A United States perspective on the changing pattern of payments

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Introduction

It is a great honor to be here on the occasion of the celebration of the 150th anniversary of the Bank of Spain. I thank you for the invitation and the opportunity to share my perspective on payments evolution with you today. When preparing my remarks for this session, I concluded that I could best contribute to the event by offering you my commentary – as a career academic and recently retired U.S. central banker – on some changes taking place in the payments arena of the U.S. financial services industry.

I believe you will find the changes occurring there interesting in their own right and an interesting point of comparison and contrast with what is happening in Europe. As anyone who knows the financial sector would readily admit, the origins and evolution of payments structures on our two continents could not be more different. Yet, it is my view that, while our two systems started out quite differently, they are now converging to a similar future system.

For retail payments, we are both moving toward more electronic payments processed through a growing number of somewhat distinct but converging vehicles. On the U.S. side, the pattern of payments is indeed evolving – some might say it is experiencing a radical change. America's paper-based payments system is giving way to a new realm of electronic payments vehicles – a transition that has already occurred in Europe.

For wholesale payments, change has been most apparent in the globalization of large dollar-based payments and the continued rapid increase in transactions across both borders and currencies. This volume acceleration and accompanying institutional changes have been palpable forces of change in the international payments arena. As a result, I believe we are beginning to see signs that our two systems are starting to converge here too.

Traditionally, when compared to Continental Europe, there has been considerable diversity in the forms of retail payments used in the U.S. The U.S. wholesale structure, however, has been relatively simple and fairly stable. Now, wholesale and retail payments structures are evolving rapidly. To be sure, their evolution is affected by our distinct financial history and shaped by our legacy systems, but changes are in fact occurring in the U.S. market.

The rapid evolution of U.S. payments systems presents our central bank with many challenges. This is because, unlike most central banks in Europe, the Federal Reserve is a primary service provider as well as a regulator. Therefore, in this world of changing payments the challenges facing the U.S. central bank may be greater than those facing its counterparts across the European Union.

The Federal Reserve has been a vital part of the retail payments system since our founding over 90 years ago. From its inception, the Federal Reserve has had a dual role as the central bank charged with ensuring the integrity of the payments system and as a participant in its evolution. As a result, the changes in the U.S. payments system are affecting not just the industry that the Fed supervises but also its own operations. Over time, the Fed's role in payments will change and is likely to converge to one more similar to the one presently occupied by European central banks. The Fed's role in paper processing will diminish over time as checks recede in both absolute volume and relative importance in our retail payments system, and our large dollar payments system is likely to evolve into one that operates more like the ones employed in Continental Europe. As this occurs, it will further increase the Fed's resemblance to the central banks of Europe.

I am quite certain that, over time, both the Fed and European central banks will concentrate more of their efforts on their provision of large value gross settlement services. Here, the U.S. has already changed quite a bit, and the same is true for continental Europe. However, we have had different reasons for the changes we have seen thus far in our central banks. For the U.S., our geography and the needs of commerce have led to significant increases in volumes as well as increasing concentration of clearing and settlement activities in the few major banks that participate in all of our key clearing systems. These changes, in turn, have raised concerns over daylight credit risk and the impact of increased concentration on the operations of our wholesale payments structure. For the EuroZone, the changed currency environment offered you a chance to institute a new, more efficient wholesale payment structure, which you are embracing under the title of TARGET 2. Despite their different starting points, I can see TARGET 2 evolving into a counterpart of Fedwire even as Fedwire adopts some of the features of TARGET 2.

With that prologue, I would like first to share my thoughts on retail payments issues, namely, the current status of the U.S. retail payments infrastructure as compared to Europe's, how the roots and evolution of the U.S. payment system differ from your own, as well as the likely future path of the U.S. payment system and

the Fed's role in it. I will next offer some thoughts on wholesale payments and trends there as well. In each case I will spotlight the forces of change and how they are leading to convergence and integration of our two systems.

The current state of retail payments technology in the U.S.

Historically, Americans and Europeans have long relied on an entirely different mix of retail payments vehicles. For example, Europeans use cash roughly twice as much as Americans.

However, looking at our noncash transactions gives evidence of where our differences truly lie. When I last looked at the data, more than half of all noncash retail payments in Europe are made through a Giro system and only about 15 percent are made by check. By contrast, it is almost exactly the reverse in the United States; half of all U.S. noncash retail payments are made by paper check and less than 10 percent are made through our ACH, which is the American version of a Giro system.

The dominance of the Giro in Europe and of the check in the United States are long-standing features of our respective payment systems. The history of how this dominance evolved is interesting and instructive, as I will elaborate in just a minute.

Payment cards account for the remainder of retail payments. Here, there are similarities and differences between Europe and the United States. The similarities are in our use of debit cards. Debit cards, a relatively recent innovation, have caught on quickly both Europe and the U.S., now accounting for about a quarter of noncash retail payments in both places. The differences are in our use of credit cards. Credit cards have long been an important payment vehicle in the U.S. and at present account for about a quarter of noncash retail payments. In Europe, credit cards are used less frequently – in about 10 percent of transactions, though I would note that Europeans' use of credit cards has picked up in recent years.

The long-standing success of the credit card in the U.S., and the rapid rise of the debit card in both Europe and the U.S. are also interesting and instructive stories, which I will touch on as well. But first, let me expand on our distinct histories in the differential use of the Giro and the check.

The European structure

To understand the dominance of the Giro in Europe and the check in the U.S. we have to go back about 100 years to the late 19th and early 20th century. At that time, European banks did not provide routine payment services. They served primarily as merchant banks and as private banks for wealthy individuals.

In the late 1800s, local post offices began establishing postal Giro systems as a convenient way for common people to deposit savings; later, these systems evolved to allow depositors to remit and receive payments. The system was successful in that it allowed every post office savings account holder to make and receive payments both locally and nationally. This revolutionary achievement rendered non-cash payment transactions accessible to large sectors of the population. Later, in the 1950s and 1960s, European banks sought to broaden their business lines to encompass the mass market as a way to expand their deposit base to fund loans. This meant providing routine payments services to customers, and so bank Giro systems were created to handle the volume.

This evolution occurred relatively smoothly and rapidly as a result of Europe's concentrated banking industry – a few banks operating nationwide, cooperating closely with each other.

At the same time, European governments wanted to establish payment systems that minimized costs and maximized access. When technology made it economical to replace paper Giros with electronic Giros, European governments pushed for the transition. The concentration of the payments system in the hands of the postal service and a few national banks made it relatively easy to accomplish. Because of its Giro system, Europe had, or could easily set up, centralized accounts for credit transfers. In short, European central banks encouraged – and in some cases, mandated – the use of electronic Giro systems.

The U.S. structure

In contrast, the U.S. payments system evolved quite differently from Europe's. Historically, U.S. banks tended to provide services – including payments services – to the broad spectrum of people and businesses. On the loan side, commercial banks focused on commercial and industrial lending, but they took deposit balances from all economic strata.

In early America, the geographical expanse of the country and the relatively weak federal government encouraged a fragmented banking system. Entry into the banking business was relatively easy, but bank branching was very restricted. Banks were prohibited from branching outside their home state, and in many states, branching was restricted still further. As a consequence, a region would be served by a relatively large number of banks, but there were no banks operating nationwide. For many years, banks issued their own banknotes. To effect transactions, people paid one another with paper checks drawn on their bank or paper currency notes issued by their bank. The banks would then clear these checks and notes among themselves.

With many small banks spread out across such a big country and with banks clearing paper instruments among themselves, effecting transactions outside the

local area was cumbersome. This was a payment system inimical to the growth of national commerce.

By the turn of the 20th century, it was clear that the U.S. needed a more well-integrated national payment system. Indeed, one of the main reasons Congress established the Federal Reserve System back in 1913 was to create a national clearing system in which checks could exchange at par value even among geographically distant banks. To achieve this goal, the Federal Reserve offered check clearing services free of charge to banks that joined the Fed System. The Federal Reserve also provided a national paper currency.

However, the Fed did not become the sole provider of check clearing services, despite offering its services for free. Especially in large urban areas, banks found it preferable to continue clearing checks directly. Nonetheless, the Fed established a large market presence, providing a baseline level of national check clearing services accessible to all banks, large and small, anywhere in the country. Thus, the Fed contributed to the viability of both the paper check and the small community bank.

In the 1960s and 1970s, U.S. banks and the Fed applied advances in computing technology to check processing, increasing the efficiency of their operations. Banks found the paper check payments business to be profitable, and consumers were quite comfortable and confident in the use of checks.

In short, checks were the dominant form of noncash payment, and there was little momentum for change in the U.S. payments system. One might argue that bank Giro systems, which were arising in Europe at the time, would have increased the efficiency of the payments system even more. Yet with so many banks in the U.S. – all serving local markets – developing the legal framework, industry standards, and institutional arrangements necessary to establish such a payments network nationally would have been a daunting task. And in any case, American banks are forbidden under antitrust law to work together. Therefore the Fed was, almost out of necessity, a prime mover in the payments system of the U.S.

In the early 1970s, the Federal Reserve itself introduced the first U.S. version of an electronic Giro system, known as the Automated Clearing House, or Fed ACH. Fed ACH has met with some success. However, unlike the European Giro, ACH did not and has not developed into the dominant form of electronic payment. In part this is because for many years only banks – not individuals – could initiate ACH payments. Therefore, banks initiated ACH payments for companies engaged in batch-processing a large number of payments, such as payroll disbursement, but the cost of initiating and processing ACH payments was too high to make originating single payments for individuals worthwhile. However as costs have declined, banks have expanded ACH services to enable large organizations to collect regular payments from individuals using the ACH. A typical transaction of this nature would involve individual customers' authorizing their bank

to make payments from their accounts directly to a firm on a recurring basis. The individuals no longer write checks to pay those bills; instead, their banks initiate the ACH transactions. ACH is now also being used to process one-time payments initiated via the Internet. The result has been a rather rapid increase in volumes within an environment where the resultant ACH is almost invisible to both the retail customer and the corporate client of cash management services.

Going forward, the speed of the transition to electronic bill paying will depend, in part, on the evolution of our payments system. Financial institutions are finding innovative new uses for ACH, spanning a broad range of retail transactions and shifting substantial volumes to this system, primarily at the expense of check volume. While our ACH has not been as successful as your Giro systems, this transaction vehicle continues to gain market share. The most important of these innovations is known by the acronym ARC for Automated Check Conversion. ARC is helping to streamline payments initiated by check by converting these payments to ACH transactions, even when the paper check would follow. Moreover, as ACH continues to gain acceptance as a payment vehicle, its products and marketing will evolve making it more attractive and accessible to individuals and businesses.

Cards drive changes in U.S. payments

While Fed ACH saw some success as a means to effect electronic payments, it was the credit card that proved most instrumental in moving U.S. payments from paper to electronics. The credit card actually was the first electronic payments instrument to emerge in the U.S. Credit cards were introduced in the 1950s, and their use grew rapidly over the next three decades.

Credit cards

Not coincidently, the U.S. credit card infrastructure looks a lot like the European banking system. There are relatively few major card associations. They operate nationwide. And they are not subject to the anti-trust laws that prohibited collaboration among U.S. banks. In fact, the credit card associations benefited from some early antitrust rulings against banks.

In the 1990s, when the tech boom made information processing and telecommunications more powerful and less expensive, the credit card associations were well-positioned to take full advantage of these developments. Low-cost telecom has made real-time, point-of-service verification of cardholders and their credit status widespread, speeding transactions and curtailing fraud. Of significance for the future, this technology also has made the credit card a viable means of payment for e-commerce.

Debit cards

After the credit card, the debit card is the second most popular electronic instrument for making retail payments in the U.S. today. The debit card arrived on the scene relatively recently – during the 1980s – in both the United States and Europe. But since its arrival, growth in usage has been dramatic – much faster than growth in credit card payments.

In Europe, the debit card emerged as an evolution of banks' automated teller machine (ATM) systems. Instead of using their card to withdraw cash from an ATM to pay merchants, bank customers simply present their card to the merchants and their bank account is debited directly.

This same progression occurred in the U.S., too. But in the U.S., the credit card networks responded with debit card products of their own. Visa and MasterCard already had an infrastructure in place for processing credit card transactions at the point of sale. They leveraged this infrastructure to establish offline debit card networks. Indeed, in the U.S., these so-called "signature" debit cards are proving at least as popular as ATM, or "PIN-based," debit cards.

Signature debit cards now account for about two thirds of the total of debit transactions in the U.S., so it could be said that they are even more popular than their PIN counterparts. However, PIN-based debits are growing a bit faster than signature. In any case, debit cards in general seem to be leading the migration away from cash and checks and toward electronic payments in the U.S.

This trend is substantiated by the Survey of Consumer Finances, sponsored by the Federal Reserve Board of Governors. The survey indicates that fewer than 18 percent of households used debit cards in 1995. By the new millennium, nearly half of all households were using them. Not coincidentally, the survey also documented a substantial reduction in the use of cash.

The growing popularity of debit cards in the U.S. seems to be part of a broader phenomenon. As I mentioned earlier, debit cards have caught on just as quickly in Europe. In fact, for the first time ever, Visa's global debit sales volume surpassed its credit sales volume in 2004.

The future of the U.S. retail payments system

Looking ahead, retail payments in the U.S. will continue moving away from cash and paper checks toward electronic instruments, including credit cards, debit cards, ACH, and emerging vehicles such as prepaid cards. Though roughly half of our noncash payments are still being made by paper check, the tide has turned. In fact, recent research by the Federal Reserve shows check usage peaked in the mid-1990s and has been declining steadily ever since. So paper checks are

not only losing market share, they are actually declining in volume and have been for about a decade. Therefore, it is easy to predict that the share of retail transactions handled by cards will continue to grow in the U.S., particularly at the point of sale.

More recently, the leading debit card issuers have been working hard to make inroads in the realm of "micropayments" – purchases under $20. According to a survey by MasterCard International, debit cards now account for about 1/3 of all micropayments, a 61 percent increase over 2001. Here, debit transactions are replacing cash with the survey indicating a substantial drop in cash micropayments.

As cards are supplanting checks and cash, the players in the payments business are changing. Organizations other than banks, especially retailers themselves, are now playing an expanded role in the payments system. As a result of recent legal action brought by WalMart against U.S. card companies, retailers now appreciate the costs and benefits associated with alternative payment processing arrangements and are weighing in to protect their interests.

As you may know, WalMart, the largest retailer in the U.S., along with other merchants, balked at the idea of accepting signature debit cards – and their associated fees, which are higher than fees for PIN-based cards – without the right to negotiate. They sued U.S. bank credit card associations, prevailing in a good portion of their efforts. Their settlement eliminated the "honor all cards" rule, effectively allowing merchants to decline signature debit products without jeopardizing their ability to accept credit products or PIN debit cards.

The resulting keen competition among card providers, and aggressive marketing by both card providers and merchants, are increasing the speed with which cards replace paper for point-of-sale transactions in the U.S. How rapidly U.S. consumers will continue their move from paper to electronic transactions is an interesting question. The speed is uncertain but the direction is not in doubt.

Managing the transition

So, the private sector is shifting retail payments in the U.S. away from paper-based instruments and toward electronic ones. But history tells us that people's payment habits change only gradually. When people are comfortable with and confident in a payment structure, they are reluctant to give it up. As a result, the paper check is likely to be with us for some time.

In the meantime, the Fed has been trying to take full advantage of the efficiencies afforded by electronic processing of payments initiated by paper check in the interest of maximizing the efficiency of the payment system. Thus, the Fed is doing what it can to foster check truncation and electronification as early as possible in the payment process.

The Fed is now well positioned to pursue this objective. Two pieces of legislation have set the stage. One is a law that has been on the books for nearly 25 years now: the Monetary Control Act of 1980. The second was passed just two years ago: The Check Clearing for the 21st Century Act, commonly called Check 21. Let me explain the significance of each.

Recall that when the Fed began its check processing operations in 1914, it provided the service at no charge, but only to its member banks. The Monetary Control Act of 1980 changed all that. It required the Fed to offer its payments services to all banks at prices fully reflecting the Fed's costs of production plus a mark-up equal to profit margins earned by the Fed's private-sector competitors. This change established a marketplace incentive for the Fed and its private-sector competitors in check processing to maximize the efficiency of their check processing operations.

The second piece of legislation, Check 21, adds an important new dimension to the competitive drive for greater efficiency in check processing. The essence of the new law is that it makes the facsimile of a check created from an electronic image serve as the legal equivalent of the check itself. In doing so, it eliminates a significant legal barrier to check truncation and electronification of check processing. A collecting bank can now create an electronic image of a check, transmit it to a location near the paying bank, and then present the paying bank with a paper reproduction or with the electronic image. The hope and expectation is that over time paying banks will prefer to receive the electronic image. Accepting images for both deposit and presentment eliminates back office capture of the check as well as the inconvenience of physical transportation.

As a provider of financial services, the Fed has been actively engaged in bringing a whole array of image products to market to take advantage of the capability of image clearing. The Fed has established an image archive for electronic items; it has enhanced their ability to produce facsimile checks; and it has extended clearing times to encourage the use of the image technology that the act allows. In short, the Fed is introducing new services that will enable banks to take full advantage of Check 21.

How fast will the transition occur? The industry has been slow to embrace the new capabilities that the law permits, but recently volumes have begun to increase rapidly. This rapid growth has caused some serious strains on the Fed infrastructure. With the evolution of the payments system in the U.S. accelerating, the Federal Reserve has had to make major adjustments to its payments infrastructure.

The Fed has been working to cut costs and improve the reliability and efficiency of the current generation of payments vehicles, even as it works to foster innovation and to support the next generation of payments vehicles. The Fed has begun implementing a strategy that includes key elements to help us successfully

meet both commitments. The Fed recently announced a program of "aggressive electronification" of retail payments in the U.S. This push toward electronics will help facilitate Check 21 and quicken the transition to an all-electronic world. The Fed also has been investing heavily in technologies that enable electronification. The resulting decline in paper check volumes has placed strong pressure on the Fed to find new processing efficiencies and reduce both fixed and variable costs. As a result, the Fed has embarked upon a downsizing strategy that includes the consolidation of operations and closing of processing sites where appropriate. As the Fed has downsized its check clearing operations, it has attempted to maintain reasonable service levels nationally by re-routing checks to processing sites near those that are closed.

To give you a sense of the scale and speed of this effort, I will note that when I joined the Fed in 2000, it had 45 check processing sites. By the end of this year they will be down to 22. In fact, by year's end the New York Fed's main check clearing facility will close and be folded into Philadelphia's facility. This is a sign of the times.

Such a radical transformation within the Fed's financial services division is made necessary by law. As I mentioned earlier, the Monetary Control Act mandates that the Fed set prices on services to fully recover costs. At the same time, the law requires the Fed to adjust its portfolio of clearing and payment services to correspond to the needs of the economy and banking industry. As a result of these requirements, the aggregate decline in volume in this volume-based service creates a substantial challenge to the System. And achieving full cost recovery will become more challenging as the volume of check usage continues to decline.

Nonetheless, by setting prices that reflect the low cost of electronic check processing relative to paper, the Fed will allow, indeed encourage, the market to drive checks toward electronics. In addition, the Fed will continue to develop its capabilities and expand its electronics capacity to respond to the market's evolution and consumers' needs. The impact of these changes and those that follow will ultimately transform the U.S. payments system and enable a complete restructuring of the U.S. retail payments system.

Turning to wholesale payments

But enough about retail payments. Let me turn next to wholesale payments in the U.S. In addition to its role of supporting retail payments and small-dollar transactions systems, the Fed has long had a role in facilitating wholesale or large dollar transactions. As most of you know, Fedwire is the Fed's wholesale, real-time, gross payments operation. It is used to transfer both funds and securities.

Fedwire transactions typically involve large-value, time-critical payments, such as payments for the settlement of interbank purchases and sales of federal funds, and

securities or real estate transactions. To give some indication of scale, currently Fedwire processes approximately 500,000 payments per day, totaling nearly $2 trillion.

Fedwire has a long and rich history. It first went into operation back in 1918, just four years after the Federal Reserve System was established. At the time, it used leased wires and relied on Morse code. Over the years its operations have evolved with advances in technology and the integration of financial markets. From the telex, to dedicated computer systems, to the emergence of the Internet, the evolution of technology has put pressure on our central bank to evolve its wholesale clearing system to the needs of commerce in America.

In the U.S., the pressures for change in wholesale payments occurred in an environment that made change somewhat easier than in other parts of the world. The U.S. has had one currency for more than 200 years, and the twelve independent Reserve Banks have increasingly operated as a single system offering national products. Moreover, designing and implementing uniform operating policies at a national level to respond to the demands of the financial sector has been easier to accomplish in wholesale payments than was the case for retail payments. Geography is irrelevant for Fedwire payments but crucial for retail payments, as I have already noted.

It is my impression that European wholesale payments systems recently have been evolving toward a wholesale payments model that is not dissimilar to the Fedwire system found in the U.S. I presume that this is at least in part because of the emergence of the Euro. If the US is any guide, your system, TARGET 2, will likely consolidate European central banks' wire transfer operations much as Fedwire has done in the U.S. This standardization of the processing platform will likely reduce costs through economies of scale and improve flexibility of wholesale payments.

However, Fedwire is not alone in providing interbank clearing services to the U.S. financial system. We have a number of other networks that facilitate transactions between our banks and their customers, including credit card networks and, of course, the payments activity of the Clearing House Interbank Payments System (CHIPS). Importantly, the Fed's National Settlement Service allows participating clearing and settlement systems to settle transactions among their members on a net basis via Fedwire. At last report, the US has approximately seventy such systems functioning in this manner. Of this group, the most important and most relevant is CHIPS; so, let me make a few comments about it and how it has been affecting the Fed.

Payments platforms on our two continents have long been bound by the international wholesale payments system, CHIPS. Yet, changes and advances in CHIPS have affected us perhaps more so than Europe, due to CHIPS dollar-based settlement process and its reliance on Fedwire for net settlement among CHIPS participants. As a result, I would speculate that the lack of finality, a hall-

mark of the CHIPS system of yesteryear, occupied, indeed worried our central bank more than others. But, with CHIPS now providing clearing finality, there is a meaningful private-sector linkage between the U.S. and European currency areas and between the wholesale clearing systems of the developed world.

The more recent addition of the Continuous Linked Settlement structure, known by its acronym, CLS, has only added to our interconnections. This foreign exchange clearing system, although still handling a modest volume of the world's foreign exchange trades, has proved to be another beneficial structure that has reduced intraday exposure and added needed liquidity to wholesale payments.

This liquidity is indeed needed. In the US, wholesale dollar based transactions volume has increased steadily and dramatically over the past twenty or thirty years. And, during this same time our banking industry has been consolidating, resulting in the volume of transactions at our largest institutions rising even more rapidly. Data from 2000, which is almost ancient history now, tell this story. The top 50 banks accounted for 80 percent of value across the system. The concentration is even greater today.

The result is that the volume of wholesale payments processed by Reserve Banks has been rising at the same time the payments flows have become more concentrated. This trend was first recognized in the 1970s and 1980s; it led the Fed to take steps to address the growing settlement risk generated by the combination of rapidly rising volumes and increasing concentration.

As a matter of practice, any institution that maintains an account at the Fed is allowed to be a Fedwire participant. And in a similar manner, intraday central bank credit, in the form of daylight overdrafts, is generally available to all Fedwire participants in sound financial condition. Overall, aggregate average daylight overdrafts averaged about $30 billion per day since 2000, with peak aggregate daylight overdrafts averaging $90 billion each day. In 2000, 10 institutions accounted for nearly 75 percent of total average overdrafts.

Working with the industry, the Federal Reserve has addressed the daylight overdraft issue through the systematic development of caps and self-regulation. The result of this effort was a slowing of the growth of daylight average overdrafts even as volumes continued to climb.

Interestingly, the Fed's emphasis has been on limiting daylight overdrafts through self-policing, and internal payments queuing. The Fed's rules require all institutions incurring intraday overdrafts to establish a daily limit ("net debit cap") equal to a multiple of the institution's risk-based capital. As you might expect, non-zero net debit caps are granted at the discretion of the Federal Reserve Banks and are subject to review by the Board as part of its overall oversight of payment system risk.

This contrasts with the approach taken in Europe, where banks either are not allowed to incur overdrafts in their accounts at their national central bank, or are re-

quired to fully collateralize them. In the U.S., the focus has not been on driving daylight overdrafts to zero, or to collateralizing them as a way to reduce payments risk. In fact it was not until 2001 that banks were allowed to obtain additional daylight credit, that is to say, an amount beyond their net debit caps, by pledging collateral. Collateral has never been a mainstay of Federal Reserve payments risk policy.

As a result, large institutions have responded to this regulatory framework by managing the timing of payments within the day to best live within the daily cap at their local Federal Reserve Bank. One effect of this queuing is that payments are increasingly becoming bunched at the beginning and end of the day. This has led some to express concern about the potential of "gridlock" in the payments system at certain times of the day, or when a large bank suffers computer problems and is unable to originate payments. Fortunately, such events are rare. In the past, when they have occurred, the Fed has extended Fedwire's closing time and supplied additional liquidity to prevent shocks or technical difficulties from spreading and causing large disruptions in the payments system. But the system is not as robust as it might be.

As I noted earlier, the American approach of relying on central bank intraday credit is quite different than the path the Europeans have followed. European central banks have relied on collateral and virtually eliminated unsecured daylight overdrafts.

While the U.S. has been slow to embrace this approach, its time may be near. Collateral already exists in the international systems that I referred to above. With the DTC same-day credit facility a reality and continuous time pricing of credit becoming more common in the global financial markets, my view is that it is just a matter of time before the US wholesale payments system relies more heavily on collateral as a source of liquidity. When that happens, the wholesale payments system in the U.S. will likely evolve to one that more closely resembles TARGET2 in structure.

In wholesale as in retail payments, we are seeing systems that were founded quite differently now evolving to a common approach. In short, here too we are seeing some convergence.

Conclusion

By way of summary, let me indicate that my discussion today had several goals. First among them was to review and explain the state of the payments structure in the U.S. to colleagues who come from a different tradition and institutional structure. There is a reason for most things, and the roots of our different payment systems are found in our different banking structure and different perceptions of appropriate regulation.

Yours is a system of few large banks that can easily be regulated into a centralized world – first with near-universal Giro accounts and soon with an electronic world of more centralized clearing. In the U.S., markets and consumers led us to a multiplicity of banks and a retail payments system that has been paper intensive.

My second goal was to explain how the U.S. retail payments structure is changing, as cards are replacing checks, and electronic clearing is truncating the maze of paper that fills our post offices. Our progress, while promising, occurs largely in fits and starts in response to market forces, reflecting the fact that the U.S. is a large nation with many providers, much complexity, and a philosophy of market-based solutions. Nonetheless, it seems the U.S. retail payments system is moving toward convergence with the European model.

The rapid transition from checks to electronic payments has presented challenges for the Federal Reserve as a provider of financial services. It has necessitated restructurings, plant closings, and difficult decisions that most central banks in Europe have been spared.

On the wholesale level, change has been less dramatic. Fedwire continues to be a resilient and dependable payments mechanism, as it has been since its emergence nearly ninety years ago. Fedwire continues to be a critical locus of net settlement services for the myriad of networks from CHIPS to credit card systems that have come to depend on its integrity and reliability. Yet, here too, change is occurring, and is likely to continue.

My third goal was to indicate that the likely outcome will be, I believe, a system not dissimilar to the one that the EuroZone is building for your new currency and integrated clearing system.

In conclusion, I want to note that the process of change will never subside. In both the retail and wholesale arenas, as payments technology moves forward, our payments system will continue to change as evolutionary forces generate new innovations in payments and new ways to deliver them. As we go down this path, however, I believe that in some important ways we in the U.S. will be operating with a payment system that looks more like the European system than ever before. We will look more alike, although we will get there from a very different starting point.