A Theoretical Analysis of Credit Card Reform in Australia*

by

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Abstract: The Reserve Bank of Australia (RBA) moved to reform credit card associations by increasing entry, allowing merchants to surcharge for card payments and regulating the interchange fee. We develop a simple model of payment systems designed to analyse the impact of these reforms. We build on the RBA's main assumptions and provide a justification for some of their concerns about excessive card use. Allowing merchants to surcharge may eliminate much of the concern over the interchange fee. On the other hand, the RBA's proposed interchange fee, based entirely on issuer costs, is unlikely to be socially optimal.

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I. Introduction

Over the past three decades, there has been a series of famous anti-trust cases in the United States concerning the operation of credit card associations and their potential for anticompetitive behaviour. In Australia, while there was some early competition scrutiny of the Bankcard association, it was only with the 1997 Wallis Inquiry that the payment system in Australia was identified as a key area for policy-makers. The Wallis report considered a potential role for the Australian Competition and Consumer Commission (ACCC) in determining the conditions of access to payment systems and also recommended that a Payment Systems Board be set up within the Reserve Bank of Australia (RBA). The *Payment Systems (Regulation) Act* gave the RBA broad powers to designate and regulate standards (including pricing terms) that arise in payment systems; and in 2001, the RBA chose to exercise those powers by first designating and then, in 2002, regulating the rules and practices under which the major credit card associations (Bankcard, MasterCard and Visa) operate.

The basis for competition concerns has been detailed in a series of reports by regulatory authorities (Cruickshank, 2000; European Commission, 2000; RBA/ACCC, 2000). In each case, investigations were triggered by natural suspicions that arise when otherwise competing banks cooperate through credit card associations. However, beyond simple allegations of price fixing and the abuse of market power, the RBA has outlined in detail its major concern: that the rules of card associations promote too much credit card use from a social perspective. The displacement of other forms of payment (including cash and debit cards), they argue, is raising the costs of transacting in the economy (RBA, 2002).

While their final policy statement focuses on a lack of competition as the ultimate cause of inefficiency in transacting, the RBA's Consultation Document (RBA, 2001) is more specific. Three particular features of credit cards are seen to drive potential over-use. The first is the 'no surcharge rule' that prohibits merchants from passing through potentially higher costs of processing credit card transactions to those customers who want to use credit cards. Consequently, all of a merchant's customers, including those who pay with cash, bear the costs of the credit card system. The second is the collectively set interchange fee. This fee is the payment made from a merchant's bank (the acquirer) to a cardholder's bank (the issuer) for settling a credit card transaction. Because the interchange fee is collectively set by the issuers and acquirers, and because merchants pass it on to all customers (and not just credit card users), it is argued that the banks can set a high interchange fee to capture more rents from merchants without a loss in credit card usage. Moreover, because the high interchange fee flows to card issuers who can encourage more card usage, those issuers set low (and perhaps negative) fees to cardholders.[1] The end result is overuse of credit cards.

The third aspect of card associations that concerns the RBA are "minimum entry standards that are intended to ensure the safety of the scheme, but have the effect of unduly limiting competition." (RBA, 2002, p.7) In this case, however, the RBA does not articulate how a potential lack of competition may drive the over-use of credit cards. Indeed, it is usually presumed that any lack of competition may lead to higher cardholder and merchant fees, and reduce rather than promote credit card use.

The RBA's final policy was directed at each of these three aspects of credit card associations. First, it proposed to eliminate association rules that prohibited merchants from imposing a surcharge on credit card users. Second, the RBA proposed a methodology that amounted to the direct regulation of the interchange fee. Finally, it proposed to enhance the ability of non-bank entities to sell credit card services, both to merchants, as acquirers and customers, as card issuers. The RBA regarded each of these policies as necessary to improve the efficiency of credit card operations in Australia. In the absence of such regulation, it was the RBA's view that there was insufficient competitive pressure on the major banks that dominated card associations to generate levels of credit card usage that were socially efficient.

The purpose of this paper is to develop a simple model of payment systems designed to analyse the impact of the RBA reforms. Previous models of payment systems, while providing insight into potential inefficiencies of credit card associations, have not been directed solely at the impact of direct regulation; particularly as it will be done in Australia. For example, Rochet and Tirole (2002) and Schmalensee (2002) demonstrate how associations might set interchange fees to balance the incentives of issuing and acquiring banks to promote the use of credit cards. In each model, there are pressures towards both under- and over-use of credit cards. Under-use can arise as a result of imperfect competition in the issuing or acquiring segments, but this is counterbalanced by the use of the interchange fee to promote adoption by either cardholders or merchants. However, each of these models has as a central feature the notion that network effects constrain the adoption of a particular payment instrument and that the practices of card associations provide a socially desirable function in resolving coordination issues.[2]

The RBA, however, is explicit in its rejection of network effects as being important in today's environment, where there is wide-spread adoption of credit cards (RBA/ACCC, 2000). Certainly, it is possible that network effects may no longer be a constraint on adoption and hence, something with significant welfare consequences.

For this reason, our model differs from all others in the literature by modeling a credit card association in an environment with no network effects. Moreover, as a welfare standard for analysing the consequences of the RBA's policies, we consider its goal of minimising the cost of transacting in the economy rather than some overall measure of producer and consumer surplus. As such, our analysis is conducted on the RBA's terms.

Given this, the main theoretical contribution of this paper is to highlight the important role played by customers when retail prices are the same regardless of the payment instrument (i.e., cash or credit card) used. It is the customer who determines the choice of payment instrument for any specific transaction; a choice that may impact upon the payoffs and profits of other participants in a payment system. As we will demonstrate, this insight is sufficient to both give some weight to concerns about inefficiencies in credit card associations but also to isolate the key impacts of the policies that will be enacted in Australia.

The paper proceeds as follows. The next section sets up our model of a credit card association. Section 3 then considers the operation of an unregulated credit card association. We demonstrate that, even absent network effects and strategic reasons for merchant adoption, interchange fees might be set too high and that there might be over-use of credit cards. Importantly, however, we do not find that a lack of competition in the issuing and acquiring segments drives potential inefficiencies (in contrast to the RBA's claim). Instead, it is a potential distortion in price signals arising out of the interaction between a privately set interchange fee and the no surcharge rule. Section 4 then considers the removal of restrictions on surcharging. We demonstrate that this is unlikely to generate price signals that will generate the socially efficient level of credit card use. Instead, merchants, who have some market power, will likely use the choice of payment instrument as a means of facilitating third-degree price discrimination. Consequently, there will too little card use. Section 5 then turns to consider the impact of regulating the interchange fee. There, we highlight the fact (explored more fully in Gans and King, 2003a) that once surcharging is possible, the level of the interchange fee has no real consequences and hence, regulation of it will be of no effect. However, if surcharging does not actually occur (say, for transaction cost reasons), we can provide a formula for the socially efficient interchange fee. We note, however, that this fee differs markedly from that proposed by the RBA. A final section concludes.

II. Model Set Up

A credit card transaction involves four parties. Card issuers are the (financial) institutions responsible for issuing cards and convincing customers to hold and use the card. Customers may then use cards to purchase goods and services from merchants who offer card facilities. If a merchant offers card facilities, these facilities are provided by acquirers who are responsible for paying the merchant and settling with the issuer. The merchant receives the amount of any transaction less the acquirer's charges. The acquirer keeps these merchant service charges less any interchange payments made to the issuer. Issuers receive interchange fees and any fees charged to card holders. The flow of funds is depicted in Figure One. If the merchant sells one unit to the customer then the merchant receives the price of the product less m, the merchant service charge. The customer pays the price plus a fee, f, associated with use of the credit card to the issuer.[3] The issuer pays the price less a, the interchange fee back to the acquirer. There are also potentially fixed fees paid by merchants and cardholders when adopting credit cards (something we consider explicitly below).

(i) Customers and merchants

We begin with a representative customer, *C*, who seeks to make a variety of purchases to maximise utility. *C* faces two classes of retailers; a variety of perfectly competitive sellers who only accept cash and a single merchant, *M*, who sells a unique product, sets their own price to maximise profits and may accept either cash or a credit card. The assumption that there is a single merchant is a simple means of focusing on cases where merchants have some market power – as is the case in many major retail sectors in Australia. However, it also removes strategic motivations that merchants might possess in adoption credit card facilities. While these strategic effects drive other analyses looking at potential problems with credit card associations, it is notable here that we can generate similar concerns even in the absence of such effects.[4]

Given the prices charged by the cash-only sellers, *C* has demand curve $Q(p)$ for the single merchant's product (that is non-increasing in *M*'s price, p) and takes all prices and bank fees as given. If *M* accepts credit cards, then the customer can use cash or credit card or any combination to pay for purchases from that merchant. Note that this demand function assumes that the consumer receives value from *M*'s product that is independent of the choice of payment instruments and any benefits that flow from that.

We denote the benefits to *C* from using a credit card rather than cash at the relevant merchant by $\int_0^{Q^c} b_c(q)dq$ where Q^c is *C*'s total credit card purchases and $b_c(.)$ is his marginal benefit from credit card usage. Let f be the per-transaction fee paid by *C* for each credit card purchase. We assume that $b_c(0) > f$ in all relevant situations and that the benefits are likely to be decreasing in card usage, $b_c' < 0$; a natural assumption given the representative customer model presented here. In other words, if cash and credit card retail prices are identical and C has paid some fixed fee, F_c, giving them a credit card, then it always pays C to make some credit purchases. However, the relative benefits of credit purchases over cash decline as the total amount of purchases rises. Let s be the difference between M's price if a credit card is used and its price if cash is used, where $s > 0$ if the credit price exceeds the cash price. If the customer makes both cash and credit card purchases, this implies that they will purchase on credit card until $s + f - b_c(Q^c) = 0$. To avoid trivial outcomes, we only consider situations where, once they pay the fixed charge, C chooses to make both cash and credit purchases.

If it accepts cards, M may also receive benefits from credit card sales relative to cash sales. The marginal merchant benefit is denoted by $b_m(Q^c)$ and again it seems reasonable to assume that $b'_m \leq 0$. M pays a fixed charge of F_m before they can accept any card transactions and then pay a merchant-services fee of m for each unit sold to a customer using a credit card. The bank that provides credit card acquiring services to the merchant sets these fees. If it accepts card, M's profit is given by

$$\pi = Q^c(s-m) + \int_0^{Q^c} b_m(q)dq + pQ - c(Q) - F_m \tag{1}$$

where Q refers to total sales by both cash and credit and $c(.)$ is the merchant's cost function. We assume the standard restrictions on both $Q(p)$ and $c(Q)$ for a solution to the merchant's profit maximisation problem to be both well defined and unique.

(ii) Timing

The timing of behaviour in the market is as follows. First, given a, issuers and acquirers set their credit card charges. M and C then independently decide whether to pay the fixed charge (if any) and avail themselves of the ability to make credit card transactions. Given all the prices of cash-only sellers, M then simultaneously sets both the cash and credit prices (i.e., p and s) and the customer chooses both their total purchases and how to divide their purchases between each payment instrument.[5]

(iii) Issuer and acquirer competition

To analyse the implications of the RBA's reforms we require a formal model of competition between issuer and acquirer banks. In this paper, we focus on a model of imperfect competition in issuing and acquiring where both functions are characterised by competition in two-part pricing. In other words, issuing and acquiring banks compete by setting both fixed charges to their customers or merchants, F_c and F_m, and by setting per transaction fees f and m. Nonetheless, it should be noted that all of the results of this paper hold for a similar model where issuers and acquirers can only use linear fees (Gans and King, 2003c).

Suppose that the per-transaction cost to an issuing bank is constant and given by c_I while the per-transaction cost to an acquiring bank is constant and given by c_A. The fixed costs to issuers and acquirers can be set at zero without significantly affecting our analysis. There might also be an interchange fee between issuers and acquirers. We denote the per-transaction interchange fee by a and adopt the convention that this fee is paid by acquirers to issuers (although that fee may be positive or negative).[6]

We begin with competition between issuers. There are n_I issuers evenly distributed around a circle of unit circumference; so that the distance between any two issuers is $1/n_I$. Location on the circle represents the underlying preference by C but issuers must set their fees prior to learning customer location. The prior belief of the issuers is that the customer has an equal probability of being at any location on the circle. The ability of C to substitute between any two issuers is given by a parameter d_c. As d_c becomes small C will readily substitute between two issuers with equivalent fees while as d_c increases the ability of C to switch issuers due to a price incentive falls.[7] After the issuers have set their fees, customer location is determined and C chooses the card of the issuer whose fees generate the highest consumer surplus. C may choose not to accept any card.

If issuers compete in two-part tariffs then competition between different issuers will lead to per-transaction credit card fees, $f = c_I - a$.[8] In equilibrium, the fixed fees will be $F_c = d_c / n_I$; where the fixed fees are capped by the total benefit that C expects to accrue from using credit cards. To see this, consider an issuer (labeled 0) located at 'zero' on the circle and its neighbour (labeled 1) located at ($1/n_I$). If the customer is located between zero and ($1/n_I$) they will buy from whichever issuer is cheapest taking into account the 'preference' or 'substitution' parameter d_c. The customer in location x will be indifferent if $F_c^0 + xd_c = F_c^1 + \left(\frac{1}{n_I} - x\right)d_c$ or $x = \frac{1}{2d_c}\left(F_c^1 - F_c^0\right) + \frac{1}{2n_I}$. Note that the probability that the customer will be located between these two issuers is given by ($1/n_I$). Further, an analogous relationship holds between the issuer at location zero and its neighbour at -($1/n_I$). Thus, given the fixed fees set by its neighbouring issuers and the probability distribution of the customer, the issuer at location zero has expected profits equal to

$$E\pi_I^0 = \frac{1}{n_I}\left(\frac{F_c^1 - F_c^0}{2d} + \frac{1}{2n_I}\right)F_c^0 + \frac{1}{n_I}\left(\frac{F_c^{-1} - F_c^0}{2d} + \frac{1}{2n_I}\right)F_c^0$$

Maximising this expected profit and noting that, by symmetry, $F_c^0 = F_c^1 = F_c^{-1} = F_c$ in equilibrium, gives $F_c = d_c / n_I$. Note that, if $d_c = 0$, the fixed fee equals zero so that issuers are perfectly competitive.

An analogous model is used for acquirer competition. Under two-part tariffs the per transaction merchant services fee is $m = c_A + a$ with a fixed fee $F_m = d_m / n_A$

where d_m is the relevant competition parameter for acquirers and n_A is the number of acquirers. Again, as d_m goes to zero, acquirers' fees simply reflect marginal cost and as d_m increases, the fixed fee is capped by the merchant's total expected benefit from accepting cards.

(iv) The benchmark for comparing use of payments instruments

As a final step, we require a social benchmark to evaluate the effects of the credit card system. Our concern here is with the efficiency of the payments system rather than the general economic surplus generated by all transactions. Consequently, we use transactions costs generated by the payments system as our point of evaluation.[9] The total net transaction cost is given by $T = \left(c_I Q^c - \int_0^{Q^c} b_c(q)dq \right) + \left(c_A Q^c - \int_0^{Q^c} b_m(q)dq \right)$. This is minimised when C divides total purchases between cash and credit so that:

$$b_c(Q^c) + b_m(Q^c) = c_I + c_A \qquad (2)$$

If C makes both cash and credit card purchases then the optimal split of total purchases between payment instruments occurs when the total marginal benefit of credit card purchases to both C and M equals total marginal cost of a credit transaction to the banks. The socially optimal quantity of credit card transactions in this situation is Q^{c*} (see also Baxter, 1983).

III. No Regulation Case

We begin, as the RBA (2002) does, by considering what happens in the absence of regulatory action. In this situation, we assume that the no surcharge rule is binding and that M is constrained to offer the same price to C for cash and card transactions (i.e., $s = 0$).[10] If M can only set a single price, then the division of sales between cash and credit card will be determined completely by C; as M has no way to cause C to favour one payment instrument over another. This means that the quantity of credit card sales, $\tilde{Q}^c$, will be such that: $f = b_c(\tilde{Q}^c)$.

Importantly, this means that $\tilde{Q}^c$ is independent of M's price. M sets p to maximise $\pi = \int_0^{\tilde{Q}^c} b_m(q)dq - m\tilde{Q}^c + pQ - c(Q)$ so that p is determined by the marginal revenue equals marginal cost rule over all sales (regardless of payment instrument); that is, $pQ' + Q = c'(Q)Q'$. This is just the simple monopoly price, which we denote by p^m.

The RBA argues that increasing the interchange fee, under the no surcharge rule, leads to an increase in credit card usage. This conclusion is supported by our model. As just noted, with the no surcharge rule, the price charged by the merchant is independent of credit card fees. Note, however, that the equilibrium per-transaction fee, f, is decreasing in the interchange fee a. Thus increasing the interchange fee reduces f and, given that $b_c' < 0$, increases credit card purchases at the expense of cash purchases. This relationship is summarised by the following proposition.

Proposition 1. *Under the 'no surcharge' rule, the volume of credit card transactions is increasing in the interchange fee regardless of the degree of acquirer and issuer competition.*

Note however that Proposition 1 does not mean that the either (1) the interchange fee will be too high or too low from a social perspective or that (2) the credit card associations will have an incentive to set an interchange fee above the socially optimal level.

We consider the association's preference over interchange fee before comparing it to the socially efficient fee. In terms of evaluating the association's preference, we focus on the interchange fee that maximises the sum of profits of issuers and acquirers. This presumes that issuers and acquirers can bargain efficiently and can make transfers between them. When this is not the case, then a precise bargaining model will need to be employed to determine the association's choice (see Schmalansee, 2002; and Small and Wright, 2001).

Consider the profits issuers and acquirers earn. Each issuer makes expected profit equal to the equilibrium fixed fee multiplied by the equilibrium probability of serving the customer, d_c / n_I^2. Similarly, expected profit for each acquirer is d_m / n_A^2. Total expected profits for the members of the card association are given by $d_c / n_I + d_m / n_A$. So long as these fees are feasible, in the sense that they do not exceed the surplus generated for *C* and *M* respectively, total profits are independent of the interchange fee. Put simply, the credit card association does not care about the value of the interchange fee. While this fee matters for the total surplus created by the card system, it does not alter the profit of the card association members.

This result has two implications. Claims that increased issuer or acquirer competition will lead to more efficient setting of the interchange fees are unfounded if issuers and acquirers can set two part tariffs. Rather, increased competition will lower the fixed card fees but will probably have no effect on the interchange fee set by the association. Further, the association will only care about the interchange fee if competition is so weak that card fees are bounded by either *C* or *M*'s total surplus. In this situation, the association will move the interchange fee to loosen the binding constraint (see also Rochet and Tirole, 2002). For example, if for a given interchange fee, competition is so weak in issuing that issuers are able to extract all customer benefits, then it will pay the association to raise the interchange fee. Raising the fee will raise customer surplus and enable the issuers to extract greater fees. The reverse holds true if acquirer competition is very weak.

In summary, unless competition in issuing or acquiring is very weak, the card association is indifferent to the interchange fee. There is no presumption that the association will set the socially optimal fee.

IV. Removing Surcharging Restrictions

In its final report, the RBA considered three options. The first, taking no action, was seen by the RBA as not resolving some important inefficiencies in the operation of credit cards in Australia. The previous section lends some support to this notion although it does not confirm the RBA's arguments that a lack of competition is the reason for inefficiencies.

We turn now to consider the RBA's second option which was to remove restrictions on merchant pricing of different payment instruments. If *M* is not constrained by a no surcharge rule then it will set its prices so as to divide cash and credit sales to maximise profit.[11] However, *M*'s desired split of total sales between cash and credit must be consistent with *C*'s choice of payment instrument. Thus, the merchant will set p, Q^c, and s to maximise π subject to $s + f = b_c(Q^c)$. From (1), the first order conditions for the merchant's profit maximisation problem with respect to s, Q^c, and p respectively are given by:

$$Q^c + \lambda = 0 \tag{3}$$

$$s + b_m(Q^c) - m - \lambda b_c'(Q^c) \tag{4}$$

$$Q'(p)p + Q(p) - c'(Q)Q'(p) = 0 \tag{5}$$

where λ is the Lagrange multiplier on the constraint imposed by the customer's choice of cash and credit purchases.

The RBA makes several claims regarding the potential beneficiaries of removing the no surcharge rule. These include cash customers, merchants and credit cardholders who use the borrowing facility. To consider these claims, first, consider the impact of allowing surcharging on cash customers. Recall that, when the no surcharge rule is in effect, the price cash customers pay is equal to the price card customers pay, and is the price that would be set by *M* if it was maximising profits over all transactions; that is, p^m. But from (5), when surcharging is possible, the optimal value for *p*, the cash price, is still p^m. This reflects the fact that when *C* makes both cash and credit purchases, the cash price determines total purchases while the difference between the cash and credit prices determine the infra-marginal split between cash and credit sales. Thus, under our model, cash customers are no better off by permitting surcharging.[12]

Turning to the other potential beneficiaries, observe that (4) determines the relationship between the cash and credit prices. By substitution, $s + (b_m(Q^c) - m) + Q^c b_c'(Q^c) = 0$. But, by the customer's optimal choice of payment instruments, we know that $b_c(Q^c) - f = s$. Thus, the merchant will set the credit card price so that:

$$(b_c(Q^c) - f) + (b_m(Q^c) - m) + Q^c b_c'(Q^c) = 0 \qquad (6)$$

Thus, $s \neq 0$ in general and the card price will differ from the cash price.

The effect of removing the 'no surcharge' rule will depend on the card fees. As issuers and acquirers can set two part tariffs, $f = c_I - a$ and $m = c_A + a$. Substituting these into (6) shows that the merchant will set a card price so that

$(b_c(Q^c)-c_I)+(b_m(Q^c)-c_A)+Q^c b_c'(Q^c)=0$. Thus, both card prices and Q^c are independent of the interchange fee.

While allowing the merchant to surcharge removes any effects of interchange fees, it does not mean that merchant pricing will lead to a socially efficient mix of transactions. Comparing equation (6) with the socially optimal rule, and noting that $b_c'<0$, *M* will set a credit card price that results in too few credit card sales from a social perspective. While transactions costs are minimised when $(b_c(Q^c)-c_I)+(b_m(Q^c)-c_A)=0$, *M* will set prices so that $(b_c(Q^c)-c_I)+(b_m(Q^c)-c_A)>0$. Thus, there will be too few credit card sales.

In the absence of any pricing restriction, *M* will use credit cards as a form of third-degree price discrimination. Credit cards are used for relatively 'high value' inframarginal transactions. By setting a relatively high credit card price, *M* is able to discriminate between these high value sales and other sales. To maximise profits, *M* will trade off the transactions cost benefits of increased credit card sales, as measured by $(b_c(Q^c)-f)+(b_m(Q^c)-m)$, and the benefit from raising profits by raising credit card prices. The ability to raise credit card prices is limited by the ability of *C* to switch to cash purchases at the margin if credit card prices are too high. This is captured by the term $Q^c b_c'(Q^c)$. This is summarised by the following proposition.

Proposition 2. *If surcharging is allowed, a profit-maximising merchant will not minimise total transactions costs even if all marginal card fees are set equal to marginal cost. In particular, the merchant will set prices so that credit card sales Q^c are strictly less than the socially optimal level Q^{c*}.*

This conclusion runs directly counter the claim in the RBA report. The RBA argued that any discrimination would be at most 'once off.'[13] However, in our analysis, this is not the case. So long as the desire to pay by card gives any information about customer willingness-to-pay, a merchant with market power will use this information when setting profit maximising prices.[14]

Unlike other models (e.g., Rochet and Tirole, 2002), the (socially undesirable) tendency of merchants to limit credit card sales here does not depend on any network externality or other externality. Rather it is simply a device for price discrimination. The merchant will tend to lower credit card sales and raise the credit card price because this allows them to identify high value customers and high value transactions.

What this means is merchants, who accept credit card payments, will benefit from the ability to surcharge but credit cardholders may not. This is what the RBA claims. Regardless of whether their card debt is paid off sooner or later, those cardholders may face higher prices; in particular, if merchants have market power, the additional charges they face will not reflect merchant service charges for card transactions. Nonetheless, the social consequences of an increased ability to price discriminate are in general, ambiguous (Varian, 1989).

V. Regulating the Interchange Fee

The final reform option and the one the RBA ultimately chose was to both remove restrictions on merchant surcharging *and* to regulate the interchange fee. Their pricing methodology for the interchange fee is cost-based, with the fee being set equal to the average costs of issuers in processing card transactions, fraud and fraud prevention, authorisation costs and costs associated with funding interest-free periods.[15] Note that (1) the costs considered do not include acquirer costs; and (2) as the RBA (2001) argues, these costs are for items that are unambiguously of direct benefit to merchants. Thus, issuer costs that may form part of c_I but that have some benefits to customers, such as costs of maintaining accounts, printing cards, and credit losses on unpaid debt, are not included. Thus, the RBA's proposed fee is strictly less then c_I.[16]

In this section, we demonstrate, first, that when surcharging occurs, the interchange fee is neutral and hence, both association attempts to use it to increase profits and regulatory intervention to improve welfare will be fruitless. Second, we consider the form of the socially optimal fee when surcharging does not occur and compare this to the RBA's proposed pricing methodology.

(i) Interchange fees when surcharging occurs

Recall that, under two-part tariff competition in issuing and acquiring, *M* sets a separate credit card price so that: $(b_c(Q^c) - c_I) + (b_m(Q^c) - c_A) + Q^c b_c'(Q^c) = 0$. The volume of card transactions is independent of the interchange fee, *a*. Thus, the level of the interchange fee has no effect on merchant or customer surplus. It is easy to see that the interchange fee will not affect issuer and acquirer profits, because the interchange fee does not enter the fixed card fees. Further, as the interchange fee does not affect the (marginal) cash price, it does not affect total sales. In this sense, without the 'no surcharge' rule, the interchange fee is neutral.[17]

The interchange fee, however, will determine the relative cash and credit prices. The customer will divide purchases between cash and credit so that $s + c_I = a + b_c(Q^c)$. Given the *M*'s profit maximising level of credit card transactions, there will be a one-to-one relationship between the surcharge associated with credit card use and the interchange fee. A rise in the interchange fee will lead to an equal rise in the credit price and fall in *f*, leaving the customer indifferent. The change in the interchange fee also leaves the merchant unaffected. While the rise in the interchange fee leads to a rise in the merchant service charge, this is just 'passed through' to customers. While the interchange fee will affect relative prices, it will have no real effects.

Interchange fee neutrality holds in more general circumstances regardless of the type of issuer and acquirer competition. In Gans and King (2003a), we demonstrate that, for any interchange fee, a rise in the interchange fee by Δ will result in a fall in f by Δ, a rise in m by Δ, a rise in the credit card price by Δ, but no change in either the cash price or any real payoffs to C, M or the card association members. What this means is that, in the absence of any reason why merchants will be unable to differentiate between cash and credit prices, the removal of the no surcharge rule removes any need to regulate interchange fees. In contrast, the RBA seeks to allow surcharging *and* to regulate interchange fees.

(ii) Interchange fees with no surcharging

It is possible that even if surcharging is permitted, surcharges may not be observed because the transaction costs of surcharging would be prohibitive (Frankel, 1998; RBA, 2001). According to the RBA, this is entirely possible given experience elsewhere.[18] In this situation, it is possible that the interchange fee would not be neutral and regulating it could impact on credit card usage and payment system efficiency.[19] Thus, here we suppose that M must set the same cash and card price and investigate the form of the socially optimal interchange fee. We will then compare that fee to the RBA's proposed methodology.

Recall that issuers and acquirers compete in two-part tariffs, so that per-transaction fees for both customers and merchants are set equal to marginal costs and all profits accrue through the fixed charges. Also, recall that we are using the RBA benchmark so that the socially optimal interchange fee minimises total transactions costs T. Thus, without surcharging the optimal outcome will occur when the quantity of credit purchases determined by the consumer $\tilde{Q}^c$ equals the socially optimal level Q^{c*}. But the customer will choose the level of card transactions so that $f - b_c(\tilde{Q}^c) = 0$. Noting that $f = c_I - a$ and that $c_I - b_c(Q^{c*}) + c_A - b_m(Q^{c*}) = 0$, this means that the socially optimal interchange fee is given by $a^* = b_m(Q^{c*}) - c_A$.

The socially optimal interchange fee is intuitive. If the merchant sets a single cash and credit price, the customer chooses the level of credit card transactions according to their own marginal costs and benefits. They ignore the marginal costs and benefits of credit card purchases to the merchant. Thus, the customer's choice of an extra credit card purchase imposes an externality on the merchant. This externality is positive if $c_A < b_m(\tilde{Q}^c)$ and negative if $c_A > b_m(\tilde{Q}^c)$. The interchange fee acts to internalise this externality. The fee is positive if there is a marginal benefit to the merchant from an additional credit card transaction at the socially optimal level of transactions. The interchange fee is negative otherwise.

To facilitate a comparison with the RBA's proposed fee, it is convenient to define $\alpha \equiv b_m(Q^{c*}) / \left(b_c(Q^{c*}) + b_m(Q^{c*})\right)$; the share of total marginal benefits accruing to the merchant. Using this, $a^* = \alpha c_I - (1-\alpha) c_A$. What this says is that if the RBA wishes to regulate the interchange fee to the socially optimal level, then they need to estimate the *relative* marginal benefits from additional credit card transactions to merchants and customers at the socially desirable level of credit card transactions. This will often be a difficult (if not impossible) task. In such circumstances, a reasonable starting assumption is that these marginal benefits will be relatively similar. Under this assumption, the socially optimal interchange fee takes a particularly simple form, $a^* = \frac{1}{2}\left(c_I - c_A\right)$.[20] In other words, if merchant and customer marginal benefits from card usage are relatively symmetric, the socially optimal interchange fee results in equal per transaction credit card fees for both merchants and customers with $m = f = \frac{1}{2}(c_I + c_A)$. Again, this accords with intuition. The interchange fee leads to merchant service charges and customer charges that reflect the marginal benefits of an additional credit card transaction to each of these parties.

Determining an optimal interchange fee by considering relative consumer and merchant marginal benefits and internalising the externality created by customers when they make a choice of payment instrument, differs significantly from the RBA's approach. Their approach is to identify those costs *incurred by issuers only* that are for payment functions that offer direct benefits to merchants. This approach appears to ignore the basic externality that underlies the optimal interchange fee; as evidenced by the exclusion of offsetting acquirer costs and no analysis of who shares proportionately more in the benefits of a card transaction. It also excludes some costs (for example, credit losses on card payments) that make up an issuer's incremental costs. At best, the RBA's methodology will lead to an interchange fee equal to issuer marginal costs, $a = c_I$. Comparing this to the optimal interchange fee, the RBA approach will only be optimal if $\alpha = 1$ and all issuer incremental costs are included. In other words, *the RBA approach will only lead to an optimal interchange fee if at the optimal mix of transactions, customers receive no marginal benefits from using a credit card relative to cash*. This is a strong assumption that does not appear to be justified in the RBA report. Nonetheless, given uncertainty over the value of α, there is a sense in which the RBA's methodology does identify an upper bound on the socially optimal interchange fee; although only if all issuer incremental costs are included (which does not appear to be the case); see Gans and King (2003b).

VI. Conclusion

The RBA's reforms to the credit card industry in Australia are amongst the most extensive anywhere in the world. To date, there is no other country that has both removed surcharging restrictions and proposed to directly regulate the interchange fee.

This paper has presented a model that respects the RBA's assumptions regarding the irrelevance of network effects and the benchmark of minimising the costs of transacting in the economy. The RBA was concerned about too high interchange fees. If banks can set non-linear fees for card users – such as an annual card fee and a per transaction charge – then card associations will generally be indifferent to the level of the interchange fee. Such non-linear fees are charged in Australia and indifference by the card associations to the interchange fee might reflect why these fees have not varied significantly over periods up to 27 years (RBA, 2002, p.8). This demonstrates that the RBA's concern about a lack of competition driving excessive interchange fees is at least partially misplaced. Increasing competition in issuing and acquiring (as the RBA hopes to do) will not necessarily improve transacting efficiency.

A key part of the RBA's reforms is the removal of restrictions on merchant surcharging. To the extent that surcharging occurs, this will (1) not necessarily lead to appropriate price signals being sent to consumers; and (2) will render any use of the interchange fee as a policy instrument ineffective. The former conclusion, which directly counters the RBA's claims, follows from the potential for merchants with market power to use the customer's choice of payment instrument as the basis for price discrimination. The latter result is simply a special case of general interchange neutrality in the presence of surcharging. As we have argued elsewhere (Gans and

King, 2003a), the removal of pricing restrictions is likely to be worthwhile because it can give regulators an assurance that a privately set interchange fee is innocuous. If surcharging occurs, the interchange fee is irrelevant.

However, the RBA has proposed to allow surcharging and to regulate the interchange fee; based on the belief that surcharging will not actually occur. In such a situation, the socially optimal interchange fee aims to internalise any costs or benefits created by the customer when they choose a particular payment instrument. The optimal interchange fee depends on the size of the merchant's marginal benefits from a credit card transaction and the acquirer's marginal costs. At a theoretical level, the pricing methodology adopted by the RBA would only be justified if they believed that customers received no marginal benefits from card transactions. There is no *a priori* reason why this will be the case and, as such, the RBA approach, based solely on issuer costs, is unlikely to generate an efficient level of credit card use. Further, the RBA has not included all issuer costs in the interchange fee. As such it is not possible to say whether or not the regulated fee will lead to a reduction in the costs of transacting in the economy relative to the status quo.

In summary, our analysis casts doubt on the benefits that will be created by the RBA's credit card reforms. While allowing surcharging makes sense, it is not certain that the regulated approach to interchange fees adopted by the RBA will lead to lower costs of transacting.

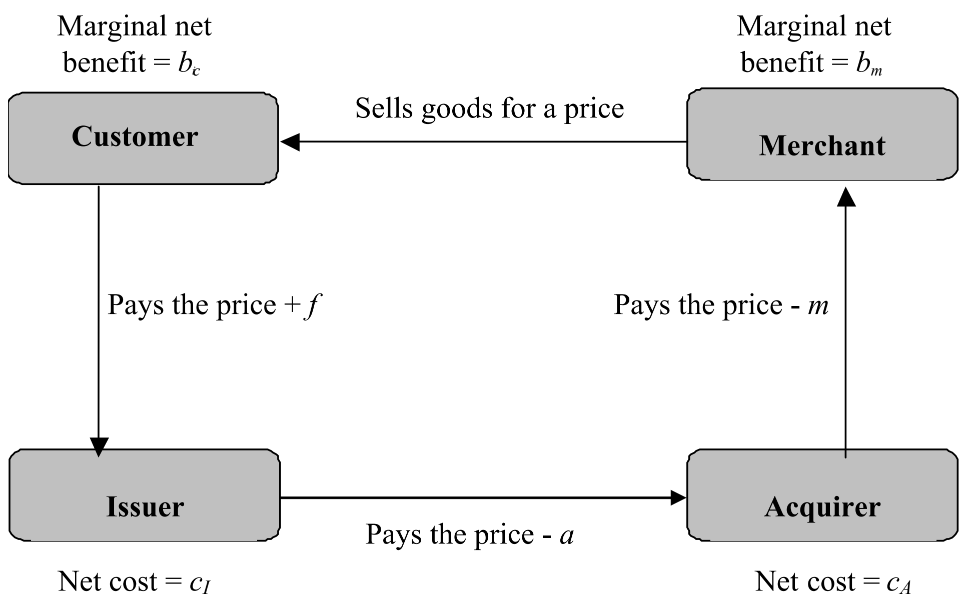

Figure 1: Four Party Payment System

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Endnotes

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[1] The RBA focus on the widespread use of loyalty or frequent flyer points as an example of this: "The price signals facing consumers choosing between different payments instruments do not promote efficient resource use in Australia's retail payments system. … Credit cardholders who settle their account in full each month (known as 'transactors') pay no transaction fee, and may be paid in the form of loyalty points, for using the funds of their financial institution. … In response to these price incentives, credit card usage in Australia has grown strongly.… Price incentives are therefore encouraging the use of a relatively high-cost payment instrument over lower cost alternatives." (RBA, 2002, pp.3-4; see also p.8).

[2] There are several other recent contributions that examine the potential inefficiencies associated with credit card associations. Chakravorti and To (2001), like Rochet and Tirole (2002), find that strategic interactions between merchants can drive credit card adoption and network effects. Small and Wright (2001) demonstrate that a bilaterally negotiated interchange fee is likely to give rise to substantial inefficiencies relative to a collectively determined one. Wright (2002) demonstrates that under perfect competition or monopoly in the merchant sector, merchant behaviour constrains potential inefficiencies arising from privately set interchange fees while Wright (2001) considers the determinants of the socially optimal interchange fee in a model with Rochet and Tirole style network effects. In each case, the formal models rely on network effects as a core to their primary results. In contrast, our model demonstrates that similar conclusions arise in the absence of network effects (as the RBA assumes) and thus lends itself towards an evaluation of the RBA's reforms.

[3] As is the practice in this literature, we do not separately model the credit aspect and interest rates associated with credit cards (Baxter, 1983). We note however that it would be simple to do so here and all of the results would continue to hold save for some additional notation. In addition, the RBA has chosen to focus on the payment functionality of credit cards and our focus on those issues in this paper is consistent with that approach.

[4] See Rochet and Tirole (2002) and the more general exploration by Wright (2001). In each case, merchants are more willing to adopt credit card processing facilities because of the potential loss in sales they might face if they did not adopt. This is a potential reason why interchange fees might be set above their socially optimal level and also is an explicit concern of the RBA (2001).

[5] There is a potential issue of coordination between the merchant and the customer when they choose whether or not to avail themselves of card facilities. The surplus to both parties from using the card can be positive, but neither party will wish to pay their fixed fee unless they believe that the other party is also going to pay the fee and avail themselves of card services. This 'network effect' has been analysed by a number of other papers (e.g. Rochet and Tirole, 2002; Schmalensee, 2002). However, it is not the focus of this paper and we concentrate on the case where both the merchant and the customer choose to avail themselves of card facilities. In each case analysed below, it is always a Nash equilibrium for both the merchant and the customer choosing to avail themselves of card facilities.

[6] Note, however, that this is a simple linear fee. Currently, card associations charge linear fees and regulators are considering linear fees only. It is an open question as to why this is the case and something we do not explore here.

[7] In some locational models, d_c is referred to as a 'distance cost.' However, in our model, d_c should be considered as simply a market power parameter. When $d_c = 0$ the issuers have no market power and are perfectly competitive. As d_c increases, individual issuer market power rises. For example, d_c could represent the convenience factor for a customer of having a credit card issued by the same bank that they use for other transactions. A rise in d_c represents a rise in this convenience factor. In equilibrium, there is not a physical cost paid by the customer. Rather, d_c represents the power of a bank to raise its fees without losing the customer due to the convenience of having multiple accounts with one bank.

[8] Setting a marginal price above marginal cost is always (weakly) Pareto dominated from the perspective of the customer and the relevant issuer so that any tariff with a marginal price above marginal cost is always dominated by a tariff with the marginal price equal to marginal cost.

[9] The model here has been constructed so that this benchmark is consistent with standard welfare analysis. As will be shown below, the fees established for credit cards and the rules of the card association do not affect total customer purchases. Thus, these rules and fees have no effect on standard

allocative efficiency in the retail market. The only role of credit card fees and rules in this model is to determine the division between cash and credit purchases, and hence, the total transactions costs.

[10] In general a no-surcharge rule does not prevent cash discounts. Frankel (1998) argues that in most cases such a rule will still lead merchants to set a single cash and credit price. Frankel refers to this as 'price coherence.' Further, in Europe, the non-discrimination rule imposed by credit card associations usually prevents both surcharges and discounts for cash or credit.

[11] Note that, if the credit card merchant wants to set the retail price for card transactions below that of cash transactions, then the no surcharge prohibition will not be a binding constraint. This possibility has been analysed by Katz (2001).

[12] The simplicity of this result arises, in part, because of our assumption that customer and merchant benefits from credit card use only depend on credit card and not total transactions. If those benefits were to depend more generally on total transactions, p and s will interact for M. However, their precise relationship is an open question and something we do not analyse in this paper. For a preliminary discussion, see Katz (2001).

[13] According to the RBA, the price discrimination argument (based on an earlier version of this paper) "does not stand up to scrutiny. In principle it seems unlikely that such behaviour could be anything but a once-off effect – customers would not frequent such a merchant once its pricing behaviour became known. Customers could also easily avoid the merchant's attempt to discriminate by paying by other means." (RBA 2001, p.77)

[14] Note that if high value transactions were associated with cash, price discrimination would still occur, but the cash price would be relatively high. The RBA (2002) conclusion would only be valid if payment instruments were never correlated with willingness-to-pay.

[15] Interestingly, this last component is not strictly a cost as the length of the interest free period is a direct benefit to cardholders (and, thereby, indirectly to merchants too). Nonetheless, some cost associated with funding card transactions is incurred by issuers, in general.

[16] See Gans and King (2003b) for a survey of alternative methodologies for calculating interchange fees.

[17] The neutrality of the interchange fee has also been noted in other specific models, for example, by Carlton and Frankel (1995), Rochet and Tirole (2002) and Wright (2001). It is a general property of payments systems when merchants can set separate cash and credit prices (Gans and King, 2003a).

[18] See RBA (2001, p.73-75). Note that the exact form of the 'no surcharge' rule differs between Australia, the United States and Europe, and "[t]he rule has been prohibited in the United Kingdom since 1991, in the Netherlands since 1994 and in Sweden since 1995" (RBA 2001, p.63).

[19] Gans and King (2003a) demonstrate that even when surcharging is not possible, competition between merchants can lead to an effective separation of cash and credit card prices in the market place. In this situation, the interchange fee would once again be neutral. Thus, an implicit assumption in the RBA's analysis must also be that retailing in Australia is not sufficiently competitive to generate such pricing separation.

[20] Schmalensee (2002), Wright (2001) and Rochet and Tirole (2002) derive privately optimal interchange fees that have a similar form although in each case network effects are emphasized as playing a critical role. For Schmalensee, an assumption is made that customer and merchant benefits depend directly on the acceptance decisions of the other while for Wright and Rochet and Tirole, externalities arise from the strategic adoption decisions of merchants. In contrast, by providing a model without such network effects, our model demonstrates that the role of interchange fees in balancing asymmetries between issuers and acquirers comes from the customer's key role in the choice of payment instrument and not any additional network effect.