Regulation of the payments market and the prospect for digital money

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1. Introduction

The growth of the internet and e-commerce raises some interesting questions for those interested in the monetary system. Why have digital cash systems failed to penetrate the payments market while electronic trading of securities has been a success? Why is the rate of technological innovation and adoption so much faster in the markets for telephony and digital television? Does this have something to do with the way that these markets are organised and regulated?

This paper reviews the problems that have held back the adoption of digital money and the ways in which these are now being tackled by commercial organisations. It considers ways in which the regulatory framework could encourage or impede the development of e-money.

2. The modern payment system

Digital money has made little headway in the payments market. At the moment, almost all internet transactions are settled using credit and debit cards. These are widely held, convenient and accepted by most retailers.[1] Yet, plastic cards are by no means ideal for a digital world. They were originally designed for making face-to-face transactions in the real world. Despite recent attempts to tighten security, including the introduction of microchip-based cards, they remain prone to fraud and moral hazard. These systems involve a lot of paperwork and are costly to operate. They are expensive for merchants and cannot be used efficiently for making small transactions or for person-to-person transfers.

Electronic media have clear advantages over card systems in all of these respects. Security is easier to maintain online through encryption and dedicated servers than offline, where operatives handle security information in readable form. Because they eliminate paper billing and other costs, all-electronic media are much cheaper than hybrid paper-electronic systems. The processing costs of digital cheques are about a third those of paper cheques, for example. Like paper cash and cheques, their digital equivalents can also be used in person-to-person transactions.

2.1 Money as a network good

However, like all new payment systems, electronic money has an initial hurdle to jump. That is because money is a prime example of a "network good". These goods are monetary, language and other communications devices that depend for their effectiveness upon the number of other people using them. As the textbooks say, money has to be "generally acceptable in settlement of transactions".

Because network goods enjoy a positive consumption externality, they are likely to be underprovided by the market. In this sense network goods are akin to public goods such as broadcasting, where consumption by one person does not reduce the amount of the good available for others. Indeed, network goods are "super-public goods" because consumption by one person increases the usefulness of the good to others. The argument for public subsidy (and ultimately provision) holds a fortiori.

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[1] Moreover, in the United Kingdom, credit card purchases of over £100 are covered by the Consumer Credit Act, so the purchaser need not worry about security and delivery.

This consumption externality leads to a catch 22 problem: people are reluctant to buy network goods until their associates have them. This means that promoters must invest huge sums of money in subsidising appliances and other costs of joining the network before they reach commercial viability. This was the case, for example, with BankameriCard, the first credit card. Bank of America sent out millions of unsolicited cards in an attempt to reach critical mass, knowing that they would be hit by huge fraud and other costs as a consequence. Similarly, in the United Kingdom, it took Barclaycard a decade to turn in its first profit.

However, once the system is established, the promoter is likely to enjoy a first mover advantage or incumbency effect. This is most likely if it is expensive or inconvenient to switch provider. The most notorious example in the technology industries is Microsoft, which has a dominant position in PC software, which it is alleged it is using to dominate associated markets.

Ginguly and Milne (2001) note that the clearing house at the centre of any payment system is usually organised as a mutual organisation by its member banks. This clearly raises competition concerns. Indeed, Cruikshank (2000), a former telecoms regulator, has argued that a payment system is a natural monopoly like a public utility. It is hard for newcomers to enter the market, because it involves a great deal of duplication. It is also difficult to get customers to switch providers.

The credit card market is arguably more contestable than the payments market. However, having made a large investment in plastic, the credit card companies and the banks have been reluctant to develop a rival payment system. Indeed, Visa and MasterCard are now in court to answer the US Justice Department's allegation that they suppressed competition by abandoning plans for new technologies such as smartcards and internet payment systems.

2.2 Money as a convenience good

Money is also a *convenience good*: wanted not for its own sake but as a way to access other goods and services. This has several implications. First, it means that money acts like a joint good with the item being purchased. This immediately tells us that the price elasticity of demand is low. If the cost of transactions goes up, we can try to switch provider, but this may not be possible (monopoly) or practicable (switching costs). We are certainly not going to change our demand for goods and services, banks or the level of transactions that we make. This is where payment services differ from network goods such as telecommunications and share dealing services where the demand for services is price-elastic.

This point is particularly pertinent when set alongside the monopolistic features identified in the previous section. A natural monopoly with a low elasticity of demand clearly raises important public policy issues.

Second, because it is a convenience good, money should be multifunctional. However, the first-generation digital systems were unifunctional. For example, the first Mondex devices were designed for settling small transactions in the real world and Digicash's Ecash product for internet use. The proliferation of different e-money systems and standards was also a handicap, as was the cumbersome and expensive hardware. These systems met stiff resistance from consumers who were happy with their credit cards, knowing that the provider would guarantee the transaction and pay the cost of misuse, at least in the United Kingdom.

2.3 Conventional payment media

Network and convenience features are very apparent in modern payment systems. Table 1 summarises the attributes of the four main conventional monetary media. The main distinction here is between cash or currency, which does not involve a financial intermediary, and the other types, which do. A token system involves the exchange of anonymous tokens or coupons, while the other models are notational or accounting systems, involving a notional transfer of funds from one account to another. Bank accounts and credit card systems are good examples.

Table 1

Conventional payment media

	Cash	Bank cheque	Credit card	Debit card
Transaction medium				
Intermediation cost?	No	Yes	Yes	Yes
Micro-suitable?	Yes	No	No	No
Settled instantly?	Yes	No	No	Yes
Payer anonymous?	Yes	No	No	No
Verifiable?	Only with receipt	Yes	No	Yes
Peer-to-peer?	Yes	Yes	No	No
Offline?	Yes	Yes	Possibly	No
Positive inventory?	Yes	Yes	No	Yes
Risk factors	Loss; theft; postal interception; forgery	Fraud; bankruptcy; counterpart credit failure	Fraud; stolen cards; counterfeiting; data intercept	Fraud; stolen cards; data intercept; bankruptcy
Defensive solutions	Policing; frequent format change	Caveat emptor; bank regulation	Swift detection and card cancellation	Swift detection and card cancellation

In addition to the transaction media shown in Table 1, there are vendor-specific devices such as storecards, air-miles and gift coupon schemes. However, these are not general currency because their use is restricted to specific stores or products. Incentive stamps and casino chips are other good examples of restricted payment devices. All of these payment media, restricted and unrestricted, have parallels in the electronic marketplace.

2.4 Electronic payment media

The new electronic community is trying to replace paper and plastic with electrons, just as medieval bankers replaced gold with paper and modern bankers substituted plastic for paper. Monetary history is essentially a story about saving the costs of making transactions. Moving to paper saved the costs of holding gold, but left the issuer with the problem of replacing worn banknotes. Notational systems economised on these costs, but left the intermediary with expensive ledger and billing costs. Now, all-electronic systems offer the chance to remove these costs altogether. Table 2 reviews these electronic payment systems and their main features, using some commercial examples.

Electronic payment systems are not new. Electronic Funds Transfer for settling large banking and commercial transactions has been in use since the middle of the last century, based like large-scale commercial procurement operations on the telegraph/telex; Standage (1998). Online credit and debit card systems are also electronic. However, these transactions are conducted through closed commercial networks, the main obstacle to wire fraud. Their security is enhanced through encryption - the Enigma cipher machine was based on this technology. In contrast, the internet is an open system, making security much more of a problem.

The challenge is to develop open systems that are secure, convenient and cost-effective over a range of micro- to macro-transactions. Anonymity would also be a commercial advantage for many types of internet transactions. How do these new systems score on these criteria?

Table 2

Conventional payment media

	Prepayment card	Smartcard	Pseudo-cash	Digital cheque
Example	Library copier card	Mondex	Digicash's Ecash	PayPal
Transaction medium				
Intermediation cost?	No	No	Yes	Yes
Micro-suitable?	Yes	Yes	Yes	No
Settled instantly?	Yes	Yes	Yes	No
Payer anonymous?	Yes	Partially	Optionally	No
Verifiable?	No	No	Optionally	Yes
Peer-to-peer?	No	Yes	Yes	No
Offline?	Yes	Yes	No	No
Positive inventory?	Yes	Yes	Yes	No
Risk factors	Minimal (low inherent value)	Forgery	Fraud; double spending	Fraud
Defensive solutions		Security hardware; updates; policing	Security software; format updates	Security software; format updates

2.5 The smartcard

As Table 2 indicates, the big advantage a smartcard has over a prepayment card is that it is a decentralised multipurpose system, which could eventually be used in peer-to-peer transactions, just like cash. It is decentralised in the sense that a commercial organisation provides the hardware and then stands back from the interchange. This means that there is no costly paperwork. Originally used for making face-to-face transactions, it is being adapted for use on the internet.

In this case, the provider's first defence against misuse is provided by the chip built into the card. However, although little is known about commercial applications, it seems that some policing of transactions must be undertaken to provide advance warning of large-scale fraud. The 1997 Vodaphone scam showed how quickly losses can mount if there is a flaw in the system, and how important it is to obtain an early warning of this. It may prove impossible to maintain the integrity of the system without allowing anonymity to be unravelled to trace fraudulent activity.

Smartcards have a potentially important role to play in reducing the risk of social exclusion from the electronic payments system. Like gas and electricity meters and, more recently, prepaid mobile phones, they allow those who cannot obtain credit access to network systems. They also offer an efficient way of organising social security payments. Smartcard technology is currently being adopted by many social security systems, notably in the United States.

2.6 Pseudo-cash

In the real world, token money is based either upon items like precious metals and stones that have intrinsic or alternative use value, or on objects such as notes and coin that are essentially valueless but generally accepted as media of exchange. To retain its value, the first kind of token must be scarce and the second hard for counterfeiters to reproduce.

Digital products, such as software, are generally useful and valuable, but can be reproduced by the provider at zero marginal cost. This characteristic immediately rules out a token money of the first kind. It also makes it difficult to devise digital tokens that cannot be reproduced by forgery. In view of these

obstacles it is not surprising that no one has yet been able to devise a true token money for the internet, something that circulates without trace. Digital currencies are actually "pseudo-cash", because they involve an intermediary and are not in continuous and decentralised peer-to-peer circulation like real-world notes and coin.[2] They look like decentralised token money and can be used for person-to-person transactions. However, these transactions are in fact intermediated by the service provider. To make the system secure against "double spending", each digital coin is returned to the provider by the seller and cancelled after being used once. The coin is then reissued with a different serial number to the seller. These systems are notational and not token money media.

2.7 Digital cheques

Although these facilities have been available for some time, they are as yet little used. This is surely because of the network effect - to catch on, they need more people to accept them. However, PayPal have turned this effect to their advantage. Their members make peer-to-peer transactions by sending digital cheques that the recipient can either cash or use to set up an account with PayPal. This system now has half a million members, but is largely confined to California.

Digital cheques have all of the advantages and disadvantages of paper cheques but, being electronic, have only a third of the processing cost. They can be used for peer-to-peer transactions. They are also subject to counterparty risk. This is a major drawback at the moment given the difficulties of assessing creditworthiness and identity in the electronic marketplace. However, digital certificates and signatures (see below) have the potential to resolve these security problems effectively. So does real-time settlement, which is technically feasible but not deployed in the market.

3. The prospects for digital money

Futurology is fraught with problems, and speculation in this area has proved very wide of the mark. Yet, it seems clear that in the near term, credit and debit cards will remain dominant for large domestic transactions. These are convenient for the consumer and carry a subsidy in the form of a zero interest period and, more recently, bonus points.

3.1 The ubiquitous credit card

Encryption is likely to buttress the position of the credit card by relieving the shopper's fears about internet confidentiality. It should also make it harder for criminals to intercept card details across the internet, although, as APACS (1999) note, there is as yet negligible evidence of this type of crime. This hazard is actually a more serious problem in the case of telephone sales and mail order. That means that the cost of fraud is likely to remain high in the case of multipurpose (as against internet-only) credit cards. A security system, like any system, is only as strong as its weakest link.

However, as the internet spreads, the drawbacks of the credit and debit card networks will become increasingly apparent to its users. At the same time, technological developments will enhance the security and reduce the cost of dedicated digital media. As this happens, uptake and acceptance should increase, overcoming the network handicap and turning it into an advantage.

This may be a gradual process, as rival technologies compete for supremacy. It could still be a long time before a winner begins to emerge and gains critical mass. This was the case with VCR and DVD systems. This would be an expensive investment process for the promoter. However, the internet is spreading much faster than earlier technologies. Moreover, there are developments that could get the ball rolling much more quickly in this case. The most obvious is the growth of small-scale repeat business over the web: providing digital products such as music and entertainment hire, gambling and

[2] The prime example is provided by Digicash's Ecash system. This is available through Mark Twain Bank of St Louis in the United States. Users of this system hold a dollar or euro account with the bank, which can be used to buy digital "coins" that are downloaded onto the user's hard disk. This is just like getting cash from an ATM. These digital coins can then be "spent" on the internet, offering the user a multipurpose facility with the option of anonymity or traceability.

game-plays. The AOL/Time-Warner and Seagram/Vivendi mergers underline the commercial potential for such “content” provision over the internet.

3.2 Technological convergence

The convergence of internet, television and telephone systems means that there is a huge digital market to be exploited. Organisations that realise this too late are in for a shock, as the music industry found with Napster and MP3. These industries will require a suitable medium for flexible, small-scale payments. If the plastic card incumbents fail to provide a more effective system for such electronic micro-transactions, this will force the development of digital devices. Indeed, the content providers may promote their own payment mechanisms. Mobile phone and satellite broadcasting companies already have a lot of expertise in electronic accounting and billing systems, and these can easily be expanded using current technology. For example, in Finland you can already use vending machines with your Nokia phone, paying at the end of the month through your mobile account.

The irony is that the credit card companies have recognised the potential of this market and the threat of competition from mobile phone companies just as the US Department of Justice has brought a case against Visa and MasterCard for failing to innovate. Visa and Nokia are now field-testing a device that allows customers to pay for goods on the internet using information stored on a chip in their mobile phones. Electronic cash can be stored on a second chip. MasterCard is collaborating with the innovative Finnish telecoms group Sonera on similar mobile systems.

3.3 E-purse and other debit systems

These developments show that e-purse systems (such as the Belgian Proton) that require a smartchip may be able to reside on a person’s credit or identity card, effectively piggy-backing off current systems. This would reduce cost and increase convenience. They would be useful for offline use as well as micro-transactions.

The explosive adoption of pre-pay mobile phones suggests another way in which debit-based systems might achieve take-off. Inter alia, these have proved very attractive to those who do not have access to the credit system. This reduces the danger of social exclusion and allows a large expansion of the network, reinforcing the membership externality. Debit-based systems may also be attractive because they carry limited liability - the maximum loss is restricted to the amount programmed into the card.

Another characteristic of e-purse and other bearer e-money systems that could help in their promotion is that it is much easier to pay interest on these balances than on conventional bearer money units such as notes and coin. This is true of any notational money system. E-banks are increasingly relying on the payment of interest as a marketing tool in the deposit market.

These second generation systems are generally multifunctional, combining systems that can be used in both the real and electronic worlds. The hardware is highly portable, designed for use in m-commerce. Its price is falling rapidly, to the point at which the credit card providers are offering free smartcard readers to their customers, ideal for use on the internet.

3.4 Digital cheques

Another impetus could come from the use of digital cheques to undertake the peer-to-peer transactions which plastic money systems do not accommodate. This is where the adoption of new encryption systems is critical. These new systems incorporate digital certificates and signatures that tackle the electronic identity problem. Digital certificates are designed to authenticate websites, so that users know that they are genuine and can submit credit card or other personal details without fear of compromise. Digital signatures are the electronic equivalent of the handwritten signature and unique to the holder. They verify identity and address and can be used to validate digital cheques and other payment instructions. Importantly, the recipient of a digitally signed instruction can ascertain whether it has been tampered with during transmission. Cheap fingerprint or handprint readers could provide another form of internet identification.

As with any payment system, the legal status of digital transactions will be important. In this respect the Electronic Communications Bill being drawn up by the UK government and the new E-Directives being considered by the European Union will strongly influence the development of e-commerce. However,

they may not be critical for e-money. As the widespread use of bank cheques in the English-speaking countries has demonstrated, what really matters is acceptance by the general public and not legal tender legislation.

3.5 Anonymity and the demand for digital currency

Whether digital notes and coin will be successfully developed remains doubtful. Even if they are, I think these networks will be notational systems. That is because the ease of replication makes it technically difficult to devise a token e-money. The lack of anonymity would greatly reduce the appeal of such media to criminal and black market operators. However, this may not prevent take-up by other operators.

Goodhart and Krueger (2001) argue that the informal economy will maintain demand for physical cash. However, this would not necessarily prevent the adoption of digital currency by the formal economy. Arguably, notes and coin remain in use in the legitimate economy only because notational transactions are costly to process. The cost of EFT is already much lower than the cost of paper transactions. This will make notational systems progressively more efficient for small legitimate transactions, especially if the problem of fraud is resolved. Transactions must be traceable if this remains a problem. However, pseudo-anonymity is surely sufficient for most users and it is possible to achieve this in a notational system.

Many commentators have argued that the introduction of digital money would reduce the velocity of circulation and pose problems for the monetary authorities. This might make conventional monetary aggregates a much less useful lead indicator, for example. However, on this point I agree with Goodhart and Krueger in thinking that there would still be an important role for the central bank.

Indeed, if digital money were to be adopted by the formal economy, leaving notes and coin circulating in the informal economy, this could actually make monetary indicators more useful. The cash-in-advance effect would make credit balances associated with pre-pay devices such as cards and phones a useful lead indicator for the formal economy. The correlation with GDP as currently measured should improve. At the same time, physical cash could be used to monitor the development of the underworld economy. At the moment, the issue of large-denomination notes provides an indication, but such holdings may be legitimate, reflecting hoarding and international currency substitution effects.

4. How will the regulatory framework affect the development of digital money?

The successful development of a new digital payment system would raise many other questions for monetary and fiscal policymakers. These issues have been explored by Bernkopf (1996), Dowd (1990), Wallace (1983) and many others. However, such debate begs the question of whether such a development is likely. Instead of debating these issues, the remaining sections of this paper discuss ways in which the supervisory framework could encourage or impede the development of e-money.

Markets should only be regulated when they fail. This can happen if there are agents with market power or externalities; or if there is asymmetric information. Market power is a problem in this context because payment systems are like natural monopolies: duplication is inefficient. The banks that operate these systems are vertically integrated, enjoying economies of scale and scope in a wide range of money, credit and other banking markets. The network externality means that we also have to consider the second type of imperfection. Asymmetric information would seem to be less important in the transactions market than in other financial markets.

4.1 Market contestability and customer switching costs

Competition issues have arisen in this area recently, largely as a result of bank mergers. Naturally these competition inquiries have focused upon the shares of different banking markets that the merging banks would enjoy. They have also considered the contestability of these markets - the ease with which outside organisations can move into or out of them without incurring irreversible entry or exit costs. On the consumer side, the main question concerns switching costs - the ease with which depositors can switch between banks. Finally, some inquiries, notably the United Kingdom's

Cruikshank Committee (Cruikshank, 2000), have looked at the operation of the payment system and the clearing house.

Entry, exit and switching costs are naturally very high in the case of a payment system. This means that an external regulator is arguably necessary to simulate a competitive environment. In the absence of such oversight, these systems exhibit classic signs of oligopolistic inefficiency: low rates of innovation and inefficient pricing structures.

As Ginguly and Milne (2001) note, retail payment systems are characterised by a slow adoption of new technology. This paper offers several reasons for this, including the scale of investments in computer systems and the expense of retraining staff. This is the essential basis of the case that the US Department of Justice is bringing against Visa and MasterCard.

It is remarkable that although similar considerations should apply in the case of mobile telephony, they have not held back investment and innovation in that area. The introduction of the new second- and third-generation systems must surely devalue the investment made in the existing systems, even if the rapid expansion of the industry means that some additional capacity is needed. However, incumbents and new entrants alike rushed to bid for the new UMTS licences. These companies clearly believed that the fashionable nature of new mobile devices would ensure a successful take-up.

Entry, exit and switching costs are also significant in the mobile telephone industry, frustrating contestability. Nevertheless, the spectacular success of new entrants against the incumbents at the first-generation stage suggests that an open market can spur technical adoption, even if such costs are significant. This suggests that, in the case of digital payment systems, it will be important for the regulator to ensure open entry to companies with digital security and settlement experience migrating from technology, communication and entertainment (TCE) industries. This should spur innovation and combat the inertial tendencies seen to characterise this sector.

4.2 The regulation of pricing structures for conventional payment media

The second point concerns oligopolistic pricing structures. These usually incorporate cross-subsidies, which often have the effect of stifling competition in processes that would otherwise be contestable (such as the production of telephone and other appliances).

This is another telltale sign of abuse of market power. That is because, in a fully contestable equilibrium without consumer switching costs, we would expect benchmark cost structure to be reflected in the charging structure. If costs and charges are not aligned, new entrants are able to pick off the clientele that finds the benchmark structure more attractive. This leaves the incumbents exposed to adverse selection, unravelling the cross-subsidy. This is the argument used, for example, by Rothschild and Stiglitz (1970) to analyse contestability in an insurance market equilibrium with asymmetric information.

Payment systems differ from TCE industries because they involve three parties (merchant, customer and intermediary), not just two (broadcaster and viewer). The credit and debit card systems were initially promoted by subsidising the provision of merchant equipment and charging merchants a turnover fee. At the same time, consumer interest payments were subsidised. However, this structure became fossilised. It is remarkable that the low cost of online debit transfer is not passed on to the merchant via a reduced fee, as we would expect it to be in a contestable system. Indeed, it is now passed to the customer through loyalty points. Having become used to this system, the merchants are arguing that the providers should pay for the cost of the new equipment needed for processing the new chipcards.

Bank account charges have also adhered to a pattern that is out of line with the cost structure. In equilibrium, we would expect to see banks offering a market rate of interest on their deposits and levying account fees related to the cost of transactions. However, in practice we tend to observe zero interest transaction accounts, with low or negligible transaction charges.[3]

[3] The interest bearing current (ie transaction) account was invented in Scotland during the free banking regime of the 19th century but only began to make inroads into the UK market when interest payments and bank charges were deregulated in 1971. Uptake was encouraged by high interest rates during the 1970s and 1980s. However, even in the United Kingdom current accounts normally offer a zero or negligible interest rate, while transaction charges are waived.

In the absence of entry, exit and switching costs, such a market would be penetrated by new entrants offering high interest low-transaction accounts, aligning charges with costs. These would be attractive to cash-rich customers with relatively low transaction needs. However, in practice entry, exit or (more likely) consumer switching costs clearly frustrate this outcome. This is why Cruikshank and others have argued that regulators need to pay particular attention to switching costs. It has been suggested for example, that bank account numbers, like mobile telephone numbers, should be portable, the property of the user rather than the system operator.

These considerations largely concern the regulatory framework that is appropriate for long-run industry equilibrium. However, they are pertinent to the discussion of financial innovation, because there are reasons for thinking that a misalignment of cost and charging structures for existing media can hold back the uptake of new media.

That is because the consumer, on convenience or cost considerations, largely dictates the uptake of new technology products. This makes it hard to see how the transaction cost advantage of digital money can assert itself as long as consumers are artificially shielded from the much higher transaction costs associated with conventional monetary media.

The implication of this line of argument is that the regulator needs to pay careful attention to the pricing of existing transaction media. Credit card charges would seem to require particular scrutiny. New digital media have found it difficult to displace this product given its current pricing structure, which effectively forces the vendor to give interest-free credit, security and even loyalty points to the purchaser. I have already discussed this problem in the context of the US Department of Justice case. Another way to help the market to work would be to allow vendors to offer discriminatory prices that reflect this subsidy, but in most countries card providers and competition authorities rule against this.

4.3 The regulation of networks

I now turn to the second reason for market breakdown: consumption externalities. I have argued that network goods are “super-public goods” because my participation actually encourages yours (as with telephone networks). These goods are underprovided by the market. This could be used to make a case for public subsidy or provision, but this is rarely necessary. New technology goods usually become fashion items, helping the promoters to secure acceptance within an elite community and use this as the springboard to critical mass (mobile phones). This normally happens so quickly that the question of subsidy to overcome inertia and encourage take-up rarely becomes a public policy issue.

The regulatory issues normally emerge once the network is up and running. First, there is the question of technical standards. Many commentators have noted that these are a public good. Sometimes, an open system is developed (Linux software), requiring little regulation. Usually, a closed system wins out, requiring other producers to pay a patent or licence fee at least initially (VHS video). In the case of Microsoft’s Disk Operating System it is claimed that this virtual monopoly of the key software component of the personal computer allowed market power to be extended across a wide range of software applications, resulting in the US Department of Justice’s case against the company.

Collaborative ventures represent a halfway house (eg Symbian, the partnership developing the UMTS phone operating system). In this case, the primary role of the regulator is to prevent abuse of market power by incumbents and to ensure reasonable access to new entrants. Ginguly and Milne (2001) suggest that clearing house payment systems are essentially of this type. These are typically not-for-profit organisations run on behalf of their members. Credit card systems are similar. In many countries, these institutions are largely self-regulating. Oversight is provided by the central bank, mainly as a safeguard against systemic risk rather than abuse of market power.

4.4 The regulation of price structures for new electronic media

TCE and payments industries all face heavy up-front investment costs. Regular update costs also occur for security and technological reasons. In the case of a public good proper such as broadcasting and entertainment, the marginal cost of provision to new subscribers is negligible. In the case of super-

public goods such as phone systems, negative capacity externality effects are outweighed by the positive network externality. This is also a feature of electronic and other security dealing platforms.[4]

These industries combat the inertial effect by neutralising the consumer's participation cost. They do this by providing consumer equipment such as games consoles, digital television decoders and mobile phones well below cost. They then try to recoup these costs via subscriptions, rentals and high user costs.[5]

As I have argued, security considerations in electronic payments markets seem to favour a debit-based payment system, since this offers limited liability to the holder. It also extends the system to those who are not deemed to be creditworthy. This means putting up cash in advance, typically in a zero interest balance, with a high cost-of-carry opportunity cost. Allowing providers to offer interest on positive balances may help to overcome this problem.

This discussion leads me to suggest that, subject to basic considerations of solvency, newcomers should be allowed a degree of freedom in their pricing strategies. Attempts to constrain their marketing strategies by restricting cross-subsidisation or imposing interest rate ceilings could well frustrate development.[6]

5. Conclusion

As the scale and scope of the internet increases, the drawbacks of the credit and debit card networks will become increasingly apparent to their users. At the same time, technological developments should reduce the cost and enhance the security and convenience of dedicated digital media. If this happens, uptake and acceptance could increase, overcoming the network handicap and turning it into an advantage.

Like many financial systems, payment systems are largely self-regulating. Oversight is provided by the supervisory authorities in order to safeguard system stability. However, in recent years, many commentators (notably Cruikshank (2000) and Ginguly and Milne (2001)) have called for the regulation of payment systems by the competition authorities. I have argued that the payments market exhibits some very worrying features, resembling a natural monopoly with a low elasticity of demand. The lack of innovation is particularly worrying, a classic telltale sign of an uncompetitive system. I am surprised that this area has not attracted the attention of the competition authorities before.

The analysis of this paper suggests several ways in which the regulator could foster the development of digital money. There is a clear need to ensure open markets, minimise the effect of switching costs, and police the pricing structures of both new and old transaction media. There may be a trade-off here with financial stability but, in my view, this is a risk we have to take in order to encourage innovation.

Intelligent supervision of payments markets could do much to promote the development of digital money. However, in view of the obstacles presented by the industrial structure, this may not be enough. It may take a grand policy initiative to get a new payment system off the ground. Ultimately, money is a super-public good and, if the market fails to do this, the state may have to provide digital money in the same way as it does notes and coin

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[4] These are arguably different from payment and TCE systems because the initial investment costs are relatively small. Consumer resistance and security concerns have proved less of a problem than in the case of payment systems.

[5] Although theoretically this is a disequilibrium phenomenon, consumer resistance to membership costs means that it tends to prevail for a long time.

[6] The draft European Union Directive on electronic money proposes a high level of regulation. In particular, it suggests that interest payments on credit balances should be banned. Such a rule would clearly prevent promoters exploiting a key advantage of e-cash over physical cash.

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