Competition and Network Economics: The Examples of Credit Cards and Debit Cards

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I. Market and competition: a matter of architecture?

The worldwide trend of deregulation and promotion of competition even in formerly unthinkable fields has raised a number of interesting questions for decision makers as well as economists. Competition institutions (competition law plus enforcement agency) have been spreading rapidly. Even Hong Kong was recently enjoined by the IMF again to pay attention to the alleged lack of domestic competition and to give further consideration to developing a "supportive legal framework" to "investigate anti-competitive behaviour and to promptly trigger a remedial process".¹

A competition law is important because it is conduct-based and transcends sector-specific considerations. Hence it provides a level playing field for everybody in the market (with the possibility of exemption for the sake of recognized public interests). If it is wrong to collude and fix prices in the telecommunications sector, why should such behaviour be tolerated in other sectors? In my view, the sector-specific approach lacks coherent logic (see Tsang 2000).

Nevertheless, one should not go to the populist extreme of eulogizing the market for its own sake. A more realistic investigation would reveal that markets could take many forms. As Wilson (1998) says it so well in the context of the electricity industry:

"The market can be centralized or decentralized; it can be based on bilateral contracting, a centralized exchange, or a tightly controlled pool; trades can be physical or financial obligations, and they can be forward or spot contracts; the market can include financial hedges or not; the "official"

market can be mandatory or optional, and encourage or discourage secondary markets."

In general, markets exhibit various degrees of efficiency and are subject to different kinds of manipulation by dominant players. An effective competition policy must pay very close attention to "market architecture" (Wilson, 1999). In other words, competition will maximize social benefits only when a competitive market can be formed. Otherwise, the authorities need to intervene to remove barriers and abuse of power. Sometimes, regulation (or re-regulation) may be necessary, as in the case of huge networks like power plants.

Readers may object at this point. Not all markets are so complicated. For example, many markets for normal consumer goods are pretty straight forward and there is reasonable competition. Well, even in those cases, I would say a comprehensive, conduct-based competition law is still useful, if largely in a preventive sense.

In any case, to situate competition policy in the proper context, this short piece will look at the complexity of market architecture by focusing on one of the most complicated markets: that of networks.

II. Market power and competition in networks

Following Economides (1995), a network good or service exhibits the so called "network externalities": adding another customer increases value to the customers of the existing network: telephony, electricity supply, transport, credit cards, debit cards. This feature is absent in other goods and services: e.g. consumer goods, haircut service. Networks can be one-way (broadcasting and paging); two-way (telephony and railways); or very complex (like credit and debit card systems).

Katz and Shapiro (1985) were the first ones to develop a rigourous model of network competition. They used the concept of "fulfilled expectations Cournot equilibrium" (FECE) to solve for various forms of competition in different market structures. One of their key concerns was the issue of compatibility. In their model, incompatibility may lead to multiple equilibria, and the most important driving variable turns out to be expectations.

But let us keep to a simpler and perhaps more updated version as developed by Economides and Himmelberg (1995). Given the network effect, the demand curve may not be downward sloping everywhere. The more customers are expected to join in, the more will an individual customer wish to acquire the network product or service. Hence the "fulfilled expectations demand curve" is constructed on the basis that the larger is the expected size \mathbf{n}^{e} of a network, the higher the price \mathbf{p} a customer is prepared to pay for it.

Figure 1, adapted from Economides and Himmelberg (1995), illustrates the point quite well. Suppose the willingness of consumer indexed by y to pay for one unit of the good in a network of the expected size \mathbf{n}^{e} is $\mathbf{u}(\mathbf{y}, \mathbf{n}^{e}) = \mathbf{yh}(\mathbf{n}^{e})$ and the cumulative distribution function is $\mathbf{G}(\mathbf{y})$. Economides and Himmelberg show that in equilibrium where the actual size of the network **n** is equal to \mathbf{n}^{e} , the mapping $\mathbf{p}(\mathbf{n},$ $\mathbf{n}) = \mathbf{h}(\mathbf{n})\mathbf{G}^{-1}(\mathbf{1} - \mathbf{n})$ defines the price level that supports a network of size **n**.



Figure 1 Fulfilled Expectations Demand

Note that the curve includes the entire vertical axis at zero, because a network of zero size is also a "fulfilled expectations equilibrium". There is a critical mass, as denoted by \mathbf{n}^0 in the diagram, below which a network will not take off. It is just like a viability threshold and represents "the smallest network size that can be sustained in equilibrium".² Moreover, Economides and Himmelberg argue that "for many network goods, the critical mass is of significant size, and therefore for these goods small market coverage will never be observed – either the market does not exist or it has significant coverage." (1995, p.5)

After taking off, economies of scale and economies of scope will help incumbents to be increasingly efficient, but they also acquire a rising degree of market power. How to strike a balance between the benefit of networks and the possible abuse of market power is therefore an important question for economists and policy makers.

With regard to the right type of market structure, Economides and Himmelberg (1995) show that both perfect competition and monopoly will fail on optimality grounds for networks, the former because "the starting size of the welfare-maximizing network (the critical mass) is larger than in perfect competition"; and the latter because the monopolist will prefer a smaller network size and a higher price than under perfect competition if he can influence expectations. If the monopolist cannot influence expectations, he will choose an even smaller network and become more inefficient than the one who can.

As to oligopoly, compatibility is a big issue. In looking at the case of the credit cards market in the US, Economides (1995), on the other hand, cites an example of the abuse of market power:

"...a firm with a small market share desires compatibility more than a firm with a large market share. Thus incumbents may want to thwart entry through the creation of artificial incompatibilities or through refusal of access."

Regarding joint ventures that ensure compatibility (of standards), horizontal collusion may create problems more than vertical ones (pp.61-62). In his analysis of an actual US case, Economides (1995) concludes that "the refusal of Visa to let Discover enter may have prevented the creation of significant additional social benefits" (p.63) as Discover wanted to enter with its own large network of customers. The entry would intensify intra-network competition and bring significant benefits to both Discover and Visa users because of the associated network externalities.

III. Networks with dubious substitutability: EPS in Hong Kong

Let us look at a network example in Hong Kong. The Easy Pay System (EPS) is a debit card payment system, operated by a single consortium of 35 banks. Complaints were lodged by merchants using the service. They accused EPSCO, the

operating company, as overcharging and raising charges unreasonably. The transaction fee for some merchants was increased from a flat fee of \$2 per transaction to a maximum of 0.75% on the value per transaction. The hike was, according to a number of users, as much as 11 times the fee under the former charging scale. EPSCO's response was that there were other substitutes such as credit cards, charge cards, cheques, cash or store value cards. ESPCO is therefore not a "monopoly" abusing its market power.

In response, the Consumer Council conducted an investigation (Consumer Council, 2000). As a start, like any anti-trust or competition analysis, one has to define the market (by product, function, geographic and temporal criteria) (para.12). Defining the relevant market and evaluating the degree of power in that market are in effect two sides of the same coin. One common method used by a competition authority (the Consumer Council is not one) is "to test the point at which consumers react to price increases by switching from one service to another." (para.13).

The Council looked at the matter from both the supply and the demand sides. As a network, one characteristic of the EPS is that individual member banks do not negotiate with merchants: it is EPSCO as a consortium which sets the charges on the users. Such an aggregation of major banks into the one single debit card service supplier with no intra-network competition has apparently denied merchants the opportunity to take advantage of the rivalry that would be expected to arise between those banks.

This aggregation has resulted in a situation where EPSCO does not face pressure from other existing or potential competitors in the price levels that it sets. As is well known, the incumbency of an established network system, particularly one with substantial market power, is a serious hurdle for new entrants to overcome. This is of course the "network effect" that we have analysed above. As can be seen in Table 2, the members of EPSCO are all the major banks in Hong Kong with the largest branching and transfer systems. It seems very unlikely the remaining banks or other groups of financial institutions could launch another debit card network to compete with the EPSCO consortium. So the issue of compatibility and entry barriers would not even arise, like the case of credit cards that we discussed in the last section.

The fact that EPSCO was in a position where it could seek to impose a substantial fee increase on merchants, particularly small to medium enterprises that

rely on the service, is also a strong indication that it is not facing the discipline of a competitive market.

Some have suggested that other payment options such as cash, cheques, stored value cards, and credit cards are direct substitutes for the EPS service. In the report, and as detailed in Table 1, the Council noted the distinguishing features of debit card service as a means of electronic payment, in particular the direct debiting of a relatively large amount of money that eliminates credit risk. The various "point of sale" payment methods apparently cater for different operational patterns and industrial characteristics. In other words, they may not be direct substitutes. A number of considerations comes readily to one's mind:

• Transaction amounts can be above the maximum value available for stored value cards, for high cost items such as electrical equipment, furniture and jewellery.

- It may be impractical for customers to use cash, because of security reasons.
- Cheques can be too risky because of the possibility of default.

• Credit card transactions typically carry a 2% to 4% charge on the merchants, which would substantially diminish the margins that some merchants are working on.

In contrast, debit cards alleviate these concerns. Hence, competitive industries that typically involve large transaction amounts and are adverse to default risk may prefer debit cards as the payment method. In return, they may offer discount incentives to consumers. Given the high level of complaints by certain merchants regarding the EPS service, this could well be the case in those sectors where the complainants operate. Their profit margins might already be very low because of strong competition, and after the discounts to consumers using EPS.

If this conjecture is accurate, it could be assumed that few of these merchants would wish to shift to other payment methods that might mean a hike in prices or charges, or a further squeeze in margins, e.g. payments by credit cards. It has been difficult for the Council to verify the validity of such a view, which would require very detailed industrial information and statistics. In any case, the fact that many of the merchants complained and boycotted was an indication of their inability to "switch".³

Payment System Overview

- Point of Sale Products for Merchants and Consumers -

POS Products	credit / Charge* Cards	Debit Cards	Stored Value Cards	Cheque	cash
Issuer Network	23 Banks and Fin Instit' ns (includes EPSCO members) 20 Banks and Fin Instit' ns (includes EPSCO members) Comembers (includes EPSCO members) Comembers (includes EPSCO members) Comembers (includes EPSCO members) Comembers (includes EPSCO members)	35 Banks (form ESPCO)	Creative Star Ltd ** BOC & STDC (EPSCO members) HSBC&Hang Seng (EPSCO members)	Licensed Banks (include EPSCO members)	3 note- issuing banks: HSBC, STDC & BOC (EPSCO members)
Merchant Fee	2 - 4% Individual issuing bank negotiates merchant transaction fee	0.75% No individual bank / merchant negotiation	0.5 - 0.6% Individual issuing bank negotiate merchant transaction fee	s NA	NA
Advantage for Merchant	√ Efficient and secure: no worry of counting, balancing, storing and banking cash	 ✓ Efficient and secure: no worry of counting, balancing, storing and banking cash ✓ Immediate fund transfer to merchant's account 	Efficient and secure: no worry of counting, balancing, storing and banking cash $$ Free terminal fee	 ✓ Efficient: no worry of counting of cash ✓ No transaction fees 	 √ Immediate fund collection √ No transaction
Merchant' s Concerns	 Delayed fund collection Merchant fee high, when compared to debit and stored value cards Terminal fee (\$200 per month but negotiable) Might have to be responsible for customer default on fake or stolen credit cards 	⊗ Merchant fee⊗ Terminal fee***	 Merchant fee Tied to limited number of banks, therefore limited bank consumers Targeted for particular 	 ⊗ Counting, balancing, storing and banking of cheques ⊗ Possible default 	⊗ Security concerns ⊗ Fake money
Advantages for Consumer	 √ Able to purchase without carrying cash or adequate balance at bank account √ Secure and handy √ Interest free credit period √ Gain reward points 	 √ Able to purchase without carrying large sums of cas √ Secure and handy √ Usually no annual fee √ Maximum transaction valu higher than stored value ca 	 √ Able to purchase without h carrying cash and coins √ Secure and handy √ Fast transaction time, e.g. ie for transport (no need to key in PIN number) 	 ✓ Able to purchase without carrying large sums of cash √ Secure √ No transaction 	 √ Acceptable almost anywhere √ No transaction limit
Consumer' s Concerns	 Credit limit High finance and late charge Annual fee (e.g. \$220 or above) Slow transaction time 	 Need adequate balance at the bank account No credit period No reward points Slow transaction time 	 Limit on maximum value (usually less than \$3,000) Need adequate balance in the card No credit period No reward points Annual fee (HK\$100) 	 ⊗ Not widely accepted ⊗ No credit period ⊗ No reward points 	 ⊗ Need to carry large sums of cash for large transactions ⊗ Security concerns ⊗ No credit period ⊗ No reward points

* American Express and Diners Club cards are "charge cards", as the balance has to be paid in full each month. However, they have now extended their product ranges to offer credit cards as well.

** Except Octopus of Creative Star Ltd, issuers of all other POS payment products for consumers include, or are EPSCO member banks.

***Complainants indicated to the Council that they paid a \$50 monthly terminal fee to EPSCO. However, EPSCO indicated to the Council that the terminals were provided free.

Table 1

Payment System Overview

- Point of Sale Product Network Members -

Credit / Charge Card: Visa International

23 members in Hong Kong. Consolidated list of members not available.

MasterCard International

20 members: Aeon, AIG Credit, BEA, BOC, Citibank, Dah Sing, Dao Heng, First Pacific, Fortis Banque, Hang Seng, HSBC, HK Chinese, IBA, Chase, Online Credit, Wing Lung, Liu Chong Hing, Wing Hang, Shanghai Commercial and STDC.

American Express

American Express Bank Limited.

Diners International

Citibank.

Debit Card:

EPS

35 member banks: American Express Bank Limited, BOA, BOC, Bank of Communications, Fortis Banque, Chekiang First, Chiyu Bank, Citibank, Dah Sing, Dao Heng, Hang Seng, HSBC, Hua Chiao Commercial, IBA, Kincheng, Kwong On, Liu Chong Hing, Nanyang, OTB, Po Sang, Shanghai Commerical, Sin Hua, STDC, BEA, Chase, China & South, China State, Ka Wah, Kwangtung Provincial, National Commercial, Yien Yieh, United Chinese, Wing Hang, Wing Lung and HK Chinese.

Stored Value Card:

Mondex
HSBC and Hang Seng.
Visa Cash
9 members including BOC and STDC.
Octopus
Creative Star Limited jointly owned by: MTRC, KCRC, KMB, Citybus, NewWorld First Bus, New World First Ferry.

Cheques:

All licensed banks. At end-March 1999, there were 168 licensed banks in Hong Kong.

Cash:

3 note-issuing banks in Hong Kong: HSBC, STDC and BOC.

In recognizing the EPS as a network, the Council agreed that in pioneering such a system, initial market power might be natural as an incentive for a risky venture. However, the market power should not be allowed to expand to the extent that competition is stifled, or the pressure to enhance efficiency is artificially reduced or eliminated.

Overall, on the basis of prima facie evidence and careful reasoning, the Council concluded that the other retail payment methods are not close substitutes to EPS, and EPSCO as the only operator of debit cards in Hong Kong does possess considerable market power particularly as it sets charges for different merchants as a single company.

In the study, the Council also examined similar network payment systems operated in the US, Canada, the UK and Australia. As the networks are cooperative arrangements between competitors, they are under the scrutiny of competition authorities that administer general competition law in those jurisdictions.

Different approaches are adopted to recover costs and apply fees that utilize competition between network members. In Australia, where transaction fees are paid by merchants for accepting debit cards issued by network members, they are almost always "flat fees" instead of percentage transaction fees. More interestingly, network members actually compete to pay a number of large merchants, such as retail chains, to use the payment system, rather than the reverse.⁴

In the absence of a competition law and an enforcement agency in Hong Kong, and in the face of clear market power through the aggregation of competitors as well as the low degree of substitutability in the provision of the EPS service, the Consumer Council has put forward as "second best" measures two recommendations:

(1) There should be competition between network members. As a matter of principle, competition between service providers should be utilized as much as possible to determine an appropriate level of fees in payment networks, and to offer competitive choices to merchants, just like in the case of credit cards. EPSCO should allow member banks to compete with each other on the quantum of merchant transaction fees and the method by which the fees are calculated.⁵

(2) There is a need for transparency and accountability. Given the strong indication of market power through the aggregation of competitors in the

provision of the EPS network service, and in the absence of legislative safeguards, there should be an appropriate degree of accountability in the operation of the debit card network payment system operated by EPSCO. A code of practice is for example needed. In view of the importance of having efficient online network payment systems to the economy, and Hong Kong's ambitions to fully embrace innovative electronic information technology, consideration should also be given to providing a similar degree of accountability for other network payment systems.

IV. Concluding remarks

Competition may promote efficiency, but a prerequisite is that an effective and efficient market can be formed. That in no insignificant measure is related to the technology and the "market architecture".

This short piece looks at the examples of two similar network systems, i.e. those of credit cards and debit cards. While network externalities are important considerations and a critical mass as well as a certain degree of market power may be inevitable, indeed even essential, it is shown that competition can still be introduced as a safeguard against the possible abuse of power, no matter how justifiably it has been earned in **h**e first place. The proposed "remedies" are however not drastic, given the peculiarities of networks. They involve compatibility and entry in the example of credit cards and intra-consortium competition and transparency in the case of the EPS service in Hong Kong.

The latter example also leads one to ponder about the relationship between substitutability and compatibility. Obviously, networks of non-substitutes (at the same level) cannot be made compatible to generate competition. But what about substitutes of various degrees provided by networks in a world characterized by rapid technological changes? This is an interesting topic for both academic and policy research.

Besides credit and debit cards, there are even more complicated networks, e.g. the computer-based Internet, energy supplies, telecommunications etc. Their "de-regulation" or "liberalization" through either vertical separation and/or horizontal break-up is seen as a way to increase competition and hence efficiency and consumer welfare. But the story may not be that simple (Newbery, 1999), as testified by the recent problems in the highly decentralized Californian electricity market (Harvey and Hogan, 2000). It appears that while competition should be promoted as much as possible, the ideological dichotomy between regulation and competition (or the "black or white" debate on the comparative efficacy of the government versus the market) is becoming increasingly uninteresting as a guide to intelligent analysis and practical reforms.

Notes

1. In the Concluding Statement For The Article IV Consultation with Hong Kong dated 3 November 2000, the IMF delegation said despite Hong Kong being one of the most open economies in the world, "we have continued to hear concerns about the lack of domestic competition, particularly in the non-tradables sector. Many, including the Consumer Council, have pointed to us that the absence of a general competition law has hindered the authorities' own efforts to investigate anticompetitive behavior and to promptly trigger a remedial process. As such, we believe that further consideration should be given to developing a supportive legal framework". The whole concluding statement is available from the SAR government website www.info.gov.hk/gia/general/200011/14/1114124.htm.

2. Figure 1 is drawn for the special case when \mathbf{k} , the value of the good in the absence of network effects, is equal to zero. For the general cases of the fulfilled expectations demand curves with strong and weak externalities, see Figure 2 of Economides and Himmelberg (1995).

3. Incidentally, as revealed in Table 2, EPSCO members are also supplying to various degrees these other point of sales payment products. For example, with the exception of a few, nearly all those issuing the Master Card also issue debit cards. If credit cards and debit cards are really close substitutes, why bother to issue both?

4. The basic reason for such "perverse" behaviour is simple: banks are thinking of the "package effect", or the "bundling effect". By attracting a merchant to use the debit card (by paying him or, less dramatically, lowering the charges), a bank is looking for other businesses that would be associated with the merchant having an account with it. This logic applies to the recommendation that intra-consortium competition by member banks should be allowed by EPSCO.

5. For the reasoning, see note 4.

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