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Mobile Payments at the Retail Point of Sale in the United States: Prospects for Adoption

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Abstract

Although mobile payments are increasingly used in some countries, they have not been adopted widely in the United States so far, despite their potential to add value for consumers and streamline the payments system. We summarize short-term and long-term benefits from mobile payments, and analyze the economic framework of that market. Both demand-side and supply-side barriers contribute to the lack of adoption of mobile payments. We contrast mobile payments at the retail point of sale in the U.S. with other countries' experiences and with examples of successful payment innovations in the U.S. Conditions that have facilitated some success in other countries and in other U.S. innovations are not present in the mobile payments market. On the demand side, consumers and merchants are well served by the current card system and face a low expected benefit-cost ratio, at least in the short run. On the supply side, low market concentration and strong competitive forces of banks and mobile carriers make coordination of standards difficult. Furthermore, mobile payments are characterized by a network effects problem: consumers will not demand them until they know that enough merchants accept them, and merchants will not implement the technology until a critical mass of consumers justifies the cost of doing so. We present some policy recommendations that the Federal Reserve should consider.

KEYWORDS: mobile payments, mobile banking, contactless, NFC, SMS

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1 Introduction

The prospect of using a mobile phone as a device for retail payments represents an important frontier for both telecommunications and payments. The widespread use of mobile phones in the United States today signifies that a large portion of the public connects via these small computers that they carry. These devices can be outfitted with applications and new functionality that could improve the way that people conduct a variety of activities in their lives. One of the most interesting new possibilities is the ability to use a mobile phone as a payment device at a retail point of sale location.

We define *mobile payments* as the use of a mobile phone to make a payment at a physical retail location, whether or not the phone actually accesses the mobile network to make the payment. Definitions vary throughout the industry, but for the purpose of this paper, mobile payments do not include *mobile banking transactions*, which involve accessing bank services through a mobile device.¹ Also, we are not primarily interested in mobile person-to-person (P2P) transfers, although to the extent that these systems can be adapted to retail transactions, they are mentioned in our discussion (Cheney 2008).² For technologies, we focus on contactless and near-field communication (NFC) technologies, which, as we discuss in the paper, appear to be the most likely candidates to be adopted for retail payments, because of their convenience and sophistication.

Strong interest exists throughout the industry in the potential for mobile payments. The scope for bundling mobile payments with value-added services is great, and consumers are already conditioned to expect, and have shown a willingness to pay for, an ever-expanding array of innovative applications on their smart phones. Not only could a consumer simply wave a mobile phone in front of a reader and have his bank or payment card account debited automatically, but using the computing and communication power of a mobile phone, the customer could also perform many other activities at the same time. For instance, a consumer could compare prices with prices offered by other local merchants, store the payment record with his financial management software, download a

¹ For example, one can often use the mobile banking bill-pay feature, which could be interpreted as a form of mobile payment but is actually more closely related to online banking, because with bill pay, a mobile phone is used to access one's bank account online.

² Mobile P2P (person to person) payments usually transfer money between parties that have a relationship (for example, family members or from a client to a service provider such as a babysitter, landscaper, or housekeeper, because this payment method requires the sender to know personal information (bank/account number, email address, phone number) about the receiver). There is usually an intermediary in the process (like PayPal, Obopay, or CashEdge). Mobile P2P transactions can and do occur today commercially in the United States, although not on a large scale.

warranty or instructional video on how to use a product, and more. Merchants could benefit by having the phones interact with reward or other promotional programs. A mobile phone could serve as a “digital wallet,” integrating multiple forms of electronic payment and thereby encouraging greater rivalry between competing card networks. And this technology could greatly increase the efficiency of the U.S. payment system by offering a payment method that would encourage the transition to electronic payments even for small dollar purchases.³

A number of countries have already integrated mobile phones into their payment systems, at least in some form. While substantial business and consumer interest exists in the United States, adoption has been slower here than in some other countries. We identify supply-side and demand-side obstacles to the adoption of mobile payments and consider why the barriers have been difficult to overcome. We discuss the expected benefits from mobile payments for consumers and merchants and their respective costs, and whether any market failures exist that would warrant policy intervention. On the supply side, we discuss issues of coordination, public goods, networks, and standards. In addition, we discuss the need to be proactive in ensuring that these emerging technologies improve or at least maintain, rather than impair, the security and robustness of the nation’s payment system.

We examine the experience with mobile payments in Japan, Korea, and Spain, and discuss prospects for future adoption in the United States. Finally, we make policy recommendations for the Federal Reserve. Our analysis is based on the existing literature and on discussions with representatives of several mobile carriers, financial institutions, and payments industry consultancies. We present our conclusions and recommendations with the caveat that forecasting adoption of innovations is particularly difficult. The market is evolving rapidly with some developments hidden behind proprietary veils, so our understanding of current market conditions is necessarily only partial. Our analysis, conclusions, and recommendations should be read in this context and may change as we gain more knowledge.

We do not find compelling evidence that mobile payments will experience widespread success in the United States in the near term (defined here as 1–3 years), although industry participants are continuing to experiment with pilots globally. Widespread deployment of NFC-enabled mobile phones, along with the requisite merchant readers, is costly, and the immediate benefits to each party appear to be small, given the widespread adoption and use of credit and debit cards in the United States. Over the next 3–5 years, as old mobile phones and merchant terminals require replacement, they may be replaced by phones and

³ FirstData reports that 75 percent of consumers prefer cash over other payment methods for expenditures of \$10 or less, whereas only 10 percent of consumers prefer cash for expenditures over \$50. See McCarthy (2008).

terminals that can process NFC contactless mobile payments, thereby removing some of the merchant barriers. Interestingly, Gauthier (2010) reaches conclusions similar to ours in a concurrent article.

In Section 2, we review the technology that can be used to conduct mobile payments, as well as short-term and long-term benefits from contactless technology. Section 3 outlines the economic framework, with an analysis of demand-side and supply-side barriers to adoption of mobile payments in the United States. Section 4 discusses the experience with mobile payments in Japan, South Korea, and Spain. Section 5 briefly describes two examples of successful retail payment innovation to contrast them with mobile payments. Section 6 discusses rationales and potential paths for public policy in this area, and Section 7 concludes.

2 Technology and benefits

This section discusses the technology involved and summarizes the expected benefits of using mobile payments. We focus on “contactless” technology, which includes near-field communication (NFC).^{4,5} As we argue below, we believe that contactless technology is likely to be more important than the alternatives in this arena.

2.1 Technology

Contactless payment technology embeds a chip with a small antenna in a payment device. When the device is passed over a specialized reader, the reader extracts information (such as an account number) and can also send information to the

⁴ While the terms “NFC” and “contactless” are sometimes used interchangeably, they are slightly different. Formally, NFC technology allows two autonomously powered devices to communicate over short distances, typically less than six inches. For example, these devices might be a mobile telephone and a merchant reader. “Contactless” technology also allows for communication at short distances, although in this case, only one item may be powered. For example, a merchant reader may communicate with a contactless card, such as MasterCard PayPass or Visa PayWave. NFC devices use the “contactless” communication protocol. Thus, an NFC-enabled mobile phone can interact with a merchant reader designed to accept contactless cards.

⁵ NFC and contactless are both defined by formal open standards that emerged from recognized industry standard-setting bodies. For example, NFC is defined by ECMA-340 (under the name NFCIP-1). See also publications from the NFC Forum. By “contactless,” we refer to ISO/IEC 14443. Formally, NFC devices can do more than contactless devices since NFC devices by definition have their own power source. This difference does not appear to be important for payments at this point, as we envision mobile phones using their power source for applications such as searching the Web and displaying information to the screen, rather than for special communication with the merchant reader beyond what a contactless card can do.

chip (such as the consumer's accumulation of loyalty points). Contactless payment technology can come in many forms, and has broader applications than for use in a mobile telephone. Many public transit systems, such as the Boston MBTA, use proprietary reloadable contactless cards to handle payments. Contactless technology can be embedded in a variety of different devices, such as a traditional plastic payment card, a key chain (or key "fob"), a cell phone cover, or a sticker that can be attached to any object, including a mobile phone. Contactless technology can also be embedded in a mobile telephone. The telephone can then make use of this information with its operating system, thus providing a new level of consumer interaction, using the screen, keyboard, and connectivity of the mobile device.

Note that using contactless technology in a mobile device does not require the device to use the mobile network. A consumer may download account information over the mobile network to set up the functionality, but this can also be done by synchronizing a mobile phone with a computer. Once this process is completed, the consumer can use contactless functionality to pay for a purchase without accessing the mobile network.⁶ This feature may be beneficial, because contactless technology can work even where no mobile signal exists and when battery power is exhausted. These are important issues if people are to be convinced to rely on this technology as an alternative to carrying a wallet.

We exclude several important areas from our discussion. For instance, e-commerce can be conducted from a mobile phone, a process sometimes referred to as m-commerce. That is, a consumer can use the web browser on a mobile device to visit a web site and make a purchase. Also, many consumers use their mobile phones to purchase digital content or software applications to use on their phones. Such purchases are usually charged directly to consumers' mobile phone accounts.

Most importantly, we exclude payment systems based on "texting" (text messages sent over the short-message system—SMS—or over a data connection). In these systems, the consumer directly contacts the financial institution with the recipient details, and the financial institution transfers the funds. Obopay is a leading example of such an application in the United States. Currently, texting payments are much more common than contactless payments, although these are almost all person-to-person payments.⁷ Even in a retail setting, it tends to be informal. Because using the mobile phone in this way is relatively slow, less secure and more difficult to integrate with the rest of the goals of merchants and consumers, we do not expect such systems to play a primary role in retail point-of-sale payments. Thus, we focus on contactless technology. We focus here on the

⁶ For this reason, some people exclude contactless technology on a phone from the definition of "mobile payments," restricting it to payments that use the mobile network.

⁷ See Shy (2010) for details on P2P payments.

use of an NFC-enabled mobile phone in retail transactions that involve the banking/payment system, including card networks.

2.2 Benefits

Speculation about the benefits of mobile payments is widespread. We attempt to characterize these benefits here. We divide them into long-run and short-run benefits. Naturally, it is possible for such a technology to evolve differently than we expect, so this discussion is speculative, especially for the long run.

Short-run benefits are those we expect to be realized by the earliest adopters. There are several. First and foremost, contactless payments are fast, since the device holder can just wave a mobile wallet or other device in front of a reader.⁸ Contactless technology may be convenient enough that it has the potential to move micropayments—typically defined as payments below \$10—into a digital form, particularly with Visa and MasterCard, eliminating signature requirements for authorization on such payments to interested merchants.⁹ Making micro-payments digital reduces society’s reliance on cash, which is relatively expensive and subject to crime.

Second, mobile payments can be made more secure. The contactless chip combined with a personal identification number, known as “chip-and-PIN” in other countries, is more secure than the current U.S. card system based on magnetic stripes. Even relative to card-based chip-and-PIN, which is widespread in Europe, the additional functionality of a contactless mobile device provides extra opportunities for security enhancements.¹⁰ Third, it becomes convenient for a consumer to “carry” many more card accounts, since each account can be

⁸ After the reader receives the necessary data, the payment moves through the payment system as any other payment does. Typically, authentication, payment, and verification take a fraction of a second. A recent mobile contactless pilot in India showed that merchants viewed speed as the main advantage of contactless payments over credit cards (Burg and Zafar 2010).

⁹ Merchants that service high volumes of consumers with low transaction values have the most to gain from contactless technology, especially if speed is an issue. Urban rail applications and stadiums are natural examples. Contactless readers are more durable than magnetic stripe readers and do not need to be cleaned. Hence, contactless technology can be implemented outdoors and in situations that lack a dedicated attendant, such as vending machines and parking meters. Speed may be less important in retail stores, but because convenience is important to consumers for all payments (Schuh and Stavins 2010), contactless can be useful in these venues as well. See www.Inbcard.com/content/contactless-payment-devices.html.

¹⁰ Contactless payment systems typically generate a new account number for each transaction, so there is little value to accessing stored account numbers or stealing an account number “out of the air.” For a discussion of security, see the proceedings of the conference “Pay on the Go: Consumers and Contactless Payment,” organized by the Federal Trade Commission at the University of Washington in July 2008.

<http://www.ftc.gov/bcp/workshops/payonthego/index.shtml>.

accessed with the mobile phone. This feature lowers switching costs between accounts, which perhaps increases competition between payments companies. Also, it allows consumers to conveniently carry multiple store loyalty accounts, which should increase the scope for competition and innovation in this environment.

Long-run benefits are those we expect to accrue as the technology becomes more widespread and markets develop a system of complementary goods. We expect substantial innovation around the platform. For example, consumers could have their payments automatically logged in their financial planning software. Also, they could upload warranties and instructional videos at the time of purchase. Merchants could engage in sophisticated rewards programs, where consumers could access their status from their mobile device and receive alerts when they are close to rewards thresholds. Also, consumers could compare prices at nearby stores. If it is relatively easy to add new payment mechanisms to a mobile device and to switch among options, we should see new entry and innovation in this arena.

Evans and Schmalensee (2009) argue that new payment technologies are unlikely to succeed in the United States based only on the merits of increased speed or convenience, as these features are already well supplied by existing U.S. payment methods. Rather, they argue that the gains will come from what they call the “technological mash-up” of telephony and payments, and they speculate about a market for advertisements delivered to a mobile phone based on a consumer’s location and buying habits. They envision an advertising market similar to the flexible market for advertising created by search engines on the World Wide Web that target specific customer segments with presumably relevant ads, based on information gleaned from consumer profiling. This view implies that what may be needed to spark the broad adoption of mobile payments by consumers and merchants is a bundled offering that assembles a set of features appealing to a significant segment of the consumer market.

The phone could also store personal information such as the holder’s driver license, employment identification, and health records and could read information from a poster or interact with enabled surroundings in a variety of ways. In this sense, a mobile phone could become a “fully enabled digital wallet.”¹¹ While these types of benefits could potentially be realized without enabling mobile devices to handle payments, incorporating payments is a natural part of a process that would lead people to use their mobile device in these varied environments. Importantly, many of the long-term benefits we describe fall

¹¹ A mobile wallet or “m-wallet” is a data repository on a mobile device that securely stores consumer information about a bank account and/or payment instruments such as debit, credit, and prepaid cards, and enables the consumer to select from the payment methods stored to make payments and purchases from the mobile device.

outside of the strict concern of payments. Thus, it is important to take an inclusive view of potential benefits in approaching mobile payments as a policy issue.

3 Economic framework

Currently, it is impossible for a consumer to use a mobile phone to make a retail payment in the United States using NFC technology embedded in a phone, except as part of a trial sponsored by a mobile carrier or bank (see Table 1 for some background data).

Table 1: Mobile banking and mobile payments in the United States

	2008 (%)	2009 (%)
Bank account adopters	93.8	93.0
Cell phone adopters	n.a.	89.5
Mobile banking adopters	8.2	10.2
Used mobile banking in last 12 months	n.a.	8.9
Mobile payment adopters	n.a.	3.0
Paid using SMS/Text		2.0
Paid via contactless mobile		1.1

Source: 2008 and 2009 Survey of Consumer Payment Choice, Federal Reserve Bank of Boston.

In this section we identify the reasons for the lack of adoption of mobile payments in the United States. In our discussion, we rely on economic concepts to explain why mobile payments have not progressed more quickly in this country. Most of the barriers relate to the following concepts: costs, substitutes, network effects, appropriability, negotiation costs, and regulatory uncertainty. As we argue below, these issues converge to impede creation of a viable business model for mobile payments.

These types of economic barriers are well-known in the literature on diffusion and technological innovation. For instance, Geroski (2000) surveys the empirical literature on the speed of diffusion. In addition to focusing on costs and substitutes, he discusses the role of information spread in determining take-up rates. This literature tends to view adopters as small players relative to the market. In contrast, the literature on technological innovation tends to focus on strategic

interactions between competing firms, highlighting how the inability to appropriate the benefits of investment depresses investment levels, whereas horizontal competition can lead to over-investment. Reinganum (1989) provides a review. These topics also play an important role in debates about patent policy. For instance, Lemley and Shapiro (2007) discuss these topics, as well as negotiation problems that arise when new products incorporate many new technologies. It is clear from this discussion that mobile payments touch on a diverse set of economic literatures.

We divide barriers to adoption into those related to demand and those related to supply.

3.1 Demand-side barriers

3.1.1 Costs: High cost to consumers and merchants to upgrade to new technology

The pecuniary costs of investing in a new technology are crucial to considering its diffusion. To accept mobile payments, merchants must install contactless readers at each terminal/cash register. The additional cost of this technology has been estimated at \$200 per reader. Merchants who have already installed readers to handle contactless cards need not make further upgrades, since NFC-enabled mobile phones can transact over the same readers. However, penetration of contactless readers has been low.¹² Besides the cost of the reader, uncertainty about which standard will emerge as dominant appears to be deterring merchants from investing in this technology. Moreover—and perhaps more importantly—merchants would have to pay merchant fees for each contactless mobile payment transaction, while no such fees are imposed on the cash transactions they would replace. Mobile purchases charged to credit or debit accounts might incur additional merchant fees.

Consumers would also have to replace or upgrade their mobile phones with phones equipped with a designated chip to be able to conduct mobile payments at physical retail locations. The additional variable cost of that technology for the manufacturer has been estimated at \$10–\$15 per phone.¹³ In addition, there is a large development cost for the handset manufacturer. If the expected market is small, this fixed cost must be recouped over a relatively few consumers. Consumers seem particularly unlikely to pay for this if they expect to

¹² In the United States, 140,000 merchants have installed 500,000 contactless readers (Ezell 2009). According to the most recent U.S. Census (2007 data), this represents only 12 percent of the over 1.1 million total retail establishments in the country.

¹³ The cost estimate comes from McCarthy (2008).

replace their mobile phones frequently.¹⁴ The carriers and handset manufacturers are reluctant to invest in equipping the phones with the required chips until they receive more assurance that they will recoup the cost of doing so.

One potential “bridge” alternative is to install contactless technology on a secure digital memory (SD) card that can be inserted into a handset and accessed by the handset’s operating system.¹⁵ Consumers could buy the SD cards or the cards could be distributed by a merchant or transit authority with preloaded account information. This approach may provide a short-term solution to overcome the need to develop specialized handsets until mobile payments become more popular and the market can bear the cost of building NFC technology into the handsets.¹⁶

3.1.2 Substitutes: Low benefits because of the existing payment system

Naturally, in considering whether a new technology will be or should be adopted, it is important to consider the available substitutes for that technology. For contactless payments, the existing card-based payments infrastructure provides a close substitute, particularly in the short term.

The United States has a well-established and widely adopted card payment system, with the vast majority of consumers carrying and using credit and debit cards. Moreover, recent changes in the U.S. debit card regulation (Reg. E) eliminate the need for merchants to give receipts for small dollar purchases, thus speeding up debit transactions and reducing consumers’ demand for faster payment method alternatives.¹⁷ Many merchants do not require signatures for low-value credit card transactions, either.

Cash—the payment method that mobile payments typically replace in other countries—is used much less frequently in the United States than in countries where mobile payments are significantly more successful (for example, Japan). Getting accurate measures of the use of cash is very difficult, but D’Silva (2009) computes the percentage of the dollar *value* of all consumer transactions paid in cash in 2006 across various countries. He finds that for Japan, South

¹⁴ The Environmental Protection Agency estimates that consumers replace their mobile phones every 18 months (www.epa.gov), although according to industry sources, mobile phones are replaced every two years on average. If only a fraction of these consumers use NFC, the carrier has a limited amount of time in which to recover its cost.

¹⁵ For instance, see <http://www.paymentsnews.com/2009/11/devicefidelity-introduces-in2pay-microsd-based-nfc-solution.html>, accessed on November 13, 2009.

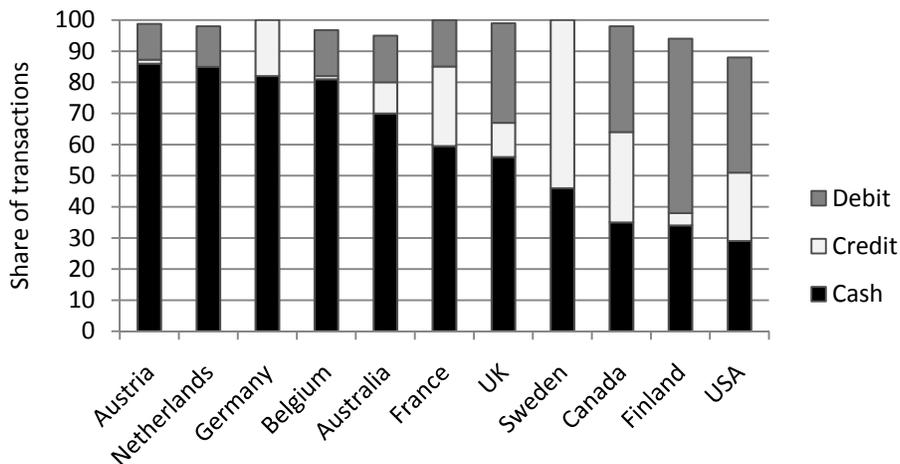
¹⁶ In February 2010, VISA and DeviceFidelity announced plans to launch a contactless-enabled microSD memory card for mobile phones. The mobile device will work at any designated payWave location. See Datamonitor (2010).

¹⁷ See Federal Reserve Board’s Regulation E (Electronic Fund Transfers), 12 CFR §§ 205.9 and 205.11.

Korea, and Spain, the shares were 50, 34, and 26 percent, respectively. This ordering corresponds to the ranking of the success of mobile payment adoption in these countries. In the United States, the share of cash transactions is 14 percent.¹⁸ Because mobile payments typically replace low-value cash transactions, countries with a higher share of cash transactions have a larger potential market for mobile payments.

Figure 1 below shows the share of the *number* of transactions at the retail checkout paid using cash, credit, and debit cards in a few developed countries. The share of cash transactions is lower in the United States than in any other country included here.

Figure 1: Share of transactions in selected countries (based on the number of transactions)



Source: Data source varies by country. Adapted from Eugenie Foster, LLC “What Do We Know About Cash Payments?” (Presented at the Central Bank Forum on Payment Surveys, Chicago, March 2009)

Cards are an effective substitute for mobile payments not only from the perspective of consumers, but also from the perspective of banks and merchants. Merchants may adopt mobile payments readers if they find that doing so motivates consumers to switch from cash to electronic payments, since electronic payments are often cheaper to process. However, if most consumers use cards already, the incentive to invest in mobile is lessened. Similarly, banks in the

¹⁸ Based on the number of transactions, the share of cash is higher: according to the 2008 Survey of Consumer Payment Choice, in a typical month, 53 percent of consumer payments were made using cards and 23 percent were made using cash.

United States gain substantial revenues from consumer credit lines and credit card transactions. If mobile payments simply cause consumers to switch from cards to phones without creating new payment volume, mobile payments are not attractive, especially if doing so means having to share revenues with the mobile carrier.

One advantage of contactless mobile payments over other payment instruments is speed. However, in the national Survey of Consumer Payment Choice, conducted for the Federal Reserve Bank of Boston in 2008,¹⁹ only 4 percent of consumers indicated that speed is the most important attribute of payment instruments in general, while 18 percent indicated that speed is the *least* important feature. Moreover, cash was considered “very fast” by the majority of respondents. Although mobile payments were not included in the survey, replacing cash with a faster payment technology, such as mobile payments, does not seem to be the most pressing need of consumers, or a strong incentive for adoption of mobile payments.

3.1.3 Network effects and two-sided markets

A network effect exists when the value of a good depends on how many other people adopt it. With retail mobile payments, consumers value the technology only to the extent that merchants accept such payments, and merchants will invest in readers only if consumers want to use them. This raises a “chicken-and-egg” problem, where neither side is willing to invest until the other side has, even if both would benefit from joint investment.²⁰ Consumers are unlikely to pay the additional cost unless contactless mobile payments are widely accepted at retail locations. Similarly, merchants do not want to invest in the technology until it is clear that there will be widespread consumer adoption. With payment systems in the past, this adoption problem was often solved by the payment companies offering incentives to adopt either to merchants or to consumers. These types of pricing and investment strategies have received new analysis in the literature on two-sided markets, such as Rochet and Tirole (2003) and Armstrong (2006). The “chicken-and-egg” problem is especially difficult to overcome in the case of mobile payments because multiple parties are involved: mobile carriers, banks, handset manufacturers, chipmakers, merchants, and consumers, making the resolution much more complex.

One way to overcome the network effects problem is to find a so-called “killer app”: a large merchant’s offering that attracts many consumers and gives the merchant the expectation of appropriating some of the benefits of the

¹⁹ Foster, et al. (2009).

²⁰ Network effects were introduced into the economics literature by Farrell and Saloner (1985) and Katz and Shapiro (1985). Shy (2001) and Farrell and Klemperer (2007) provide helpful overviews.

investment, despite the many players in the market. In Japan, this part was played by the Tokyo rail systems. Those transit systems carry a large percentage of the population daily and provide a relatively high value proposition for mobile payments, since many transactions are conducted in cash and speed is crucial for both consumers and the rail companies. Rail systems became the first mover, which then led the “virtuous circle” of network effects to spread the technology to nearby merchants and beyond. We expect transit systems to be early participants in the United States as well. However, it is important to keep in mind that there is no equivalent to the Tokyo rail systems in the United States, in terms of the size of the affected population or the importance of rail system in the lives of the riders. Finding equivalently large merchants (particularly in terms of the number of transactions) requires negotiating across multiple merchants, a more costly proposition.

3.2 Supply-side barriers

3.2.1 Negotiation costs

Mobile payments require multiple industry participants to work together. If collaboration is difficult, adoption will be delayed. Difficulty may arise because the industry is made up of many small participants, because they are heterogeneous and have very different preferences, because of a culture of distrust, or because of legal restrictions. We argue that all of these issues play a role in mobile payments.

Table 2: Coordination or Standardization Game (Battle of the Sexes)

		Firm 2	
		Standard α	Standard β
Firm 1	Standard α	200 100	0 0
	Standard β	0 0	100 200

Source: Adapted from Shy (2001).

For a quick example, Table 2 demonstrates the standardization problem faced by the players in this market, using a coordination game commonly called the Battle of the Sexes. In this example, there are two firms (Firm 1 and Firm 2),

and two standards (α and β). Both firms are better off if they choose the same standard, but because Firm 1 stands to gain more from standard α and Firm 2 stands to gain more from standard β , they may end up selecting different standards if they do not coordinate. Coordination enables the firms to select the same standard and makes all the players better off. In the case of mobile payments, coordination among the large number of firms involved is necessary in order to help them agree on a single industry standard (we discuss standards below).

Negotiation costs appear to be much higher in the United States than in many other countries. The U.S. banking and mobile carrier industries have very low market concentration compared with these industries in other developed or developing countries. For example, while the Japanese carrier DoCoMo has about 50 percent of the Japanese market in terms of the number of customers, each of the biggest U.S. carriers has less than 35 percent. The U.S. banking market is even less concentrated: the United States has almost 7,000 commercial banks,²¹ whereas Japan currently has about 200 banks serving a population almost half the size of the U.S. population.^{22 23}

Because there are many banks and four major mobile carriers in the United States, industry-wide agreements on technology standards and business policies are very difficult to coordinate and negotiate to reach consensus. Bilateral negotiations between a single bank and a single carrier are much easier, but the market share of customers having accounts with both the bank and the carrier for any given pair of institutions is likely to be small, lowering the impact of any resulting agreement. In addition to the decentralized horizontal structure described above, vertical coordination is made difficult because of the number of parties involved in each transaction: a mobile carrier, a handset manufacturer, a card association (for example, VISA, MasterCard), a mobile software vendor, a bank, a merchant, and a consumer. The parties would have to agree on who is responsible for verifying the consumer's identity, resolving disputes, handling customer service, etc. A bank might worry about reputational risk if a payment failed to be executed because of an issue involving a carrier. Carriers have never been involved in financial services and would have to tackle a host of new legal and regulatory issues.

²¹ According to the FDIC, there were 8,099 depository institutions in the United States as of September 30, 2009: 6,911 commercial banks and 1,188 savings institutions.

²² Even though the top banks hold the vast majority of deposits (the FDIC data show that the top four bank holding companies hold about 34 percent of all deposits), the mobile payment standards need to be interoperable across all banks for retail payments to be processed, just as the MICR line on paper checks is a common standard used by all U.S. banks. Thus, the number of banks is as relevant a measure as the share of top institutions.

²³ Currently, Japan has 203 banks and fewer than 750 deposit-taking institutions (<http://www.fsa.go.jp/en/regulated/licensed/index.html>)

Coordination problems may be exacerbated by the possibility that the significant players want to “own” the relationship with the customer and the rich set of information that mobile payment services could yield.²⁴ As an aside, even preliminary jockeying for position over ownership of the customer relationship raises privacy and consumer protection issues that are of concern to the Federal Reserve.

3.2.2 Appropriability or public good nature of industry standards

A firm will invest in a technology only if the firm is able to appropriate the benefits of its investment. This issue is also referred to as the free-riding problem. It is particularly intense if investments have a public good quality, that is, if they benefit many industry participants, or if the benefits are realized in the long term or in other industries.

The issue of free-riding is particularly important in the case of open industry standards. Industry standards for mobile payments would specify the technical details and process for exchanging data between mobile devices, financial institutions, and merchants. An open industry standard would allow any firms that adopted the standards to participate.²⁵ An open standard is developed by a standard-setting committee, in which any interested party may participate. Such committees typically require a consensus vote. These groups have no enforcement power—it behooves them to generate standards that their constituencies will accept.²⁶

Because participants expect an industry standard to be publicly available (as we explain below), any private party investing in development of the mobile payments standard helps other potential adopters. Thus, there is an issue with appropriability. Even if the industry-wide benefits of mobile payments are high, any investing party must be concerned that the private benefits would be smaller than the private costs that would have to be incurred.

Why are open, industry-wide standards necessary? Based on our interviews, it appears difficult to achieve mass adoption of mobile payments without involving all stakeholders. One can imagine alternatives. For instance, mobile carriers could offer payment services without the involvement of banks, perhaps by limiting consumers to pre-pay accounts or by offering consumer credit themselves. Alternatively, a single carrier could contract with a single bank to

²⁴ McCarthy (2008).

²⁵ Some industries use open, negotiated standards (for example, providers of DVDs, cell phones, web browsers), while others use proprietary standards (VCRs, some computer operating systems). Greenstein and Rysman (2007) discuss this issue in the context of computer modems.

²⁶ A proprietary standard is developed by one firm or a group of firms, explicitly owned or licensed by them.

offer payments services. These types of approaches are feasible, but they face serious hurdles. Limiting consumers to pre-pay accounts reduces the attractiveness of the product, and offering credit services brings carriers into an unfamiliar industry at a large scale, with important regulatory obligations. To succeed on a large scale by contracting with a single bank, consumers must agree to transfer their financial relationship across institutions, something consumers are often reluctant to do.

Thus, the development of open, industry-wide standards through collaboration of industry stakeholders may be the best path towards successful adoption of mobile payments. Importantly, an open standard for mobile payments is currently under development. The financial industry standard-setting group ASC X9 is developing U.S. standards, and ISO is developing an international version of the standards.²⁷ The X9 and ISO standards will specify how a mobile phone formats information about a bank account and delivers that information to a merchant's card reader via NFC technology. Any bank, mobile carrier, or other vendor that develops its service in compliance with the standards would be able to participate in the mobile payments market. Standard-setting processes can be slowed significantly when there is strong commercial interest in the outcome (see Simcoe 2008 and Farrell and Simcoe 2009). At this stage, prospects for the ultimate development of mobile payment standards appear to be strong, although their readiness is at least 18 months away. However, developing a standard does not ensure its adoption.²⁸ While the people we spoke with stated that an industry standard was necessary for adoption, it appeared that their individual knowledge of the standard-setting efforts at X9 and ISO was surprisingly low.

An important issue in the adoption of standards is the issue of competition and substitutability. If suppliers conform to the same industry standard, they are naturally limited in their ability to differentiate themselves from one another. Thus, suppliers face close substitutes, increased competition, and reduced incentives to invest in the first place. The incentive to differentiate was very important in encouraging adoption in Japan and Korea, where mobile payments were started by individual firms trying to distinguish their mobile products from those of competitors. However, if the best solution for the United States is an industry-wide standard serving all carriers and financial institutions, adopters will find themselves in a competitive environment. Suppliers can focus on offering

²⁷ ASC X9 (Accredited Standards Committee X9) is an industry nonprofit association composed of members of the financial services industry. ISO (International Organization for Standardization) is a network of national standards institutes of 162 countries, one member per country. It is the world's largest developer and publisher of international standards.

²⁸ A great deal of literature on voluntary standard-setting considers the factors that predict when a codified open standard is actually adopted and implemented. For instance, see Egyedi and Dahanayake (2003) and Farrell and Saloner (1998).

mobile payments with other value-added capabilities and could succeed despite the speculation of Mas and Rotman (2008) about the industry-wide nature of Mobipay in Spain, which hurt adoption by reducing the possibility of reaping rewards from a first-mover advantage with a differentiated offering.

The United States is making important progress in developing an industry standard for the technical details for how mobile payments might work, thus overcoming substantial negotiation costs in this regard. However, the issue of how firms will appropriate the benefits they bring to mobile payments is still unresolved.

3.2.3 Lack of clear regulatory oversight and regulations

Providing mobile payments involves entities in several different industries currently supervised by different agencies: financial institutions are regulated by the Federal Deposit Insurance Corporation (FDIC), the Office of the Comptroller of the Currency (OCC), the Federal Reserve, and the National Credit Union Administration (NCUA); mobile carriers are regulated by the Federal Communications Commission (FCC); the Federal Trade Commission oversees competition more generally. The use of a mobile device to make payments and purchases falls outside the regulatory boundaries defined by each agency. For example, FCC regulation does not address mobile payments or financial transactions specifically for carriers. Financial regulators do not currently distinguish between risks stemming from payments initiated via a mobile phone and those stemming from any other payment method. To ensure the safety, robustness, and stability of the U.S. payments system broadly defined, these regulatory bodies need to be better aligned to close the gaps in order to enable mobile payments to be considered a viable payment option.

An example of a confusing regulatory issue is the oversight of Obopay. A consumer can access Obopay either through a bank website or through an application on his mobile phone. The service is covered by banking regulations in the first case, but not in the second, although the service is exactly the same. In the second case, the consumer is protected only by the terms and conditions established by the service provider.

Regulatory oversight would have to be provided by one or more government agencies experienced in regulating financial transactions in order to manage risk and security, including consumer protection, for mobile payment transactions. The existing boundaries would most likely have to be extended to include not only mobile payments for purchases at retail locations, but also mobile payments over the Internet, and/or via mobile P2P payments. Many private sector stakeholders cited two major obstacles to their participation: (1) lack of clarity as to who will regulate mobile payments and how these payments

will be regulated and (2) lack of guidance on which current regulations cover mobile payments.

3.2.4 Business model

Among the people with whom we spoke, the lack of an appropriate business model was cited as the biggest obstacle preventing widespread adoption of mobile payments. The business model specifies the expected revenue sources for all parties, the roles of the various participants, and how the parties will compensate one another for their activity. At its most basic level, the business model refers to who pays and to whom the payment accrues. A mobile transaction involves a consumer, a merchant, a bank, and a mobile carrier. Who will pay whom to consummate this transaction, and how much?

The most likely scenario involves banks paying carriers, perhaps by consumer or by transaction, by fixed amount or by percentage. The lack of a viable business model indicates an inability to reach an appropriate fee structure. There is also disagreement on who will “own” the consumer relationship and who will be responsible for the various stages of the relationship. Why is it so difficult to construct an appropriate business model that all necessary participants can embrace?

We view this problem as a symptom of the other issues we have discussed. In particular, it is driven by a distinction between short-run and long-run benefits, the ability to appropriate those long-run benefits, and the economic barriers mentioned above. As we have discussed, the short-run benefits do not seem large. The existing card-based systems already deliver substantial speed and convenience and what appears to be an acceptable level of security. Instituting a mobile payments system involves substantial costs, both in terms of explicit investment costs and in overcoming costs associated with network effects and negotiation. The long-run benefits we described could be quite large. However, many of these benefits are not solely linked to payments, and may be difficult to appropriate by the firms that must make the largest investments. Otherwise, participants are just bargaining over relatively little short-term surplus, so it is not surprising that it is difficult to arrive at an attractive agreement.

Despite the barriers, there are reasons to be hopeful about the prospects for the development and implementation of a successful business model. The short-run benefits can be substantial and could be realized by a provider (or a group of providers) who offers a value proposition that could be the basis for the development of a successful business model, even if at the start we see more modest solutions than ones that would apply to the entire industry.

4 International experience

It is instructive to consider how mobile payments have evolved in other countries, both those where the service has succeeded and those where it has not. We focus on three examples: Japan, South Korea, and Spain. We do not discuss in detail developing countries where mobile payments are used for person-to-person transactions among the unbanked, as those examples are less relevant for the United States, where the unbanked share of the population is relatively low.

4.1 Japan²⁹

Sony developed a contactless technology called FeliCa in the late 1980s. The technology achieved high penetration in Japan when JR East, a major commuter railroad in Tokyo, implemented the technology in a reloadable, prepaid card format. Merchants could also adopt readers, so use of JR East cards expanded to making purchases, for instance at convenience stores near train stations. Railway commuters initially provided an essentially captive customer base and many were also customers of surrounding merchants, providing a favorable environment for mobile payments to spread to nearby merchants.

Sony and JR East developed the technology for mobile phones with NTT DoCoMo. DoCoMo, a spinoff from NTT that handled mobile telecommunications, was a natural choice, since it held a 50 percent market share in mobile services, far more than any competitor. After some small trials, DoCoMo introduced the technology nationally in 2004, selling mobile phones enabled with FeliCa and including an “e-wallet” application preloaded on each phone. Originally, consumers’ prepaid accounts were associated with their phones. However, in late 2005, DoCoMo developed a system to allow consumer charges to go to their credit cards, and in 2006, DoCoMo itself entered the consumer credit business. In 2005, the other major mobile carriers implemented FeliCa and adopted mobile payments.

FeliCa provided DoCoMo with several revenue streams, which allowed DoCoMo to appropriate at least some of the benefits created by technology. However, we do not believe that any of these will be relevant in the U.S. market. Thus, U.S. carriers will most likely have to find alternative revenue sources if they adopt mobile payments. DoCoMo gained from FeliCa in several ways. First, and probably most importantly, DoCoMo became part-owner (along with Sony) of the company that licensed and managed FeliCa technology for other users, primarily other mobile phone companies and merchants. Second, merchants paid

²⁹ This section is based mainly on Bradley, Eisenmann, Egawa, and Kanno (2006), Edelman and Hagiu (2009), and Bradford and Hayashi (2007).

a fee to receive e-money payments, typically 1 to 4 percent. Third, DoCoMo's early adoption and later innovations differentiated it from its competitors, possibly making it more costly for DoCoMo's mobile phone consumers to change carriers. Although the Japanese government had recently mandated phone number portability, a consumer was less likely to change brands if he had a substantial prepaid account with DoCoMo. Fourth, DoCoMo entered the credit business by purchasing a bank, eliminating the conflict that might otherwise exist between a mobile carrier and a bank (for example, over who "owns" the customer or which company receives the revenue). Finally, DoCoMo offered fee-based services, such as loyalty programs, to merchants.

Perhaps another important explanation for Japan's higher adoption rate of mobile payments lies in the country's demographic, physical, and cultural characteristics. The country is predominantly urban and densely inhabited, has a population that is homogeneous and technically sophisticated but highly cash intensive, and relies heavily on mass transit. Over 70 percent of mobile phones in Japan have payment capability. Adoption of contactless cards by approximately 50 percent of Japan's population helped the transition to mobile payments (Ezell 2009). These characteristics and circumstances generate strong demand for fast and easy payments.

4.2 South Korea³⁰

In 2002, two large telecoms launched competing payment systems in Korea. These were not successful, in part because they relied on less convenient infrared technology. Also, merchants needed separate readers to handle the different payment methods. A third telecom company, LG Telecom, partnered with Kookmin Bank to launch an NFC-based system in 2003. The system worked at public transit stations and ATM machines but not at retail merchants, and it allowed payments to be withdrawn only from accounts at Kookmin Bank. This system proved to be a success, motivating the larger telecoms to introduce their own NFC systems by partnering with numerous banks. Visa and MasterCard introduced SIM card³¹ implementations in 2006, in which consumers inserted a special card into their mobile phones in order to make payments. However, if a consumer wanted to change payment applications, for instance to change to an

³⁰ This section is based on Bradford and Hayashi (2007) and Mas and Rotman (2008).

³¹ A SIM card, also known as a subscriber identity module, is a smart card that stores data for GSM (Global System for Mobile Communications) cellular telephone subscribers. Such data include user identity, location, and phone number, network authorization data, personal security keys, contact lists, and stored text messages. Security features include authentication and encryption to protect data and prevent eavesdropping. A SIM card can be switched easily from one phone to another.

account for train stations, he had to swap the SIM card in his device. Not until 2007 did mobile carriers start introducing devices that could hold and easily switch among multiple payment cards. As in Japan, the high rate of progress with adoption of contactless cards in South Korea helped the transition to mobile payments.

4.3 Spain³²

Mobipay was formed in 2001 in Spain, jointly owned by the major mobile carriers, financial institutions, and payment card companies. With Mobipay, a consumer can load multiple accounts onto his phone and make a purchase at a retailer either by giving his mobile phone number to the retailer or by having the phone display a special bar code that the merchant reads. The consumer then receives a message via SMS or data connection, confirming that he wants to make a payment. Also, to pay for something like parking, a consumer can “text” money to a parking meter with a digital address. Mobipay collects no fees for its services. It pays carriers for its use of the telecommunication networks from shareholder investments. Essentially, the shareholders are paying for a method to increase payment account and phone use.

Mobipay cannot be regarded as a success. By 2007, less than 1 percent of Spain’s population had registered to use the service, and the actual use was presumably lower. Mas and Rotman (2008) argue that this lack of success stems from the fact that Mobipay did not generate any direct revenue and therefore could not fund any promotions. In contrast, the payment cards that competed with Mobipay were adopted widely and functioned well. In addition, no single firm could gain market share relative to its competitors from the success of the mobile technology, since it was a market-wide initiative. We argue below that these last two issues are particularly relevant when assessing the situation in the United States.

5 Successful U.S. examples

In this section, we briefly describe two examples of successful business models in U.S. payments and explain how they differ from the mobile payments market.

5.1 PayPal

PayPal is an online payment service provider. It became successful because there was a need for an efficient online payment method. Many small on-line merchants

³² This section is based on Mas and Rotman (2008).

were unable to accept credit card payments either because of low volumes or because they were considered high risk. PayPal filled a gap in the payment infrastructure for Internet purchases. It did not replace an existing well-established payment method, because credit cards were not widely used on the Internet at the time (10 years ago). Even though PayPal started as an online auction payment on eBay, it spilled over to other Internet merchants. PayPal offered security by serving as an intermediary between an unknown merchant and a customer and protecting the customer's personal financial information by not sharing it with any merchants. PayPal is a remarkable success story, but unlike mobile payments, PayPal has very low adoption costs, had a clear niche to fill and a “killer app” (eBay) to get started, and did not require shared investments by multiple parties across different industries.

5.2 Credit cards

The closest comparison to mobile payments is probably credit cards, which also required a physical investment by merchants and a change in behavior by consumers. However, when credit cards were first adopted as a payment method, there were no close substitutes available to consumers. In addition, because there were few banks at the time rather than the several thousand banks that exist in the United States today, it was easier for an individual bank to appropriate the benefits from technology development. Despite these advantages, it took many years for credit cards to reach widespread acceptance, and use is still evolving today.

6 Policy recommendations

At this stage, the rationale for any public policy intervention to promote mobile payments is unclear. Since we cannot reliably estimate the overall social benefits at this time, we do not recommend government intervention involving any type of financial subsidy. However, the complexity and importance of the safety, robustness, and integrity of the payments system do suggest a degree of ongoing involvement by the Federal Reserve. We offer several steps the Federal Reserve should take to ensure that the mobile technology and the industry stay in sync with the regulatory framework. Such efforts might have the side effect of supporting the adoption of mobile payments.

6.1 Conduct quantitative research, including survey and market research, to estimate the potential value of mobile payments in the United States.

We will not be able to quantify the potential benefits or indeed the prospect for mobile payments on the demand side until we understand what consumers value. The private sector has conducted consumer-side research, surveys, and opinion focus groups, as well as pilots, but their research is proprietary and possibly biased, and there is no publicly available objective research. There are *potential* social welfare gains from mobile payments on the consumer side. But because mobile payments have not yet been implemented commercially in the United States, surveying consumers on their preferences is the best way to evaluate these potential benefits. Research on consumer demand could help us assess consumers' willingness to pay for replacing low-value cash (and possibly some check, credit, and debit card) transactions with mobile payments, using a mobile wallet. Consumer and merchant research could also help to identify potential new areas that are vulnerable to fraud and any need for additional consumer protection.

Mobile payments could reduce the social cost of payment processing if they replaced more costly alternatives, such as cash or checks. However, we lack adequate information to determine the implications of mobile payments for payment efficiency. As one step, the Survey of Consumer Payments Choice conducted by the Federal Reserve Bank of Boston could be expanded to add a diary that better tracks small transactions, to estimate the potential benefits from replacing coins and currency with contactless and other forms of mobile payments. If operational cost savings to the Federal Reserve and/or the financial sector are estimated to be relatively high, this may be another reason for the Federal Reserve to help remove some of the market-related obstacles mentioned above.

6.2 Help to establish regulatory guidelines for security and privacy and to clarify oversight responsibilities.

Although preserving the stability of the payments system is within the Federal Reserve's mandate, there is ambiguity regarding which agency or agencies would be responsible for regulating mobile payments. According to our industry sources, this ambiguity, including which guidelines apply, is one of the barriers to private sector innovation in mobile payments. As stated above, mobile payments could fall under several jurisdictions. The Federal Reserve could address this issue by convening a group of regulatory agencies to start planning potential regulatory

changes in advance of the widespread adoption of mobile payments and by raising the issue with legislators and the administration. For instance, a Radio Frequency Identification (RFID) Intra-Government Council already exists, consisting of members of several agencies, including the FCC, the FTC, the Department of Defense and the National Institute for Standards and Technology (NIST).³³ Perhaps a similar council could handle policy issues for mobile payments or at least publicly establish the boundaries of agency oversight.

Resolution of this issue may help to set the context for determining which type of entity plays the lead in assembling the various pieces of the first successful offering and in determining the business model, but the reverse may also be true: whether the first successful offering is led by a carrier, a bank, a technology vendor, or another type of entity may also influence the identity of the appropriate regulator. An important benefit of bringing multiple regulators together would be the ability to adequately recognize the type of benefits that might be possible. For instance, the Federal Reserve Bank is interested because it manages payments, but if a principal benefit of mobile payments is the varied uses of mobile wallets outside of the payment system, the Federal Reserve Bank might be limited in its ability to address those topics.

6.3 Facilitate coordination of industry-wide standards that ensure the continued safety, soundness and efficiency of the payments system by establishing a neutral setting where all the stakeholders can exchange ideas without concerns about collusion.

Because open standards are already being developed by groups representing multiple stakeholders, both in the United States and internationally, there is no need right now for the Federal Reserve or any other government body to step in to coordinate the standards beyond our existing membership and active participation in the standards development on X9 and ISO.

There is a need for technical and process standards concerning the interface with the rest of the payments system. This is an area where the Federal Reserve has the opportunity to reduce a key area of uncertainty. The Federal Reserve could facilitate coordination of industry-wide open standards and business rules by establishing a neutral setting where all the stakeholders can exchange ideas and negotiate resolution of common requirements. The Federal Reserve is not the only possible agency that could do this, but there are compelling reasons for the Federal Reserve to get involved. As the central bank and a payment service provider, the Federal Reserve has a key responsibility for

³³<http://csrc.nist.gov/groups/SMA/ispab/documents/minutes/2005-06/June2005-RFID-Handout.pdf>

ensuring the integrity, effectiveness, and accessibility of U.S. payment systems. Because mobile purchases can be made via the ACH network, the Federal Reserve as the primary ACH operator has an additional responsibility to be involved. While mobile payments are just starting to emerge as a payment method,³⁴ the Federal Reserve needs to understand this market segment better and, specifically, to understand the challenges resulting from involving several parties from multiple nonbank sectors. The Federal Reserve's involvement would ensure that the process has credibility and integrity. The Federal Reserve Bank of Boston participates in the NACHA Internet Council Mobile Payments Workgroup and in both the international (ISO) and U.S. (ASC X.9) standards committees, which are working to develop open technical standards for formatting mobile payment transactions. Facilitating such a process would continue a long tradition of the Federal Reserve's involvement in standards setting.³⁵

The timing of broad mobile payment implementation is uncertain, but bringing the interested parties together is a relatively low-cost initiative to begin to remove the barriers. In January and April 2010, the Federal Reserve hosted meetings with key mobile industry stakeholders to better understand perspectives, roles, and responsibilities of the various parties involved in U.S. mobile payments.³⁶ At these meetings, stakeholders discussed barriers and possible solutions to mobile payment growth in the United States, as well as areas where discussion among the parties involved could be helpful without running afoul of antitrust issues. In February 2010, the Board of Governors' Division of Consumer and Community Affairs hosted another mobile industry event—a forum on consumer protection and education issues associated with mobile financial services. It is important for the Federal Reserve to monitor the development of mobile payments to forestall any excessive increase in risk to consumers or to the payment system as a whole and to foresee any issues that might require regulation in the future. The Federal Reserve is also interested in the industry's views on what role the Federal Reserve should be playing to promote innovation, efficiency, and security in mobile payment systems. The Federal Reserve's

³⁴ The use of mobile payments for donations to Haiti (albeit through the use of text messaging, not contactless technology) showed that mobile payments are technically possible.

³⁵ In the past, the Federal Reserve was instrumental in organizing a standards work group to develop check image technology, proposed a check endorsement standard that helped to implement the Expedited Funds Availability Act, and worked with banks to implement the MICR line standard. See Connolly and Eisenmenger (2000) for a historical perspective and Oliver and Weiner (2009) for current initiatives.

³⁶ The meetings were hosted jointly by the Federal Reserve Banks of Boston and Atlanta. Invited organizations included financial institutions, mobile network operators/carriers, card networks, payments processors, handset manufacturers, relevant trade groups, and key mobile payment platform and application vendors.

involvement early on would ensure that the standards that emerge as a result of the negotiations are consistent with consumer protection goals.

These recommendations do not eliminate the industry's need to arrive at a viable business model. Industry-wide discussion of the business model among potential or actual competitors has the potential to raise charges of collusion. One policy that the government could consider is to exempt a particular set of discussions from charges of collusion, treating such discussions similarly to the way research joint ventures (RJVs) are treated.³⁷ The Antitrust Division of the Department of Justice (DOJ) and the FTC have authority to declare that they view a particular agreement as legal under the antitrust law (although doing so does not guarantee that a court will find an action legal in a litigated case). As an example, the DOJ and the FTC recently switched to encouraging standard-setting organizations to engage in simultaneous discussion of technical standards and licensing prices.³⁸

7 Conclusion

What are the prospects for mobile payments in the United States? We do not expect mobile payments to be successful on a wide scale in the near future, that is, in at least the next 1–3 years, for a variety of reasons. The United States currently has a very well-developed and efficient payment system, and enabling mobile payments via contactless technology would require a major investment in contactless chips and readers. Thus, the ratio of benefits to costs is extremely low in the short run. Even if the social net benefits were positive, private net benefits for each party might be negative. Furthermore, the lack of concentration in the telecommunication and financial services markets means that it is difficult both for one firm to lead the market and for groups of firms to negotiate a successful joint agreement. In addition, and perhaps most importantly, industry participants appear to be far apart right now on their ideas of what an industry-wide agreement should look like. Although it appears that some useful standards, both proprietary and open, will be available in the short or medium term, they will not be widely adopted until a business model develops that gives industry participants incentives to support this product, or until consumer demand for mobile payment services increases substantially.

Despite some serious obstacles, the potential long-run benefits of the mobile phone serving as a “fully-enabled digital wallet” are large, from the

³⁷ See Grossman and Shapiro (1986).

³⁸ Another example is the use of patent pools, in which groups of independent patent owners market their licenses jointly, providing technology users with “one-stop shopping” to implement a particular technology and theoretically alleviating the inefficiency associated with independent pricing of complementary goods.

storage of payment accounts, health records, and identification to the “technological mash-up” of payments, telecommunication, and advertising envisioned by Evans and Schmalensee (2009). We certainly expect to see some progress on U.S. mobile payments in the near future, although on a limited scale. It is possible that a public transit system will develop a chip to enable a mobile device to serve as the payment device, perhaps with one or more regional carriers. Such a project could be successful with a proprietary standard rather than an open one, allowing the party making the initial investment to accrue the benefits. The public transit industry may have the best opportunity to lay the groundwork for more widespread adoption of mobile payments because of their obvious benefits in a cash-intensive, time-sensitive, high-volume market with a captive ridership and because the contactless technology has already been implemented on proprietary transit cards in many areas of the United States today. Based on the successes with contactless card technology for the migration of payments for transportation to mobile phones in Hong Kong, Japan, and the United Kingdom, the U.S. transit system might be a good model to examine further.

In summary, we recommend three general policy initiatives for the Federal Reserve:

- Conduct survey research to learn about the benefits of mobile payments to consumers and businesses, and thus estimate potential social welfare gains.
- Promote and participate in establishing appropriate regulatory oversight for mobile payments.
- Facilitate coordination among private industry stakeholders to help them establish common industry standards.

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