initially, credit cards were even given away to consumers to encourage them to participate in the system and solve the chicken-and-egg problem. At the same time, merchants were ready to pay more for membership to attract buyers they perceived as valuable. This asymmetric pricing is not specific to card payment systems. Gift vouchers, for example, are often given away to consumers, while merchants must pay a commission to the platform on acceptance [22]. These examples show that two-sided market theory provides us with a strong framework for explaining asymmetric pricing on payment platforms.

Case of open-loop systems

As far as open-loop systems are concerned, the issue is more complex, because two levels of prices must be taken into account: the prices that banks are charged by the platform, and the prices that end-users are charged by banks. The impact of platform pricing on end-users will depend on the kind of competition between payment institution members of the system. Economic literature on this subject provides an in-depth analysis of open-loop payment card systems managed by payment card associations [23]. These systems use a specific mechanism of commissions to charge platform usage, referred to as "interchange fees" [24].

Prices of payment card systems and interchange fees

The literature on payment card systems assumes that the platform chooses a special tariff: the merchant's bank, A, (A for "Acquirer") pays to the consumer's bank, I, (I for "Issuer") a price per interaction "a", which is called the "interchange fee". In that case, using the notations we introduced previously, we have: $a^S = -a^B = a$. If the interchange fee is positive, the cardholder's bank is subsidised each time the card is used. Consequently, if this subsidy is partially passed on to the cardholder, who pays a lower price p per transaction, it serves to boost consumer demand. In compensation, the acquirer (A) can totally or partially pass on its cost "a" to the commissions

22 This information is confirmed by the French company Kadeos.

23 Payment card systems are not the only example of open-loop payment systems. One can cite, for instance, the system of cheque exchange and storage managed by the American company Viewpointe. Literature on this topic analyses a lot of payment card systems because of the popularity of this payment instrument.

24 Interchange fees have been subject to many controversies, which are not discussed in this article.

"m" paid by merchants. This linear pricing studied in literature on the topic is a good representation of a system like Visa. Indeed, the merchant's bank pays the consumer's bank a fixed percentage per transaction, which corresponds exactly to interchange fees as defined by literature on this subject. However, other systems have chosen to implement more complex pricing methods. The French payment card system "CB", for example, chose to use a two-part tariff, which involves a fixed multilateral part, and a variable bilateral part [25]. This example suggests that the theoretical results shown by the literature rely heavily on the modelling choice. Indeed, in all articles, the interchange fee is modelled using a linear and multilateral tariff. In reality, the definition of interchange fees varies a lot across countries and payment card systems. The reader will find useful information in the comparative analysis carried out by WEINER & WRIGHT (2005).

Interchange fees and externalities

Baxter's basic model shows that an appropriate choice of interchange fee enables the platform to internalise the fundamental externality described above. Let us look once again at the benefits and costs of an interaction for each user.

	Benefit from a transaction	*Cost of a transaction*
Consumer	b^B	$c_I - a$
Merchant	b^S	$c_A + a$

Assume that the platform chooses an interchange fee $a = b^S - c_A$ [26]. In this case, social optimality is restored, because each agent agrees to proceed with a socially optimal transaction. Consequently, when there is perfect competition, the platform pricing perfectly internalises a negative externality, if any, caused by the consumer to the merchant.

Literature on interchange fees

Baxter's analysis of interchange fees opened up a new branch for economic literature on payment card systems and several authors extended

25 The variable part will vary across the couples I-A. The first element of the variable part depends on the transaction volume, and the second on another bilateral part, which is calculated according to the relative number of cards from each bank used fraudulently.

26 The interchange fee in this model is either positive or negative. The hypothesis of a positive interchange fee is equivalent to the assumption of a negative usage externality caused by the consumer to the merchant.

their work to cover this issue [27]. In fact, this literature mainly considers two questions. Firstly, under what conditions does the interchange fee chosen by the platform impact the transaction volume generated by end-users? Secondly, if the interchange fee is not neutral, is the interchange fee chosen by the platform socially optimal? The reader can refer to ROCHET's review of the literature for further details (2003), and to WEINER & WRIGHT (2005) for a cross-country analysis.

■ Modelling competition between payment systems: perspective from two-sided markets theory

The two-sided markets theory offers a good start to model platform competition, which sheds light on the way payment systems interact strategically. This section shows that payment platforms can compete either to attract new consumers or to affiliate new merchants. Afterwards, when several payment platforms are available, platforms compete for usage. The intensity of competition for membership depends on whether users can belong to several platforms. We then discuss the findings of research on the usage prices chosen by competing payment platforms. This section will essentially follow the literature and focus on payment cards.

Competition between payment systems: access and usage

There are two kinds of competition between payment platforms: competition for access or membership and competition for usage. Access competition characterises the fact that payment systems seek to encourage as many users as possible to become members of the platform. For closed-loop payment systems, like Amex, it simply consists of getting a large number of consumers and merchants on board. For open-loop systems, as usual, the mechanism is more complex, because there are two levels of players. The system must provide incentives for banks to participate and become members. Afterwards, the latter compete in banking retail markets to offer payment services to consumers and merchants.

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[27] ROCHET & TIROLE, SCHMALANSEE, WRIGHT, GANS & KING… they model different sorts of competition between banks, between merchants on retail markets, consider heterogeneous consumers, differentiated merchants etc.

This difference between closed-loop and open-loop systems is extremely important to an understanding of the way payment systems compete to provide payment services on the one hand and the way banks compete in retail markets on the other, as members of the same payment association. Platform usage is necessarily impacted by the fact that an open-loop system does not directly charge its end-users. Indeed, banks will not necessarily provide incentives for consumers to buy the payment instruments specifically accepted by the system and to use them at the point of sale. Most of the time, banks multihome, which means that they offer consumers a bundle of payment instruments, which can be issued by competing systems. For instance, for a given transaction, a bank may offer its clients the possibility of using the cheque payment system, the Visa card payment system, or other competing systems. Multihoming can offer a competitive edge, because consumers will choose the bank that provides them with the most comprehensive bundle of payment instruments at the best price. To some extent, banks can sometimes encourage the use of a payment instrument at the point of sale, by providing consumers with bonus points or rebates.

This shows that the issue of multihoming and singlehoming is essential to understanding payment platform competition. If consumers hold several payment instruments at the point of sale, for instance, systems cannot charge merchants with excessive commissions, otherwise the latter would not choose to be affiliated with the platform. Merchants need not be affiliated with several platforms, because they know that consumers can substitute one payment instrument for another. In order to compete with Amex for merchants' acceptance, for instance, Visa chose to charge merchants lower fees. This strategy was supported by an advertising campaign claiming that Visa was "everywhere you want to be", whereas some merchants do not accept Amex. This enabled Visa to overtake Amex in the credit card market, despite the fact that the Visa brand appeared 18 years later [28]. Conversely, if payment systems know that merchants need to accept as many payment instruments as possible to be valuable for consumers, they will tend to compete on the other side of the market by opting for lower fees for consumers. The cost allocation is then skewed towards merchants.

[28] Amex started issuing cards in 1958.

Competition for usage [29]

ROCHET & TIROLE obtain the first results about the prices charged by two competing closed-loop platforms. In a first step, they assume that buyers and sellers are affiliated with two proprietary platforms, and that they can use one platform or both. They also consider that merchants are not strategic, and that consumers end up choosing the platform on which the transaction will be processed, when sellers are ready to deal on both platforms. This assumption is perfectly realistic for most payment systems because the consumer chooses the instrument used at the point of sale, provided the merchant leaves him the choice. However, it is perhaps not empirically true to assume that merchants always accept all cards. For instance, in 1991, Boston restaurant owners started to decline American Express cards in their establishments in a highly public campaign against Amex's high merchant commissions. The incident became known as "The Boston Fee Party."

ROCHET & TIROLE show that platform competition results in prices very similar to those chosen by a monopoly platform. Indeed, the symmetric equilibrium is characterised by the following equation:

$$a^B + a^S - c = \frac{a^B}{\eta_0^B} = \frac{a^S}{\eta^S / \sigma}$$

On the buyers' side, demand elasticity is replaced with η_0^B, the "own-brand" elasticity (demand elasticity of buyers who choose platform i when the seller offers transactions on both platforms [30]). On the sellers' side, demand elasticity is multiplied by the inverse of s, the singlehoming index. The s, which can also be seen as a loyalty index, measures the proportion of consumers that stop trading when their favourite platform is no longer available. In reality, is there a lot of multihoming for payment systems? Empirical results from Marc RYSMAN's work (2004) show that consumers often hold several payment cards, but tend to use one platform. Over 75% of

29 ARMSTRONG (2005) "competition in two-sided markets" analyses platform competition when heterogeneous agents differ across their fixed adoption benefit (In ROCHET & TIROLE, agents differ across their usage benefits). He suggests that his assumptions (lump sum pricing, fixed costs) intend to better reflect other two-sided markets than payment cards (nightclubs, shopping malls and newspapers).

30 If $\sigma_i = 1$ then own-brand elasticity is equal to demand elasticity.

the participants surveyed in his study spend over 87% on the same card in a month. However, some consumers switch to another platform periodically. Marc Rysman computes a transition matrix, which provides a good estimation of the loyalty index [31]. The indices computed are relatively high (from 73.1% for Amex to 85.4% for Visa) [32].

How are Rochet and Tirole's results modified if competition takes place between open-loop platforms? The latter assume constant margins for banks competing in retail markets, denoted by m^B and m^S respectively, with $m = m^S + m^B$ [33]. The prices charged by competing platforms at a symmetric equilibrium are characterised by the following equations:

$$p^S + p^B - m = c$$

$$\frac{p^B}{\sigma\eta_0^B} = \frac{p^S}{\eta^S}$$

Even if competition in retail markets is intense (m=0), platform competition does not result in a socially optimal price structure, as the equation above fails to acccount for end-user surpluses.

GUTHRIE & WRIGHT (2003) extend ROCHET & TIROLE's models (2002 and 2003b) [34]. If consumers hold only one payment card, platforms compete to attract this group of users. Consequently, they wish to distort the price structure to favour them, which can only take place through a rise in the interchange fee subsidising the issuer. However, if merchants are homogenous in terms of costs and acceptance benefits, platform competition does not modify the prices chosen by a monopoly platform. Indeed, the latter already chooses the maximal level of interchange fee compatible with card acceptance. On the contrary, if all merchants are heterogeneous, platform competition causes an increase in interchange fees, and at the same time of commissions paid by merchants. This situation

31 For example, if a consumer mostly used the Visa network in a given month, what would be the probability that the Visa network would be his/her favourite network again the following month?

32 ARMSTRONG & WRIGHT analyse the role of exclusive contracts that prevent multihoming in platform competition.

33 According to this hypothesis, maximisation of profits and volumes are equivalent for the platform.

34 They consider strategic merchants with no surcharges and perfect competition between identical platforms. Like ROCHET & TIROLE (2002 and 2003), they also assume constant margins for banks on each group of users.

has been observed in reality: platform competition can paradoxically trigger a rise in the prices paid by a group of users [35]. Indeed, a study conducted by Kenneth Posner and Athina Meehan from Morgan Stanley research department [36] shows that Visa and MasterCard raised their interchange fees to face competition with Amex.

If consumers hold two payment cards, platforms compete on the merchant side to encourage the latter to accept their card, or even to favour it over the second card held by the consumer. In such cases, platform competition decreases interchange fees, which may even become lower than the socially optimal fees. This situation is less frequently observed in reality, because merchants are not allowed to temporarily refuse a payment card when they multihome. Sometimes they must even accept all cards offered by a given network, due to the "honour-all-cards rule" [37]. Furthermore, as we saw previously in Rysman's study, consumers often express a strong preference for one card.

CHAKRAVORTI & ROSON (2005) extend the literature in two directions. Firstly, they assume that platforms are differentiated and that the benefits of usage of each platform are different for consumers and merchants. Secondly, they take into account the impact of competition on the total price charged by the platform [38]. However, they do not consider strategic merchants and assume that consumers use one card at most. The falling of the constant margin hypothesis modifies the results obtained first by Rochet and Tirole, then by Guthrie and Wright. Indeed, Chakravorti and Roson compare the prices chosen by a duopoly of two differentiated platforms and a cartel. They show that competition reduces the total price charged by the platform, which increases the welfare of consumers and merchants. However, the impact of the price reduction on each sub-market (consumer and merchant) is not uniform. Consequently, when banks' margins are not fixed, platform competition has a positive impact on welfare. If benefits are uniformly distributed, they determine the conditions whereby consumers stand to benefit more from the price decrease than merchants.

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35 However, Guthrie and Wright's hypotheses do not offer a clear description of the situation observed in reality.

36 Diversified financials. Industry Overview "Attacking the death star", April 15th, 2004.

37 In practice, it is extremely difficult to verify whether merchants respect this rule for payments at the point of sale.

38 Banks' margins are not fixed. As we saw previously, maximisation of profits and volumes are not equivalent for the platform.

■ Research perspectives and changes needed to better understand retail payment systems

The limits of the "two-sided" markets approach

The lack of empirical evidence quantifying indirect network externalities in payment systems

The first natural criticism of the two-sided market theory pertains to the lack of empirical research to quantify indirect network externalities between consumers and merchants. In order to estimate membership and usage externalities in payment card systems, for instance, one should first use data to estimate demand on both sides of the market. This would be difficult to achieve, since most merchants are already equipped with terminals to accept cards in the majority of developed countries. When they are affiliated with a system, merchants are generally not allowed to turn down cards because of the "honour-all-cards" rule. It would consequently be impossible to estimate the negative usage externality that merchants would be likely to cause to consumers. It would also be rather difficult to derive a demand function for cards on the consumer side, because prices vary significantly from bank to bank, according to the bundle of services sold with the card. The appropriate theoretical framework from the literature on two-sided markets should consquently be chosen to estimate the links between transaction volumes and price structure. This would also prove difficult to estimate for the payment card industry, since consumers usually pay yearly or quarterly membership fees, while merchants are charged per transaction. Compared to other two-sided markets, like the media industry, it seems more difficult to gather the appropriate data and develop a theoretical framework to analyse the payment card industry [39].

The lack of specific elements from payments industry

As far as theory is concerned, the models developed by literature on two-sided markets do not take into account key aspects from the payment industry such as risk management or fraud prevention. Payment systems

[39] Readers interested in empirical analysis of other two-sided markets can refer to KAISER & WRIGHT (2006) for the media industry and RYSMAN (2004) for the business directory market.

often choose more complex pricing methods to provide incentives for their members to invest in security or in fraud detection programs, as already mentioned for the French Carte Bleue system. For the moment, the quality of payment services (which can depend on different elements such as security or payments guarantee) is absent from the analysis of payment systems. However, current evolutions in the European legal framework (NLF) should encourage economists to analyse other aspects of payment systems, such as the impact of risk management on access and usage pricing. Let us consider another example. If a payment system gives access to two different types of users, a mobile network operator that is a simple "payment institution" and a credit institution, which pricing method should it implement? Both players are subject to different regulatory constraints in the New Legal Framework. However, an incident caused by an erroneous risk management strategy could eventually affect all members of the system in the same way. It would also be interesting to take the quality and risk management issues in to account when studying platform competition. The following subsection provides some research perspectives for competition between payment platforms.

The limits of platform competition models for the payment industry

It is worth noting that there are some limits to the current approach towards competition between platform systems. Firstly, payment system differentiation is not sufficiently taken into account. Moreover, the models used in the literature do not help us to understand competition between closed-loop and open-loop systems. Finally, evolutions observed in the industry encourage us to study other issues, and enable us to provide some research perspectives.

The issue of payment system differentiation

It seems difficult to use the results obtained by Rochet and Tirole or Guthrie and Wright to compare the prices chosen by Amex and Diners, or Visa and MasterCard. Indeed, payment systems generally offer differentiated services for the settlement of a transaction: payment guarantee, transaction security, clearing method etc.. Even the Visa and MasterCard networks, which seem very similar, try to differentiate themselves through innovation and technologies. Consequently, system competition is unlikely to generate a symmetric equilibrium, as is often the case in the literature. Moreover, differentiation of payment services could be

useful to model the entry of newcomers in the payment industry. This issue is all the more important, since new players, like retailers or mobile network operators, have shown their willingness to participate to the payment industry, and to offer alternative payment technologies. Under what conditions will these newcomers compete with existing payment systems? Will competition between payment systems involve some infrastructure sharing, differentiation or complementarity of payment services?

CHAKRAVORTI & ROSON (2005) already started to analyse the impact of payment system differentiation on platform competition. It would be interesting to develop their study to find analytical results [40]. Meanwhile, it seems very important to lift the constant margin hypothesis to analyse platform competition [41]. Are the results obtained by Chakravorti and Roson sensitive to the assumption of uniform distributions of benefits for consumers and merchants? It would also be interesting to see how these conclusions may evolve with strategic merchants. This would confirm whether Guthrie and Wright's results are related to this specific hypothesis and enable us to compare both models. At the same time, it may be useful to study platform system differentiation through the prism of unbundling. Will payment systems benefit from the unbundling of essential functions, such as clearing, to better differentiate themselves from other services? When the transaction chain is unbundled, how do payment systems manage their complementarity? What is the impact of unbundling on the risks born by each payment systems?

Competition between closed-loop and open-loop systems

The literature on two-sided markets does not often model competition between closed-loop and open-loop systems [42]. In the panel data used by Mark Rysman, 12% of the consumers that prefer to use the Discover network one month will switch to Visa the following month. This proves that there is also a kind of competition between closed-loop and open-loop systems. From a bank's point of view, it would be interesting to analyse the incentives to participate in an open-loop system, rather than building its own

40 CHAKRAVORTI & ROSON only give numerical simulations for the results of competition between differentiated platforms.

41 These authors work on the hypothesis that banks' margins are constant. Consequently, as we saw previously, maximisation of volume and profits for the platform are identical.

42 To our knowledge, the only paper on this subject was written by MANENTI & SOMMA (2002).

proprietary network. This issue seems all the more important nowadays since open-loop systems are increasingly subject to regulatory pressure, forcing them to decrease their interchange fees. Is it possible for open-loop systems to decrease their interchange fees while facing competition from closed-loop systems? And is it socially optimal to set up an asymmetric regulation of interchange fees as the Australian regulator has done?

New research perspectives inspired by the single European payments area

The creation of a single European payments area and the future of the various national payments systems open interesting research perspectives. For instance, the literature on two-sided markets does not offer answers to incentives that could encourage two payments systems to merge. In fact, the single European payments area will certainly encourage national systems to seek economies of scale. Mergers between payment systems are not the only scenario to consider. One could also imagine that the national systems would cooperate so as to accept payment instruments issued by other platforms. National payment systems can also decide to use common supports for payment instruments that can be used in several different systems. For instance, the cards issued in the French system CB are cobranded with the Visa or the MasterCard logo, which means that they are accepted by these networks, when the French use them abroad. Under what conditions and rules will the payment systems be able to use common instruments [43]? What is the impact of cobranding alliances on competition?

■ Conclusion

The literature on two-sided markets sheds light on the way some retail payment systems work and interact. The essential contribution of this branch of literature is to show that asymmetric user pricing is needed to optimise the volume of transactions that are routed through the platform. Consumers and merchants are charged prices by payment systems that do not reflect the cost of serving them. Nevertheless, we show that the two-sided market approach does not enable us to cover all the features of the payments

[43] It would be interesting to examine if the example provided by SCHIFF (2003) , whereby open-loop systems offer shared access to one side of the market, could be applied to payment systems.

industry. Moreover, while card payments have been widely analysed, we still lack results on other payment instruments such as cheques. Furthermore, risk management and fraud prevention deserve more attention. One way of tackling those issues may be to consider the quality of the service provided by the platform. Finally, the literature on platform competitionhas not yet dealt with the issue of cooperation or mergers between payment systems.

Our view is that a better understanding of retail payment systems is needed to ensure an appropriate regulation of these markets. For instance, we do not yet know which definitive rules will be adopted in the European directive to define European payment instruments. However, we think that the contributions of the two-sided market theory should not be neglected. For example, payment cards and direct debits do not obey the same logic and should not be dealt with in the same way. We also believe that fraud prevention is a key issue, which should inform reflections on the various statuses that the Commission intends to define for payment service providers.

Moreover, the emergence of new payment instruments and technological evolutions, such as contactless payments, will perhaps provide us with some data to empirically test the hypotheses of two-sided market theory.

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