

# Mobile Payments: What's in It for Consumers?

*By Fumiko Hayashi*

**M**obile payments—those initiated on a mobile device such as a cell phone or tablet computer—have received a significant amount of attention recently. Yet, despite the attention, mobile payments have not been widely adopted in the United States. While industry experts agree mobile payments eventually will take off, there are many barriers. Some barriers are on the supply side—for example, the difficulty of getting industry participants to agree on technological standards and the lack of compelling business models for participants. Barriers, however, also exist on the demand side.

The main demand-side barrier has been the uncertain value of mobile payments to U.S. consumers. In some other countries, there have been obvious advantages to consumers of using mobile payments. Mobile payments were adopted rapidly in Japan as a convenient way of paying for mass transit. In some African countries, mobile payments gained traction because consumers lacked access to other noncash forms of payment such as checks or credit cards. Neither factor is as important in this country, raising the question of how U.S. consumers would benefit from mobile payments.

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The potential benefits to consumers of mobile payments can be evaluated by comparing mobile payment methods to traditional payment methods in terms of key payment attributes. Some attributes, such as convenience, cost, security, and acceptance by merchants, apply to both mobile payments and traditional payment methods. Others, such as the ability to receive targeted ads and monitor account balances from any location, are especially relevant to mobile payments.

This article draws on consumer payments research to assess which attributes of mobile payments might encourage or discourage adoption by U.S. consumers. Although mobile devices can be used for a variety of payments, including person-to-person transfers and purchases on the Internet, this article focuses on the use of mobile payments at brick-and-mortar stores. The article concludes that greater convenience and enhanced ability to monitor account balances are likely to encourage consumer adoption of mobile payments for in-store purchases, while initial lack of merchant acceptance may discourage adoption. The effects on consumer adoption of cost, security, and targeted marketing are less clear and will depend on which mobile technology is used and how it is implemented.

The first section of the article reviews the state of mobile payments in the United States. The second section compares mobile in-store payment methods with traditional methods in terms of attributes, such as convenience, that apply to both types of payment method. The third section considers the potential benefits to consumers of attributes unique to mobile payments, such as the ability to receive targeted ads. The last section summarizes the findings and draws conclusions about the net benefits to consumers of mobile payments for in-store purchases.

## **I. THE STATE OF MOBILE PAYMENTS IN THE UNITED STATES**

This section examines the state of mobile payments in the United States. First, the section explains the types of mobile payments and the technologies used. Second, it compares the use of mobile payments in the United States to use in other countries. Third, it discusses the main factors holding back mobile payments in the United States.

*What are mobile payments?*

Consumers can make three types of payments with a mobile device such as a cell phone or tablet computer. The first consists of person-to-person transfers initiated from a mobile device. These transfers include noncommercial payments from one consumer to another and commercial payments from a consumer to a small-scale merchant, such as a plumber or gardener. The second is for goods and services purchased over the Internet on a mobile device. The third is mobile payments at a point of sale (POS), which are payments initiated from a mobile device at physical locations, such as a grocery store, restaurant, or gas station. Mobile POS payments are the main focus of this article because POS purchases account for the vast majority of consumer payments.

Mobile payments can be funded in a variety of ways. One is to fund the payment directly from a bank account or an account at a nonbank payment provider. When funded from a bank account, payments are typically processed over the automated clearinghouse (ACH), a system for direct electronic transfers between bank accounts. Another way is to fund the payment with a traditional credit, debit, or prepaid card. A final way is to pay for purchases through a mobile carrier, either by drawing on a prepaid account with the carrier or adding the purchase to the monthly phone bill. A consumer could also consolidate multiple funding options on a mobile device, through an application known as a “mobile wallet.”

Several technologies are available for mobile payments at POS (see Box). Near field communication (NFC) chip technology enables wireless communication between devices over a short distance. Google is using NFC technology in its recently introduced mobile payment application, Google Wallet. A plan to use NFC for mobile payments has also been announced by Isis, a joint venture including three of the largest mobile carriers—AT&T, Verizon Wireless, and T-Mobile.<sup>1</sup> With NFC, consumers can simply tap or wave their mobile device at the POS device to complete a transaction.

While NFC is the best-known technology, there are others for making payments from a mobile device. Radio frequency identification (RFID) technology is similar to NFC, but with a longer transmission

**BOX****TECHNOLOGIES USED FOR  
MOBILE POS PAYMENTS**

**Near field communications (NFC)** is a short-range, high-frequency, standards-based wireless communication technology that enables exchange of data between devices in close proximity (less than two inches to four inches). When NFC is used for mobile POS payments, a mobile device embedded with a NFC chip sends encrypted data to an NFC-enabled POS device. Thus, instead of swiping a card or paying with cash or check, the consumer taps or waves his mobile device at the POS device. NFC can also be used for mobile person-to-person transfers if the sender's and receiver's mobile devices are in close proximity.

**Radio frequency identification (RFID)** is a technology that uses radio waves to transfer data from an electronic tag called an RFID tag. Some RFID tags can be read from several meters away. An RFID reader transmits an encoded radio signal to interrogate the tag. The tag receives the message and responds with its identification information. Similar to NFC, RFID can be used for both mobile POS payments and some mobile person-to-person payments. However, RFID's longer transmission range may cause RFID-enabled mobile payments to be less secure than NFC-enabled ones.

**2D barcode** is a two-dimensional barcode containing more information than a conventional one-dimensional linear barcode. A 2D barcode enables fast data access and is often used in conjunction with smart phones. Mobile POS payment applications using 2D barcodes include Starbucks and Target pre-funded accounts. A mobile device displaying a 2D barcode with the consumer's pre-funded account information is scanned by a POS device at checkout.

**Wireless Application Protocol (WAP)** is a technical standard for accessing information over a mobile wireless network. The principal application is to enable access to the Internet from a mobile device (WAP browser). However, additional applications using WAP

can be downloaded and installed on the mobile device. Similar to an Internet browser on a personal computer, a WAP browser on a mobile device can be used to make remote consumer-to-business payments and person-to-person transfers. Applications downloaded and installed on the mobile device can also be used to make POS payments.

range. RFID has been used in Japan and South Korea, two leading countries in mobile payments. However, because of the longer transmission range, some RFID-enabled mobile payments are considered less secure than NFC-enabled ones (Bublely, Contini and others; Joan). Another technology, 2D barcodes, has been used by merchants such as Starbucks and Target to allow consumers to make mobile payments from a prepaid account with the merchant. The consumer's mobile device displays a barcode, which is then scanned at the cash register to complete the purchase. Finally, Wireless Application Protocol (WAP) is a technology for transmitting information over a mobile wireless network. WAP allows the consumer to log on to the payment provider's website through a mobile web browser or an application that can be downloaded and installed on the mobile device. In contrast to the use of NFC by Google and Isis, PayPal plans to use WAP for its mobile POS application (Thompson).

### *Current use of mobile POS payments in the United States*

Mobile payments are widely used in a number of countries, including both emerging markets and the developed countries. In emerging markets, most mobile payments are person-to-person transfers. In developed countries, mobile payments tend to be used for consumer purchases at stores or over the Internet. Factors driving mobile payment adoption also differ between emerging markets and developed countries. In emerging markets, such as in Africa, many consumers have mobile phones but few have bank accounts, spurring interest in mobile phones as a means of access to financial and payments services. On the other hand, in developed countries such as Japan and South Korea, mobile payment methods using RFID technology were

introduced along with contactless cards because they were especially suited to mass transit. With that base, mobile payments then gradually became accepted by other merchant sectors.<sup>2</sup>

Compared to Japan and South Korea, mobile POS payments in the United States are in their infancy. No data exist on how many U.S. consumers have downloaded POS payment applications to their mobile phones. However, the United States has far fewer NFC- or RFID-capable POS terminals relative to population than either Japan or South Korea—about one terminal per 600 people in the United States, versus one per 130 in Japan and one per 100 in South Korea.<sup>3</sup> Further evidence that mobile payments are used much less in the United States can be found in data on contactless payments. Such payments include both mobile payments with NFC or RFID technology and payments with contactless cards using the same technology. In Japan, \$22 billion of contactless payments were made in 2010 (Bank of Japan). In contrast, only \$1.5 billion of contactless payments were made in 2009 in the United States, despite its much larger population (Federal Reserve System).

Although the United States lags Japan and South Korea in mobile POS payments, there has been some recent progress. First, as mentioned above, some potentially large-scale programs are under way or are planned, including the mobile wallets of Google and Isis. Second, many mass transit systems in large U.S. cities have deployed contactless card payment systems for fares (NFC Forum). Such systems can be easily adapted to accept contactless payments from mobile phones, and some transit authorities, such as those in Chicago and Utah, plan to implement mobile fare payment systems in the next two years (Hernandez 2011b; Clark 2011a). Finally, though still on a small scale, some mobile payment programs offered by merchants appear to have been well received by consumers. For example, in the first 11 months after Starbucks launched its mobile payment application in January 2011, consumers made more than 26 million transactions using the application (Flancy).

### *What factors are holding back mobile payments in the United States?*

To make further progress in the U.S. mobile payment market, a number of barriers must be overcome on both the supply and demand sides. On the supply side, one major challenge is to create viable busi-

ness models for all parties involved in providing mobile payments. These parties include mobile carriers, mobile software developers, payment networks, banks that issue cards or fund payments over the ACH, and manufacturers of chips, handsets, and POS terminals. For all parties to be willing to participate, it is necessary to establish fees, rules on ownership of consumer data and relationships, and rules on liability for fraud losses that allow each party to cover its costs and earn a reasonable profit. A second supply-side challenge is getting major participants to agree on technology standards for mobile payments. As noted above, different technologies exist for conducting mobile payments, including NFC, RFID, 2D barcodes, and WAP. Consumer adoption and merchant acceptance will be delayed if mobile payments providers adopt incompatible technologies.<sup>4</sup>

On the demand side, the main barrier has been uncertainty about the net benefits to consumers of mobile payments relative to traditional payment methods. One recent consumer survey found that customers of large credit card issuers do not think the ability to make mobile payments from a smart phone is very important (Lightspeed). But other surveys have found that U.S. consumers, especially younger consumers, are generally interested in mobile payments (Brown; MasterCard). One reason for these divergent results may be a lack of information from providers regarding the value of mobile payments relative to traditional payment methods. Another reason consumers may be unsure of the benefits of mobile payments is that those benefits depend on which technology is used, a matter that has not yet been resolved. The perceived benefits to consumers of mobile payments may also depend on how much choice is available for the consumers between different funding methods.

Uncertainty about the net benefits to consumers of moving to mobile payments not only discourages consumer adoption but also reinforces the supply side barriers discussed earlier. Specifically, lack of information on what consumers want from mobile payments keeps providers from making important decisions, such as which technology standard to adopt, what fees to charge, and what kind of mobile payment applications to offer. Thus, on both the demand side and the supply side, a better understanding of the potential benefits to consum-

ers of replacing traditional payments with mobile payments may help overcome barriers to adoption.

## II. ATTRIBUTES COMMON TO MOBILE AND TRADITIONAL PAYMENTS

This section examines four key payment attributes that apply to both mobile payments and traditional payment methods—convenience, cost, security, and merchant acceptance. For each attribute, the section considers how mobile payment methods compare to traditional payment methods, evaluates evidence of the importance of the attribute to consumers, and concludes whether the attribute is likely to encourage or discourage adoption of mobile payments. The attributes are ordered in terms of their likelihood of encouraging adoption.

Two forms of empirical evidence on the importance of each attribute are considered. First are regression studies that examine how perceptions of various attributes affect a consumer's choice among different payment methods. In these studies, an attribute is considered to be important if the regression coefficient on the consumer's perception of the attribute for each payment method is statistically significant and large enough to be economically meaningful.

In general, two conditions must be met for a regression study to find an attribute to be important to consumers in the above sense. First, the attribute must be perceived by consumers as varying significantly across payments methods. Second, the attribute must matter to consumers, in the sense that an improvement in the attribute would significantly increase their welfare. A regression study could find an attribute to be unimportant in consumers' payment choices not because consumers are indifferent to the attribute, but because they perceive little difference in the attribute across existing payments methods. In such cases, it is important to remember that the attribute might still influence consumers' likelihood of adopting a *new* payment method if that method differed sharply from existing methods in terms of the attribute.

The second form of empirical evidence consists of results of consumer surveys. These surveys typically specify a set of payment attributes and ask consumers to select important attributes in specific use cases, such as POS purchases, Internet purchases, or bill payments. Surveys provide less rigorous evidence on consumer preferences than



regression studies because the latter are based on actual payments choices and control for other factors besides perceived attributes that could influence those choices, such as a consumer's age and income. However, consumer surveys can help assess consumers' likelihood of adopting new mobile payment methods. Because these payment methods have been introduced only recently, regression studies analyzing their adoption or use by consumers have not yet been conducted. Findings from recent consumer surveys on mobile payments and related technologies can help fill the gap.

### *Convenience*

When referring to the convenience of payment methods, consumers may have different aspects of the attribute in mind. These aspects include portability, flexibility, speed, ease of use, and ease of setting up and learning to use each payment method.

*Mobile vs. traditional payments.* Mobile payments will likely be more convenient than traditional payment methods in terms of portability. A mobile device will eliminate the inconvenience of carrying multiple plastic cards in a physical wallet by enabling consumers to link mobile payments to those card accounts. Because of this enhanced portability, consumers may have access to more card accounts than is feasible with plastic cards. These card accounts could include general purpose credit, debit, and prepaid cards, as well as merchant-specific cards (good only at the store issuing the card) that entitle the user to rewards or discounts. Finally, to the extent mobile payments can be used for small-dollar transactions, they will eliminate the inconvenience to consumers of carrying coins and currency.

Another convenience advantage of mobile payment methods over traditional payment methods is flexibility. In addition to various card accounts, a mobile device can carry other payment methods, such as PayPal, that allow the consumer to pay directly from a bank account through ACH. From the many payment instruments loaded on the mobile device, consumers can choose a payment instrument that best fits a type of payment. Many consumers may want to fund payments from a debit card account or directly from a bank account for everyday, small-dollar purchases, or from a credit card account for occasional large-dollar purchases. To maximize their rewards, some consumers also may want the option

of paying with a merchant-specific card rather than a general purpose credit or debit card. Mobile payments can make it easier for consumers to choose among these options at the point of sale.

A final convenience advantage of mobile payments to consumers is faster transaction speed for certain types of purchases. With contactless payment methods, including contactless cards and NFC-based mobile payments, the consumer need only tap or wave the contactless device in front of a reader to make a purchase. According to some estimates, this method of payment can be 15 seconds to 30 seconds faster than swiping a traditional card and signing the receipt or entering a PIN (Morea; Polasik and others). This small difference in transaction speed can be important in situations such as mass transit or highway toll gates where consumers need to move quickly through the checkout point.<sup>5</sup>

The main way mobile payments could be less convenient than traditional payments is that mobile payments could be difficult for some consumers to set up and learn to use. Compared with traditional payment methods, such as checks or debit and credit cards, setting up mobile payments will require more steps. Consumers will need to download a mobile payment application and put multiple accounts into the application. Consumers will also need to devote time and effort to learning how to use the application. However, these setup and learning processes are likely to be much less burdensome for some consumers than others. In particular, younger consumers familiar with the technology of mobile devices may find it easy to learn how to use mobile payments. Indeed, for such consumers, downloading a mobile payment application and putting a payment account in the application may be faster and less burdensome than waiting for the delivery of physical devices, such as plastic cards or checkbooks.

*Evidence on importance to consumers.* Regression studies have found that overall convenience and specific aspects of convenience are important determinants of consumer payment choice. In Ching and Hayashi, consumers' beliefs about the overall convenience of different payment instruments have a large and statistically significant effect on their preferred instrument at all five types of retail stores considered. In Schuh and Stavins, consumers' perceptions of the overall convenience of a payment instrument have a significant impact on their use of that in-

strument for four out of seven instruments considered—cash, checks, credit cards, and prepaid cards.<sup>6</sup>

Regression studies have reached similar conclusions about the influence of specific aspects of convenience on consumer payments choice. Ching and Hayashi find that perceived speed has a significant influence on consumers' preferred payment instrument at all types of retail stores, and that ease of use has a significant effect at all types except fast-food restaurants. Mantel focuses on consumers' choice between paying bills electronically or by paper-based methods. He finds that consumers who highly value specific aspects of convenience, such as saving time and being able to pay bills while out of town, have a significantly higher likelihood of being heavy users of electronic payment methods than light users.

Consumer surveys have found that overall convenience and ease of use are primary reasons cited by consumers for using a particular payment instrument, while speed and ease of setting up an instrument are less important. In a survey of U.S. debit card users, 88 percent of respondents reported that they used a debit card because of its greater convenience relative to other payment methods (Borzekowski and others). Only 14 percent cited speed as their reason for debit card use. The Federal Reserve Bank of Boston's 2008 Survey of Consumer Payment Choice (2008 SCPC) asked consumers to select the most important payment attribute among eight listed.<sup>7</sup> Ease of use was selected by the second largest share of respondents, 29 percent, but speed was chosen by only 4 percent and ease of set up by less than 1 percent.

The few consumer surveys on attitudes toward contactless and mobile payments suggest that convenience is a major attraction. A U.K. survey asked consumers who liked mobile payments with immediate funds transfer what they found attractive about the payment method (VocaLink).<sup>8</sup> The three most-cited reasons were related to convenience—ease of use (34 percent), overall convenience (25 percent), and speed (23 percent). A recent U.S. survey asked consumers what factors would cause them to use a contactless card or a contactless device, such as a NFC-enabled mobile phone (Javelin Strategy & Research 2011). Ease of use was the reason cited most often for using contactless payments (57 percent), followed by speed (53 percent).

*Conclusion on impact of attribute on adoption.* Overall, convenience is likely to encourage consumer adoption of mobile payments. Mobile payments surpass traditional payments in portability and flexibility. For certain types of transactions, such as mass transit, mobile payments also have a speed advantage. Mobile payments could be harder for some consumers to set up and learn to use than traditional payment methods. However, this factor will be less important for many consumers, especially the young, who are already familiar with mobile technology. Both regression studies and consumer surveys indicate convenience is important to consumers in choosing among payment methods. As a result, the convenience advantages of mobile payments could be a major factor inducing consumers to use them.

### *Cost*

The cost of using a payment method includes two components. First are the fees paid to payments providers, banks, or merchants for using the method. Second are the costs of equipment and materials needed to use the method.

*Mobile vs. traditional payments.* The cost of investing in equipment needed for mobile payments is likely to vary significantly across consumers, depending on the type of mobile phone the consumer has and which mobile technology is used. To make a mobile payment with NFC technology, even consumers who already have smart phones would have to purchase a new phone because few smart phones are now equipped with the technology. However, it may be inappropriate to view the entire cost of upgrading to an NFC-enabled smart phone as a cost of making NFC-based mobile payments because the phone may have other valued features.

For mobile payments with other technologies, such as WAP or 2D barcode, the equipment cost will depend on whether the consumer already has a smart phone. Surveys indicate that about 40 percent of mobile phone users owned smart phones by mid-2011 (Kellogg 2011b; Smith). These consumers would not need new equipment to make mobile payments with non-NFC technology. The other 60 percent of mobile phone users would have to pay to upgrade from a regular phone to a smart phone. As before, however, it would be inappropriate to consider the entire cost of switching to a smart phone as a cost of making

mobile payments because consumers would likely derive other benefits from upgrading to a smart phone.

The ongoing costs to consumers of using mobile payments are likely to be the same as or lower than for traditional payment methods. One cost of using mobile payments is a data plan subscription fee to a mobile carrier. The amount of data communication used for mobile payments, however, is likely very small compared to that for other activities, such as accessing a social networking site or sending and receiving text messages, photos, and videos. Thus, most consumers may see no increase in the cost of their data plans when they start making mobile payments.

Another ongoing cost consists of fees consumers are charged by banks, payment providers, or merchants for using the various payment instruments loaded on their mobile phones. The relevant cost for the consumer is the fee, net of any rewards or discounts for using the payment instrument. For most payment instruments, the net fee is the same whether or not the card is linked to a mobile payment method, suggesting that mobile payments would have neither an advantage nor a disadvantage over traditional payment methods. For example, if a consumer's bank charges a monthly debit card fee, the consumer will have to pay the fee whether the debit card payments are made using a mobile device or a plastic card.

As noted earlier, however, mobile payments allow consumers to access a wider range of payment instruments at the point of sale, including general purpose payment cards and merchant-specific cards that entitle the consumer to rewards for purchasing from the merchant. The resulting flexibility in choice of payment method may allow the consumer to lower the net fees he is charged for making payments. For example, if the net cost of paying with a debit card rises because the card issuer reduces rewards, a consumer may be able to switch to a merchant-specific card with more generous rewards that is already loaded on his mobile phone.

*Evidence on importance to consumers.* Empirical evidence on the importance of the costs to consumers is strong. Several regression studies have found that consumers respond to differences in costs to a significant degree when they choose payment methods. In a study by Carbó-Valverde and Liñares-Zegarra of consumer payment choice in Spain, card rewards significantly increase a consumer's likelihood of preferring

to pay with a card rather than cash in six of eight sectors considered. In Ching and Hayashi, rewards on credit cards and signature debit cards significantly increase consumers' likelihood of preferring these payment methods. In Borzekowski and others, per-transaction fees charged by banks for using a PIN debit card significantly decrease a consumer's likelihood of using such a card. Simon and others find that participation in a rewards program has a significant impact on Australian consumers' probability of using a credit card, though not on their probability of using a debit card. Mantel finds modest evidence that cost matters to consumers in bill payment. Consumers who indicate they care about costs have a greater likelihood of paying some of their bills electronically, but they do not have a greater chance of being heavy users of electronic payments rather than light users. Finally, in a study of toll payments in Illinois, drivers are significantly more likely to pay with a contactless card if they are charged a lower toll for using that method than for using cash (Amromin and others).

Consumer surveys provide somewhat weaker evidence that cost matters to consumers in making payments choices. In the 2008 SCPC, cost was chosen by only 10 percent of respondents as their most important payment attribute. Similarly, in a survey of debit card users, only 12 percent of respondents cited cost as their reason for using debit cards (Borzekowski and others). However, a recent survey of consumer attitudes toward mobile payments found strong evidence that consumers care about cost. Only 22 percent of respondents said they would use mobile payments without incentives, while 62 percent said they would use mobile payments with incentives (Mobile Marketing Association).

*Conclusion on impact of attribute on adoption.* The effect of cost on consumers' willingness to use mobile payments is ambiguous. Some consumers will have to pay to upgrade their mobile phones to use mobile payments, especially if NFC is the primary technology. However, ongoing costs could be lower for mobile payments than traditional payments due to consumers' greater flexibility in choosing the payment method with the lowest fees net of rewards. If one of these effects dominates, the impact on consumer adoption could be substantial, since the empirical evidence indicates that consumers respond strongly to differences in costs across payment methods.

## Security

Consumers consider two aspects of security in choosing among payment methods. First is the likelihood of fraudulent transactions. Such fraud occurs when someone uses a payment instrument to complete a transaction that has not been authorized by the account holder. Second is the extent to which laws and regulations protect consumers from financial loss when unauthorized transactions occur.

*Mobile vs. traditional payments.* Mobile payments have the potential to significantly reduce the likelihood of fraudulent POS transactions. One way is by facilitating dynamic authentication of the transaction at the point of sale. For card payments in the United States, authentication has traditionally relied on static data, such as a card account number, expiration date, PIN, or signature. Such data does not change from transaction to transaction. If intercepted by a criminal, static data can be used to make fraudulent payments. In contrast, a chip embedded in a mobile device can enable dynamic authentication, in which data unique to each transaction is used to authenticate the payment device. Data of this type cannot be used to make fraudulent transactions, even if intercepted by a criminal (Smart Card Alliance).

Mobile payments are especially suited to dynamic authentication. The reason is that NFC-equipped mobile phones will have the necessary chip, and NFC-enabled merchant terminals will be able to communicate with the chip to perform dynamic authentication. It is important to note, however, that dynamic authentication is possible with other payment methods. The required chip can be installed on a plastic card, as is common in other countries. Visa and MasterCard have recently announced plans to promote the use of such cards by giving merchants stronger incentives to accept them.<sup>9</sup>

A second way mobile payments could reduce the likelihood of fraudulent transactions is through password protection of the mobile phone and of the mobile payment application on the phone. Such password protection provides an extra layer of security that does not exist when consumers use plastic cards to make payments. Advances in mobile technology may also enable new forms of authentication, such as facial recognition. For example, the payments startup FaceCash created a mobile application that enabled participating merchants to view a photo of the consumer before approving a POS purchase (Hernandez 2010). Other

facial recognition software under development would provide greater protection of the phone itself by requiring the user to take a picture of himself with the phone for verification (Etherington).

While mobile payments have the potential to reduce the likelihood of fraud, such benefits will be realized only if mobile devices are protected from malicious software and hacking attacks. To fully exploit the convenience of mobile payments, consumers may store large amounts of sensitive payment information on their mobile phones. The concentration of such information in a single place may pose a greater risk of theft by criminals than when consumers carry cash, checks, and plastic cards in their wallets. Although payment information stolen from a phone could not be used to make payments that rely on dynamic authentication, that information might be used for other types of fraudulent payments. Stolen information might be used to make unauthorized transactions with magnetic stripe cards or unauthorized transfers from a consumer's bank account through the ACH network. Avoiding such information theft will require strong security for mobile applications, operating systems, and hardware. It will also require a commitment by consumers to update their systems and applications.

The other security aspect important to consumers is protection from loss when fraud occurs. Under current laws and regulations, most consumer protections depend on the payment instrument and not whether the instrument is used with a mobile device. For example, whether a fraudulent purchase is made with a credit card or with a mobile payment method linked to a credit card, the consumer's maximum liability under federal law is the same, \$50. For a debit card, the consumer's liability can be higher, but as in the case of a credit card, it does not depend on whether the fraudulent payment is made with a mobile phone.<sup>10</sup> For still other payment methods, including prepaid cards and accounts at payment intermediaries such as PayPal, federal laws and regulations provide the consumer little or no protection against loss from fraud. Once again, though, the lack of protection does not depend on whether the method is used with a mobile phone.

While consumer protections for most payment instruments are the same whether or not the instrument is used with a mobile phone, mobile payments could worsen consumers' actual or perceived protection against fraud losses in two ways. First, the only consumer protections



for mobile payments linked to a mobile phone bill or mobile prepaid account are those provided by state laws and public utility agency rules. These protections differ across states and are generally weaker than federal protections against losses from fraudulent credit and debit card payments (Jun). Second, the greater flexibility that mobile payments provide to consumers in choosing among payments methods—all with different consumer protections—may create greater uncertainty in their minds about their liability for fraud losses. This potential for confusion has led to calls by some consumer advocates for a consistent set of consumer protections for mobile payments independent of the method used to make the payment (Jun).

*Evidence on importance to consumers.* Regression studies have found that security has little effect on consumer payments choice. In Schuh and Stavins, a consumer's perception of the safety of an instrument does not have a statistically significant effect on the volume of transactions conducted with the instrument. Similarly, in their study of consumer payments preference at various types of retail stores, Ching and Hayashi find that consumers' beliefs about the safety of different payments instruments have a significant effect on their preferred instrument in only two of five types of stores. Furthermore, the magnitude of the effect in these cases is considerably smaller than the effect of attributes related to convenience. Finally, a regression analysis based on the 2008 Hitachi Study of Consumer Payment Preferences indicates that consumers' perceptions about online security affect their decision about whether to make any online payments (Hayashi). However, once that decision has been made, safety does not appear to affect either the number of online payments or the decision about which payment instrument to use for the payments.

Surveys provide stronger evidence that security matters to consumers. In the 2008 SCPC, more respondents selected security as their most important attribute than selected any other attribute (32 percent). At first glance, this result seems to contradict the regression findings that security has little effect on payments choices. As suggested earlier, however, the reason the regression studies have found security has little influence on payments choices may be that security differs little among the traditional payment instruments considered by the studies, not that consumers are indifferent to se-

curity. Consistent with this explanation, a number of recent surveys focusing on mobile payments have found concern about security to be the most-cited reason for consumers' reluctance to adopt mobile payments. In a survey by MasterCard, 62 percent of respondents said that they need confirmation that their personal information is safe to be comfortable making a mobile payment transaction. In another survey, 63 percent of respondents thought their personal information was more vulnerable when using a mobile phone for purchases than when using a debit or credit card (Clark 2011b). A third survey found that 94 percent of respondents would be willing to make a mobile payment if they knew it was secure (Brown).

*Conclusion on impact of attribute on adoption.* Security is likely to dissuade consumers from adopting mobile payments initially due to concerns about the safety of a relatively new and unproven payment method. Uncertainty about consumer liability for losses from fraudulent mobile payments may reinforce these concerns. However, regulators may be able to take steps to reduce, if not eliminate, this uncertainty. In addition, mobile payment providers may be able to convince consumers of the safety benefits of such mobile features as dynamic authentication, multilayered password protection, and authentication by facial recognition. If so, security could eventually become an attribute that encourages rather than discourages consumer adoption.

### *Merchant acceptance*

Merchant acceptance is the likelihood that merchants will accept a payment method when the consumer wants to use it to pay for goods or services. In some cases, a merchant may be able, but unwilling to accept the payment method. For example, the merchant may consider the fees charged by the card issuer or payment provider to be too high or fear the payment will not be completed as promised. In other cases, a merchant may be unable to accept a payment method. For example, a merchant may not have invested in the equipment needed to process the payment or may not have signed up with the payment provider or payment network that will process the payment.

*Mobile vs. traditional payments.* Because mobile payments are relatively new, they are much less likely to be accepted by U.S. merchants than traditional payment methods, such as cash, checks, or debit and

credit cards. Initially, merchant acceptance is likely to be lowest for mobile payment methods using NFC technology. As noted earlier, the number of merchant terminals in the United States capable of communicating with a contactless card or NFC-enabled mobile phone is still very low—only one terminal per 600 people, according to the most recent data available (Ezell). The recently announced plans by Visa and MasterCard to encourage acceptance of chip cards is likely to increase the number of merchants able to accept NFC-based mobile payments because terminals that accept chip cards can also accept NFC-based payments. However, the card networks' new merchant incentives will not be fully effective until October 2015 (Johnson 2012).

Merchant acceptance of mobile payments based on other technologies, such as WAP or 2D barcode, is not as dependent on merchant willingness to invest in new equipment because these payments can be accepted with current equipment. In this case, however, merchants will generally need to enroll with the mobile payment provider in advance in order to accept the mobile payment. To be willing to take that step, the merchant must be convinced that the mobile payment method will generate enough additional revenue to outweigh the fees charged by the mobile payment provider.

*Evidence on importance to consumers.* Evidence on the effect of merchant acceptance on consumer payments choice is limited but confirms that consumers are more likely to adopt payment methods with high merchant acceptance. Rysman found that a specific card brand, such as Visa or MasterCard, is more likely to be a consumer's first choice if a large number of local merchants accept cards of that brand. The study by Ching and Hayashi indirectly supports the importance of merchant acceptance to consumers. Specifically, their regressions better explain payments choices when consumers are assumed to choose among the payment instruments they believe will be accepted by merchants than when consumers are assumed to choose among all possible instruments.

Consumer surveys have generally not asked consumers about the influence of merchant acceptance on their payments choices. An exception is a recent survey by Javelin (2011) about contactless payments, which finds modest evidence that acceptance matters to consumers. Among respondents who indicate they are unlikely to use a contactless

device, 16 percent say they are worried that the merchants they usually shop with will not accept contactless payments.

*Conclusion on impact of attribute on adoption.* Few brick-and-mortar stores are currently able to accept NFC-based mobile payments, and recent steps by Visa and MasterCard to push merchants in that direction will not take full effect until 2015. Therefore, unless alternative technologies such as WAP and 2D barcode gain traction, merchant acceptance of mobile payments is likely to remain low in the near term. Though empirical evidence on the subject is scant, it indicates that low merchant acceptance of a payment method makes consumers less willing to use the method. Thus, for at least the near term, this attribute of mobile payments will tend to discourage consumer adoption.

### III. ATTRIBUTES ESPECIALLY RELEVANT TO MOBILE PAYMENTS

This section considers two attributes that are especially relevant to mobile payments. The first is the ability to manage finances and control spending. The second is the ability to receive targeted advertising and promotions. For each attribute, the section first explains why the attribute is especially relevant to mobile payments. As before, the section then reviews the empirical evidence on the importance of the attribute to consumers and draws conclusions about the likely impact of the attribute on consumer adoption of mobile payments.

#### *Ability to manage finances and control spending*

Traditional payment methods provide consumers only limited ability to monitor their finances and control their spending while shopping at brick-and-mortar stores. Consumers who attempt to pay with a prepaid card or with a debit card without overdraft privileges learn immediately whether they have sufficient funds to cover the payment. If there are insufficient funds, the bank that issued the card will refuse to authorize the payment. Such an authorization procedure helps prevent consumers from spending beyond their means. However, a better way for consumers to manage their finances and control their spending is to be able to check their account balances before attempting a purchase. Even without overdraft privileges, for example, a debit card payment might be approved because the consumer had just enough funds in his

account to cover the purchase. If the consumer could ascertain that the purchase would almost deplete his account, he might choose an alternative payment method or forego the purchase.

Mobile payment methods have several advantages over traditional payment methods in managing finances and controlling spending. Mobile payment methods can enable consumers to check their account balances prior to making a purchase, even in a brick-and-mortar store and without access to a personal computer. Because many different payment instruments can be loaded on a mobile phone, consumers have greater flexibility to choose the payment instrument with the most favorable financial impact—for example, the instrument with the lowest fee, highest reward, or in the case of credit cards, most favorable terms for repayment. Finally, a mobile payment application could help consumers manage finances and control spending by enabling them to set purchase thresholds for different categories of spending. A consumer would be alerted when a threshold was reached, regardless of which payment instrument was being used.

*Evidence on importance to consumers.* Although traditional payment methods provide only limited ability to monitor finances and control spending, regression studies suggest that consumers value that ability. Ching and Hayashi considered how consumers' payment choices were affected by their perceptions about the degree of control over money provided by each instrument. The ability of each instrument to help the consumer budget and spend within his means also was considered. For the five types of stores examined, control over money has a statistically significant effect on the preferred payment instrument in all stores except drug stores; help with budgeting has a significant effect in all stores except fast-food restaurants. In Schuh and Stavins, consumers' beliefs about the suitability of a payment instrument for record keeping has a significant effect on use of the instrument for two of the seven instruments considered—cash and prepaid cards.

Consumer surveys confirm that the ability to monitor finances and control spending is an important payments attribute for key groups of consumers. According to McKinsey, consumers who mainly use debit cards for POS payments say the most important reason is that it “helps manage spending/finances.” In contrast, among consumers who rely primarily on credit cards, “defers payment and earns rewards” is cited

as the main reason for use three times as often as managing spending and finances. The value debit card users place on the ability to monitor finances and control spending is important because POS debit card use has grown rapidly in recent years and now exceeds POS credit card use.<sup>11</sup> Other surveys indicate that unbanked consumers with low and uncertain incomes place an especially high value on payment methods that allow them to monitor finances and control spending (Romich and others, and Federal Reserve Bank of Kansas City). For example, more than half the consumers interviewed in Romich and others say they do not use the bill pay feature on their prepaid cards because they fear loss of control over their accounts.

*Conclusion on the impact of attribute on adoption.* Mobile payments can provide consumers much greater ability than traditional payment methods to monitor finances and control spending—for example, by allowing them to check account balances at the point of sale and select the most financially advantageous payment instrument. While limited, the ability to manage finances and control spending is greater with debit cards than other traditional payment methods, and empirical studies suggest that heavy debit card users prefer debit cards for that reason. Thus, the even greater ability to monitor finances and control spending with mobile payments should favor adoption by consumers, though the magnitude of the effect is uncertain.

#### *Ability to receive targeted advertisements and promotions*

Targeted advertisements and promotions are those tailored to consumers based on their personal characteristics, purchase history, or current location. Some brick-and-mortar merchants are able to gather enough information about their customers through loyalty cards and digital receipts to engage in a modest degree of targeted marketing (Sewell). To receive a loyalty card, consumers must reveal their name, address, and sometimes their age. In return, they receive discounts or rewards on purchases at the store. Because consumers must show the loyalty card when making a purchase, the merchant is able to track their purchase history at the store. This information can then be used along with the information revealed at sign-up to target ads and promotions

to the consumer. Digital receipts can be used in a similar way because consumers must reveal their email address to receive them (Clifford).

Mobile payments could greatly increase opportunities for consumers to receive targeted ads and promotions from brick-and-mortar merchants. Consumers almost always carry their mobile phones with them. As a result, they can receive ads and promotions on a mobile payment application while they are in or near the store, not just when they are going through the store checkout. Mobile payments could allow merchants to acquire more information about their actual and potential customers than is possible with traditional payment methods, increasing the scale and sophistication of their targeted marketing. For example, a mobile payment application might be able to determine the precise location of the consumer and transmit the information to nearby merchants, who could then send ads and promotions to the consumer's mobile device. Depending on the arrangement with the mobile payments provider, a mobile application might also provide the merchant with detailed information about consumers as they enter the store, including their purchase history. Armed with such information, the merchant could then target ads and promotions to consumers while they shopped.<sup>12</sup>

*Evidence on importance to consumers.* Whether targeted marketing is valued by consumers is unclear. Consumers might like targeted marketing because it provides them with products that better match their tastes. However, they might dislike targeted marketing because they view the use of personal information as an invasion of privacy or find targeted ads irrelevant and annoying. The empirical evidence does little to resolve this ambiguity.

Studies of consumer attitudes toward targeted marketing and mobile ads have obtained mixed results. Early studies found that consumers generally dislike receiving mobile ads, suggesting that they believe the costs of targeted marketing outweigh the benefits (Tsang and others; Haghirian and Madlberger; Beneke; eMarketer). However, a more recent survey finds that more than half of Internet users are willing to receive relevant online ads in exchange for access to free content (PreferenceCentral). Similarly, another survey finds that two-fifths of consumers would use mobile payments if they could apply discounts and coupons from their mobile devices (Clark 2011b). This study also

concludes that dislike of targeted ads is primarily due to annoying on-line ads rather than to privacy concerns.<sup>13</sup>

Adding to the uncertainty about the importance of targeted marketing to consumers, some researchers have found evidence that consumers have inconsistent attitudes toward privacy. For example, Acquisti and Grossklags find that consumers feel entitled to protection of personal information that they do not control, yet they willingly trade away the same information for small rewards. Thus, even if consumers express a dislike of targeted ads and promotions due to privacy concerns, they may still opt in to targeted ads and promotions to receive rewards and coupons on their mobile devices.

*Conclusion on impact of attribute on adoption.* The effect of targeted marketing on consumers' likelihood of adopting mobile payments is uncertain. Mobile payments are likely to significantly expand the ability of consumers to receive targeted ads and promotions when shopping at brick-and-mortar stores. However, the empirical evidence suggests that consumers are ambivalent about the value of receiving targeted ads. Consumers like receiving ads tailored to their needs and preferences, but they dislike the loss of privacy and the inconvenience of receiving irrelevant ads. The empirical evidence also suggests that the ability to receive targeted ads on their mobile phones is more likely to appeal to consumers if the ads are made available on an opt-in basis and are accompanied by incentives.

#### IV. SUMMARY AND CONCLUSIONS

In the United States, mobile payments have generated much discussion but have not yet been widely used. Considerable attention has been paid to barriers to adoption on the supply side. These barriers include lack of agreement on technological standards and the need for viable business models for all the parties involved in providing mobile payments. Less attention has been paid to demand-side barriers, the most important of which is uncertainty about the net benefits to consumers of mobile payments relative to traditional payment methods. This article attempts to fill the gap in the understanding of demand-side barriers by identifying which attributes of mobile payments will encourage or discourage adoption by consumers and which will have uncertain effects on adoption. While mobile payments can be used in a



variety of situations, the article focuses on the use of mobile payments at brick-and-mortar stores because such payments account for the bulk of consumer payments.

The article finds that the payment attributes most likely to encourage use of mobile payments are convenience and ability to monitor finances and control spending. The convenience advantage of mobile payments derives from the ability to link a mobile phone to a wide variety of cards and other payment instruments. The greater control over finances and spending comes from the ability to check account balances prior to making purchases and receive alerts when spending reaches designated thresholds. The empirical evidence reviewed in the article suggests that consumers highly value convenience and are increasingly looking for control of finances and spending. As a result, both attributes are likely to favor adoption of mobile payments.

The article finds that in the near term, the attribute most likely to discourage consumer adoption is merchant acceptance. If NFC becomes the dominant mobile technology, as some predict, merchant acceptance may remain low for some time because NFC-enabled terminals are costly. The limited empirical evidence on the subject suggests that a low rate of merchant acceptance would cause consumers to delay adopting mobile payments. Over the longer term, however, the current low rate of merchant acceptance may be less of a problem. The reason is that Visa and MasterCard are actively promoting chip-based payment cards, and the merchant terminals needed to accept these cards will also be able to accept NFC mobile payments.

The effects of other attributes of mobile payments on consumer adoption are highly uncertain. Empirical studies have consistently found cost has a significant impact on consumer payments choices. How the cost to consumers of mobile payments will compare to that of traditional payment methods is still unclear, however. Equipment costs are likely to be higher, due to the need for some consumers to purchase a more advanced mobile phone. But ongoing costs to the consumer could be lower, due to the greater flexibility that mobile payments provide in choosing the lowest-cost payment instrument for each purchase.

Although mobile payments have the potential to be less vulnerable to fraud than traditional payments, uncertainty about security could slow consumer adoption. NFC technology can be used for dynamic au-

thentication of mobile payments, making consumers' payment information harder to steal. In addition, new mobile technology, such as facial recognition, can make it easier for merchants to verify a consumer's identity at the point of sale. Despite this potential for reduced fraud, surveys suggest consumers are unconvinced that mobile payments are safe enough to be used widely.

Finally, while mobile payments can significantly increase the ability of consumers to receive targeted ads and promotions, consumers appear ambivalent about the benefits of such marketing. They like receiving ads tailored to their individual needs and preferences, but they dislike receiving irrelevant ads and giving up their privacy.

On balance, the findings of this article suggest cautious optimism about the willingness of consumers to adopt mobile payments. Consumers clearly benefit from mobile payments in convenience and the ability to monitor finances and control spending. For the other attributes, mobile payments compare less favorably to traditional payments in the view of consumers. However, through steps such as migration to chip-based cards, improvement in mobile phone security, and opt-in requirements for targeted ads, these other attributes may eventually appeal to consumers.

## ENDNOTES

<sup>1</sup>Initially Isis announced it would join with the Discover card network and Barclay's Bank. In July 2011, it changed course by signing up the other three major card networks (Visa, MasterCard, and American Express) and welcoming all card-issuing banks (Johnson 2011).

<sup>2</sup>In Japan, for example, acceptance of Suica contactless mobile and contactless cards has expanded from stores in stations to stores outside stations (East Japan Railway Co., pp. 44-47).

<sup>3</sup>Data on the number of terminals are from Bank of Japan for Japan and from Ezell for South Korea and the United States.

<sup>4</sup>To help overcome these supply-side barriers, the Federal Reserve Banks of Atlanta and Boston facilitated the creation of the Mobile Payments Industry Workgroup (MPIW). The MPIW consists of key players throughout the mobile payments supply chain. The group shares information and ideas, discusses barriers and opportunities, and seeks a common vision for mobile payments success in the United States (Contini and others).

<sup>5</sup>In recent years, card networks have waived the signature requirement for traditional magnetic stripe cards for transactions under a certain size, on the grounds that such payments pose relatively little risk of fraud. Some analysts argue this change has eliminated the speed advantage of contactless devices over traditional cards for small-dollar payments (Digital Transactions). However, contactless payments may still be a few seconds faster than no-signature payments with a magnetic stripe card, giving them an advantage in situations such as mass transit, where speed is critical.

<sup>6</sup>The other instruments considered in the study are debit cards, automatic bill payment, and online banking.

<sup>7</sup>The eight attributes are merchant acceptance, acquisition (i.e., ease of setup), control, cost, ease of use, security, speed, and record keeping.

<sup>8</sup>In the U.K. immediate funds transfer system, otherwise known as Faster Payments, transfers are made directly from the payer's bank account to the payee's bank account and settle nearly in real time.

<sup>9</sup>These cards are often referred to as EMV cards. When Visa announced its plans to encourage use of the cards, it noted that the change would not only allow dynamic authentication but also promote mobile payments. The reason is that the same terminals required to accept EMV cards could also be used to accept NFC-enabled mobile payments (Visa 2011b).

<sup>10</sup>When a debit card is lost or stolen, the consumer's maximum liability is \$50 if he notifies his bank within two days of learning of the loss or theft, \$500 if he notifies the bank within 60 days of receiving the statement with the unauthorized transaction, and unlimited if he notifies the bank after 60 days (Federal Trade Commission). Legal experts generally agree that a mobile phone can be

considered an “access device,” which means that consumers enjoy the same protections when a mobile phone linked to a debit or credit card is lost or stolen as when the card itself is lost or stolen (Barbagallo; Jun). It is important to note that debit and credit card issuers can (and often do) offer greater protection to cardholders than required by the regulations.

<sup>11</sup>In McKinsey, 36 percent of consumers are classified as POS debit card users and 25 percent as POS credit card users. See Javelin (2010) for evidence on the recent shift from credit card use to debit card use. Analysts are divided as to whether the shift reflects a temporary response to the economic downturn or a shift in consumer preferences toward payments instruments with greater control over finances and spending (Fitzgerald).

<sup>12</sup>There is still uncertainty over which party in mobile payments transactions will own the information on the consumer’s personal characteristics and purchase history (Jones). This uncertainty may limit the use of mobile payments for targeted marketing in the near term.

<sup>13</sup>The only regression study to examine the effect of privacy on consumer payments choice is Schuh and Stavins. It finds that consumers’ perceptions of the privacy of a payment instrument have a significant effect on use of the instrument only in the case of credit cards and, in that case, the effect goes in the wrong direction.

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