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The Boston Fed study of consumer behavior and payment choice: A survey of Federal Reserve System employees

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The Boston Fed Study of Consumer Behavior and Payment Choice: A Survey of Federal Reserve System Employees

Marques Benton, Krista Blair, Marianne Crowe, and Scott Schuh

Abstract: The way people pay for goods and services is changing dramatically, but little data and research on consumer behavior and payment choice are publicly available. This paper describes the results of a survey of payment behavior and attitudes taken by Federal Reserve employees in 2004. Major contributions of the survey are that it asks: 1) *why* payment choices are made; 2) *why* individual payment behavior has changed; and 3) *why* individual-specific payment characteristics matter for payment choice. Although the survey is not statistically representative of U.S. consumers, and thus may not provide accurate estimates of aggregate U.S. payment trends, many results are consistent with data from more representative payment surveys. For example, the data show a trend away from check-writing and toward electronic and emerging payment methods, but the choice of payment method depends on the type of payment, amount of payment, and other complex factors. Also, cost, convenience, and control over timing are the most important characteristics determining respondents' adoption and use of payment methods. We find that payment characteristics vary widely across respondents, partly because of inherent heterogeneity but perhaps also because of measurement error, misperception, or inadequate information (lack of consumer education). Cross-sectional evidence shows that respondents tend to use payment methods in a manner broadly consistent with their reported assessments of the payment characteristics.

JEL Classifications: D12, D14, E41, C81

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The views expressed in this paper are those of the authors and not necessarily the views of the Federal Reserve Bank of Boston or the Federal Reserve System.

This paper, which may be revised, is available on the web site of the Federal Reserve Bank of Boston at http://www.bos.frb.org/economic/ppdp/index.htm.

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1. Introduction

The way people pay for goods and services is changing dramatically. Evidence—including new results from a Boston Fed survey reported in this paper—is accumulating that consumers are making substantially different choices among payment methods to settle their transactions than in the past. Apparently, consumers are shifting away from paper checks and currency and turning instead to "electronics," an expanding array of methods that leverage advances in information technology and financial markets to offer low-cost transactions and improved convenience.[1] Even the British version of the classic Monopoly® board game has switched from cash to a debit card.[2]

Perhaps the most tangible change in payment behavior is occurring in the use of paper checks, a change that directly affects a central business concern of the Federal Reserve System. Figure 1 depicts the available data on check volumes. The upper panel shows the latest official Fed estimates of the total U.S. volume of check payments, which are available only at four selected points in time.[3] The estimates reveal a decline in check volume from 50 billion in 1995 to 42 billion in 2000 and to 37 billion in 2003 (26 percent overall). The first evidence of decline was announced when the estimates for 1995 and 2000 were published in 2002 by Gerdes and Walton (2002, p. 360): "The exact year in which check use peaked is unknown, but it appears the number paid began to decline sometime in the mid-1990s." The relative scarcity of reliable, publicly available data on check volumes prior to 2000 made it difficult to know and understand completely the aggregate trend, much less the underlying consumer payment

[1] Note that the use of the term "paper check" to distinguish traditional check-writing from "electronic" forms of checking—such as electronic images of paper checks, paper checks initiated electronically through online bill payment, or conversion of paper checks to electronic debit via the Automated Clearing House (ACH) system—illustrates our point nicely.

[2] See Henry (2006) at http://www.boston.com/news/local/massachusetts/articles/2006/07/25/new_monopoly_version_drops_paper_money_adds_debit_card/ .

[3] Actual survey data estimates are from Federal Reserve Bank of Atlanta (1981), the Federal Reserve System (2002, 2004), Gerdes and Walton (2002), and Gerdes, Liu, Parke, and Walton (2005); Projections are from Federal Reserve Bank of Atlanta (1983).

behavior driving the trend. The recognition of a significant change in the aggregate trend is a key reason why the Fed has been estimating check volumes more frequently since 2000.

The bottom panel of Figure 1 shows data on check processing done by the Federal Reserve only—roughly 40 percent of the U.S. total processing. The total number of checks processed by the Fed declined from about 19 billion per year in 1994 to about 12 billion in 2005 (37 percent). Much of the fluctuation in total volume during the mid-1990s was associated with legal, regulatory, and operational changes that significantly affected the volume of a relatively small proportion of checks handled by the Fed.[4] However, the core number of unsorted checks processed by the Fed trended upward until the early 2000s, as indicated by the dashed line. Prior to the Gerdes and Walton (2002) announcement in August 2002, an observer using this core measure of check processing as an estimate of aggregate check use might have surmised that volume was increasing. But since 2002, the volume of unsorted checks processed by the Fed has declined significantly too.

The decline in volume of Fed-processed checks has impacted System operations significantly. It has contributed to a reduction in Fed employment from 23,448 in 2001, to 19,935 in 2005 (15 percent) and a reduction in the number of check-processing operations sites from 45 to 22 (51 percent) by the end of 2006.[5] Not surprisingly, these developments have fully captured the attention of Fed and private payments industry managers, who need to know how fast and how far check-writing will decline, what payment methods will replace checks, and what roles the Fed should play in the new payments environment.

The paper-to-electronics transformation clearly has important implications for participants in the payments industry, including the Federal Reserve System, but it has broader economic and public policy implications that merit examination as well. What is not understood well is *why* the transformation is occurring. For example, why is it happening now and not earlier (or later)? Why are some consumers participating in it, but not others? A full understanding of the broader implications of the payments transformation hinges critically on

[4] These were checks influenced by the same day settlement process, which affected the way checks were presented and settled among banks.

[5] This includes the closing of two check-processing branches in the First (Boston) District: Lewiston, ME, in 1997, and Boston in 2006.

understanding why it is happening. Unfortunately, answers to these questions are not easily forthcoming, largely because demand for payment methods by consumers—perhaps the most important end-users of payment methods—is not well understood.

Although some information is available about *what* payment choices consumers are making, little is known about *why* consumers make those choices. For example, why do some consumers still write checks and put them in the U.S. mail when they could "write" an electronic check via online bill payment faster and more cheaply? Among consumers who have stopped using checks for retail payments, why do some switch to a debit card, especially if the payment involves a fee, when they could use a credit card and get what is, in effect, an interest-free loan and perhaps frequent flyer miles to boot? Unanswered questions like these, and many others, are perplexing payments system providers, researchers, and policymakers.

A key gap in the understanding of consumer behavior and payment choice is a shortage of fundamental research on the topic. Perhaps the clearest evidence of the lack of research appears in a very useful bibliography compiled by the Federal Reserve Bank of Philadelphia.[6] Although the title of the document is "Consumer Payments Bibliography," only about 5 percent of the more than 700 entries are even indirectly connected with *consumer* behavior and payment choice *per se*, and far fewer directly address the theory of consumer payment choice. Schreft (2006) provides an overview of this small literature and advocates more research on the topic.[7]

The shortage of research on consumer payment behavior both stems from and is exacerbated by a lack of data on actual consumer payment choices. Kennickell and Kwast (1997) were among the first to cite the lack of data as an important part of the reason for the neglect of research on consumer demand for payments. They turned to the Federal Reserve's triennial Survey of Consumer Finances (SCF), which contains some information about *what* payment choices consumers make, although payments are not the main focus.[8] Aside from the SCF, there are few publicly available alternative data sources on this subject; private-sector data sources

[6] See http://www.phil.frb.org/pcc/bibliography.pdf for a PDF file of the bibliography or http://www.philadelphiafed.org/pcc/bibliography.cfm for a searchable online version.

[7] Schreft's paper was commissioned by the Emerging Payments Research Group at the Boston Fed and presented at the Bank's first "Consumer Behavior and Payment Choice" conference in 2005 (see Federal Reserve Bank of Boston 2005).

[8] For information about the SCF, see Board of Governors (2006a).

are generally not available to policymakers and researchers.[9] Another corroborating assessment appears in a survey of research on financial innovation by Frame and White (2004): "A striking feature of this literature, however, is *the relative dearth of empirical studies* that specifically test hypotheses or otherwise provide a quantitative analysis of financial data." [Emphasis added.] The lack of empirical studies on the adoption of payment methods by consumers is one specific example of the problem cited.

Noting the transformation in payments and its vital importance to the Fed, we set out to make a modest contribution toward filling the data gap and improving the understanding of consumer behavior and payment choice. Beginning in 2002, we developed a survey of consumer behavior and payment choice designed to go beyond asking what choices consumers were making by beginning to ask *why* they make those choices.[10] Because of our connection to the Federal Reserve, we focused the survey on check-writing behavior. But because the decision about whether to write a check is made jointly with the decision about whether to use any other payment method, the survey includes questions about most common alternatives. The three primary contributions of our survey design are: 1) the survey asks *why* consumers make the payment choices they do; 2) it asks individual consumers about *changes* in their specific payment behavior over time (although it is not a true longitudinal panel); and 3) it asks consumers how they rate the relative values of some fundamental characteristics of payment methods, in addition to asking about actual payment behavior.

Working on a limited budget, we chose a convenience sample of the most readily available, highly motivated, and inexpensive potential respondents: Federal Reserve employees. We first conducted the survey in 2003, with more than 500 Boston Fed employees, and then in 2004, with more than 5,000 Federal Reserve employees from across the System.[11] These samples have five serious limitations: 1) Fed employees are not demographically representative of U.S. consumers (on average, Fed employees are older, better educated, and have higher incomes); 2)

[9] See Appendix A for a brief discussion of data sources and their availability.
[10] For an example of research along these lines, see Schuh and Stavins (2005).
[11] The survey results are posted on the Boston Fed's public web site. For the survey instrument with all numerical results in tabular form, see http://www.bos.frb.org/economic/eprg/FRBBsurvey04num.pdf. For a graphical summary of most results, see http://www.bos.frb.org/economic/eprg/FRBBsurvey04.pdf

Fed employees are far more knowledgeable about the payments system than U.S. consumers (a bias problem); 3) Because of professional duty, reward incentives, and a general sense that providing the information could help the Fed during a time of institutional change, Fed employees were more likely than other U.S. consumers to respond to this voluntary survey (a sample selection problem); 4) Because Fed employees work in an organization that supplies payment services, they may answer certain survey questions—knowingly or unknowingly—from the perspective of a firm rather than from the perspective of a consumer; and 5) Because almost every Fed employee has a checking account, Fed employees' behavior is not representative of the behavior of all U.S. consumers, particularly those without checking accounts.

Because the survey results are not representative of all U.S. consumers, the aggregate statistics from our survey should not be used to draw conclusions about U.S. consumers in general. However, cross-sectional (individual consumer-level) studies using the survey data can provide valid and useful information about individual consumer behavior.[12] Furthermore, in 2006, we collaborated with the AARP (formerly the American Association of Retired Persons) to implement a modified version of the Boston Fed survey with a nationally representative sample drawn randomly from the entire U.S. population. [13]

This paper provides an overview of the Boston Fed survey.[14] Section 2 defines terminology, and Section 3 describes the survey. Section 4 compares our results on *what* payment choices consumers are making with results from similar surveys that are more representative of U.S. consumers. Section 5 presents selected results on *why* consumers are making the payment choices they make and how those choices are changing. Section 6 discusses some survey results that bear directly on Federal Reserve payment operations. Section 7 presents a brief assessment of the issues raised by the transformation in payments and the challenges facing policymakers. Section 8 concludes with a high-level assessment of the

[12] For an example of research along these lines, see Schuh and Stavins (2005).
[13] Documentation of this survey is forthcoming in another Boston Fed Public Policy Discussion Paper.
[14] Krieger and Braun (2005) describe the results of an analogous survey of large corporations' preferences with regard to payments, conducted by the New York Fed.

contributions of the survey and suggestions for future research to advance the understanding of consumer payment choice.

Although the survey design is imperfect, we were encouraged to discover general consistency with findings of other, more representative surveys (Survey of Consumer Finances (2001, 2004), Michigan Survey of Consumers (2003), and American Bankers Association (ABA) and Dove (2003, 2005), for aspects of the survey that were also addressed by others.

Our results include several findings that seem important and suggest the need for further study and consideration:

- Fed respondents overall rate checks worse than other payment methods across most fundamental characteristics, and ACH payments appear to strictly dominate checks in all characteristics. This finding may help to explain why consumers are shifting from paper to electronics, especially for recurring bill payments.
- Yet, even in 2004, checks were still the most common single payment method used by respondents. The survey results suggest that improvements in user control of payment timing, overdraft protection, and consumer knowledge of ACH might increase use of ACH payments considerably.
- Nearly one-third of respondents indicate that their payment behavior, especially check-writing, is sensitive to float.[15] However, even fewer respondents would or did alter their payment, banking, or shopping behavior in response to changes in the check-processing environment—particularly the introduction of electronic check images and conversion of paper checks to electronic ACH transactions that affect float.
- Cost, convenience, and timing are the three most important fundamental characteristics that determine respondents' adoption and use of all payment methods. Safety and privacy also are important for methods more susceptible to consequences like identity theft that are costly to consumers.

[15] Float is the interval between the physical writing of the check (payment) and the time when the funds are deducted the consumer's checking account (settlement) by the bank.

- Respondents are heterogeneous in their views about and use of payment methods. The most important barrier to the adoption of a payment method differs by method, and most respondents use a variety of payment methods each month. When respondents switch from checks to other payment methods, the method they choose depends on the location and amount of the payment, among other things.
- Respondents choose payment methods in a manner that is broadly consistent with their reported ratings of the relative characteristics of those payment methods. Reported characteristics could vary across respondents, even within narrow demographic groups, for many valid reasons. More research and data are needed to determine whether the reported characteristics accurately reflect the actual payment characteristics consumers face, and the extent to which the assessments may be subjective or biased.
- When the payments system changes, some respondents report that they would or did alter their payment behavior. The extent to which behavior changes, and the circumstances under which it changes, depends on the type and magnitude of the payments system change. Understanding whether the change is beneficial for society as a whole requires a much deeper understanding of consumers' tastes and preferences regarding payments than we currently have. Put simply, for a complete understanding of the overall payments industry, the views of consumers matter.

We view these key survey results as an illustrative step toward gaining a better understanding of consumer payment behavior. We hope that they will stimulate further research, data collection, and public policy discussion.

As consumer behavior is understood more fully, it will be natural for policymakers like the Federal Reserve to begin to ask, what is *best* for consumers with regard to the payments system? A major hurdle to answering this question is the surprisingly widespread and persistent heterogeneity of consumers' payment preferences. Also, some U.S. households have no bank account and thus cannot participate in some electronic payment innovations. Other developments—identity theft, credit and debit card interchange fees, technology barriers,

financial market complexity, rapidly expanding choices, and the like—have potentially important impacts on the welfare of consumers as well.

2. Definitions and Terminology

As with any rapid change in society, the payment transformation is engendering new language and terminology that is sometimes redundant and unclear. So, before diving into the details of consumer payment behavior, it will be helpful to define the terms used in this paper and their relationship to alternative terms used elsewhere.

The term "consumer" refers to a household member who makes payment decisions when buying goods and services for personal or household use. Thus, we are all consumers who demand payment services. However, our survey queried Federal Reserve employees, who, as we have noted, are quite different on average from the average U.S. consumer. For these reasons, we try to distinguish carefully between consumer and respondent, and the reader should always bear in mind the potentially important differences between them.

The payment survey includes seven main payment methods: cash, paper check, credit card, debit card, Automatic Clearing House (ACH), stored-value card (SVC), and online bill payment. To some extent, these payment method terms are self-evident and have become part of today's vernacular, but no consensus on all terminology has emerged yet. Thus, to be clear and precise, we list and define the terms we use, plus alternative terms, in Table 1.

Three general issues concerning payment methods cause unusual confusion and merit additional brief discussion. First, there is great variety in the payment methods that are available to consumers; these are summarized in Table 1. Consumer preferences and choices in the face of this variety are discussed further in Section 6. Second, ACH, which plays a pivotal role in several other payment methods (debit cards, check conversions, and online bill payments), is not a payment method *per se* but rather an electronic medium for settling payments that can be initiated by various payment methods. However, in developing our survey we relied on "ACH payments" as a short-hand for one form of payment—automatic bill payments initiated by consumers (mortgage payments, insurance payments, and the like)—so the reader should think of these when reading references to ACH.

Similarly, a third issue is that payments made over the Internet can occur in at least three ways, any of which might be viewed as a form of online bill payment. One way is via online banking, a process that allows a consumer with a checking account to pay bills electronically rather than with a paper check. Typically, the bill is paid by the bank through ACH, but, ironically, this method sometimes involves the bank's writing a check for the consumer. A second form of online bill payment occurs when a consumer accesses a company's web site and initiates a payment to the company for the bill. This form of payment can be made by credit or debit card or by ACH, either period-by-period or recurring automatically, the latter requiring only a single online transaction to sign up. A third form of online bill payment can be mediated through a third party, such as a payment provider like PayPal. This form of online payment is similar to a payment made directly to a company (or individual), but the payment provider acts as an intermediary and may offer additional payment options.

We did not distinguish among these different forms of online bill payment, leaving the survey respondents some leeway in defining the term. Thus, as with ACH, we treated online bill payment as a payment method even though it is actually not a payment method *per se*; rather, the Internet is an electronic medium used to facilitate various payment methods. In future surveys, it might be better to distinguish more clearly among the various forms of payment methods that can be initiated online.

Finally, we need to clarify the terminology used in this paper to describe various aspects of payments themselves. We use the term "payment method" to describe the various means that consumers (including respondents) can use to effect a payment; we use the term "form" in a general sense, as in the discussion immediately above; and we use the term "payment type" or "type of payment" to describe the kind of obligation that is being discharged, for example, a mortgage payment, a utility bill, a retail sales purchase, etc.)

3. The Boston Fed Consumer Payment Survey

This section describes the design, implementation, and sample properties of the Boston Fed consumer payment survey conducted in 2004.

3.1 Survey Design

To begin, we conducted focus group interviews for three months in early 2003 with employees of the Boston Fed to gain a better understanding of the importance of changes in check processing for Federal Reserve payment operations and of the gaps in knowledge about consumers' use of checks. These interviews, formal and informal, included the Bank's most senior officers with expertise in payments and economic research. Two key findings emerged clearly from the interviews:

- Although most observers were keenly aware of the decline in check volume by early 2003, the timing and magnitude of the check decline were not fully anticipated or explained, suggesting the need for greater understanding of the underpinnings of consumer demand for checks and other payment methods. This gap in knowledge mirrored the lack of fundamental research on consumer payment demand noted in the introduction. It also stemmed in part from the fact that the Fed's primary customers are depository financial institutions (banks, for short), rather than individual consumers, and neither the Fed nor banks had developed a sufficient understanding of why consumers make their payment choices.[16] Together, the decline in check volume and the gap in knowledge about consumer payment demand are cultivating the need to develop greater insight into consumer payment demand and its impact on all Federal Reserve payment operations.[17]
- It is impossible to design a proper survey of consumer behavior about a single payment method. When consumers make choices about buying goods and services, they form relative comparisons among these goods and services, based on prices and other characteristics of the products. Consumers' decisions about payments work the

[16] This point also was made by Rich Oliver, head of the Federal Reserve's Retail Payments Office, in his keynote address at the Boston Fed's 2005 *Consumer Behavior and Payment Choice* conference. Oliver identified four stumbling blocks to eliminating the gap of understanding between banks and consumers, one of which was the need to ask consumers what they want in their payments. In fact, Oliver noted that the conference's survey of participants' payment preferences represented the first time in 40 years that he had been asked about payments as a *consumer*. For more details, see Crowe, Schuh, and Stavins (2006).

[17] The series of Retail Payment Studies in the early 2000s described in Gerdes and Walton (2002) and Gerdes *et al.* (2005) represent one improvement in strategic thinking on this topic.

same way. The decision to write a check is a choice among options, and as such is integrally related to the choice to pay by alternative methods.

These two findings influenced the survey design in two ways:

- The survey aimed to elicit information primarily about check-writing behavior to understand how and why consumer payment behavior matters for the Fed.
- Although focused primarily on check-writing, the survey also includes questions about other common payment methods; specifically, it asked for pair-wise comparisons of checks versus other payment methods.

The result of these findings and design considerations is a payment survey that emphasizes checks and Federal Reserve operations to a greater extent than would a survey designed to understand U.S. consumer payment behavior in general.[18]

The Boston Fed consumer payment survey contains 55 questions of various types in the following categories:[19]

- General check-writing behavior and attitudes [questions 1–8];
- Adoption and use of six non-cash payment methods (checks, credit cards, debit cards, ACH, online bill payment, and SVC) [9–17];[20]
- Three-year retrospective changes in payment method usage [18];
- Reasons for substituting other payment methods for checks [19–22];
- Types of payments made using debit, ACH, and SVC [24–26];
- Pair-wise comparisons of non-check payment methods, relative to paper checks, along seven payment characteristics [27–31];
- Experience with check conversion to ACH in retail stores, also known as point of sale (POS), and check conversion to ACH for recurring bills mailed to a lockbox, also known as Accounts Receivable Conversion (ARC) [32–42];
- Miscellaneous payment experiences [43–48];

[18] Indeed, the version of our survey implemented by the AARP excludes some of the questions most relevant for the Federal Reserve and most detailed about check-writing.

[19] See Table 1 for complete definitions of all payment methods as well as all new terms (for example, Accounts Receivable Conversion).

[20] The omission of cash from this group was inadvertent.

- Reasons for not having a checking account [49];
- Demographics [50–54];
- Open-ended essay about check-writing decisions [55].

Although the survey seeks primarily to measure consumers' behavior and attitudes at a point in time, it asks some retrospective questions to gain perspective on changes in attitudes and behavior over time. Most respondents reported that they took about one-half hour to complete the survey.

3.2 Survey Implementation

We distributed the main version of the survey to all employees of the Federal Reserve System during approximately six weeks in June and July of 2004. It was advertised as voluntary and respondents were promised complete confidentiality.

The primary form of the survey was posted by the Boston Fed on the internal Federal Reserve intranet, which is accessible by employees of the Board of Governors, all 12 regional Banks, and all Bank branches. Each Federal Reserve District (plus the Board of Governors) appointed a representative to work with the Boston Fed survey team. However, each location was individually responsible for promoting the survey and encouraging participation among its own employees. Not surprisingly, participation and enthusiasm varied across Fed locations for this voluntary project. Paper copies of the survey were also made available to an extent that varied across Banks, but only 4 percent of all surveys were completed in writing.[21]

Although participation in the survey was voluntary, it was encouraged in at least two ways. First, we made an unabashed appeal to employees' loyalty to the Fed, citing the changes in Federal Reserve employment and the need to understand the payments transformation. Most employees who provided feedback indicated that loyalty, duty, and a desire to help the System—especially a desire to help employees in check-processing operations—were highly motivating factors. Second, the Bank also sponsored a modest raffle drawing as incentive; the

[21] The availability of paper surveys was an important issue because computer access is not uniform across all jobs within the Federal Reserve. Employees in jobs with less computer access tend to be among the most underrepresented demographic groups of the Fed universe (younger, with lower incomes and less education than others). Thus, broader availability of paper surveys may increase sample representation. However, distribution and collection of paper surveys is also much more costly (especially in time and labor) than is the case with electronic surveys.

top prizes were valued at about $25, and participants had a 4.7 percent *ex post* chance of winning a prize.[22]

3.3 Sample Properties

Nearly one in four Federal Reserve System employees participated in the consumer payment survey. A total of 5,344 Fed employees responded to the survey, 5,110 electronically (96 percent) and 234 by paper, a response rate of 24 percent.[23] This rate is considerably higher than the rate obtained by some private-sector firms that conduct voluntary consumer payment surveys designed to be representative of the U.S. population.[24]

Survey participation was uneven across the regions of the country. The top panel of Figure 2 compares the Fed survey responses with the regional distribution of the U.S. population.[25] The distribution of survey responses generally reflects the U.S. population distribution in all but four Districts: Minneapolis and Kansas City are over-represented, and San Francisco and Atlanta are under-represented.[26] If variation in *respondents'* payment behavior across Districts differs from variation in U.S. *consumers'* payment behavior across Districts, the Fed survey results will be subject to bias.

Even if the geographical variation of respondents accurately reflects the geographical variation of consumers in these respects, the unequal representation of Districts may be a source of additional geographical bias. Gerdes and Walton (2002) and Gerdes *et al.* (2005) find

[22] In May and June of 2003, we also conducted a very similar, but slightly shorter, version of the survey with Boston Fed employees as well as several test versions prior to that with small groups. The main differences between the two surveys were: 1) most of the Boston Fed 2003 survey was conducted via paper copies (64 percent) rather than electronically; and 2) the top prize in the Boston Fed 2003 survey raffle was a free vacation day, considerably more valuable than $25.

[23] Unfortunately, 1040 electronic responses were lost due to technical difficulties in Boston, but 329 of these lost responses (32 percent) were replaced by employees' taking the survey a second time. These employees were offered an additional raffle with a 19.6 percent *ex post* chance of winning. Results from the employees who retook the survey clearly may be biased for several reasons, but we can identify these responses and control for their potential biases.

[24] For example, the ABA/Dove (2005) survey response rate was about 6 percent for paper surveys (the rate for e-mail surveys is not known).

[25] To create population by Federal Reserve District, we made two simplifying assumptions: 1) The Board of Governors (Washington, DC) was included in the Richmond District; and 2) population in states served by two Reserve Banks was divided evenly between the two Districts.

[26] The top panel of Figure 2 uses the total usable number of surveys to calculate the Fed Survey numbers (that is, it does not include the lost surveys described in footnote 22). Most of the lost surveys were in the San Francisco District; this explains much of that District's relatively low (usable) response rate.

statistically significant regional differences in check-writing; for example, the Midwest region writes more checks per capita than the other three regions that these authors studied. However, this evidence is for total checks (including those of businesses), not just for consumer (individual) checks, and thus it is not comparable to the Fed survey estimates we report in Section 4. Although we find regional variation in payment behavior, Federal Reserve Banks do not provide representative sampling of the regions in which they are located and thus are unsatisfactory indicators for regional analysis.[27]

Participation was also uneven across the Federal Reserve System, in a slightly different manner. The bottom panel of Figure 2 plots the per-employee response rates and the usable response rates (excluding lost surveys) by Federal Reserve District, as well as the total System response rate. Participation was greatest in Minneapolis (51 percent rate) and Kansas City (46 percent rate), and generally above average in most Midwest districts. Participation was poorest, in total and rate, at the Board of Governors in Washington, DC.

In addition to geographic region, four other demographic characteristics from the survey are available to gauge the representativeness of the Fed sample relative to the U.S. population: age, education, income, and home ownership, which proxies for wealth. Figure 3 plots the distributions of each of these characteristics for Fed respondents and for the U.S. population.

- AGE: Fed respondents are older than the U.S. population. Most Fed respondents are middle-aged (35–55) employees from a heavily white-collar industry; as a result, the relatively young and relatively old are underrepresented, especially the youngest (18–25).
- EDUCATION: About two-thirds of Fed respondents have a college degree or some higher education, compared with only about one-fourth of the U.S. population; as a result, consumers with a high-school diploma or less education are vastly underrepresented in the survey.
- INCOME: In part because of these age and educational advantages, Fed respondents tend to have much higher household incomes than U.S. consumers

[27] Moreover, we find considerable heterogeneity within the broader regions. Five Reserve Bank Districts are included in the Midwest region defined by Gerdes and co-authors, and our estimates of checks per capita per month range from 9.3 to 13.2 across those Districts (the System average is 10.5).

generally.[28] About half of Fed respondents have annual household incomes of $75,000 or more, about twice the share of the total population with such high incomes.

- HOME OWNERSHIP (WEALTH): Fed respondents are more likely than the general population to own a home (82 percent vs. 67 percent).

Like the regional imbalances, these demographic differences will contribute to bias in the aggregate survey results if consumer payment behavior is systematically related to demographics.

3.4 Survey Question Types

Many of the survey questions are straightforward, single-response questions, but some of our other questions are designed to gain an understanding of why consumers make their payment choices; these latter questions readily admit multiple responses. For example, we asked respondents who do not use certain payment methods to explain why they do not, and one can easily imagine multiple answers to this type of question. Survey designers have two basic choices with regard to multiple-answer questions: 1) provide a large number of reasons and allow respondents to choose multiple reasons; or 2) ask open-ended, essay-type questions. Open-ended questions generally are preferable for a number of reasons; for example, they do not lead respondents to answers and they allow for responses that the survey designers may not have considered. However, open-ended questions are more difficult and time-consuming to handle in data analysis, and they require the survey analysts to interpret respondents' answers, leaving open the possibility of subjective interpretation and the introduction of errors and biases. For this reason, we opted primarily for multiple-response questions with predetermined answers.

Having chosen multiple-response questions, we then had to decide whether or not to design the response format to elicit the relative importance (or weight) of each respondent's multiple responses. One option is ordinal ranking, which would require respondents to list the order of importance of each response (from 1 to the total number of responses, for example).

[28] The income data are in nominal terms (2004) and not adjusted for cost-of-living differences across regions. Most Federal Reserve employees work in large metropolitan areas that tend to have populations with much higher incomes on average than the rest of the country, especially on the East and West coasts.

However, if one response was far more important than all the others, this format would not provide that information. Another option was to ask respondents to rate each response on an absolute scale of importance (from 1 to 10, for example). After considering the additional complexity and burden of eliciting relative importance, we opted to use un-weighted, multiple-response questions.

In analyzing the results of these un-weighted, multiple-response questions, we examined the data from two different perspectives. For some questions, we were most interested in knowing the distribution of choices among *respondents*; for example, we might want to know what percentage of respondents cited concerns about safety as a barrier to the use of an electronic payment method. For other questions, we were most interested in the intensity of response to each choice. For this latter set of questions, we looked at the distribution of *responses* among the possible choices, for example, what percentage of responses identified convenience as a factor in influencing respondents' choice of payment method. The percentage of responses provides a crude measure of the relative importance of a response, although it is clearly inferior to the direct weighting alternatives discussed in the preceding paragraph.

4. *What* Consumers Use When They Pay

This section reports basic results on Fed respondents' typical payment behavior, as of June 2004. The survey asked respondents what payment methods they had adopted and how they used the payment methods—in general, and in specific payment situations. Because much of this "what" behavior has been measured in other, more representative surveys, we compared our results with these benchmark surveys to highlight potential biases in the Fed sample. The main benchmarks for the general payments questions are the Survey of Consumer Finances (2001, 2004) and the Michigan Survey of Consumers (2003). For more detailed payments questions, the surveys by the ABA and Dove (2003, 2005) are the benchmark.[29] We also provide demographically corrected Fed results to check for biases.

[29] See Anguelov, Hilgert, and Hogarth (2004) for more details.

4.1 Payment Method Adoption

The survey begins with several questions (2–8) about checking accounts.[30] Fed respondents are considerably more likely than the U.S. population to have a checking account. Nearly all have one (99 percent), as shown in Table 2, compared with fewer than 90 percent of the general population. There are two reasons for this disparity. First, Fed employees are employed, and the unemployed and non-participants in the labor force are less likely to have (or need) a checking account. Second, the Fed has been particularly aggressive among employers in requiring their employees to sign up for direct deposit of their pay; thus Fed employees must have checking accounts.[31] For these reasons, demographic adjustments to the Fed checking account adoption rate do not alter the response much. Interestingly, however, only 49 percent of Fed employees with a checking account earn interest on their checking account balances (question 3).

Among those who do not have a checking account, the Fed respondents are much more likely to eschew them because they do not need one, rather than for other reasons. Table 3 shows that 53 percent (20 of the 38) Fed respondents without a checking account reported no need for one, much higher than the 5-percent benchmark results. Because respondents were allowed to respond more than once in the Fed Survey (and only once in the other surveys), this comparison may not necessarily suggest that having no need for a checking account is Fed respondents' most important reason for not having a checking account. Fed respondents may actually weight the reasons for eschewing checks differently than the overall U.S. population. For example, these Fed respondents are likely to be more comfortable than the U.S. population at large in dealing with banks (presumably because they work for one).

Unfortunately, we inadvertently designed the survey to exclude respondents who lack a checking account from answering the remaining questions in the survey. Consequently, all of the remaining statistics in this paper are based on respondents who do have a checking account.

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[30] The survey did not distinguish between traditional demand deposit checking accounts at commercial banks and money market accounts through investment brokers. Anecdotal evidence suggests that some Fed employees may have only the latter type of checking account; the other surveys were clearer in asking about traditional checking accounts.

[31] A small percentage of Fed workers—temporary, itinerant, contractors, and the like—may be exempt from direct deposit, making the total adoption rate slightly less than 100 percent.

Fortunately, as noted above, 99 percent of respondents do have a checking account (however, application of this survey to a representative sample would be even more problematic in this regard).

Among those who do have a checking account, Fed respondents are more likely than the overall U.S. population to adopt all of the other non-cash payment methods except stored-value cards, as shown in the remaining rows of Table 2.[32] Respondents are somewhat more likely to adopt credit and debit cards and online bill payment. Demographic adjustments actually increase the debit card adoption estimates slightly, making them even more upwardly biased. Income and education adjustments, however, help to explain some of Fed respondents' relatively high adoption of credit cards and online bill payment. Respondents to the Fed survey are more likely than respondents to the other surveys to use (pre-authorized) ACH payments for some bills by a wide margin (71 percent versus 44-47 percent). Even though income and education adjustments reduce the bias a bit, Fed respondents clearly are unusually frequent ACH users. This result likely reflects their much greater familiarity with, and trust in, ACH payments than is the case for the U.S. population overall.

The most striking difference between Fed employees with checking accounts and the U.S. population is in the adoption of stored-value cards, where Fed respondents are less than half as likely (35 percent versus 73 percent) to adopt the technology even after demographic adjustments. In fact, only 5 percent of Fed respondents even use the stored-value cards available to them internally at their own Fed location (question 26). Three qualifications apply to this result. First, with only one benchmark estimate of population adoption of stored-value cards (2003 Michigan Survey), this result should be viewed with caution. It is possible that the responses to the two surveys differ because of the way terms were defined or questions were

[32] In the following discussion of demographically adjusted statistics, it is important to understand that for demographic weighting to have an effect, two conditions must hold: 1) the group must be under-sampled by a large amount; and 2) the group must have very different behavior from the rest of the population. Thus, we find that weighting by education or income has a much larger effect then weighting by home ownership or age. See Mester (2006) for data from the SCF on payment method adoption rates from 1995–2004.

asked.[33] Second, as we explain further in Section 6, the overall Fed adoption rates for stored-value cards may be considerably lower than adoption rates at individual Fed locations if some locations do not have the cards. Finally, as with other payment methods, there could be regional differences more generally in stored-value card adoption.

4.2 Payment Method Use

Paper checks still represented the single largest payment method in terms of transactions volume for Fed respondents in 2004, but the volume of all electronic payments far exceeded checks written. Checks represented 30 percent of all monthly non-cash transactions, as shown in Figure 4, whereas electronic payments accounted for 70 percent. Because these data on payment use were collected from memory rather than from observed or recorded transactions, a concern arises about the accuracy of these responses. Fed respondents who write checks (that is, 99 percent of all respondents) stated that they write an average of 10.5 checks each month. This estimate is less than the estimate of 12.1 (not shown) inferred from ABA/Dove (2005) survey, which also relies on respondents' memories and was obtained a year later.[34]

When considering all respondents (maroon bars, Figure 4)—that is, both users and non-users of payment methods together—the non-check payment methods were used less frequently than checks, but use of debit and credit cards was nearly as common. Debit card use for all respondents averaged 9.4 transactions per month, and credit card use averaged 8.5 transactions per month. Respondents used newer "emerging" payment methods much less frequently. Online bill payment and ACH were the more common of these, averaging about three transactions per month each, while stored-value cards were used on average about once

[33] The Michigan survey said: "Prepaid cards are cards that contain a stored value, or a value that has been paid up-front, allowing you to use the card much like cash. As you use the card, the prepaid value is drawn down. Examples of prepaid cards include phone cards, gift cards, and student cards. Have you ever had or used a prepaid card or bought one as a gift?" The Boston Fed survey said: "**Stored-Value Card**—A plastic card that stores electronic data on dollar values. One example is a pre-paid phone card. Other examples include gift cards from stores like Macy's, Home Depot, or Starbucks." If the Michigan definition were clearer or easier for respondents to understand, it might have increased Michigan respondents' likelihood of acknowledging use of stored-value cards.

[34] The ABA/Dove estimate was obtained from the data on the percentages of checks written for payments in-store (retail), online, and bills. Although this estimate may undercount checks written if consumers write them for many other types of payments, the results may still give a general idea of the comparison between the two survey populations.

per month. Thus, checks, debit cards, and credit cards accounted for the vast bulk of respondents' payments—about 28 per month compared with about seven per month for emerging payment methods. Note that these self-reported monthly payments imply that the typical respondent is making slightly more than one payment per day (roughly 35 per month); unfortunately, we do not have independent information to verify the accuracy of this number.

Looking by payment method only at respondents who have adopted each method (yellow bars, Figure 4), we find, not surprisingly, that the incidence of use is somewhat more evenly divided across the spectrum of payment methods. Most notably, respondents who adopted a debit card tend to use it much more frequently than any other payment method is used by its adopters (14.7 transactions per month on average). In addition, respondents who adopted online bill payment tend to use it about seven times per month on average, a rate of use approaching that of the other most common methods by their adopters. Respondents who adopted ACH or a stored-value card tend to use them substantially less (about four transactions per month on average). Thus, even among users of "emerging" payment methods, we find the use of these methods is still relatively infrequent. The reason for the low intensity of use among users of these "emerging" payment methods is unclear. Probably, it is explained partly by low demand by respondents and partly by limited supply, since for many types of transactions, these methods are simply not available options at the present time.

4.3 Payment Choices by Venue

One of the most striking findings, and one that makes it clear that a great deal more study will be needed to gain a full understanding of consumer payment choice, is that consumers' payment choices are quite heterogeneous, varying by venue (retail store or whatever venue is used for recurring bill payment), and within a given venue, by bill payment type and (for retail store payments) by payment amount.

4.3.1 Payment Choices at Retail Stores

Although checks are the most common payment method overall, at retail stores Fed respondents most often choose a debit (36 percent) or credit (31 percent) card to make payments, as shown in Figure 5. In fact, only 12 percent of Fed respondents make most retail

payments by writing checks. Comparing our results with the more representative ABA/Dove survey results, we see that Fed employees tend to favor checks more than does the U.S. population (12 percent versus 7 percent), and to use cash less (21 percent versus 26 percent). But overall, the results are similar.

Interestingly, Fed respondents' use of payment methods at retail stores is far from uniform across payment amounts, as shown in the remaining bars of Figure 5.[35] For payment amounts below $20 (also called micro payments), cash is still king (51 percent). For medium-sized payments ($20–50), debit cards are most common (46 percent), and for large payments (amounts above $50), credit cards are most common (48 percent). One shortcoming of the study is that the survey did not obtain enough information to distinguish between use of credit cards for credit (borrowing with repayment over time) and use of credit cards for deferred payment (interest-free loan or negative float) or incentives. In any case, payment size appears to be a factor in respondents' payment choices.

4.3.2 Payment Choices for Recurring Bills

Checks are still the dominant payment method for recurring bills, as shown in the upper panel of Figure 6, but respondents to both surveys also use other methods. Eighty-three percent of respondents to the Fed survey and 72 percent of respondents to the ABA/Dove survey write checks to pay some bills. ACH payments are the next most common among Fed respondents, followed by online bill payment and credit cards. Compared with the ABA/Dove results, Fed respondents appear to be roughly representative of U.S. consumers in their check-writing.[36] Heterogeneity of payment choice is evident from the data on payment choice (of Fed respondents) by type of bill payment, as shown in the bottom panel of Figure 6. About half of all respondents pay their housing, telephone, cable, and insurance bills by check, but only one third of respondents pay their Internet service providers by check. The use of ACH payments is relatively widespread for housing, insurance, and loan payments, but relatively unpopular for telephone and cable bills. Roughly one-third of respondents use credit cards to pay their Internet service providers, but no more than about one-tenth of respondents (and in some cases

[35] We do not have results from a representative survey against which to compare these results.
[36] Credit cards were excluded from the ABA/Dove survey.

hardly any) use this method to pay other bills. Understanding the root causes of this heterogeneity in consumer payments across recurring bill types is a challenge.

5. Why Consumers Pay the Way They Do

Because our primary goal is to develop a better understanding of why consumers make the payment choices they do, a significant portion of the Boston Fed consumer payment survey contains two types of questions designed to elicit this information. One type of question explores changes in the way consumers make payments, asking them what changes they made and why. A second type of question explores the fundamental characteristics of payment methods that likely influence consumers' decisions to adopt and use the methods, and seeks to understand whether these characteristics are consistent with actual payment behavior. The remainder of this section examines these two important dimensions of consumer payment behavior.

5.1 Changes in Consumer Payment Behavior

Ideally, changes in consumer payment behavior would be measured using longitudinal surveys in which the payment behavior of the same consumers was followed consistently over time. However, because the Boston Fed payment survey was originally intended to be a one-time survey, we designed some retrospective questions to try to obtain information about changes in individual consumer payment behavior over time. The most direct question of this kind asked respondents whether they use fewer, more, or the same volume of each payment method compared with three years earlier in June, 2001 (question 18). Follow-up questions asked respondents who said they were writing fewer checks than in the past what payment methods they had substituted for checks, and why they had chosen these methods—both in general and for retail or recurring bill payments (questions 19–23, 44–46, and 48). Additional queries asked about payment method substitution, specifically for retail and recurring bill payments.

5.1.1 Changes in Payment Methods: From Paper to Electronics

Most respondents' use of checks (for all types of payments) had declined over the preceding three years, and their use of electronic payments had increased commensurately.

Figure 7 shows that 64 percent of respondents who write checks reported having decreased their use of checks in the past three years, and only 8 percent reported having increased their use, with the rest reporting about the same use.[37]

The largest increases in the use of electronic payments occurred in online bill payment and the use of debit cards. Eighty-four percent of Fed respondents who use online bill payment increased their use of that method, 77 percent of users of debit cards increased their use of debit cards, and fewer than 5 percent of users of each of these two payment methods decreased their use of the method in question. Just over half of Fed respondents who use ACH reported having increased their use of ACH, with only one percent reporting reduction in their use of ACH. Forty-three percent of users of stored-value cards reported increased use of those cards, although half reported that their use had not changed.

On the other hand, users of credit cards, a more traditional and previously more widely used type of electronic payment, reported that they had not increased their use of credit cards in the past three years. Thirty-five percent of respondents who used credit cards reported increased credit card usage, with 42 percent indicating no change, and 24 percent reporting a decline.

5.1.2 Replacement of Checks by Electronic Methods, by Bill Payment Type and Value

Electronic payments are replacing checks in retail payments and in a wide variety of recurring bill payments, as shown in Figure 8. Mortgage and rent payments are the most common recurring bills for which Fed respondents eliminated check-writing completely for each given payment type and switched to electronic payments for that payment type (39 percent). Among respondents who switched from writing checks, about 30 percent switched to electronics to pay their credit cards, utilities, and insurance, and 22 percent did so for telephone bills. However, of those who switched from writing checks to electronic payment methods, only 14 percent switched for their retail purchases. In each of these cases, the survey data do not indicate directly whether a low percentage indicates that consumers are substituting electronic payments for checks because the electronic payment options have become more desirable and

[37] The results are quite similar for retail purchases only. Sixty-five percent of respondents reported writing fewer checks for retail payments than they did three years earlier, with 31 percent writing the same amount and only 4 percent writing more (question 45).

feasible, or whether consumers were already writing fewer checks for these payments than they had three years earlier. The former seems more likely for many types of bill payments (only 6 percent of respondents wrote more checks for bills, according to question 48); the latter seems more likely for retail purchases (65 percent of respondents write fewer checks at retail stores than formerly, according to question 45).

Changes in retail payments from checks to electronic payments were not uniform: Respondents who wrote fewer checks for retail payments compared with three years earlier chose different electronic payment methods depending on the value of the retail transaction.[38] Figure 9 shows what other payment methods respondents used as their check-writing decreased. Results for these changes in payment behavior between 2001 and 2004 are quite similar to the results depicted in Figure 5 for respondents' payment behavior in 2004. Most respondents who reduced their use of checks primarily replaced checks with cash for small purchases under $20 (43 percent), followed closely by debit cards (41 percent). For medium-sized purchases of $20 to $50, nearly two-thirds (62 percent) of those who reduced their use of checks primarily substituted debit cards, with 31 percent using credit cards. But for large purchases over $50, only about half of all respondents who reduced their paper check-writing opted for debit cards instead, while almost as many (48 percent) chose credit cards. Those who reduced their use of checks most definitely did not choose stored-value cards to replace checks for any size purchase, and they chose cash for small purchases only.

It is difficult to understand why consumers change their payment methods in general, and even more complex to understand why the shift in payment choice depends on the type of bill and the value of a payment. Still, we offer some possible explanations. With respect to payments in general, it may be that the convenience of setting up automatic payments for recurring bills is seen as a stronger advantage than the convenience of paying electronically at retail stores. With respect to payments at retail stores, it may be that consumers do not increase their use of cash as they reduce their use of checks for larger (>$20) purchases because they want to avoid carrying a great deal of cash as a result of security concerns or other reasons. The

[38] Here, "Respondents who wrote fewer checks," refers to any respondent who simply reduced check usage for retail purchases, whereas the discussion in the previous paragraph deals with respondents who eliminated check-writing entirely for a given payment type.

shift from checks to credit cards for larger (>$20) purchases in general may be explained partly by loyalty (reward) programs. However, the fact that this checks-to-credit cards shift is greatest for the largest purchases (>$50) is more difficult to understand fully without separately identifying respondents' use of credit cards to borrow money to pay for these very large purchases. Moreover, for medium-sized retail purchases, a very high percentage of those who reduced their use of checks chose debit cards instead (62 percent). This raises the question of why these respondents do not take advantage of the interest-free loan and incentive features of credit cards for these purchases, too. Perhaps they are guarding against overdrafts or building up debt. The variety and complexity of possible explanations for consumer behavior payments behavior highlights the need for further research.

5.1.3 Why Did Respondents Substitute Electronic Payments for Checks?

What explains the general shift from paper checks to electronic payment methods for retail purchases and recurring bills? Respondents reported that convenience and various elements of cost were the primary influences on their decisions to substitute electronic payments for checks, as shown in Table 4. Note, however, that the term "convenience" is somewhat vague, both inherently and because it was left for respondents to define subjectively. As only one response was allowed and because the definition of convenience may vary across respondents and may overlap with other similar terms, interpreting the responses is somewhat difficult. In future research, a more granular definition of the characteristics of payment methods may shed additional light on why consumers as a whole, and by demographic or other characteristics, shift from checks to specific alternative payment methods.

For online bill payment, which showed the largest increase in use, several diverse factors prompted Fed respondents who switched from writing checks to electronic methods to change their payment method. Respondents switched from checks to online bill payments because they found that it is faster (22 percent of responses) and generally more convenient (21 percent of responses) to pay bills online. In addition, the greater ability to control the timing of their payment (20 percent of responses), save on postage (19 percent of responses), and enjoy the recordkeeping benefits of online bill payments (13 percent of responses) were all influential in the decisions of respondents who made the switch from checks to online bill payment.

The reasons for switching from checks to ACH were similar to the reasons provided for switching to online bill payment. Convenience, lack of mail hassles, and not having to remember to pay the bill each month were reasons cited in 19 percent of responses of respondents who switched, while cost savings—saving money on postage and the absence of fees—were slightly less important in this case (16 percent of responses).

Thirty-seven percent of the responses indicated that convenience was a factor for respondents who switched from checks to debit cards, while 18 percent of responses showed cost (saving money on checks) as an influencing factor on respondents' decisions. Thirteen percent of responses indicated that better recordkeeping was a factor in respondents' switching from checks to debit cards. Almost one-third of responses indicated that use of debit cards increased simply because more stores now accept them than previously (a supply-side reason).

Convenience was also cited most often by respondents who switched from checks to credit cards, but several aspects of credit-card cost were cited relatively frequently as well. The ability to buy now and pay later (17 percent) makes the credit-card payment an implicit interest-free loan. Incentives (rewards), such as mileage, points, or cash-back, promoted by credit card use (15 percent) also reduce the net cost of credit card payments. These examples of cost savings are reductions in the full economic cost of the payment method, not out-of-pocket cash costs. However, saving money on postage (11 percent), an out-of-pocket cash cost, also was important to some respondents.

5.2 Determinants of Payment Choice

A consumer's decision to adopt and use a particular payment method is likely to be based heavily on the fundamental characteristics embodied by that payment method. In this regard, the consumer's payment choice is essentially no different from other choices consumers make to use (buy, or consume) any other type of good or service. However, unlike the case of consumption of goods and services, very little attention has been paid thus far to the study of payment characteristics and the role that they play in consumers' choices of payment methods.

This subsection offers three types of evidence on the fundamental characteristics of payment methods that influence consumers' decisions to adopt and use various methods. First, for respondents who do not adopt a payment method, we describe the main barriers they

reported to the adoption of payment methods. These barriers suggest important characteristics that discourage certain consumers from adopting payment methods. Second, we describe how respondents rate each payment method, relative to checks, with respect to seven fundamental characteristics. Relative characteristics of payment methods can vary widely across respondents, even within demographic categories, because of actual heterogeneity in the payment characteristics at the individual level. However, as we explain in more detail later, the assessments of relative characteristics reported by respondents may differ from the actual relative characteristics of the payment methods—for a variety of reasons. Third, we present a relatively simple comparison of respondents' actual payment behavior with their reported assessments of relative payment characteristics.

5.2.1 Barriers to Adoption of Payment Methods

Many respondents are now using electronic payment methods instead of checks for some transactions, and they gave us numerous reasons to explain why they switched. But why aren't more people making greater use of electronic payment methods? For each method, we asked respondents to cite the reasons, or barriers, for not adopting the particular method. (This was a multiple-response question where we allowed respondents to select more than one choice.)

Barriers to adoption vary considerably across payment types for two reasons, as illustrated in Table 5.[39] First, the range of possible barriers is not the same for each payment type because some barriers are not applicable to certain payment methods (reflected by missing values in a row). Second, the relative importance of the barriers is not the same for each payment type or for each consumer. The color-coding of the barriers indicates their degree of importance, as measured by the percentage of responses citing the barrier. Red barriers are the most important (more than 15 percent of responses), and white barriers, the least (5 percent or fewer), with orange and yellow in between. In assessing the importance of barriers to payment method adoption, the reader should bear in mind the adoption rate of each method from Table

[39] Table 5 is derived from questions 10–17. The numbers in the table are the percentages of responses that cite the barrier as a factor (row) for respondents who do not use the payment method (column). Respondents were allowed to choose more than one barrier. For results on the barriers in terms of the percentages of total respondents, see the survey results files.

2, which (excluding checks) varies from 86 percent for credit cards to 35 percent for stored-value cards. Thus, the most important barrier to the adoption of stored-value cards likely has a greater effect on overall consumer payment choice than does the most important barrier to the adoption of credit cards.

Scanning the columns of Table 5, one can see that the most important barriers to adoption vary across payment methods. Although some methods share similar barriers, no two payment methods have the same most important barrier, and each payment method has a most important barrier that the others do not. The most important barriers to credit card use are the amount of debt in the household (38 percent of responses) and interest and fee expenses (32 percent of responses) or out-of-pocket cost. For debit cards, the barriers are much more varied, with five rated as most important or second most important (at least 11 percent of responses). Interestingly, two elements of the cost of credit cards have opposite effects on the adoption of debit cards. Incentives, which make credit cards *cheaper* relative to debit cards, are the most important barrier to the use of debit cards (19 percent of responses), but interest and fee expenses, which make credit cards *dearer* relative to debit cards, are tied for third place with theft and misuse, among barriers to the use of debit cards (13 percent of responses). Concern about tracking payments (14 percent of responses) is the second most important barrier to debit card use. The most important barrier to the use of ACH payments cited by non-users of ACH is concern about overdrafts (20 percent of responses), with concern about the lack of flexibility in timing of payments coming in second (16 percent of responses). Not surprisingly, the major concerns related to online bill payments were privacy and security (22 percent of responses) and theft (19 percent of responses).

These results on adoption of payment methods suggest that the barriers are so different among the electronic payment methods that it is unlikely that any single improvement to the payments system will encourage consumers to increase their use of electronic payments in general. However, respondents generally would be willing to use electronic payments more if the specific barriers that inhibited them for using each type of payment were removed (see the odd-numbered questions from 10–17). These results suggest ways that payment providers may have an opportunity to increase the use of their payment methods. For example, offering

consumers protection against overdrawing accounts and more flexibility on payment timing might significantly increase use of ACH payments.

5.2.2 Relative Payment Characteristics

To understand better how consumers think about their payment choices, we attempted to determine the relative importance (or value) of some fundamental characteristics of the payment methods. Our strategy was to ask respondents to self-report the qualitative values of the characteristics of each payment method relative to the values of the same characteristics of a benchmark payment method (paper checks). As is the case for the entire survey, self-reporting by respondents is susceptible to a variety of errors, which might be lessened if the data on relative payment characteristics were collected from other sources. Furthermore, the potential weakness of consumer self-reporting is exacerbated for payment characteristics because they are hard to define—a subject we discuss in more detail in the next sub-subsection. Nevertheless, for this sub-subsection, we proceed under the assumption that the *reported* and *actual* relative payment characteristics are the same.

To keep the comparison manageable, we asked respondents to compare each type of electronic payment, one at a time, with paper checks with respect to seven characteristics: cost, convenience, safety, privacy, ability to resolve errors, ability to control the timing of payments, and ease of recordkeeping. Specifically, we asked for a simple, qualitative comparison of the value of each characteristic by asking the following question: Is the electronic payment method better, the same as, or worse than a check?[40] For each respondent, these value results were converted to a discrete numeric format (better is 1.0, worse is –1.0, and same is 0.0). Table 6 summarizes the results of our qualitative comparison of payment characteristics by averaging the quantitative values assigned to the qualitative assessments across respondents. Like Table 5, the entries in Table 6 are color-coded to indicate the relative value reflected by the averages. Red shading indicates that the electronic payment method is rated worse than checks, green shading better, and white shading the same. Each color has two shades, with the darker shade

[40] A more continuous and quantitative evaluation would be preferable, but we decided that it would have been too difficult to obtain accurate answers of this type in the survey. Data from this kind of qualitative assessment question have some notoriety in economic analysis; for example, see the surveys of business activity by the Institute for Supply Management (ISM), which can be found at http://www.ism.ws/ .

indicating greater intensity. Thus, green indicates "better," darker green indicates "much better," red indicates "worse," and darker red indicates "much worse."

Our assessment of relative payment characteristics is adversely affected by a serious error in our survey design. We asked only the respondents who use a particular payment method to answer the group of questions that compare payment methods by characteristic. But to gain a full, accurate understanding of the relationship between characteristics and payment choice, one needs the payment characteristic comparisons of both users and non-users.[41] Fortunately, because some respondents did not follow directions, we actually did obtain responses for the payment characteristic comparisons for a relatively small—and probably even more unrepresentative—number of non-users of each payment method. Thus, we can report characteristic ratings separately for respondents who used the particular payment method (Table 6, top panel) and for those who did not (Table 6, bottom panel).[42]

The clear and pervasive message of Table 6 is that respondents who use each of the electronic payment methods (top panel) generally view them as markedly superior to paper checks. Of the 35 possible comparisons, in only three cases is the electronic payment method rated worse than checks (negative numbers in the top panel of Table 6), while in 27 cases the electronic payment method was rated by its users as better or much better than checks (light green or dark green in the top panel). Respondents who use electronic payments view them as strictly better than checks (value is positive) in four characteristics: cost, convenience, timing, and errors. Respondents think electronic payment methods are overwhelmingly more convenient than checks—all five payment methods were rated as much better for convenience than checks. Respondents also think that electronic payment methods are significantly better in terms of cost and timing.

[41] Unless consumers are completely illogical or constrained in their behavior, the users of any particular payment method almost surely rate that particular method better than other methods, as evidenced by their decision to use it. Thus, data gathered only from payment users will give a biased (more favorable) assessment of relative payment characteristics than such assessments made by all consumers.

[42] Of course, it is conceivable that respondents who do not follow directions have their own set of biases and thus induce sample selection problems. We have no way to test or verify this possibility, so the reader should keep this potential flaw in mind.

Of all the electronic payment methods, respondents who used the method rated only one—ACH payments—as uniformly dominant over checks. In all seven categories, ACH payments were rated better or much better than checks. Overall, it seems likely that a better understanding of the availability of ACH payments would lead to further reductions in check-writing. However, with respect to this finding, it is important to recall once again that Federal Reserve employees are probably not typical users of ACH payments.

In contrast, respondents who do not use a particular electronic payment method (bottom panel) tend to rate the electronic methods about the same, on average, as checks. Even non-users of a particular payment method view the electronic payment method as better in convenience across the board, and they tend to view ACH as essentially equivalent to checks in all characteristics. However, non-users see several areas in which credit cards, debit cards, and online bill payment are significantly worse than checks. Cost, safety, and privacy are key concerns for the respondents who do not use these electronic methods and who rated them worse than checks. Among these non-users, recordkeeping (for debit cards) and payment timing (for SVCs) are also viewed as worse than checks. Interestingly, respondents who do not use SVCs nevertheless rate them better than checks on convenience and privacy; apparently, some other unobserved factors discouraged these respondents from using stored-value cards.

The important result to keep in mind with respect to the characteristics of payment methods is that Fed respondents overall rate checks worse than other payment methods across most fundamental characteristics. Only among the small group of respondents who are non-users of electronic payment methods did we find some characteristics for which checks were viewed as superior.

5.2.3 Relative Payment Characteristics and Consumer Payment Behavior

A natural question arising from the evidence on relative payment characteristics is whether they play an important role in determining actual consumer payment behavior. In this sub-subsection, we perform a simple comparison to try to answer this question, at least at a

cursory level.[43] However, first we must examine the concept of relative payment characteristics in a bit more detail.

Economists generally assume that consumers act in their own best interest to maximize their utility, which depends positively on their consumption of goods and services and negatively on their supply of labor for work. Implicitly, economists typically assume as a benchmark that consumers accurately and completely observe the fundamental characteristics of the goods and services—price, color, quality, speed, and the like—that they consume, thereby enabling them to make fully informed decisions and behave in their own best interest. If this benchmark assumption is correct for relative payment characteristics, then we can compare them with the observed payment behavior of the respondent who reported the characteristics to see whether the behavior is consistent with the characteristics. For example, respondents who rate paper checks as costlier than another payment method should (all else being equal) use that other payment method more frequently than checks.[44]

However, numerous aspects of the relative payment characteristics and corresponding consumer payment behavior may complicate this simplistic analytical conclusion. Before proceeding to our comparison of payment characteristics and behavior, we provide an itemized discussion of these key issues:

- *External heterogeneity* – Relative payment characteristics most likely vary across individual consumers, for a variety of reasons. One can imagine that the cost of a payment method may be different for two consumers, even if they have similar demographic characteristics. For example, checking accounts have different fee

[43] See Schuh and Stavins (2005) for a more rigorous and thorough investigation of this issues. They find evidence that relative payment characteristics are much more important than demographics in econometric models that try to explain consumer payment behavior.

[44] Even if consumers have accurately and completely observed their economic environment, they may not make choices that are in their own best interest, or "rational." A relatively new branch of the profession, called behavioral economics, challenges the basic premise that consumers consistently make choices in their best interest and offers evidence that consumers sometimes deviate from the rational behavior traditionally assumed by economists (see the overviews by Mullainathan and Thaler (2000) or Camerer and Loewenstein (2004)). Consumer payment choice is an area where many of the ideas advanced in behavioral economics may be evident in the real world, but a formal evaluation of whether consumer payment behavior is consistent with relative payment characteristics requires an economic model and statistical tests, which are beyond the scope of this survey overview. For examples of this kind of work, see Zinman (2005) or Meier and Sprenger (2006).

structures, interest rates, cost of paper checks, and other pecuniary features; likewise, payment service providers (such as banks) may differ in their abilities to resolve errors or payment disputes with their customers. This kind of characteristic heterogeneity is external to consumers, thus taken as given.

- *Endogeneity* – One reason payment characteristics may be heterogeneous across consumers is that consumers can choose many of the characteristics of their payment methods simultaneously with the choice of the method itself. In the preceding example of the checking account, a consumer who chose to write checks intensively would likely search for (and choose) a relatively inexpensive checking account (low fees, high interest) and buy discount checks—actions that work to lower the relative cost of checks for that consumer. Likewise, among credit card users, the cost is heavily determined by a respondent's decision whether to carry balances across months (thereby incurring or avoiding interest charges) and by the decision whether to pay in a timely manner (thereby avoiding or incurring late fees and perhaps an increase in the interest rate charged on future balances). For these reasons, we cannot view the relative payment characteristics as something consumers take as given when they choose their payment methods.
- *Measurement error* – Some payment characteristics are very difficult for consumers (and perhaps even others) to measure properly. For example, although identity theft is being discussed and publicized much more frequently than before, the actual unconditional probabilities of various forms of identity theft are not well known. Moreover, it is likely that the conditional (on individual consumer behavior and characteristics) probabilities are even more difficult for individual consumers to estimate. Thus, reported relative characteristics probably contain some measurement error.
- *Experience* – Some payment methods may exhibit the characteristics of an experience good, which is one whose price and features are not fully known by the consumer until the consumer actually consumes (experiences) it. For

example, consumers may not grasp accurately the convenience (ease of use) of online bill payment until they actually set up their online banking facilities and begin to pay bills this way.[45]

- *Subjectivity, internal heterogeneity, and perceptions* – Some payment characteristics may be subjective from the perspective of the consumer. For example, convenience (ease of use) and recordkeeping (ease of financial management) are characteristics that may be determined largely by the tastes and preferences of individual consumers. If so, the relative payment characteristics would reflect heterogeneity in consumer utility functions, which is internal to the consumer, rather than a fundamental feature of the economic environment that influences consumer decisions. But subjectivity may run even deeper. Some consumers may form perceptions about payment characteristics that have no systematic relationship to measurable, objective characteristics of the economic environment. For example, consumers who read a great deal about identity theft in the newspaper may perceive that safety is much lower for online bill payment than is actually the case (even if they are shown evidence to the contrary), or than do consumers who rarely read the newspaper or who already use online bill payment.

Each of these factors may influence respondents' reported relative payment characteristics and may drive a wedge between the reported characteristics and the actual characteristics that prevail in the marketplace.[46] Nevertheless, actual payment behavior is most likely to be determined primarily by reported payment characteristics. Much more data and research are needed to distinguish more clearly between reported and actual payment characteristics, and to

[45] See Goettler and Clay (2006) for an example pertaining to the use of online grocery services that has similarities to the payment choice. Experience goods are also susceptible to price discrimination.

[46] For several payment characteristics, such as privacy, security, and payment timing, one might wonder whether the difference in reported characteristics across respondents and the divergence (if one exists) of reported and actual characteristics are matters of misinformation that could perhaps be remedied by education. For example, a paper check, which has one's name, address, and account number on it, and which passes through many individuals' hands as it makes its way through the clearing process, is probably not more secure than a debit card, especially if the latter is guarded by a PIN, but individual consumers may not be aware of this fact.

understand the extent to which deviations from actual characteristics actually influence consumer payment behavior.

Proceeding under the assumption that respondents' reported payment characteristics are accurate assessments of actual payment characteristics, we seek to determine, in a rough way, whether there might be some obvious, first-order deviation of respondents' payment behavior from the relative characteristics they reported for the various payment methods. To do so, we devised a simple way to evaluate whether respondents' assessments of relative characteristics were consistent with their payment method usage. From the results on usage (question 9), we identified three types of respondents:

- *Check payers*: Respondents who wrote checks for more than 75 percent of their monthly payments.
- *Eclectic payers*: Respondents who wrote checks for between 20 and 75 percent of their monthly transactions.
- *Electronic payers*: Respondents who wrote checks for fewer than 20 percent of their monthly transactions.

These three types of respondents are represented by the different colored bars in Figure 10.

Fed respondents appear to behave in a manner broadly consistent with their reported assessments of relative payment characteristics, a point illustrated by Figure 10 in two ways. Both the intensity of use of electronic payment methods and the adoption of electronic payment methods are consistent with the reported relative superiority of electronic payment methods.

Electronic payers (third, deepest row of bars) rated electronic payment methods consistently better than checks. In each of 14 possible categories—users (top graph) and non-users (bottom) across seven payment characteristics—more electronic payers than eclectic payers rated electronic methods as superior to checks, and more eclectic payers than check payers rated electronic methods as superior to checks. For four characteristics—cost, convenience (ease), timing, and recordkeeping—more than 50 percent of electronic payers rated the electronic payment methods that they use better than checks. In contrast, check payers conceded the superiority of electronic payment methods in only one characteristic—convenience (ease of use); fewer than half of check payers (nearest row of bars) rated electronic

payments (whether they use them or not) better than checks in all other characteristics. Eclectic payers rated electronic payments better than checks at a rate that lies between the ratings of the other two groups of payers, as one might expect. Thus, the *intensity* of electronic payment usage is consistent with the reported superiority of electronic methods.[47]

A second way that reported behavior appears to be consistent with ratings of relative characteristics is that respondents generally rate more of the electronic methods they use as superior to checks than the electronic payment methods they do not use. For each type of payer (check, eclectic, and electronic), respondents generally rate electronic methods that they use (bars in the top graph) higher than electronic methods that they do not use (bars in bottom graph), with only a few exceptions: Among electronic payers (deepest bars), privacy and payment timing (fourth and sixth characteristics) are rated about the same for electronic methods, whether these respondents use them or not. More than 50 percent of electronic payers rate electronic payment methods that they do not use as better than checks only for convenience (ease) and payment timing. Thus, it appears that *adoption* of electronic payment methods by respondents is also generally consistent with their assessments of superiority of electronic payment methods.

Although these results do not constitute sufficient proof that *consumers'* payments decisions are consistent with their reported relative payment characteristics, they do suggest that there is no obvious behavioral inconsistency among the Fed respondents. When it comes to understanding the diversity of payment behavior among consumers, it is difficult for researchers to distinguish accurately among the following possible sources: measurement error, heterogeneity of consumer circumstances, heterogeneity of consumer preferences (utility functions), irrationality (as explained by behavioral economics), or other important determinants of consumer payment behavior. Nevertheless, our findings show that respondents choose payment methods that are broadly consistent with their ratings of the relative characteristics of those methods. More research should help us determine whether assessments

[47] One caveat is that self-reporting, especially in the context of a survey that also asks about relative characteristics, may induce a bias toward false consistency.

of relative characteristics accurately reflect the actual payment system and economic choices faced by consumers.

6 Application to Federal Reserve Operations

A considerable portion of Federal Reserve Bank operations is devoted to running a business: the provision of payments services.[48] Like any business in the marketplace, the Fed needs to understand its customers. So, naturally, the Federal Reserve payments staff are well acquainted with the needs of their direct customers, banks. Consumers, however, are not direct customers of the Fed, but rather customers of banks.

In our focus group interviews with Boston Fed payments staff, we discovered a lack of detailed familiarity with the needs and values of end-users of payments, particularly consumers. The prevailing view was characterized by an overriding concern about the cost-efficiency and frontier technology of the supply of payment methods. In contrast, consumers' tastes and preferences were judged to be much less important factors in decisions about the supply of payment methods. In fact, the staff assumed, at least implicitly, that consumers would adopt the payment methods supplied to them precisely because those methods were the most cost-efficient and high tech. For example, although Boston was among the System leaders in developing and implementing check image technology (originally for Treasury checks), the staff were not well informed about consumer attitudes toward imaging before implementing the technology. Although the Fed's customers (banks) may have a somewhat greater understanding of consumer payment behavior than the Boston Fed payments staff, we learned that the Boston Fed staff are not privy to much of this proprietary bank information.

The sudden, swift, and large decline in total U.S. check-writing, which has not yet been fully explained, is helping to elevate the importance of understanding consumer payment

[48] In fact, for certain designated priced services to depository institutions, Section 11A of the Monetary Control Act of 1980 (MCA) requires the Federal Reserve to set fees to recover, over the long run, all direct and indirect costs and imputed costs, including financing costs, taxes, and certain other expenses, as well as return on equity (profit) that would have been earned if a private business firm provided the services. In setting the fees, the MCA requires that due regard be given to competitive factors and the provision of an adequate level of such services nationwide. For an example of this principle applied to a cost of equity capital analysis of Reserve Bank rates of return, see Barnes and Lopez (2005).

behavior within the Federal Reserve. Now, the Fed, as well as other stakeholders (the banking industry, payments providers, and the like), sees clearly that it has an increased need to understand payment trends and to assess implications of changes in consumer payment behavior. What impact will further declines in check volume have on operating costs, staffing, and revenue—not only in check services, but in other complementary and competing payment services? The Fed, along with commercial banks, must consider how rapidly to downsize or consolidate in order to contain costs, and in which products and services to continue to invest or divest.

Having better information to improve one's ability to understand and predict the future of products and the marketplace is critical to making good decisions in any business. For the Fed and the rest of the payments industry, this information includes recognizing and understanding the role that consumers play in the demand for payment services. To contribute to the accumulation of this information, we included questions in the payment survey that bear directly on four issues related to changes in the check-processing environment that are of specific interest to the Federal Reserve and commercial banks: 1) reduction in check float; 2) increase in electronic imaging of checks; 3) conversion of checks to ACH payments; and 4) provision of alternative payment services, especially stored-value cards.

6.1 Sensitivity to Changes in Check Processing

We begin with an assessment of the overall responsiveness to changes in the check-processing environment. The questions aim to determine whether these particular changes are likely to affect respondents' check-writing behavior and, if so, how and why. Table 7 presents the central results from questions about four changes (some posed as hypothetical questions, some asking about actual behavior) to summarize respondents' stated reactions to these changes.

In general, a substantial majority of Fed respondents would not or did not alter their check-writing behavior in response to hypothetical or actual changes in the check-processing environment. Table 7 shows that 69 percent of respondents stated that they would not alter their behavior if check float were eliminated; 86 percent would not alter their behavior if they were no longer able to receive cancelled checks; and 73 percent and 90 percent, respectively,

have already accepted POS check conversion and ARC conversion without changing their behavior. Among those who would or did change their check-writing behavior, the primary reasons and the primary responses given were different in each instance. These results further underscore the difficulties facing payments providers and policymakers who are trying to understand changes in consumer payment behavior.

Two caveats are in order. First, the proportion of respondents who would or did change their check-writing behavior is not trivial in any of the cases. More than one in four respondents either said that they would alter behavior (27 percent, if confronted with POS check conversion) or did alter behavior (31 percent, in response to the elimination of check float). Because this represents a sizable fraction of respondents, it is important to understand the motivation for the change. For policymakers, it may be important to know whether the changes improve the welfare of society as a whole; this, in turn, requires an understanding of the tastes and preferences of all consumers. Second, the response to changes in the check-processing environment—particularly to changes in unfamiliar high technology—is probably influenced by the fact that respondents are Fed employees. Because of their greater familiarity with payments technology, Fed employees may be more accepting of changes than the general public would be.

6.2 Check Float

Float is the interval between the physical writing of the check (payment) and the time when the funds are deducted from the consumer's checking account (settlement) by the bank. The payee, U.S. mail, payee's bank, and even the payer's bank may all contribute to the delay between payment and settlement. Consumers take advantage of float for a variety of reasons. The simplest one is that they benefit from interest paid, either directly on the checking account funds or indirectly on other interest-bearing assets, until those assets are transferred to the checking account. Float also can function as an interest-free loan for a consumer who has insufficient funds in a checking account at the time of payment. The consumer values this loan at his or her rate of time preference, which can vary across consumers and is very large for impatient consumers, but the prevailing market interest rate also influences the consumer's decision whether to exploit the float.

We asked Fed respondents whether they would change their check-writing behavior if their float were reduced to less than one day (question 4). This question was hypothetical and general, without reference to a particular manner in which the float would be eliminated, and it was worded to indicate that the money would be withdrawn from the checking account the same day the check was written. Thus, float might be reduced by varying amounts for different types of check payments, but there was no implication that float would be eliminated entirely.

More than two-thirds (69 percent) of respondents said that they would not change their check-writing behavior if their float were reduced, as shown in Table 7. The simplest potential implication is that float, which is relatively short in modern times, may not be an economically significant consideration for most respondents. Because of their relatively high incomes and wealth, it may be unlikely that many Fed employees were using float as an interest-free loan to finance consumption. Thus, they might not need to switch to another payment method to provide them that loan. Moreover, with interest rates relatively low—especially on bank checking accounts—and with checking account balances a relatively small portion of consumer wealth, the interest earned from float is very modest (recall that only about half of Fed respondents with checking accounts earn interest on their balances).[49]

For the nearly one-third (31 percent) of respondents who have a checking account and who would alter their behavior, the reason to change might partly be the loss of interest. Fed employees who are more sophisticated than others in managing their assets and rates of return, and thus more sensitive to changes in float, may be among those whose behavior would change. Furthermore, these financial sophisticates may be more aware of the implications of changes in float for the relative costs and benefits of all payment types, and therefore more likely to act on them.

[49] However, the incomes and wealth of most individuals (including Fed employees) are not generally on a scale (like those of some corporations) associated with the writing of checks of such high amounts that even a day or two's worth of interest can amount to a substantial sum. Consider the following example. Suppose a consumer had an average daily checking account balance of $10,000 and earned 5 percent annual interest—both amounts are probably unusually high for the average U.S. consumer. Then a change in float that reduced the average daily balance to $8,000 by clearing checks much faster would cost the consumer only about $100 per year in interest.

Some electronic payment methods reduce float, as explained in detail below, but we do not know how clearly the respondents observed the changes in float. Conversion of paper checks to ACH payments accelerates settlement and reduces float. Some aspects of electronic imaging of paper checks, most of which are not well observed by consumers, also accelerate settlement and reduce float (imaging connected with canceled checks and bank statements, as described below, is one case where it does not). If changes in float were the only implication of these payment methods, then 31 percent would be an upper bound on the share of respondents who might change their check-writing behavior in response to these changes. However, these payment methods involve other potentially beneficial features, so reduced float (a disadvantage for consumers) may have some impact that we cannot identify separately in these other payment methods.

6.3 Electronic Processing

By 2004, most U.S. consumers with a checking account had encountered, or at least heard about, new electronic technologies introduced to the processing of checks. Two types of change are most apparent. First, banks are beginning to create electronic check images from paper checks, a development that consumers may notice most in the way banks do or do not return checks. However, check imaging can also affect the clearing of checks between banks, including the Fed; this effect occurs behind the scenes and may be difficult for consumers to observe. Check imaging is being used by banks to expedite the clearing process (thereby reducing float) and to reduce the costs of handling paper checks. Public acceptance of check-image exchange has been greatly facilitated by passage of The Check Clearing Act for the 21st Century (or Check 21).[50] Second, many companies that are paid by check are converting the checks upon receipt to an ACH debit (ARC), thereby accelerating clearing, reducing float, and eliminating return of the check to the consumer.

6.3.1 Check Imaging

Because the Fed has been a leader in promoting check image products since the mid-1990s, it has a keen business interest in understanding the impact of check imaging on

[50] One of the main accomplishments of Check 21 is to give a substitute check (a paper reproduction of an original check from an electronic image) the same legal status as the original paper check, provided it meets the specified legal requirements. For more details on Check 21, see Board of Governors (2006b).

consumer check-writing behavior. Based on our focus group interviews, we realized the importance to the Fed of understanding consumers' attitudes toward check images. With this in mind, we asked respondents about their willingness to receive images of canceled checks from their banks (questions 5–8) in place of the paper checks themselves (the image is an electronic picture of the canceled paper check, usually front side only).[51]

Almost everyone knows someone who insists on receiving canceled paper checks from their bank, cataloguing them meticulously, often in old shoe boxes. Apparently, however, canceled checks are not very important to most Fed respondents. Table 7 reveals that only 14 percent of Fed respondents with checking accounts would change their check-writing behavior if their financial institution stopped returning canceled checks. Nevertheless, those who would change would make rather drastic changes. About half of those changing behavior (7 percent overall) would react by changing their financial institution, presumably to one that did return canceled checks, and about half would reduce or eliminate check-writing altogether.

Most likely, the 86 percent of respondents who would not change their check-writing behavior do not place high value on receiving their canceled checks. Figure 11 indicates that 75 percent of respondents do not receive canceled checks, and only 11 percent of those who do, said it was very important to receive canceled checks. The mix of responses may be a reaction to existing bank practices rather than a strong preference: Check image may not be offered at one bank; at another bank check image may be the only option. Although 21 percent of respondents indicated that it was *somewhat important* to receive their canceled checks, only two-thirds of them (14 percent overall) would change their behavior.

The vast majority of Fed respondents with a checking account (91 percent) were willing to accept a check image (either electronically or on a paper copy) instead of a canceled check, as shown in Figure 11. The reasons given by the 9 percent who were unwilling to receive check images were highly varied; no single reason accounted for even one-tenth of the negative responses (question 8A). The second most common reason given was that respondents want copies of the front and back of the check (with the bank cancellation stamp) rather than just the

[51] Although we did not ask about the specific impact of imaging on float, an effect that occurs when check images are used by banks in the process of clearing checks, it would be interesting to know the extent to which consumers observe and respond to this effect.

front.[52] Other reasons given were the notion that the images generated too much extra paper, concern about theft or errors, or simply wanting the original checks back.

If demand for the return of canceled checks appears not to be widespread, then why are check-image acceptance rates so low in the banking industry? Perhaps banks have not been trying hard enough to market the feature or to get at the root causes of resistance. The results suggest that banks may have an opportunity to increase the use of check image and to cross-sell other electronic services, such as online banking and bill payment. The Fed and other financial institutions need good data to develop forecasts of check use in coming years in order to decide which of these payment businesses and products to invest in further. If Fed employees are representative of U.S. consumers with regard to attitudes toward and acceptance of check image services, our results may suggest that the supply of check image services to consumers will grow relatively rapidly in the near future. However, the intensity of resistance to check imaging among a small proportion of respondents and the multiplicity of reasons given for the resistance suggest that it may be difficult to completely eliminate check-writing any time soon. More understanding of the economic and psychological underpinnings of these attitudes is needed.

6.3.2 Converting Checks to ACH

Because the Fed has also been a leader in providing electronic payments settlement through its Automated Clearing House (ACH) network, it has a keen business interest in understanding the impact on consumer demand for checks of conversion of paper checks to ACH.[53] Direct ACH use by respondents (pre-authorized debits), although growing rapidly, still lags far behind check-writing (8 percent versus 30 percent of respondents' monthly transactions, Figure 4). However, our survey results suggest that the triggering of indirect consumer ACH payments by business applications is an important determinant of the increase in ACH volume

[52] The most common reason given for unwillingness to accept a check image was that respondents do not need the image. This response probably is not a sign of unwillingness to accept a check image *as a substitute for a paper check* but rather a reflection of lack of need for a paper record of either type. Indeed, of the 399 respondents who were "unwilling" to receive a check image, 254 (64 percent) reported not receiving canceled checks from their financial institution (Question 5) anyway.

[53] In 2003, ACH transactions totaled 10 billion and were expected to double in the subsequent five years as ACH expands to more consumer applications. For more details, see NACHA (2004).

and that this conversion contributes indirectly to the decline in check-processing volume over and above the decline in check-writing *per se*. Therefore, we asked respondents questions about their experience with, and attitudes toward, indirect ACH payments (questions 32–42).

Consumer-initiated indirect ACH payments occur in at least two instances—at the point-of-sale (POS) and at the lockbox (ARC).[54] Increasingly, consumers are beginning to encounter situations where payees are engaging in these kinds of check conversion, so consumers are faced with a decision whether to participate in the conversion. Because conversion changes the way consumers' checks are processed, it alters the fundamental characteristics of check payments facing consumers. Consumers' reactions to conversion provide data that may shed light on their payment preferences and help the Fed improve its efficiency in providing payments. Check conversion accelerates the clearing process and reduces float because the demand deposit account is debited the same day or the next. Thus, respondents who would alter their check-writing behavior in response to lost float might react in a similar manner to conversion, although other characteristics of these payment methods may matter to respondents as well.

Table 7 indicates that most Fed respondents who were confronted with check conversion did not change their payment behavior: Only 10 percent did so for Lockbox/ARC and 27 percent for POS. Both percentages are lower than the 31 percent of respondents who would alter their payment behavior if they lost their float. So, either the respondents were unaware that check conversion reduces float or other factors restrained their actions (or both). Because the loss of float is greater for POS conversion than for ARC (float still occurs with ARC during the U.S. mail delivery period), one might expect a greater response to POS conversion.[55]

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[54] In POS conversion, the consumer writes a check, the cashier scans it to create an ACH debit, and the cashier returns the "processed" check to the consumer. In lockbox conversion, the consumer mails a paper check for a recurring bill to a third-party processor, which converts it to an electronic ACH debit; this is called Accounts Receivable Conversion (ARC). On the consumer's bank statement, a transaction message "ARC e-check (check #)" appears in place of the check detail. The paper check is destroyed, never entering the check processing system or being returned to the consumer. POS and ARC transactions are no longer governed by check law, but are considered to be ACH transactions that are governed by ACH rules and regulations (Regulation E, NACHA; see NACHA 2005).

[55] In fact, the data from NACHA on payment volume attributable to POS conversion (falling) and ARC (rising) seem to bear out this hypothesis. See NACHA (2006) for more details.

However, familiarity with check conversion probably influenced the results, too. At the time of the survey (June 2004), respondents' experience with conversion was relatively limited, as can be seen in Table 8. Only 52 percent of respondents had experienced POS conversion, and a mere 16 percent had experienced the newer ARC, which can easily be overlooked in a standard Bank statement if consumers do not conduct a thorough reconciliation of their checking accounts.[56] Thus, relatively less familiarity with ARC may be one reason why relatively fewer respondents said they would change their payment behavior to avoid experiencing ARC. Among consumers who had experienced check conversion, most knew that their paper check had been converted (91 percent for POS, and 67 percent for ARC, Table 8).

At the time of the survey, a rule change in ARC procedures occurred that increased consumers' knowledge about ARC transactions and we wished to learn what effect, if any, this new information would have on consumers' payment behavior. As of June 11, 2004, pursuant to NACHA rules, companies were "strongly encouraged" to notify U.S. consumers of their right to "opt out" of conversion of their checks to ARC and to provide information about how to do so.[57] We asked survey participants whether they would exercise this right under the circumstances, and about half said no, as shown in Table 8. Another 38 percent indicated that they were uncertain, perhaps because they did not understand the service, and 13 percent said they would opt out of ARC. The most common reasons respondents cited for opting out were check return, float benefits, and concerns about errors. However, it should be noted that opting out requires an active and time-consuming response from consumers, who must notify the originator of the ARC, and this may have inhibited some consumers from opting out.

[56] However, 14 percent were unsure whether they had experienced ARC, so the actual percentage having experienced it may be a bit higher. About one-third of respondents indicated that the question was not applicable, from which we assume that they do not pay their recurring bills via check. These respondents probably pay their recurring bills electronically via automatic ACH debits to their bank accounts or credit cards, or use online bill payment.

[57] Prior to June 11, 2004, the official staff commentary to Federal Reserve Regulation E stated: "A consumer authorizes a one-time EFT (in providing a check to a merchant or other payee for the MICR encoding), where the consumer receives notice that the transaction will be processed as an EFT and completes the transaction." In other words, Regulation E required consumers to be notified in advance that their check would be converted, thus giving consumers the choice to not participate in ARC by choosing not to mail their check to the company. To enhance customer service for consumers who may be opposed to check conversion, NACHA implemented the rule change for ARC that suggested notification of the opt-out possibility to help clarify further consumers' rights and options.

When respondents were confronted with paper check conversion and did change their payment behavior, the payment venue clearly was an important determinant of the payment method substituted. According to Table 7, POS conversion (which concerns retail payments) primarily prompted substitution to debit cards, whereas ARC (which concerns recurring payments) primarily prompted the substitution of online bill payment. This result further underscores the heterogeneity of consumer payment behavior by venue.

Two additional manifestations of heterogeneity are evident from the results on payment methods to which Fed respondents switched because of check conversion, as shown in Figure 12. First, they switched to many payment alternatives within each type of conversion. When faced with POS conversion, most responses indicated a switch to debit card (43 percent of responses from respondents who switched), while a substantial share of responses indicated a switch to credit card (29 percent of responses) or cash (23 percent of responses). Responses from the small number of respondents who switched in reaction to ARC mostly indicated a switch to online bill payment (38 percent of responses), but credit cards and other methods (23 percent of responses each) were also popular choices, as was ACH (17 percent of responses).

In a second form of heterogeneity, responses indicated a switch to various payment alternatives across conversion types. A similar share of responses indicated a switch to credit cards (29 percent of responses for POS, versus 23 percent for ARC), but the share of responses indicating switching to other methods was quite different for each conversion type.

The most extreme aversion to check conversion—that is, reduction or discontinuation of patronage—is rare. Table 8 shows that only 10 percent of the subset of respondents who knew that their checks were converted using POS altered their retail shopping behavior. Only 6 percent who knew that their checks were converted with ARC altered the companies to whom they made recurring bill payments. Most who changed retailers reported that they did so because they "didn't like" the check conversion. This kind of deep preference is something many economists would argue is fundamental to consumer character and cannot be changed. Some respondents who changed the companies they paid by check did so because the companies had not asked their permission to convert the check. This reason suggests that fairness or business ethics can be a determinant of consumer payment behavior.

Open-ended questions in the survey (questions 34, 36, 39, and 41) shed some light on the reasons respondents reacted the way they did. The vast majority of respondents who were prompted by check conversion to switch to debit cards (the most popular choice in this circumstance among those who switched) did so because they believed that debit cards do the same thing as checks. Many who switched to any of these methods did so simply because they do not like the check conversion process for some reason. Some switched because they wanted the paper check or check image back, and some simply wanted to control the timing of the payment.

The heterogeneity of responses to check conversion highlights the complexity of consumer payment behavior. Two basic conclusions stand out. First, at least some consumers who do not like changes in their payments environment will respond by changing their shopping or payments behavior, a fact that payments providers need to consider. Second, consumers' reactions to changes in the payments environment depend on many factors.

6.4 Stored-Value Cards

Amid the ongoing transformation of the payment system, many new payment methods are emerging, challenging traditional Fed payment services and raising questions about the Fed's role. According to its 1990 policy statement, "…the role of the Federal Reserve in providing payment services is to promote the integrity and efficiency of the payments mechanism and to ensure the provision of payment services to all depository institutions on an equitable basis, and to do so in an atmosphere of competitive fairness."[58] In addition to this general statement, the Fed's 1981 guidelines for providing financial services specifically allow Reserve Banks "…to modify existing services or to offer new services, as appropriate, to meet the specialized and changing needs of financial institutions and the public." However, more recent statements from Fed officials express a clear preference for private-sector solutions. For example, from Stern (2003): "…the Federal Reserve and other government entities must clearly demonstrate that a new product or service will improve social welfare before offering it," and "…without market failure, there is no reason to believe that government intervention in payments markets ... will lead to a superior allocation of resources."

[58] See Board of Governors (1990).

In evaluating a potential role for the Fed in emerging payments, perhaps the most obvious instrument to consider is the stored-value card (SVC). Because an SVC is essentially a form of electronic cash, it competes directly with traditional cash (paper currency, or Federal Reserve Notes, and coinage). If the Federal Reserve or the U.S. Treasury ever considers issuing cash in an electronic format, that format is likely to be some type of technological and financial descendent of the SVC. In fact, the Boston Fed has been working with the Treasury for many years to develop SVC applications for U.S. military personnel.[59] Likewise, the Financial Management Service of the U.S. Treasury, which disburses nearly 1 billion Federal payments to 100 million recipients each year, also has a great need to understand alternative payment instruments like SVCs.

In focus group interviews, we discovered an interest among Fed payment experts working with cash and smart cards to understand better consumers' attitudes toward SVCs. For this reason, we included SVCs as one of the main payment methods in the survey, even though their use is limited to a relatively narrow set of applications. We have already discussed results pertaining to SVCs in general. Although nearly half the respondents reported increased use of SVCs during the previous three years (43 percent, Figure 7), SVCs are still not very popular compared with other payment methods (only 3 percent of monthly transactions, Figure 4). More specifically, they are not used much in retail payments (less than 1 percent of transactions, Figure 5), and they are not viewed as good substitutes for paper checks for retail payments (also less than 1 percent, Figure 9), despite being rated as better than, or the same as, checks on all characteristics but one for all venues (Table 6).

We also asked about specific SVC use (question 26), including cards issued for internal use at Federal Reserve locations (presumably for the cafeteria, coffee and gift shops, and the like, although the survey did not ask about the specific kind of SVC used). Figure 13 shows the shares of SVC-user respondents who use each kind of stored-value card. Eighty percent of the SVC-user respondents indicate use of a gift card, and almost half indicate use of a phone card, but very few other kinds of stored-value cards are used. In particular, only 7 percent of Fed

[59] Because these cards include a computer chip that may incorporate the latest high-technology and security features, they are sometimes called "smart" cards.

employees use internal Federal Reserve SVCs. However, this result is likely influenced by the absence of SVCs at some Fed locations. As Figure 13 shows, responses suggest that use of internal SVCs at the Boston Fed is much higher than the rate of use across the System as a whole, at 50 percent, and the responses indicating such use in Boston actually increased from 2003 to 2004.[60] Although these cursory results on SVC use are interesting, much more data and research are needed to gain a better understanding of the low rate of use of SVCs among respondents

7. Potential Public Policy Implications

We have argued that it is important to understand consumers' preferences and the payment behavior they induce, to be able to form a coherent interpretation and forecast of the payments transformation. We believe that the Boston Fed consumer payment survey begins to suggest some important factors in the determination of consumers' preferences and behavior. However, to understand the economic importance of consumer behavior and payment choice more fully, it is necessary to examine the welfare of society as a whole. As described in a speech by Minneapolis Fed President Gary Stern (2003), the payments transformation must be evaluated in the context of social welfare, and public policies that are consistent with maximizing that welfare must be developed. [61]

[60] In the Boston Fed pilot survey, we also found that about one in three respondents who used a stored-value card used only a Fed stored-value card. These employees, who presumably were attracted to the stored-value card at the Fed because of synergies with the workplace, also tended to be respondents who wrote far fewer checks than did consumers who did not hold a stored-value card at the Fed.

[61] To quote Stern, "A policymaker's overriding concern is improving the welfare of society as a whole. And I am specifically thinking of social welfare in the sense that economists use the term; that is, allocating resources to maximize the benefits that society receives from them. This perspective is not one that leaders of a private-sector banking organization or other participants in payments usually take, nor should it be. But for the Federal Reserve, an institution created to further the public interest, net societal benefits are critical. A focus on social welfare and resource allocation may sound of only theoretical value, but it has some pertinent implications for how I view both developments in the payment system and the manner in which the Federal Reserve ought to respond to those developments. For example, because of the focus on resource allocation, I, unlike the head of a private firm, view social welfare from the vantage point of households. This means that I support developments that in the aggregate improve the welfare of households, even if in some sense they make some Federal Reserve financial services, and related private firm services, worse off."

Thus far, consumers' welfare with regard to payments has been a relatively neglected aspect of the evaluation of social welfare. Although the Boston Fed consumer payment survey is a step in the direction needed to evaluate social welfare, it is a modest and imperfect step. Clearly, a great deal of additional data and research on consumer behavior and payment choice are needed before public policymakers can design and implement the policies necessary to optimize this aspect of social welfare.

To help motivate this research agenda, we draw attention briefly to some current real-world payment issues that are particularly relevant to at least some consumers, and therefore potentially important in the evaluation of social welfare and public policy. However, given the incomplete state of knowledge about consumer preferences and payment behavior, we cannot draw any firm conclusions about these issues yet. Instead, we simply provide a list of prominent issues, along with some key questions:

- *The unbanked and offline* – According to Jacob *et al.* (2005), up to 20 million U.S. households in 2000 were unbanked (without a checking or saving account); according to the U.S Census Bureau (2005), about 45 percent of U.S. households in 2003 were offline (without access to the Internet at home).[62] Clearly, the use of electronic payment methods by these unbanked and offline consumers is limited. Why are some consumers unbanked or offline? What policies are in the best interest of consumers who: a) want to become banked or online but cannot; or b) do not want to become banked or online but may have no reasonable alternative?
- *Interchange fees* – Credit card associations charge merchants a fee as large as about 2 percent of the transaction value when consumers pay by credit card or debit card. Many merchants are involved in a major legal battle over these fees with Visa, Mastercard, and some major commercial banks, currently pending in U.S. District

[62] For more on the challenges regarding the unbanked, see the proceedings of a conference sponsored by the Federal Reserve Bank of Philadelphia (Federal Reserve Bank of Philadelphia 2005). Regarding the offline, researchers from Kennickell and Kwast (1997) to Kim, Widdows, and Yilmazer (2005) so far have been able to discover the characteristics of consumers who use the Internet for payments, but not the reasons why consumers are (or are not) using it.

Court in New York.[63] Thus far, attention to this issue has generally focused on the viewpoint of retailers rather than the viewpoint and welfare of consumers.[64] Are interchange fees a consequence of uncompetitive market power? Are interchange fees passed on to consumers in higher retail prices? If so, are consumers aware of this price increase, and do they make informed payment decisions based on it?

- *Identity theft* – Identity theft has gained prominence in the media, and is alleged to be growing fast and threatening to undermine the benefits of high technology and electronic payment methods.[65] Easier access to credit, proliferation of personal information via the Internet, and advances in computer technology and hacking are making consumers more susceptible to the work of identity thieves—in part because publicly available court documents contain personal financial information. This problem is particularly extreme in Phoenix, Arizona, which reportedly has the highest rate of identity theft in the nation.[66] Is the threat of identity theft a significant deterrent to the adoption of electronic payment methods? Are consumers aware of the threat and the large costs of credit repair? Are consumers sufficiently protected from identity theft?
- *Stored-value card costs* – Disclosure of credit card fees and lending terms have long been a concern for consumers. Now, similar issues are arising with stored-value cards, which can have very high fees that often are hard to discover. In some cases,

[63] The "Payment Card Interchange Fee and Merchant Discount Antitrust Litigation" case is a multi-district litigation (MDL) in the Eastern District of New York that combines 49 related lawsuits.

[64] For example, see the proceedings of a Federal Reserve Bank of Kansas City conference on interchange fees in 2005 (Federal Reserve Bank of Kansas City 2005).

[65] The Boston Fed's brochure *Identity Theft* (http://www.bos.frb.org/consumer/identity/idtheft.htm) says the FBI calls it one of the fastest growing crimes in America. However, comprehensive and statistically reliable data on the growth of identity theft are relatively scarce.

[66] For more details, see Leland and Zeller (2006).

this problem is hitting the lower-income segment of society hardest.[67] Are consumers adequately informed about the costs associated with stored-value cards? Do issuers of these cards earn uncompetitive profits? How effective are these stored-value cards for consumers without bank accounts, particularly for government transfer payments?

Together, these real-world payments issues highlight the importance of gaining a better understanding of consumer preferences and social welfare.

8. Conclusions and Future Directions

When we first considered the consumer payment survey, our expectations of discovering convincing and enlightening information about why consumers make their payment choices were low. The survey was primarily a leadership development project, our resources were limited, the prospective sample was not representative, and we had very little guidance from existing data and research on consumer payment behavior. Nevertheless, the results from the initial survey of Boston Fed employees in 2003 were sufficiently intriguing to warrant a survey of all Federal Reserve System employees in 2004, and those results, described in this paper, seem intriguing enough to pursue additional research and data collection.

Although the survey has its limitations, we have identified the following specific elements of success:

- *High response rates* – The response rate of 24 percent for the System (and 40 percent in Boston) far exceeded our expectations for a voluntary survey run by a team of

[67] "Caught in the consumer backlash against the fees and expiration dates attached to gift cards, mall operator Simon Property Group is fighting back. The Indianapolis company filed suit in federal court against the Massachusetts attorney general's office, claiming that Simon Visa gift card is not subject to state law and is therefore exempt from any civil enforcement action taken by the state office. The suit was filed in response to a letter from the attorney general, notifying Simon of its intent to bring a civil enforcement action. Because the gift card is issued by Bank of America and banks are federally regulated, Simon argues that its card is not subject to state law." (Aoki 2004). Specifically, Massachusetts deems this gift card illegal because of its one-year expiration date, its $1.50 initial-handling fee, and its $2.50 monthly dormancy fee that goes into effect after six months. Simon, which operates 14 malls in Massachusetts, including South Shore Plaza and Copley Plaza, has stated that it sold $10 million worth of the cards in December 2004 alone (Aoki 2004).

Boston Fed employees without high-level authority, and far exceeded the response rates of many private surveys.

- *Enthusiastic participation* – We received widespread anecdotal reports that survey participants actually enjoyed completing the survey and thinking about the issues it raised.
- *Changed behavior* – We also received widespread anecdotal reports that survey participants' payment behavior changed as a consequence of taking the survey. Apparently, the survey forced participants to think about why they were making the payment choices they made, and the introspection led to change. This result bodes well for consumer education.
- *Importance of reported payment characteristics* – Although we do not explore and show this result in full detail in this paper, observed payment characteristics (as reported by respondents) are remarkably important in explaining respondents' payment choice—far more important than key demographic variables, including income (see Schuh and Stavins 2005).
- *Importance of heterogeneity* – The results reveal widespread heterogeneity in consumer payment behavior, increasing the difficulty in understanding the best design of the payments system. This finding suggests that we need to develop a much deeper understanding of why individual consumers choose their payment methods than is developed by looking at simple, easily observable consumer characteristics like demographics.

Of course, the survey project had a number of serious limitations, which we have noted already. Given the motivation to develop a deeper understanding of consumer payment behavior, we conclude with a list of some important issues for future data collection and research:

- *Survey design flaws* – The Boston Fed survey contains some design flaws, which are listed in detail in Table 9. These flaws should be corrected before the survey is used in another application.

- *Use a representative sample* – Future surveys and data collection should be undertaken using nationally representative samples. As we noted in the beginning, we are collaborating with the AARP in 2006 to conduct a representative version of the Boston Fed consumer payment survey. More generally, effort should be given to developing the most accurate estimates possible of aggregate U.S. payments volume.[68]
- *Don't forget cash*! – By focusing on paper checks and electronic methods, the Boston Fed survey overlooked the importance of studying the use of cash. The surprising resilience of demand for cash, even in today's technologically advanced marketplace, suggests the need for a more extensive study of cash payments.[69]
- *Avoid conditional survey questions (unless they are obviously appropriate)* – We inadvertently designed the Boston Fed survey in such a way that many questions that we intended (and needed) to ask of all respondents were asked only of those who responded a certain way on (a) prior question(s).
- *Avoid overtaxing respondents with multiple, similar questions* – Likewise, the extent to which respondents can continue to answer similar questions without losing patience or focus was probably taxed.
- *Avoid overlapping or ambiguous choices* – Be precise in defining choices intended to be mutually exclusive. For example, the following were among the response choices offered for Question 22 ("If you use Internet bill payment for bills you previously paid by check, what made you switch?"): "Faster to pay bills online," "More convenient than a check," and "Easier/better record keeping." Both "Faster to pay bills online" and "Easier/better record keeping" can be interpreted as aspects of

[68] In a panel discussion of the need for payments data at the Boston Fed's 2006 Consumer Behavior and Payment Choice conference, Jeff Marquardt of the Federal Reserve Board cited this objective as one of the most important priorities in the development of payments data.

[69] The Federal Reserve Banks' Cash Product Office (CPO) intends to conduct a large-scale survey of U.S. businesses to understand trends in payments and business cash management practices. A smaller-scale pilot study is scheduled to be completed by April, 2007, and published later in the year. For more information, see http://www.frbservices.org/Cash/paymentssurvey.html .

"More convenient than a check." In this example, it might have been better to omit "More convenient than a check" or to define more precisely what was meant.

- *Question order* – Investigate the importance of asking general attitude questions toward electronic payments after having asked specific questions about use, and vice versa, as question order may affect the responses to the attitude questions. Use appropriate survey design techniques to control for the potential effect on responses of the order in which questions are asked.
- *Take into account the fact that payment choice is a joint decision* – The consumer perspective on payment choice has been somewhat neglected, so it is important to study consumer behavior. However, the payment choice is made jointly between the two parties involved in the payment. The survey results show that payment choice varies across transactions and parties (and even payment value). Therefore, surveys of consumer payment behavior are likely to be more effective if they include information about both parties (business and consumer) involved in the payment.
- *Aim to understand payment characteristics and how they are understood by consumers* – Given the remarkable importance of relative payment characteristics in determining payment choice, it is clearly important to develop a deeper and more precise understanding of these characteristics. As discussed in Section 5, it would be helpful to know things like how these characteristics are determined and measured; how well consumers observe, perceive, and understand them; and what roles might consumer education or public policy play in improving the supply of and demand for different types of payment services to consumers. For example, what aspects of a given attribute—such as cost or convenience—are most important in the eyes of consumers, and why? More definition and exploration of this key idea and information are vital.

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Appendix A: Alternative Consumer Payments Data

One of the main reasons for the dearth of adequate research on consumer payment behavior has been a lack of sufficient data on the actual payment practices of U.S. consumers.[70] Of course, some data on consumer payments behavior do exist. In this appendix, we describe the main alternative sources of consumer payment data.

Probably the most prominent data source is the triennial Survey of Consumer Finance (SCF) conducted by the Federal Reserve, which contains data on a limited number of consumer payments variables from a nationally representative survey of about 4,500 U.S. households.[71] However, with payment practices changing at breakneck speed, a three-year lag in data on payments behavior is a serious disadvantage. Recognizing this, researchers at the Ohio State University are proposing to expand to the national level, a monthly SCF-like survey of Ohio consumers, perhaps including more payments-related questions.[72] From time to time, policy-makers also commission the collection of data. The U.S. Senate Committee on Banking, Housing, and Urban Affairs recently became concerned about debit card fees and directed the Board of Governors of the Federal Reserve System to study debit card use. The Board did so by collecting data from two new, nationally representative surveys (including the University of Michigan's Survey of Consumers), but this data collection was a one-time effort.[73]

Private firms in the payments industry also collect and analyze data on consumer payment behavior. Studies, such as the joint collaboration between the ABA and Dove Consulting (2005), have been conducted by private consulting firms for private clients. In some cases, results from these studies can be obtained from the consultants, though usually for a price. However, since most private firms collect data on consumer payment behavior for their own purposes, the data are generally proprietary and unavailable to the public or public policymakers. One example of a particularly rich and potentially useful data source is the 14-

[70] A similar problem exists in Europe, and efforts are underway to develop consumer payments data there too. For examples from Belgium and the Netherlands, see Loix, Pepermans, and Van Hove (2005) and Jonker (2006).

[71] For more information about the SCF, see http://www.federalreserve.gov/pubs/oss/oss2/scfindex.html.

[72] See Dunn, Ekici, Lavrakas, and Stec (2004) and Kim, Dunn, and Mumy (2005) for details of the Ohio data. Thus far, proposals to expand the data have been informal and undocumented.

[73] See Board of Governors (2004) for details.

year panel of consumer payment behavior created by Visa (2006). Because the data and survey methodologies of these private sector studies are kept confidential, it is very difficult to evaluate their reliability.

Appendix B: Acknowledgments

Many people played a vital role in developing and implementing the 2003–2004 Boston Fed consumer payment surveys. **Table B.1** provides our best effort at a comprehensive list of everyone who contributed to the survey or this paper in any way. Because we did not keep detailed records of all meetings, we may have missed some individuals; to those we apologize.

In addition to this general recognition, we want to identify and acknowledge several individuals who made extraordinary contributions to the survey project. Without them, it would not have been possible to complete the study.

- *Administration* – Boston Fed employees Marci Vencil-Wiegand (Boston Fed 2003 survey) and David Brown (Federal Reserve System 2004 survey) provided a tremendous amount of administrative assistance that was essential to conducting the surveys. Furthermore, after the surveys were completed, they devoted many hours to compiling and presenting the detailed results in tabular and graphical format.
- *Information technology services* – Peter Tai (Boston Fed technical services division) designed and programmed the web version of the survey and managed it throughout the survey periods. Peter contributed his survey assistance above and beyond his regular job responsibilities and contributed many hours of his own free time. In addition, Peter was responsible for managing the Fed System survey during a time when the Boston Fed was changing its network platform—no easy task.
- *System leadership* – Convincing all Federal Reserve locations to permit and encourage their employees to participate in a voluntary, lengthy survey required a considerable amount of time and diplomacy. Cathy Minehan, Paul Connolly, Sally Green, Lynn Browne, and Tom Lavelle were instrumental in obtaining 100 percent cooperation and participation from the entire Federal Reserve System (Board of Governors and the 12 Regional Banks).
- *Onsite representatives* – Each Federal Reserve location provided at least one person to serve as our onsite representative responsible for facilitating the implementation of the survey at their respective Fed locations. Without these onsite representatives, we could not possibly have accomplished the survey. Among these outstanding

assistants, we particularly want to acknowledge Abby Mayer of Kansas City, whose extraordinary enthusiasm and assistance spilled over to the rest of the System.

Table B.1
Federal Reserve Employees Helping with 2003–2004 Consumer Payment Survey

Fed District	Employees
Atlanta	Charles Davidson
Board	Tim Markey
Boston	David Brown, Lynn Browne, Grace Cerrone, Cynthia Conley, Paul Connolly, Jim Cunha, David DeRemer, Jeff Fuhrer, Dexter Holt, Sally Green, Linda Kopec, Tom Lavelle, Paul Malloy, Leah Maurer, Cathy Minehan, Trish Rivard, Research Department research assistants, Amy Ross, Harriet Santiago, Delia Sawhney, Joanna Stavins, Peter Tai, Geoff Tootell, Marci Vencil-Wiegand, Jennifer Young
Chicago	Dan Wassman, Geraldine Vaughn
Cleveland	Steve Collette, Melanie Loper, Kinley Stalker
Dallas	Magda Salazar
Kansas City	Lori Hand, Abigail (Abby) Mayer, Timothy Todd
Minneapolis	Debbie Drake, Michael Garrett, Paul Wallace (WEDGE)
New York	Hildon James, Evelyn Kender, Christine Opferkuch
Philadelphia	Sally Burke
Richmond	Bridgette Craney, Trisha Meade
San Francisco	Beth Hager, Chantel Mandel, Andrea Todd
St. Louis	Heather Black, Dan Brennan, Laura Hopper

NOTE: Employees listed are by their location at the time of the survey in June 2004.

Table 1
Payment Method Terminology and Definitions

Terminology		Definitions (*Definitions included in the payment survey are in italic*)
Primary	**Other**	
Cash		Coin and currency
Check or Paper check		Any paper check written against demand deposit accounts at a depository institution, plus any other paper checks written against other check-writing accounts (e.g., money market funds).
Credit card		Any general purpose or branded/merchant card offering revolving credit.
Debit card	Check card/ATM debit card	Initiates an electronic debit against a checkable account that is settled the same day via ACH.
Automated Clearing House payment (ACH)	Automatic payment, preauthorized debit	*"ACH clears and settles electronic payments and receipts among financial institutions. If your pay is directly deposited to your checking account, you are being paid through ACH. You also use ACH when you make automatic payments (e.g., mortgages, insurance, etc.)."* The critical distinction is between automatic payments and occasional or self-initiated payments through a company's web site. The latter also initiates an ACH transaction.
Online (Internet) bill payment services	Online banking, Internet banking, Electronic banking	*"If you use the Internet through your bank or other service provider to access your bank account to make payments from your checking account, this is online bill payment. This does not include credit card purchases from Internet shopping sites."* "Other service provider" could include a private (non-bank) firm that processes payments through ACH.
Stored-value card	Prepaid card, gift card, smart card	*"A plastic card that stores electronic data on dollar values. One example is a prepaid phone card. Other examples include gift cards from stores like Macy's, Home Depot, or Starbucks,"* or general-purpose, bank-issued cards (e.g., Visa, Mastercard).
Point-of-sale (POS) check conversion	Point-of-purchase (POP) check conversion, check-to-ACH	A paper check converted to an ACH debit transaction at the point of sale or purchase, such as a retail store. The cashier processes it through a special electronic reader, voids it, and returns it to the customer. The special reader captures the bank number, account number, and transaction amount and transmits the information for electronic settlement via ACH.
Accounts receivable conversion (ARC)	Check conversion at a lockbox processor, Lockbox	*"ARC is an electronic payment that is created when you pay a bill by mail with a check and that check is converted into an ACH payment. When this ARC conversion occurs, a line item like "ARC E check #1234" appears on your bank checking account statement, and your paper check or electronic image is not returned to you."*
Electronic check image	Check truncation, Check 21 payment	A paper check deposited to a bank (or its processor), which uses check image technology to convert the check to an electronic image to send through the check clearing process for payment and settlement. The paper check is truncated, usually at the bank of first deposit (BOFD), and is not returned to the depositor. An image of the check may be included on the customer's bank statement received at the end of the billing cycle. A check image is processed under check law (Regulation CC, Operating Circular 3).

Table 2

Comparison of Payment Method Adoption Rates

(Percent of respondents)

	2001 Survey of Consumer Finances	2003 Michigan Survey of Consumers	2004 Survey of Consumer Finances	2004 Boston Fed Survey				
				Unweighted	Education-Weighted	Income-Weighted	Age-Weighted	Own/Rent-Weighted
Check	87	---	89	99	99	98	99	99
Debit Card	50	54	59	67	69	70	69	68
Credit Card	80	---	75	86	79	80	86	85
ACH – All	44	46	47	71	64	66	70	70
Utility	13	---	18	28	22	25	27	27
Mortgage/Rent	14	---	16	30	25	23	28	26
Online Bill Payment	21	32	40	49	42	47	51	50
Stored-Value Card	---	73	---	35	31	33	36	35

Note: The 2001 SCF and 2003 Michigan statistics were taken from Anguelov et al. (2004). The sample for both surveys includes only those households with a bank, thrift, or credit union account. The sample for the Fed Survey includes all respondents for check adoption, and only individuals with checking accounts for all other adoptions. Demographic weights are derived from the 2003 American Community Survey.

The reported results from the Fed Survey are tabulated from a subsample consisting solely of check users. Blank responses are considered to indicate that the respondent does not use the payment type.

Table based on Fed Survey Questions #9 and #25.

Table 3
Reasons for Not Having a Checking Account

(Percent of respondents)

	2001 Survey of Consumer Finances	2004 Survey of Consumer Finances	2004 Boston Fed Survey
Don’t write enough checks	28.6	27.9	34.2
Minimum balance too high	6.5	5.6	8.0
Service charges too high	10.2	11.6	15.8
Don’t like to deal with banks	22.6	22.6	10.6
Can't manage a checking account	6.6	6.8	13.2
Don’t want/need an account	5.3	5.1	52.7
Other	20.2	20.4	15.8

Note: In both Surveys of Consumer Finances, respondents are instructed to choose the single most important reason why they don’t have a checking account, while in the Boston Fed Survey, respondents are allowed to choose multiple reasons. The columns should be compared with this in mind. Also, this explains why the Fed Survey column sums to more than 100 percent.
Table based on Fed Survey Question #49.

Table 4
Reasons for Switching from Checks to Electronic Payments

(Percent of responses)

	Credit Card	Debit Card	ACH	Online Banking
Convenience	19	37	19	21
Better recordkeeping	10	13	8	13
Save money on postage	11		16	19
Easier to resolve disputes	10			
Internet purchases require credit cards	16			
Incentives (rewards)	15			
Can buy now, pay later	17			
Save money on checks		18		
More stores accept debit cards		29		
No fees			16	
No mail delays or hassles			19	
Don’t have to remember to pay the bill			19	
More control over payment timing				20
Faster to pay bills online				22
Other	2	4	3	6

Table based on Fed Survey Questions #19-22.

Table 5
Barriers to the Adoption of Electronic Payment Methods

Barrier	Credit Card	Debit Card	ACH	Online Bill Payment
Privacy/Security	9	10	12	22
Theft/Misuse	10	13	11	19
Tracking payments	5	14	11	6
Expense (interest and fees)	32	13	6	8
Debt	38			
More benefits w/CC (incentives)		19		
Same-day debits		11		
Overdrawing account		9	20	8
Not accepted everywhere		6		
Bank doesn't offer		1		
Can't control timing			16	8
Difficult set up/use			13	7
Lack of access				8
Inconvenient				9

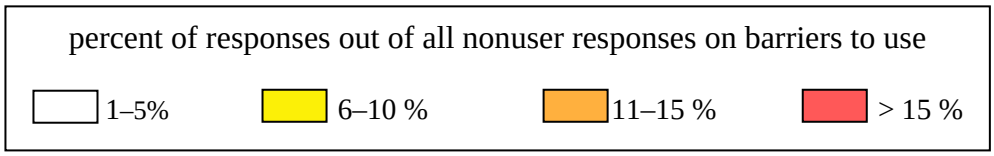


Table based on Fed Survey Questions #10, 12, 14, and 16.

Table 6
Relative Perceptions of Payment Characteristics

Users of Payment Instrument

Characteristic	Credit Card	Debit Card	ACH	Stored-Value Card	Online Bill Payment
Cost	0.18	0.57	0.67	0.39	0.71
Convenience	0.85	0.91	0.87	0.72	0.89
Safety	0.08	0.10	0.63	-0.12	0.26
Privacy	-0.02	0.17	0.45	0.59	0.13
Errors	0.21	0.28	0.41	0.35	0.41
Timing	0.61	0.46	0.61	0.46	0.84
Record keeping	0.37	0.21	0.37	-0.05	0.59
# Respondents [min, max]	[3385, 3678]	[2621, 2882]	[2623, 2844]	[1224, 1385]	[1809, 1946]

Nonusers of Payment Instrument

Characteristic	Credit Card	Debit Card	ACH	Stored-Value Card	Online Bill Payment
Cost	-0.55	-0.12	-0.05	0.08	0.07
Convenience	0.52	0.31	0.08	0.33	0.23
Safety	-0.25	-0.40	0.02	-0.16	-0.35
Privacy	-0.26	-0.29	-0.03	0.32	-0.40
Errors	-.08	-0.12	-0.09	0.12	-0.02
Timing	0.20	-0.19	-0.06	0.26	0.24
Record keeping	0.11	-0.28	-0.14	-0.10	0.08
# Respondents [min, max]	[222, 236]	[204, 211]	[144, 150]	[309, 341]	[314, 332]

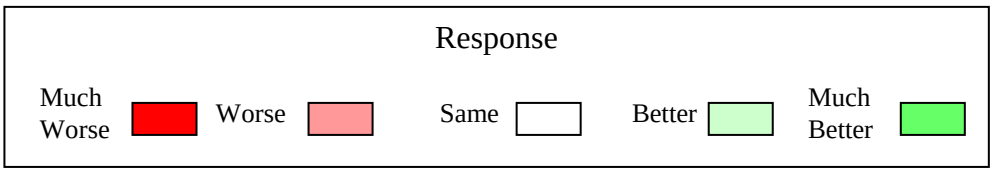


Table based on Fed Survey Questions #27-31. Characteristics are rated relative to checks. Numerical values of 1, 0, and -1 were assigned to the responses Better, Same, and Worse, respectively. The results presented here are the average value of the responses. Much Worse refers to an average less than -0.6; Worse is between -0.6 and -0.2; Same is from -0.2 to 0.2; Better is from .0.2 to 0.6; and Much Better is greater than 0.6.

Table 7
Responses to Changes in Paper Check Processing Environment

Responses about Hypothetical Changes from all Respondents

Change	Would You Change Your Payment Behavior? (%)		Top Two Payment Responses
	Yes	No	
Eliminate Check Float	31	69	N/A
Stop Returning Canceled Checks	14	86	Change institution (7%) Reduce check usage (6%)

Responses from Respondents Who Experienced the Actual Change

Change	Did You Change Your Payment Behavior? (%)		Top Two Payment Responses
	Yes	No	
POS Check Conversion	27	73	Use debit cards (43%) Use credit cards (29%)
Accounts Receivable Conversion (ARC)	10	90	Use online banking (38%) Use credit cards (23%)

Table based on Fed Survey Questions #4, 7, 32–35, 37–40.

Table 8

Responses Concerning Check Conversion to ACH Payments

	Experienced Conversion? (%) ‡			Know it was ACH?†		Changed Store or Vendor?*	
	Yes	No	Unsure	Yes	No	Yes	No
POS	52	48	-	91	9	10	90
ARC	16	38	14	67	33	6	94
Opt Out?**	13	50	38	-	-	-	-

‡ Question was posed to all respondents.
† Question was posed only to respondents who answered the "Converted?" question in the affirmative.
*Respondents answered the "Changed Store or Vendor?" question only if they had answered earlier that the conversion had caused them to change their behavior.
** This is the result from Question #42 which reads: "….*companies or banks that bill you and do check-to-ARC (accounts receivable check) conversions must give you the chance to stop them from doing ARC conversions. Will you choose to stop ARC conversions, when given the chance?*"

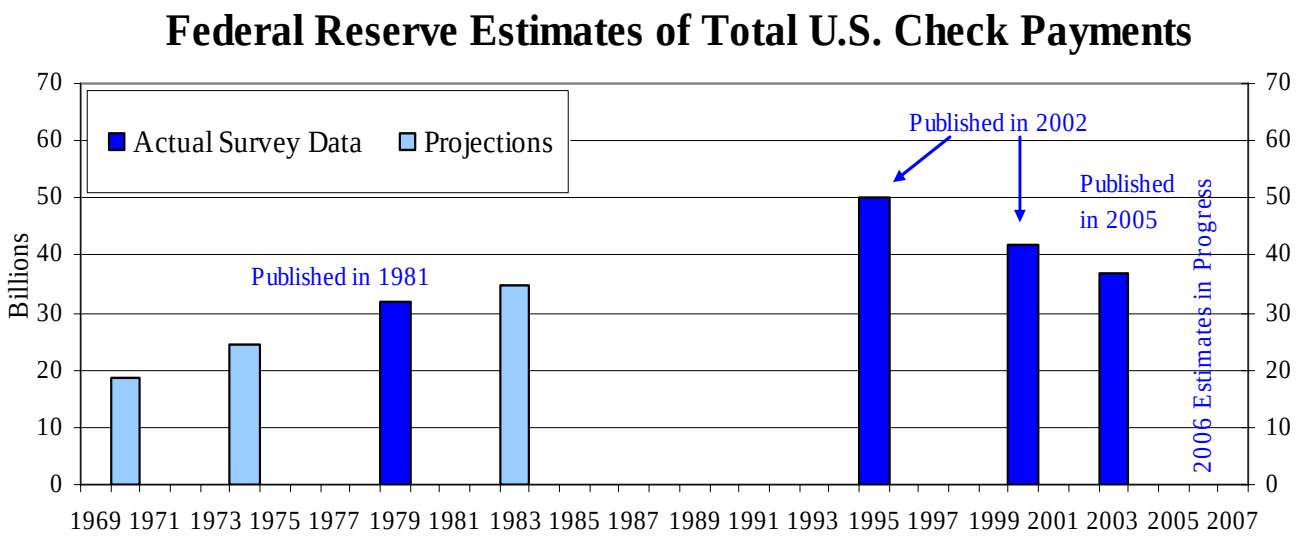
Table based on Fed Survey Questions #32, 33,34, 36, 37, 38, 39, 41, and 42.

Table 9

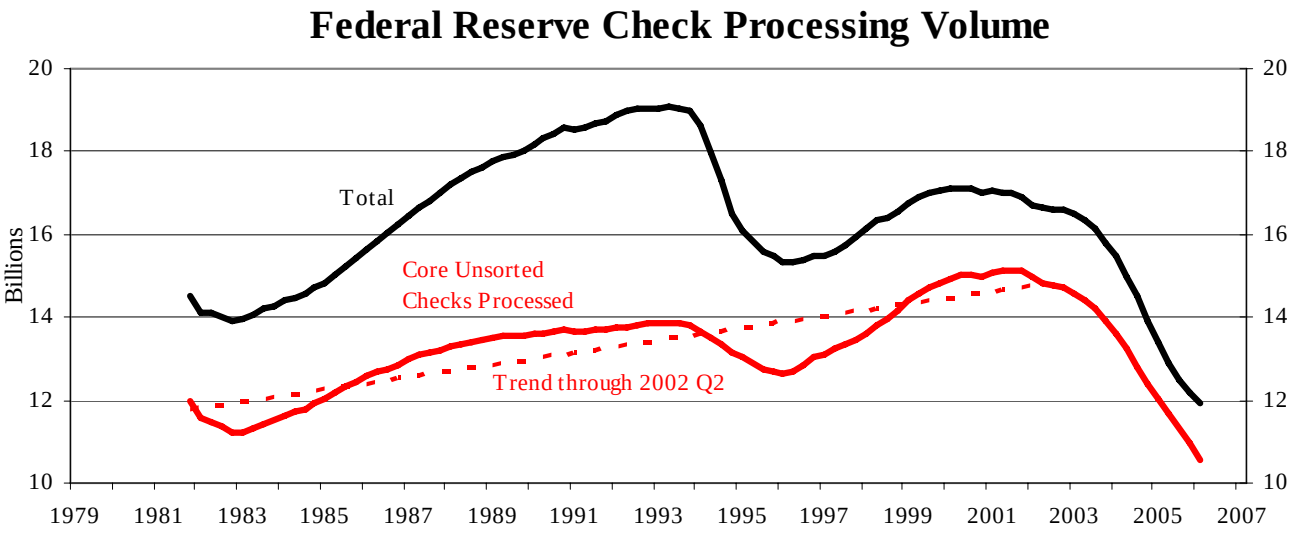
Survey Instrument Flaws and Recommended Corrections

Question	Flaw	Problem	Recommended Correction
#2	Non-users of checks were asked not to answer the majority of the survey.	Data on the behavior of non-users of checks provide equally valuable insight on non-check payments.	Remove exclusion of non-users of checks.
#10-26, 35, 40, 47, 49	Multiple responses were allowed.	Allowing multiple responses does not reveal the relative importance of each answer.	Limit respondent to one choice or allow ordering of answers.
#23	Retail payments were included in the same section as bill payments.	Retail payments are not bill payments, and this adds some potential ambiguity to the survey.	Define bill payments, and separate retail payments from bill payments.
#24-26	Failed to ask about types of purchases made with a credit card.	Information on purchase types is included for all other payment methods in the survey.	Include credit card purchases as another question.
#27-31	Only respondents who use a payment were asked about the payment characteristics.	The assessment of payment characteristics by non-users is equally valuable and important.	Ask all respondents to assess the payment characteristics.
#9, 18, 27-31	Cash was excluded.	Cash is an important payment method that needs to be understood more thoroughly.	Include analogous questions or choices for cash as a payment method.
#27-31	Several response choices were vague (convenience, privacy, etc).	This ambiguity in payment characteristics may lead the answers to be subjective and not comparable.	Define the payment characteristics more clearly and specifically.
#32, 37	Respondents who did not answer "yes" were asked to skip the next question about awareness.	Information on the awareness of all respondents is valuable, especially for understanding the connection between experience and awareness.	Ask all respondents to answer these questions.
#43, 46	Credit card purchases were not separated into payments (bill paid off in full each month) and revolving debt (carrying a balance over time).	While the payment instrument is the same, these two ways to use credit cards indicate different saving behavior that should be distinguished.	Ask credit card users to distinguish between pure purchases and the use of credit.
#50-54	Omitted key demographic questions (e.g., gender) and failed to ask for sufficient detail in existing questions.	Unexploited opportunity exists to obtain additional valuable information on demographic characteristics of respondents.	Include other key demographic questions; break up answers into more detailed categories.
#54	Geographic areas were broken up only into Federal Reserve Districts.	State, city, and other small-region trends, as well as urban/rural trends, are not observable.	Ask geographic location more specifically (state, city).
General	ACH and online banking are not payment methods *per se*, but were treated as such.	The definitions of these payment methods potentially add ambiguity to the survey responses.	Define ACH and online banking payments more specifically.

Figure 1
Check Volume



Sources:
Actual Survey Data:
Federal Reserve Bank of Atlanta (1981); Federal Reserve System (2002, 2004); Gerdes and Walton (2002); and Gerdes, Liu, Parke, and Walton (2005).
Projections:
Federal Reserve Bank of Atlanta (1983).



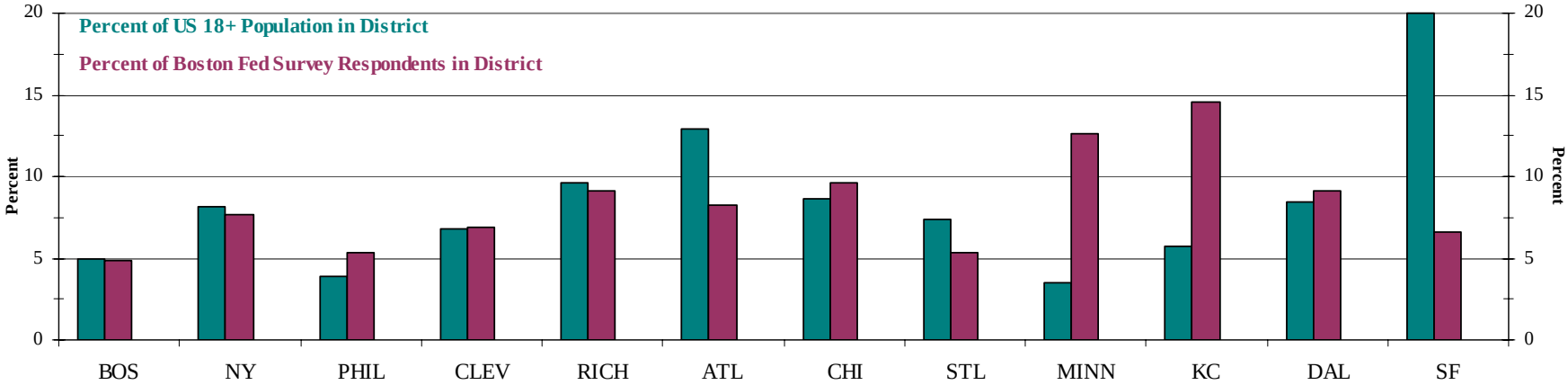
Source: Federal Reserve System.

Note: Check volume is calculated as a four quarter moving average.

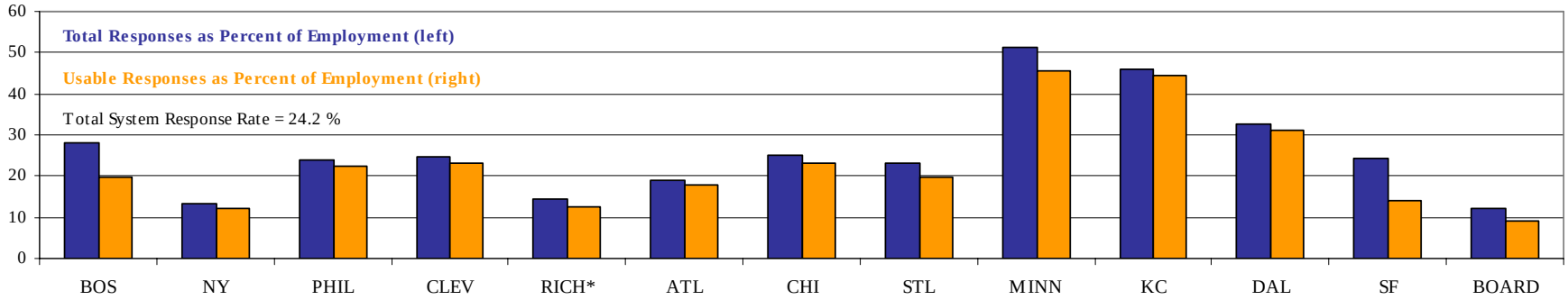
Figure 2

Comparison of Population and Respondent Distributions Across Federal Reserve Districts

Population Distributions



Boston Fed Survey Response Rates



*Survey respondents from the Richmond district include both the Richmond Fed and the Board.

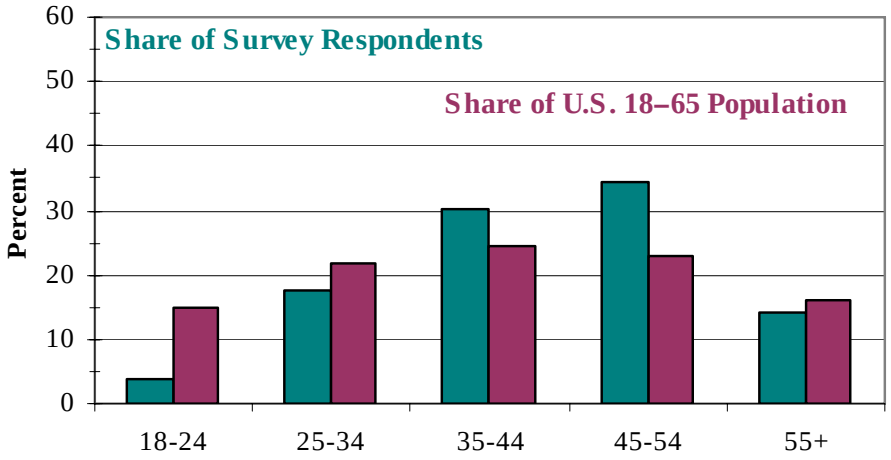
Note: District population shares (top panel) come from the Census's 2004 ACS.

Figure based on Fed Survey Question #54.

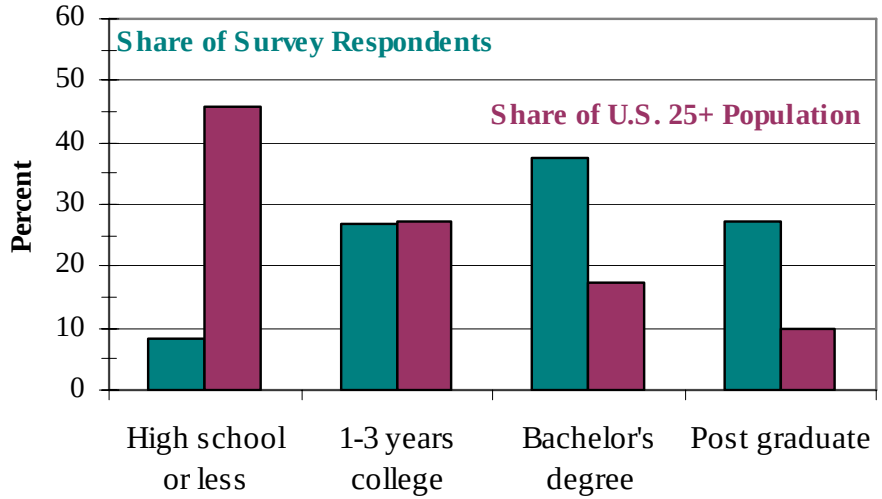
Figure 3

Boston Fed Payment Survey and U.S. Demographic Characteristics

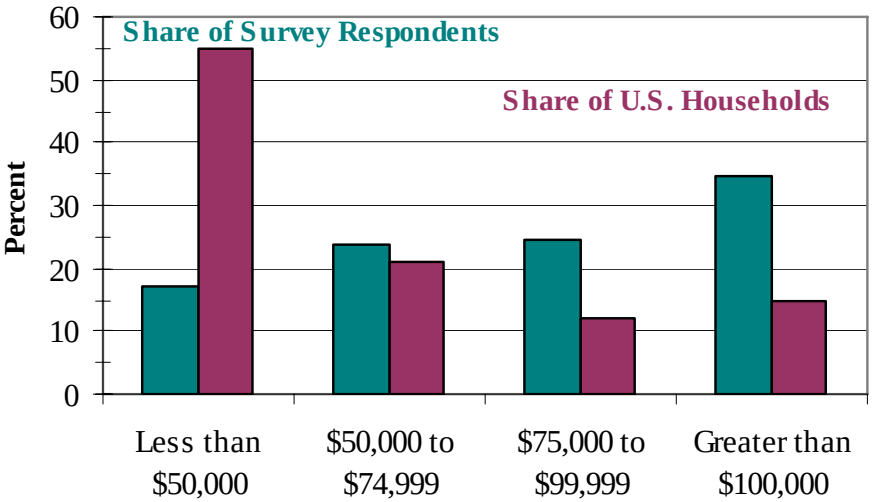
Age



Education



Household Income



Home Ownership

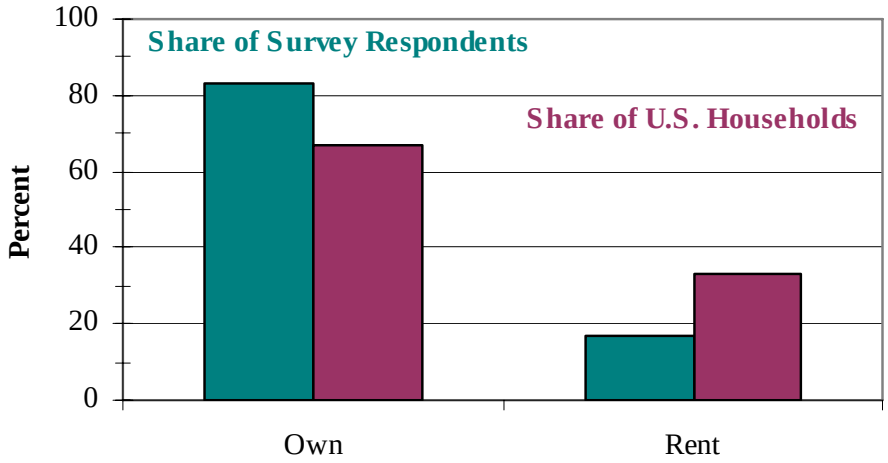


Figure based on Fed Survey Questions #50–53

Figure 4
Reported Payment Method Use per Month

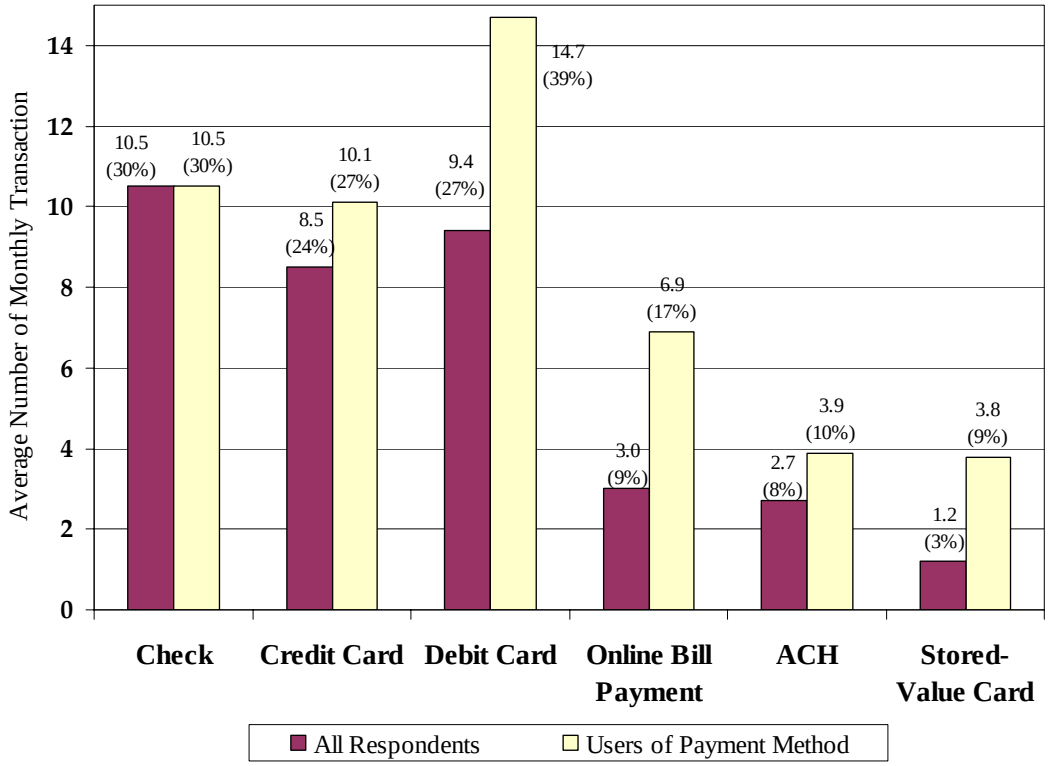
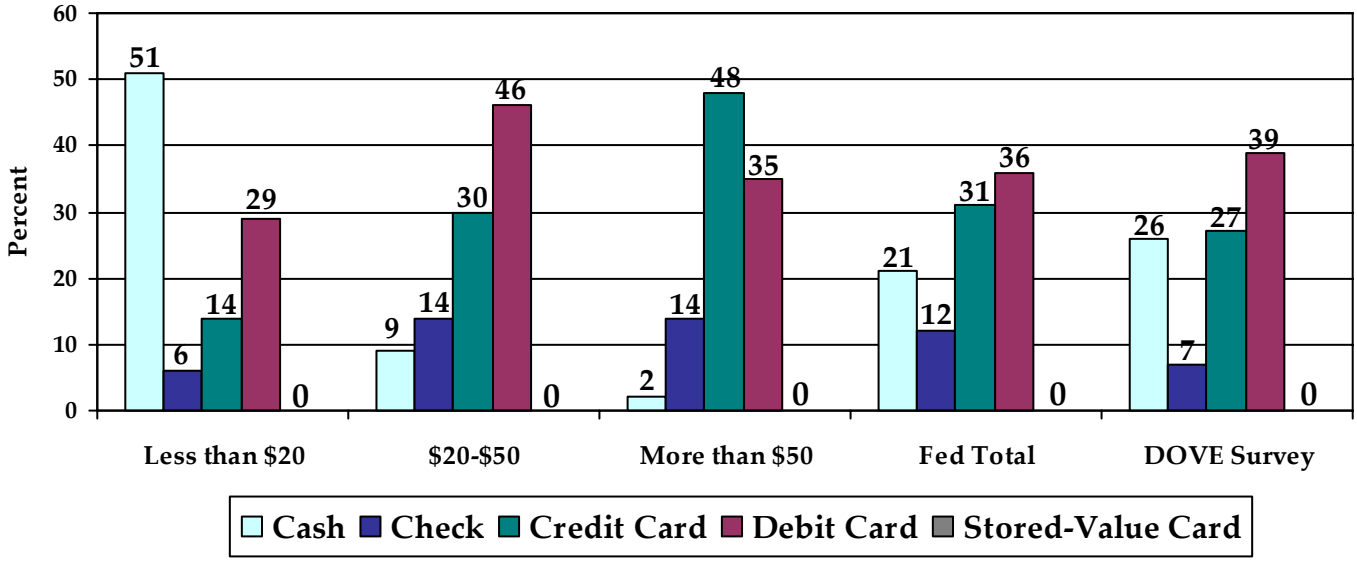


Figure based on Fed Survey Question #9. Percentages are of total average monthly transactions.

Figure 5
Payment Choices at Retail Stores
(From all respondents)



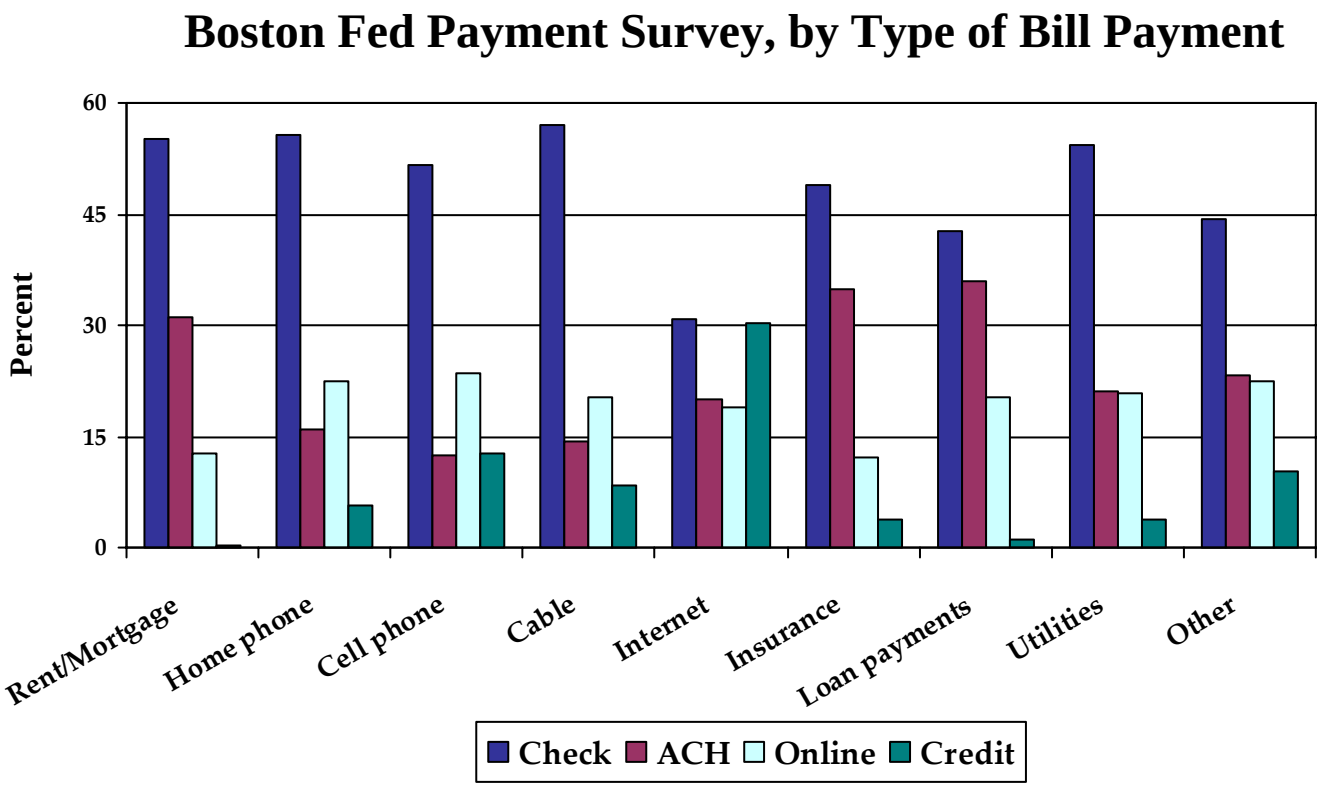
Dove Survey results are based on the 2005 American Bankers Association/Dove Survey of Consumer Payment Preferences, Question # 4, parts A, C, D, and E, which ask for respondents' most used payment method for purchases at Grocery, Department, Discount, and Drug Stores, respectively.

Figure based on Fed Survey Question #43.

Figure 6
Payment Choices for Recurring Bills
(Percent of respondents)

All Bills*

Payment Choice	Fed	Dove
Check	83	72
ACH or Credit	75	27
Credit only	33	-
ACH only	64	-
Online	36	14
Other Payment Types	-	72



*The Dove column is based on Question #55, part A, from the 2005 ABA/Dove Survey of Consumer Payment Preferences. The ABA/Dove survey did not have credit as a payment option, but did have autopay (credit or ACH), money orders and cash.

Figures based on Fed Survey Question #47.

Figure 7
Reported Changes in Payment Use during Past Three Years (2001–2004)

(From respondents who use the payment method)

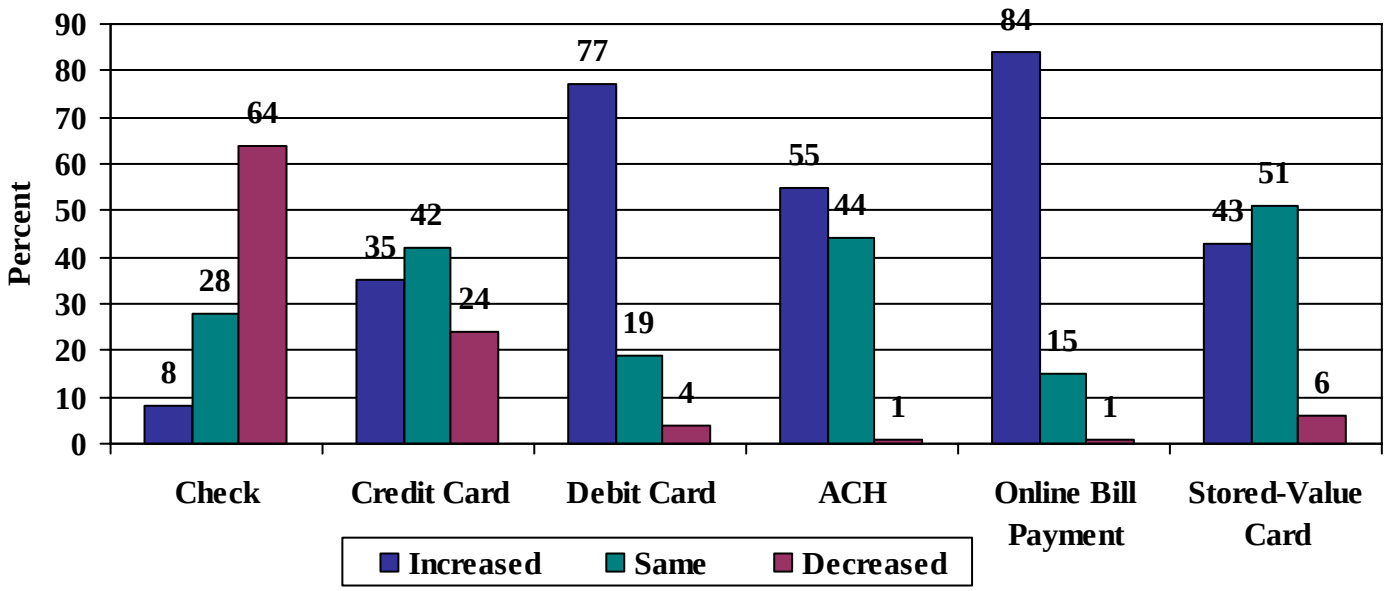


Figure based on Fed Survey Question #18.

Figure 8
Types of Bills and Purchases Formerly Made by Check

(From respondents who switched from check)

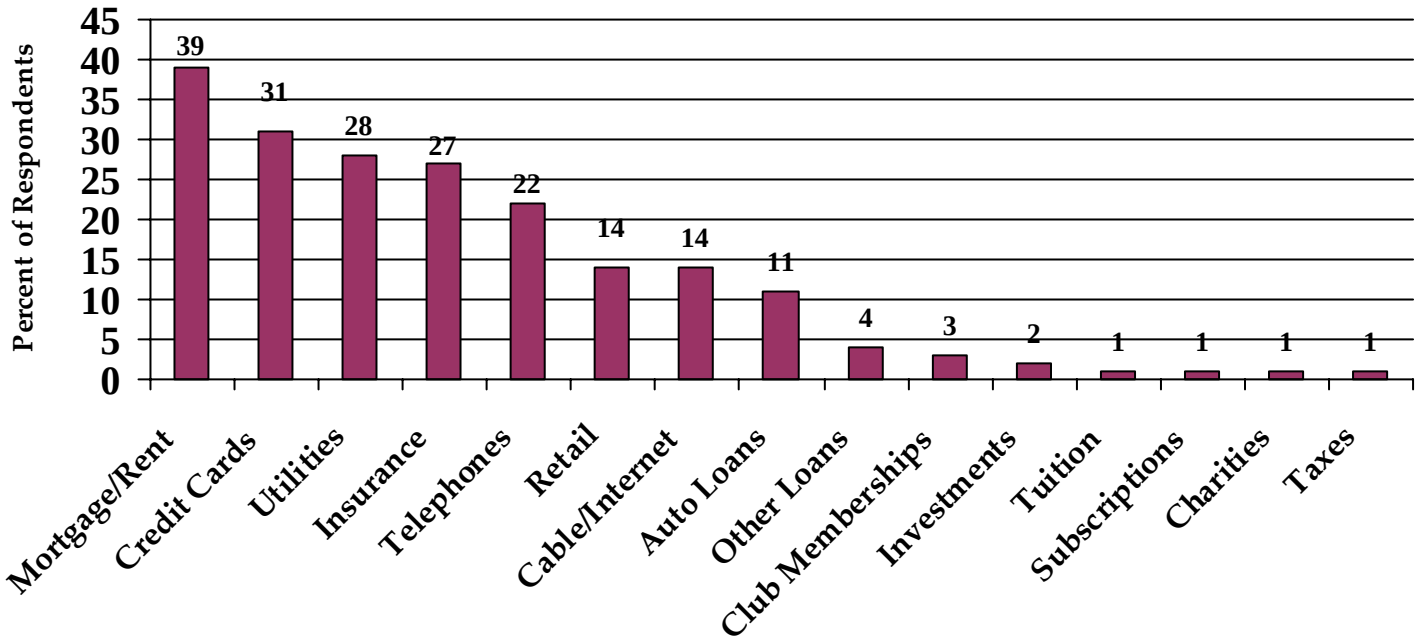


Figure based on Fed Survey Question #23.

Figure 9
Payment Methods Substituted for Checks for Retail Payments
(by value of purchase)

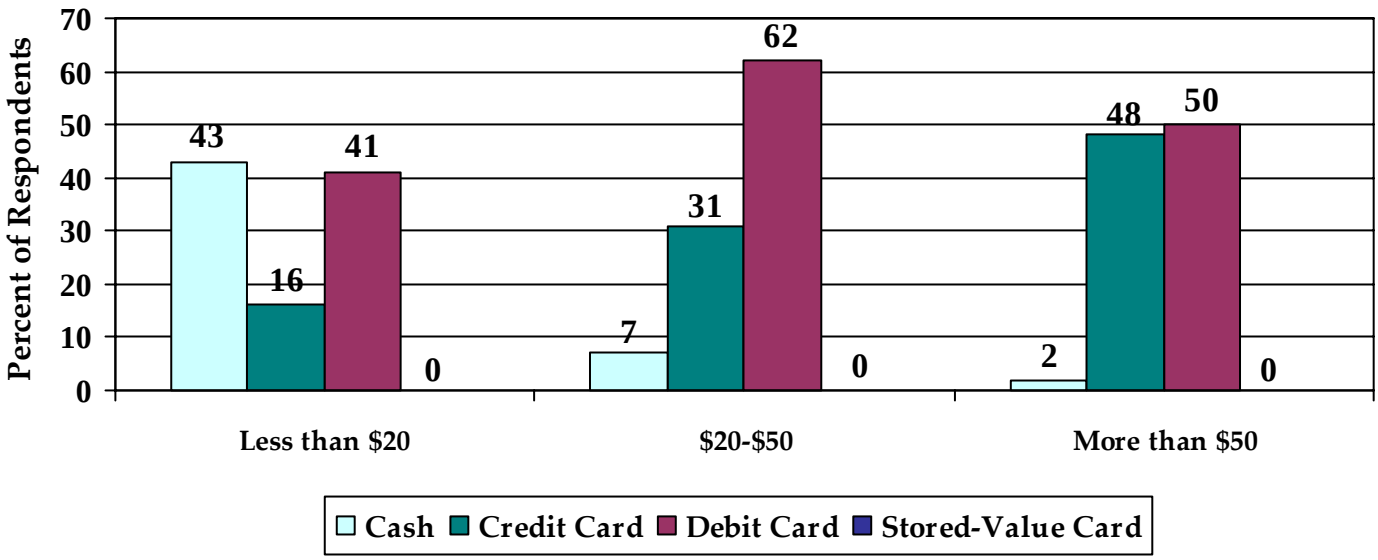
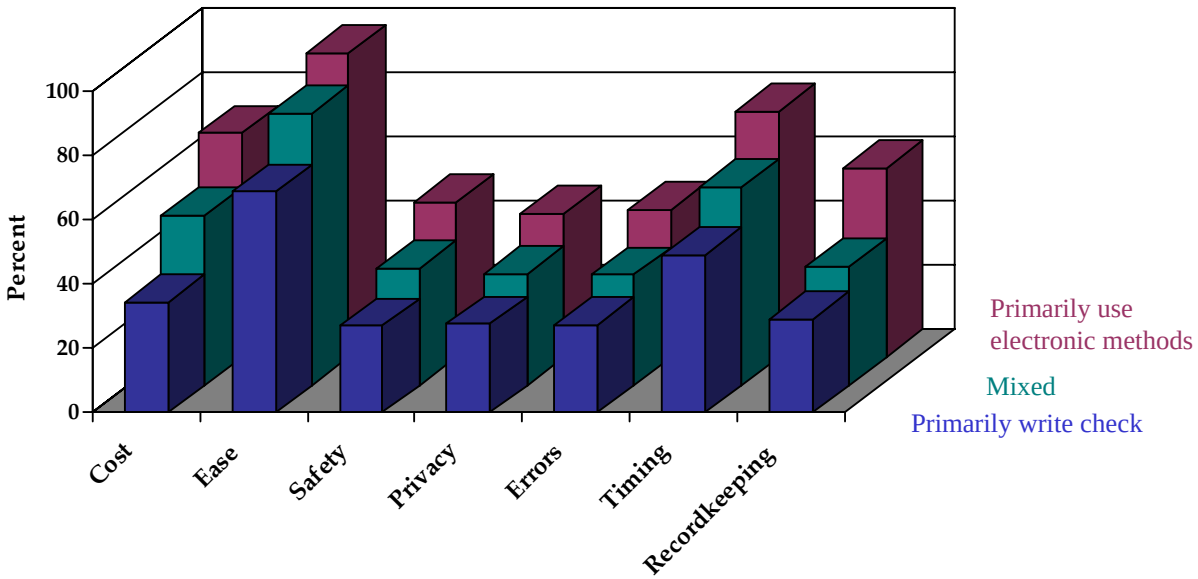


Figure based on Fed Survey Question #46.

Figure 10
Percent of Respondents Rating Electronic Payments Better than Checks

(Respondents' Rating of Payment Methods They Use)



(Respondents' Rating of Payment Methods They Do Not Use)

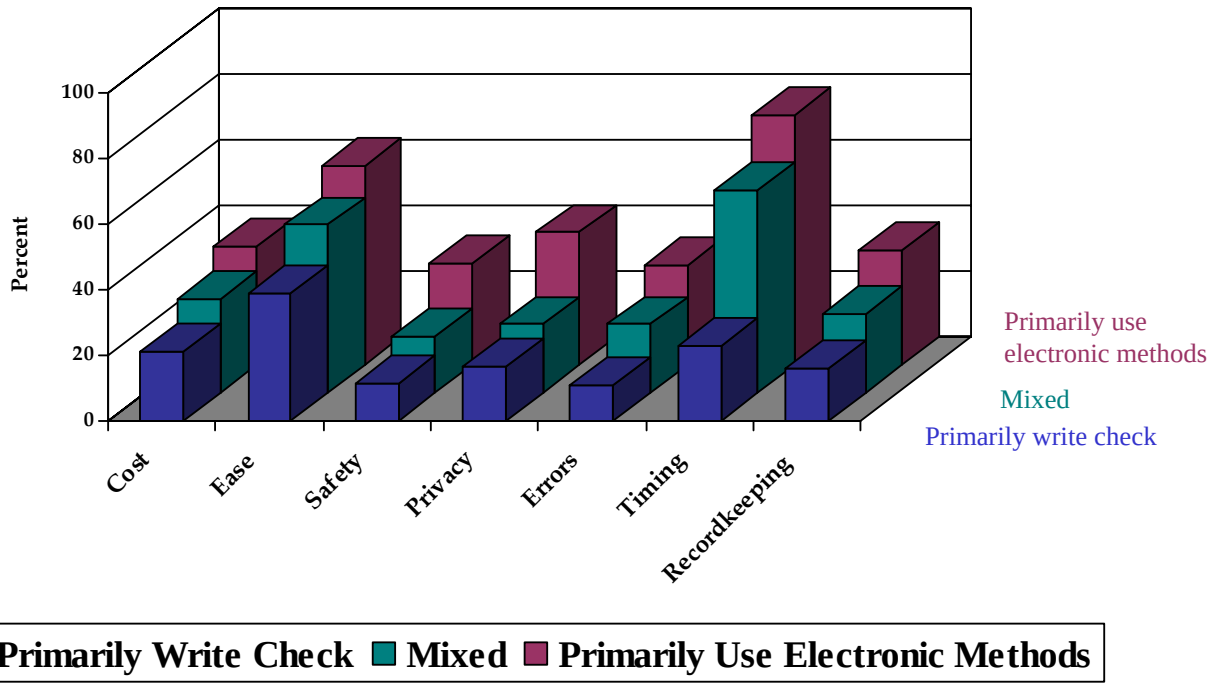
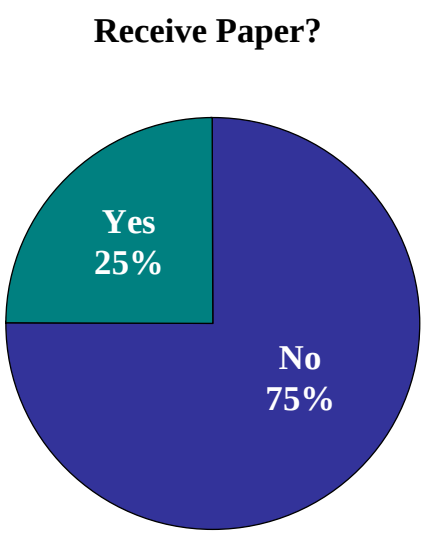


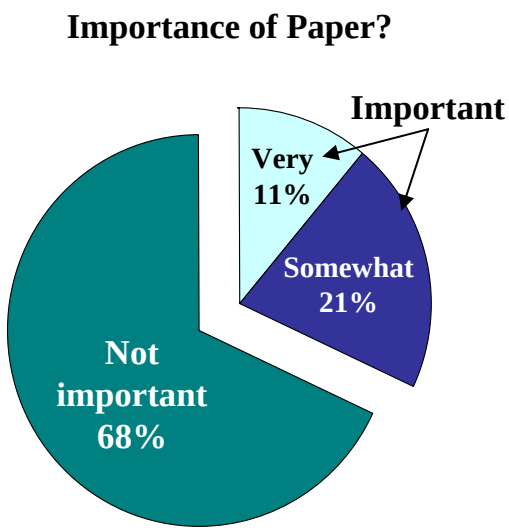
Figure Based on Fed Survey Questions #27–31.

Figure 11

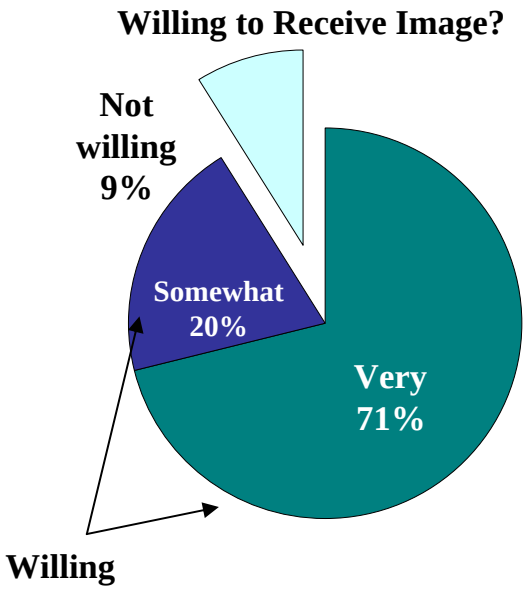
Consumer Responses Concerning Canceled Checks



For your primary checking account, does your financial institution return your canceled checks to you?



How important is it for you to receive your canceled checks back?



How willing would you be to receive an image copy (either paper or electronic) of the front of your check instead of receiving canceled checks?

Figure based on Fed Survey Questions #5, 6, and 8.

Figure 12
Payment Choice When Checks are Converted to ACH Payments

(Percent of responses from respondents who switched because of check-to-ACH/ARC conversion)

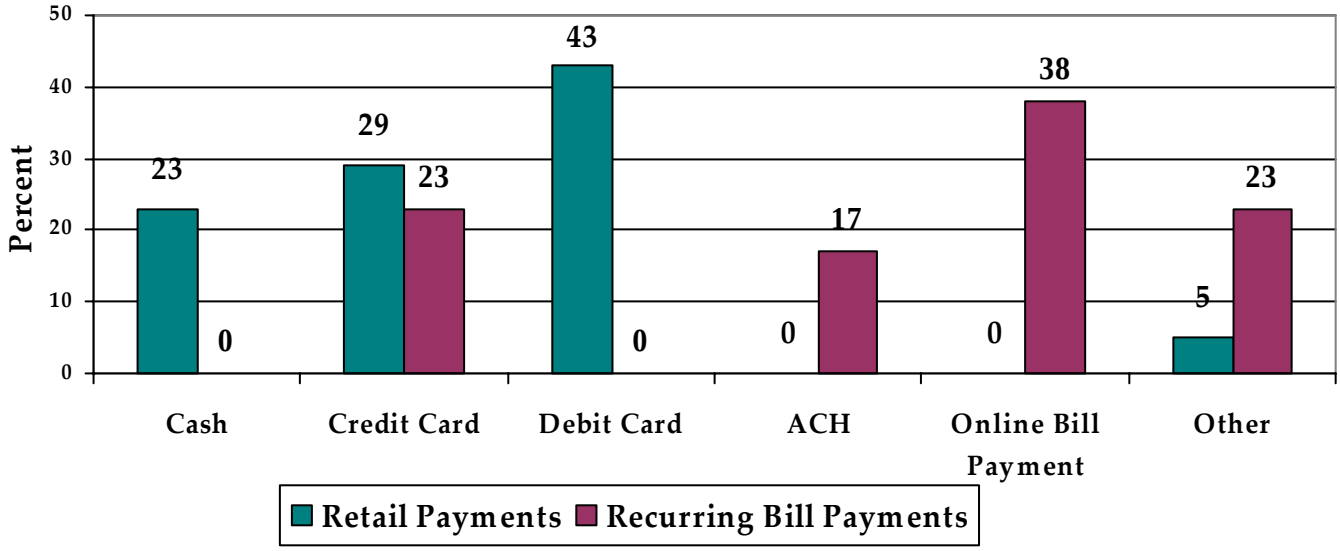


Figure based on Fed Survey Questions #35 and 40.

Figure 13
Stored-Value Card Use

(Percent of respondents who use Stored-Value Cards)

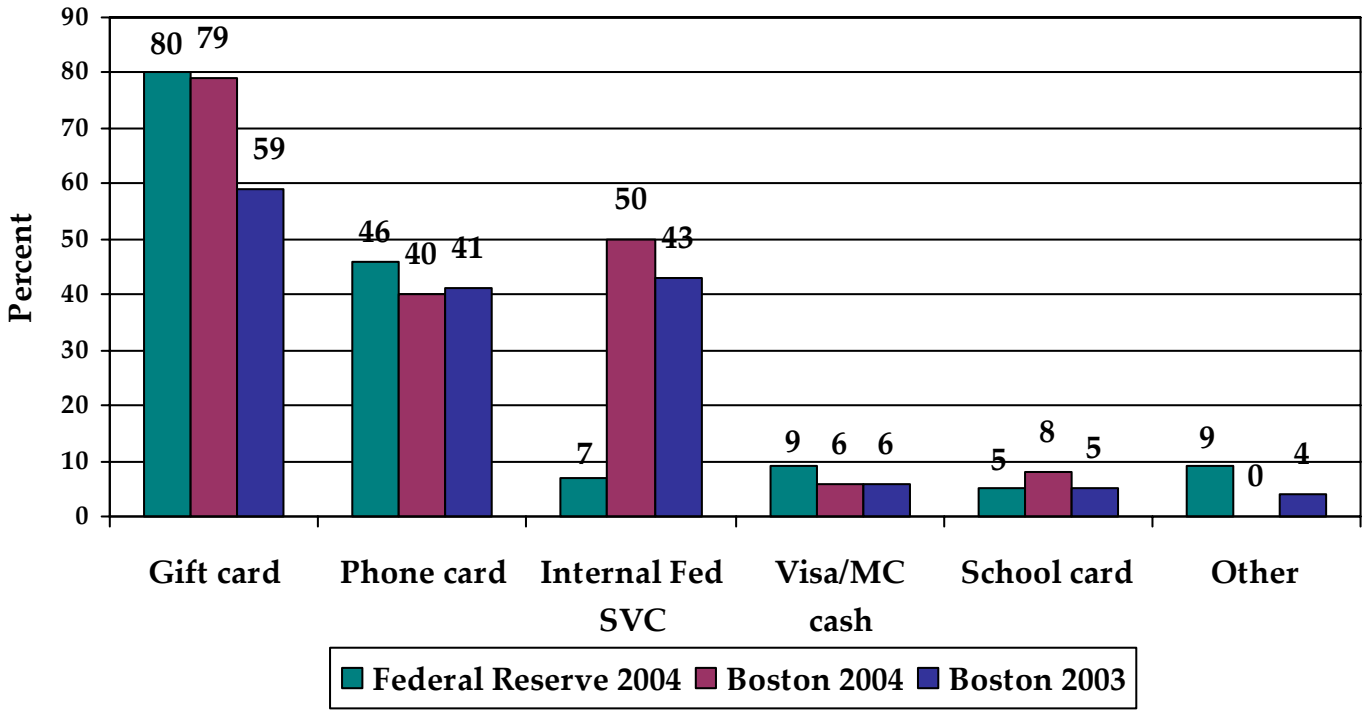


Figure based on Fed Survey Question #26.