The Federal Reserve Board

Remarks by Governor Edward M. Gramlich

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Although the United States economy seems to be leading the world in the adoption of new computer and internet-based technology, the picture is not uniform. The United States is not at the forefront in the adoption of electronic money systems, one area that would seem most eligible for the information revolution. Adherence to traditional payment systems, check and cash, is very strong. The United States is the only developed country in the world where check use is still increasing, with the number of checks written growing at a rate nearly as fast as the overall economy.

Use of cash is extensive as well. Americans still use cash for about three-quarters of all transactions. The total U.S. supply of coin and currency now comes to $550 billion, about one-third of which is actually circulating in this country (the remainder is held abroad). But even after subtracting estimated foreign balances, the supply of outstanding coin and currency comes to $670 per capita, which strikes most people as incredibly large.

For many years, observers have looked forward to the advent of electronic money, a system that uses either a computer chip or another electronic device to record payments and debits automatically. There are obvious efficiency advantages in terms of ease of handling and record-keeping for consumers, merchants, the banking system, and the Federal Reserve. Use of electronic money systems appears to be growing in at least a few foreign countries. But in this country, growth of electronic money systems is sluggish--well behind earlier predictions, well behind the growth of credit and debit card use, and way behind the growth of other types of electronic commerce. Even fervent advocates of electronic money will admit disappointment at its rate of adoption.

In this talk I will try to assess the state of the electronic money transformation, here and abroad. I mention some promises, some stumbling blocks, and some technological and regulatory issues that will have to be dealt with as electronic money use proceeds.

Historical Antecedents
The idea of using technology to improve the efficiency of the payment system is very old. World commerce has seen an evolution from barter to valuable metals, to paper money, and to checks. In the United States, as early as 1853, more than a half-century before the Federal Reserve System came into existence, private banks in the New York area formed an exchange and settlement system that economized on the movement of paper and settlement balances. In 1970, some of these arrangements were automated and became the basis for a wire transfer system called the Clearing House Interbank Payments System (CHIPS). CHIPS is still the leading clearing and settlement system for large dollar interbank payments (average size of $6 million) originating in international trade and finance.

When the Federal Reserve System came on the scene in 1913, one of its early tasks was to eliminate gold transfers and exchange rate differentials between the dollar and gold across the Federal Reserve Districts. The Fed created a "goldwire" system that involved inter-District settlements through the Gold Settlement Fund. This system quickly gave way to a telegraphic system for adjusting reserve balances. This system in turn evolved into a highly automated and centralized Fedwire system to handle large volumes of high-value payments settled in reserve balances on a real-time basis. The Fedwire system is the key interbank settlement system for the federal funds market. Average payments are around $3 million, but the system is also used for much smaller time-critical payments.

There is also a system for handling smaller retail payments, now averaging about $3,000. In the early 1970s, a group of California commercial banks, in cooperation with the Federal Reserve Bank of San Francisco, organized an automated clearing system operating within the San Francisco District. A similar development occurred in the Atlanta District, with groups in other Districts studying similar systems. These efforts led to the creation of an Automated Clearing House (ACH) throughout the entire Federal Reserve System. The federal government along with some other large private employers began making some payroll deposits through this system in 1975. I vaguely remember the University of Michigan switching to automatic payroll deposit at about that time, apparently one of the early large employers to switch. Use of the ACH has grown and is still growing rapidly, with the number of payments made through ACH rising at double-digit annual rates right up to the present time (in contrast to the sluggish growth of electronic money use). But there is still vast potential for further ACH growth because only about 45 percent of payroll payments are now made through the ACH and only about 8 percent of consumer bill payments. Since the marginal cost to consumers of making payments by ACH is about half that of the cost of making payments by check, in the end the most interesting question may be why the ACH has not displaced the costlier check system even more rapidly.

Electronic Money

With that background, we now turn to our main topic, electronic money. This term is normally taken to refer to a stored-value product, where a prepaid balance of funds is recorded on a card or personal computer controlled by the consumer and updated automatically as payments are made in or out. The stored-value balance would be recorded as a liability of the institution, financial or otherwise, that issues the card.

Early stored-value cards recorded the account balance on magnetic strip, but magnetic strip cards can be difficult to reload and are easy to tamper with. Future smart cards are likely to record stored value through an embedded microprocessor chip, which permits sophisticated encryption to protect against counterfeiting. These cards can also be used as credit cards, debit cards, or repositories of other identifying information for the consumer.

While much rarer, electronic money systems can also be computer based. Under these systems, variously called ecash, cyber coins, and cyberbucks, computer software generates electronic (virtual) tokens that serve as cash. The seller has to verify the tokens, and the issuer may have to settle them--operations that at this point have proven costly and difficult.

Stored-value products can be used in open or closed systems. Closed systems involve a narrowly defined group of consumers, such as riders of a metropolitan transportation system or students at the University of Michigan. The infrastructure necessary to redeem the value is in place either at transportation system terminals or owned by merchants within a

relatively small geographic area. Open systems involve many consumers and merchants over an extended geographic area, with the stored-value cards really functioning as electronic money.

One way to assess the potential of electronic money is to analyze the benefits and costs of electronic money, as compared with alternative ways of making payments. I will discuss this separately for consumers, merchants, financial institutions, and the Federal Reserve System. While the potential gains to all groups together may not be huge, they do seem to be positive, adding to the puzzle about the slowness of adoption of stored-value technology.

From the consumer's standpoint, there could be many potential advantages of electronic money, but there are also risks. Stored-value cards are easier to handle than either cash or checks. Although most electronic money systems now do not have pin number protection, that protection is technologically possible, and protection against loss through theft could be developed in the future. There is some risk of insolvency by the issuer, but at least for financial institutions that risk is very low statistically. A greater problem is that until the stored-value system becomes universal, there is a risk that the sellers will not accept the card. Payment systems involve a network--money is not truly money unless it becomes nearly universally acceptable--and network problems have been a big impediment to the development of any currency system. This is one reason that electronic money systems may be more likely to develop in natural closed systems or in small countries.

One apparent cost of electronic money for consumers, at least in comparison with credit cards, is that of float. In benefit-cost parlance, float is an internal redistribution--a cost of electronic money felt by consumers offset by gains to other sectors. Float then should not affect the overall social interest in electronic money. Moreover, in the long run we might expect the competitive market to offer electronic money products that compensate consumers for their loss of float.

Electronic money systems might raise a potential tradeoff between protection and privacy. Consumer protection could be enhanced by stored-value systems because there could be a record of all transactions, and this record could be used to resolve disputes or to deal with losses due to theft, in much the same way that consumers' credit cards are now protected. At the same time, this record could also be misused to defraud consumers or infringe on their financial privacy, by irresponsible action on the part of the issuing institution or in some other way. Consumers could sacrifice their protection but retain their privacy by purchasing cards without this extensive recordkeeping or by signing "opt out" forms to prevent the disclosure of confidential information. Consumers could also limit invasions of privacy by keeping low balances on their card or restricting its use, but this limits the utility of electronic money in the first place.

From the standpoint of merchants, electronic money systems raise orthodox benefit-cost questions. It is costly for merchants to invest in the infrastructure to process the stored-value cards, much more so than for credit cards because of the encryption technology or the difficulty of verifying electronic tokens. But once merchants have made the investment, costs of handling at least some types of payments should go down. Compared with credit and debit cards, there may be little cost reduction. Compared with checks, there is less risk of default because the sale will not be completed unless the stored value is adequate to make the purchase and the amount of the stored value can be determined immediately. Compared with cash, there is less risk of theft, at least out of the traditional cash register. While

merchants have not eagerly invested in the infrastructure because of the network problems mentioned above, in the long run there should be some gains to them from electronic money technology.

For financial institutions, stored-value products may offer new opportunities for delivering banking services and improving security through computer chips. Consumers may switch from using cash to using deposits that are linked to stored-value products, say with automatic loading from an ATM machine or with links to a personal computer. This could be a profitable new market for financial institutions, with relatively little risk. While financial institutions have not been early to climb aboard the electronic money bandwagon either, they may become strong supporters at some point.

If financial institutions issue the stored-value cards, there is some protection against abuses because financial institutions are already regulated, particularly with respect to their solvency. Regulations could also encompass the institutions' disclosure policy, its privacy policy, and its following of other proper procedures. Many institutions are now announcing very strict disclosure and privacy policies, and extending these policies to stored-value products should be straightforward.

In one early indication of coming complications, the Federal Deposit Insurance Corporation (FDIC) has ruled that electronic money accounts issued by insured institutions are not always legally defined as deposits under the deposit insurance act. This means that stored-value balances do not always carry deposit insurance. By contrast, in virtually all European countries, some of which seem to have more-rapid growth of electronic money products, stored- value balances are typically accorded the same protection as deposits issued by a bank. At this point it is unclear whether the negative FDIC decision could be a major reason for the sluggish growth of stored-value products in this country. In a statistical sense, risk of loss of value through financial insolvency is minor and is probably much less of a factor to consumers than risk of loss of the card or risk that merchants will not accept the card.

Finally, governmental institutions could have a stake in stored-value technology. The Debt Collection Improvement Act of 1996 encourages the federal government to make most of its payments electronically. When consumers do not have bank accounts, as about 10 percent now do not, governments have at this point made most payments through debit cards. But at some point, stored-value products might become an easy way for governments to pay social security benefits, unemployment insurance benefits, and even welfare and food stamps. Innovations are often criticized because they leave low- and moderate-income groups behind, but this is an innovation that might actually benefit low- and moderate-income groups disproportionately.

Returning to the protection-privacy tradeoff, government crime control agencies may find stored-valued transactions easier to trace than cash transactions. But as said above, to the extent that the government may gain records of transactions, consumers will lose a corresponding degree of privacy. When this issue has come up in the past, the desire for customer privacy has clearly won out, and there is no obvious reason that the balance of political weight will shift in the future. While the potential is there for increased crime control, this potential seems unlikely to be realized.

Federal regulators have also had to face the issue of whether to regulate stored-value products. On the one hand, when networks are important, there is something to be said for

having the government define a technology early to provide a standard for future development. As mentioned earlier, the role of the Federal Reserve was critical in the past development of some of our major payment systems.

On the other hand, the existence of an already well-functioning payment system is an argument for a more passive governmental regulatory posture. Presumably now that the main institutions are in place, payment systems can develop in ways that effectively meet consumer desires. One can imagine network externalities, but it is not obvious that the natural development of payment systems in an environment with minimal regulation will lead to serious inefficiencies. For what it is worth, federal regulators have taken the passive posture, and there is at this time little federal regulation of stored-value products.

Summing all of this up, it seems that all groups--consumers, merchants, financial institutions, and governments--can realize potential gains from electronic money. The gains will be greater, the easier it is to establish natural networks or closed systems. Net gains will be correspondingly less, the more convenient are alternative payment systems.

Foreign Experience with Electronic Money

Moving from the general to the specific, I now review the actual experience with electronic money in other developed countries. As said earlier, adoption of electronic money products is proceeding somewhat more rapidly in some foreign countries than at home, and it makes sense to examine the reasons.

Electronic money pilot programs are at least in the development stage throughout much of the world. A recent survey found that fifty countries had at least some electronic money pilot projects. The vast majority of the projects involved stored-value card systems, with a handful of countries having at least small-scale experimental network systems.

Seven countries appear to be making the most use of electronic money products. Switzerland, the Netherlands, and Hong Kong have numbers of outstanding cards exceeding 75 percent of their population, though in Hong Kong a great many of the cards are for transportation purposes. Germany, Singapore, Belgium, and Austria have numbers of outstanding cards exceeding 40 percent, though many of these are linked to debit cards. By contrast, the U.S. number is a fraction of 1 percent. But even in countries where card use is widespread, the cards are used for very small transactions and account for a small share of overall payments.

Many countries have adapted their commercial codes to electronic money products. They have protocols for dealing with fraud, loss, theft, other disputes, and privacy disclosure requirements. Many of these countries have anti-money-laundering provisions, and unlike the United States, most have ruled that deposit insurance does cover electronic money products.

While it is difficult to generalize, the countries where stored-value products seem to have made the biggest inroads are small, implying that electronic money systems work better in natural closed system or in isolated areas. They also work better in more-developed countries where wages and personnel costs to handle less-automated payment systems are higher.

The small average size of stored-value transactions suggests that stored-value cards will

substitute for currency, if they substitute for anything. In that light, the average ratio of currency holding to GDP in the seven countries where stored-value cards are common is 6.8 percent, higher than the average ratio of 6 percent for all developed countries. It is also much higher than the ratio for the United States. Nominally, the U.S. ratio is 5.2 percent, but when we consider that two-thirds of U.S. currency is held abroad, the effective U.S. ratio is less than 2 percent. This comparison implies that stored-value products have their best chance of success in countries where use of currency is widespread. Even though the United States seems to have a lot of domestic currency outstanding, currency usage is even higher in these other countries.

Domestic Experience

In this country there are a number of closed electronic money systems, but still relatively few open systems. In Atlanta, more than 1.7 million electronic money cards were produced for the 1996 Olympic Games, and these cards paid for about 200,000 transactions totaling $1.1 million. The Olympics are over, and this system has now been discontinued. Two separate pilot programs, involving 100,000 customers and 1,200 merchants, began in New York City but were discontinued as of December 1998, largely because of sluggish acceptance by consumers and merchants.

Nationally, the firm Digicash tried a network-based system, but acceptance was again sluggish and the system was discontinued. Cyber Cash and Wells Wallet are now trying other network-based systems.

There is a growing amount of commerce on the internet, but at this point only a minuscule amount takes place through stored-value products. Most takes place through credit cards, not electronic money systems. It may be easier and cheaper for consumers to make Internet transactions directly through stored-value routines, or it may not. Given the slight cost differences between Internet credit card transactions and Internet stored-value transactions, it may be realistic to look toward a continuation of the slow development of stored-value Internet transactions. Stored-value transactions would seem to offer the biggest cost savings relative to cash, not existing Internet transactions.

Conclusions

This brief survey of electronic money suggests some tentative conclusions. Stored-value products could have a promising future--they could become easier or cheaper for every potential stakeholder--consumers, merchants, financial institutions, and governments. At the same time, there have been continuing innovations in the payment system in this country, and part of the reason for the slow adoption of electronic money products here is surely that innovations in credit cards, debit cards, and the ACH have made it much easier and safer to conduct transactions through these systems. Stored-value products have done better in small countries and in countries where there is greater use of coin and currency.

Looking ahead, the United States may be one of the countries least likely to adopt open stored-value systems. It is a big country, with many alternative ways of making payments. Americans are strongly attached to checks, and use of credit cards, debit cards, and the ACH is growing rapidly. Even cash is still widely used for small transactions, though less so than in other countries.

A major hurdle for the electronic money products is the network problem. If most merchants do not accept stored-value products, most consumers will not bother with stored-value

cards. This is the classic chicken-egg problem, a problem that often gets solved by slow growth on both sides of the market. In principle, the government could intervene and force or induce merchants, consumers, and financial institutions to adopt the new technology, but in practice, alternatives to stored-value products are cheap and safe enough that such intervention is both economically unwise and politically unlikely. It is also possible that this network consideration leads to the development of many closed electronic money systems--for transportation, for university students, for one-employer towns, and the like. This is perhaps not the visionary's dream, but even the development of closed systems cuts the demand for cash and check and makes the payment system more efficient.

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