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Measuring Unfamiliar Economic Concepts: The Case of Prepaid Card Adoption

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Abstract:

Recent evidence suggests that the use of prepaid cards is growing in the United States. The study of how prepaid cards fit into the existing payments market requires accurate data about the adoption of prepaid cards among consumers. This paper describes several experiments conducted by the Consumer Payments Research Center that compare the efficacy of various question forms regarding reported adoption rates. A primary focus is on the effect of "disaggregation" or asking about adoption of a number of prepaid card categories sequentially rather than asking about adoption of prepaid cards as a whole. We find strong evidence that increases in the number of categories yield higher adoption rates. Findings about the robustness of responses with changes in a few aspects of the question are also discussed.

Keywords: survey design, disaggregation, Survey of Consumer Payment Choice

JEL Classifications: B4

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CPRC CONSUMER PAYMENTS Research Center

1 Introduction

A consumer in virtually every modern economy has a number of choices when it comes to the payment instrument used to pay for a transaction. In the United States, there are as many as 10 unique methods of payment (Foster et al. 2011; Foster, Schuh, and Zhang 2013). The choice of payment instrument for any particular transaction, however, is hardly random. Cash is used predominantly for small, in-person purchases, while checks are more often used for bills and larger expenses (DCPC; Schuh and Stavins 2010). Each payment instrument is associated with different characteristics, such as speed of money transfer or security against fraud, which influence how often and in which situations they are used.

The collective tendencies of a population can change with time. Introduction of new payment options, improvements in technology, and the evolution of public opinion can easily affect the relative popularity of payment instruments. For example, easier and faster access to the internet (Fox 2002), along with a lessening fear of fraud (House of Commons Treasury Committee 2011), has corresponded with the rising popularity of online banking. The trend lines in Figure 1 for estimates by the Federal Reserve Payments Study (FRPS 2013) of the annual number of transactions made with various payment instruments highlight how rapidly shifts can occur. Understanding the evolution of consumer preferences is important for a well-functioning payments system, as a constant feedback cycle links consumer behaviors to the actions of banks and retailers, as well as government agencies and those responsible for public policy.

The Survey of Consumer Payment Choice (SCPC), conducted by the Consumer Payment Research Center (CPRC) at the Federal Reserve Bank of Boston, is an annual survey measuring the use and adoption of payment instruments. Adoption statistics naturally provide a baseline measure of instrument prevalence within the population. Knowledge of adoption data for a particular consumer is also fundamental to understanding that individual's payment decisions. In short, one cannot use a payment instrument one does not adopt, and many consumer choice models condition on the bundle of adopted instruments (Schuh and Stavins 2010; Koulayev et al. 2013). As a result, the collection of accurate adoption data is

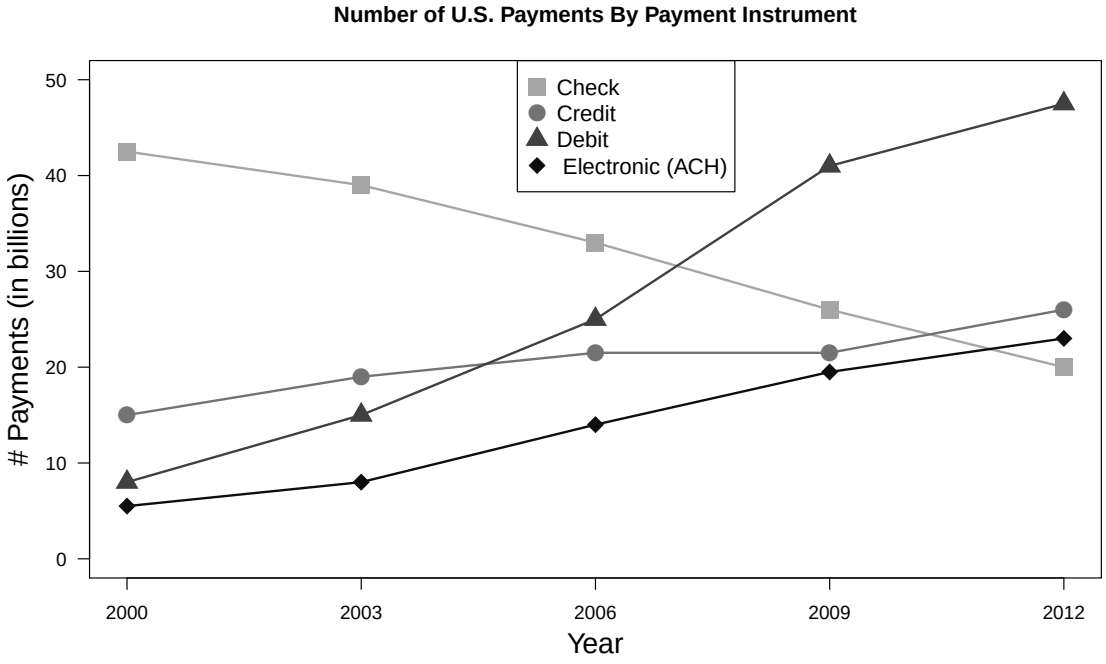


Figure 1: Aggregate use within the U.S. economy of various payment instruments. Values are provided by the tri-annual Federal Reserve Payments Study.

a major concern of the CPRC.

This paper describes the findings of a series of experiments on the efficacy of different survey questions in measuring the adoption of prepaid cards. Background information on prepaid cards is provided in Section 2, which highlights the history and increasing economic significance of prepaid cards, and Section 3, which discusses the challenges of measuring prepaid card adoption. In Section 4, we give a brief overview of the key features of the survey questions studied in this work and establish a statistical framework for the analysis of responses. Section 5 details an experiment conducted within the 2011 SCPC, while Section 6 does the same for a series of experiments conducted in the 2013 Prepaid Card Experiment (PCE). These later experiments partly expand on the findings in the 2011 SCPC, but also attempt to explain a puzzling result in the 2011 SCPC. It is important to note that the 2013 PCE features additional questions related to the study of prepaid cards that are not discussed in this work. The full questionnaire, tabulation of results, and raw data can be found on the 2013 PCE website. Finally, Section 7 provides a discussion of the experiment results.

2 The Economics of Prepaid Cards

A prepaid card is generally defined as any device on which money can be stored for later use. Popularization of prepaid cards began in the second half of the 20^{th} century when merchants offered them as a substitute for cash or check payments (Federal Reserve Bank of St. Louis 2011). Cards of this type, which are defined by a restriction on the merchants who accept them, are referred to as "closed-loop" cards. Today, this broad category of prepaid cards includes gift cards, phone cards, transportation passes, as well as location-specific cards, such as university-issued cards that are only accepted on campus. The main advantages of closed-loop cards are convenience of use and, in some cases, a discount or rewards program provided by the issuing merchant.

An alternative type of prepaid card is a "general purpose" (or "open-loop") prepaid card, which is associated with an electronic payment network, most often Visa or Mastercard, and can be used anywhere credit or debit cards are accepted. These cards were initially intended as a payment option for individuals with poor credit or without traditional bank accounts. Two examples are the payroll card, which allows employers to pay employees without checking accounts, and the Direct Express card, which was introduced by the U.S. Department of the Treasury in 2008 as a means of providing a variety of government benefits. More recently, however, general purpose cards have been marketed to a broader population of consumers, as many have fees and characteristics that are competitive with those of traditional checking accounts (Wishusen, Hunt, and van Opstal 2012; Federal Reserve Bank of St. Louis 2011). Examples of such cards include NetSpend, Green Dot, Bluebird, and Chase Liquid cards, which together own a majority of the market share (Nilson 2013). Insight into how and by whom such cards are used can be found in Hayashi and Cuddy (2014), which analyzes NetSpend data from 2011 to 2012.

Despite their diversity, from an economic perspective, prepaid cards collectively represent a means of storing expendable assets outside of cash or checking accounts. Consequently, understanding the propagation and patterns of use of prepaid cards is of great interest to economists. The need for reliable prepaid card adoption data is made more urgent by recent

evidence of a boom in the prepaid card market. Indeed, the FRPS survey showed a 56 percent increase in the number of prepaid card payments from 2009 to 2012 (most prepaid card payments are made by consumers) (FRPS 2013). Although the fastest growth in that interval occurred for general-purpose cards (33 percent), closed-loop cards still account for about two-thirds of prepaid card transactions. Perhaps more importantly, the share of non-cash payments made by prepaid card increased from 5.5 percent in 2009 to 7.5 percent in 2012 (FRPS 2013), and there is evidence that prepaid card prevalence will continue to grow in the following years (Sloane 2012).

3 Measuring Prepaid Card Adoption

While the payments industry broadly classifies prepaid cards as either closed-loop or open-loop cards, consumers are more likely to think of payment instruments in terms of the situation of their use. The diversity of prepaid cards in this regard makes it difficult to compile a comprehensive mental list of all prepaid card types and thus measure adoption. Certain prepaid cards, such as phone cards or transportation cards, are used in narrow contexts and so are easy to overlook and are often not thought of as payments. In addition, general purpose cards are often mistaken by consumers for credit or debit cards, which often look similar and are used in the same manner. Moreover, the fact that many prepaid cards can be gifted or reloaded by external sources introduces a potential degree of separation between the consumer and the payment instrument, perhaps increasing the likelihood that the card will be overlooked. Cognitive interviews commissioned by the CPRC show that many card types are often overlooked when the topic is prepaid cards as a whole and are considered only when prompted for directly (de Bruin, Gutsche, and Holbrook 2014).

Therefore, the CPRC has based the design of all prepaid card adoption questions around different levels of "disaggregation." Disaggregation involves dividing prepaid cards into several categories and asking the respondent about each category directly. The hope is that explicit prompting will improve recall and thus result in more accurate data. Indeed, in the context of measuring expenditures, several studies have shown that higher levels of disaggregation or

use of more categories generally yield higher estimates (Menon 1993; Winter 2004; Comerford, Delaney, and Harmon 2009), though it is not clear that results based on disaggregation are more accurate (Jagger et al. 2012). A crucial difference between a variable like consumption and one like adoption is that in the case of the former the quantity of interest is the sum of the responses for each category, while in the latter it is the maximum of all the binary responses. As a result, in the context of adoption, double-counting is not a concern.

The prepaid card adoption question has changed in every rendition of the SCPC, with a trend toward higher levels of disaggregation. Figure 2 shows SCPC-based estimates of the adoption rate among the population of U.S. consumers along with the number of categories used in each year. While the 2008 SCPC asked each individual to provide the number of prepaid cards bought and the number received, later versions asked for binary responses indicating adoption for each category. More details about the specific questions used in the 2010 – 2012 SCPC are given in Section 5, and the 2009 version was similar to the later four-category versions.

There is a clear pattern in Figure 2 suggesting that higher levels of disaggregation lead to higher reported adoption rates, although some of this phenomenon could be explained by an upward temporal trend in prepaid card adoption. In Section 5, to get a better sense of the effect of disaggregation on adoption estimates, we analyze the results of the 2011 SCPC experiment, in which two versions of a prepaid card adoption question were randomly assigned to respondents, and compare the results to those from the 2010 and 2012 SCPCs.

4 Experiment Analysis Overview

This work analyzes responses to seven different prepaid card adoption questions, four taken directly from the 2010 – 2012 SCPCs and three additional questions first introduced in the 2013 PCE. Each survey question analyzed in this work is identified with a two-character code: an integer followed by a letter of the alphabet. The integer represents the number of categories in the disaggregation, while the letter simply distinguishes different versions of questions within a level of disaggregation. From a notational point of view, we represent the

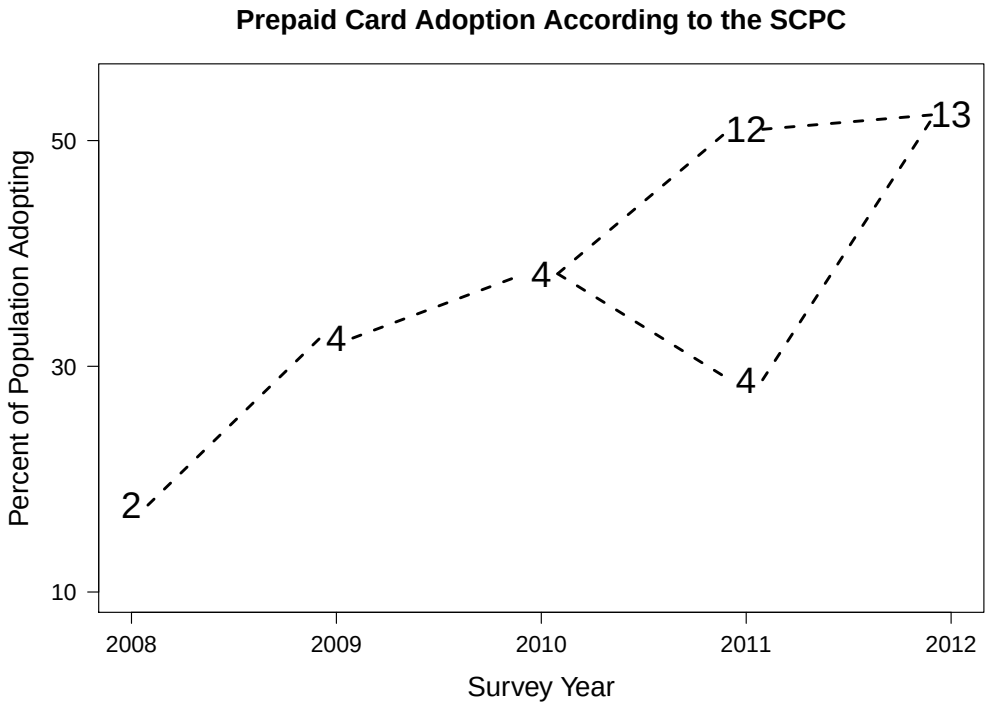


Figure 2: SCPC-based estimates of the adoption rate of prepaid cards among U.S. consumers. Plotted numbers indicate the number of levels of disaggregation in the prepaid card adoption questions.

set of survey questions with four categories as '4X,' with a similar naming framework holding for other levels of disaggregation. The seven questions, along with the surveys in which they were used, are listed in Table 1. The specific question forms used in the experiments are described more thoroughly in Sections 5 and 6.1, and screenshots of each are provided in the appendices.

	SCPC Year				
Question	**2010**	**2011**	**2012**	**2013**	**2013 PCE**
1A					X
4A	X				X
4B		X			X
4C					X
12A		X			
13A			X		X
13B				X	X

Table 1: Use of various versions of the question in the SCPC and the 2013 PCE. An 'X' indicates use in the corresponding survey.

While one hopes for a great deal of robustness in survey responses, a variety of factors other than the degree of disaggregation, including word choices and screen presentation, can have sizeable influence on the response process (Couper 2008; Dillman, Smyth, and Christian 2009; Tourangeau, Rips, and Rasinski 2000). We take advantage of the 2013 PCE experiments to study the effects of a few aspects of the question form. In one experiment, the effects of re-branding and reordering of categories are studied. An additional experiment compares reported adoption rates when asking for binary responses to ownership (Yes/No) as opposed to the number of cards owned for each category.

4.1 Statistical Framework

Survey participants for the SCPC are selected from the RAND Corporation's American Life Panel (ALP), a nonrandom sample of U.S. consumers (Foster et al. 2011; Foster, Schuh, and Zhang 2013). As a result, in order to provide estimates for the population of U.S. consumers, the CPRC must use weighted averages of survey responses, with the weights designed to post-stratify the sample to be more representative of the general population (see Angrisani, Foster, and Hitczenko (2013) for discussion on survey weights). However, because the focus of this work is to shed light on survey question effects, we employ unweighted analysis, treating our samples as random samples from some undefined population. In generalizing the findings to more standard populations, one must assume that the survey effects are consistent across sub-populations of varying demographic composition.

We begin with a finite population composed of N_t individuals in year t. If individual i is an adopter of prepaid cards in year t, we let $a_{it} = 1$, and we let $a_{it} = 0$ otherwise. Therefore, the overall true adoption rate is given by

$$p_t \;=\; \frac{1}{N}\sum_{i=1}^{N_t} a_{it}.$$

Of course, the variable a_{it} is not observed directly, and insight into adoption by individual i is given through responses to survey question q. Thus, let $x_{it}[q] = 1$ if individual i reports being an adopter under survey question q and let $x_{it}[q] = 0$ otherwise. A census of the entire

population would yield

$$x_t[q] \;=\; \sum_{i=1}^{N_t} x_{it}[q]$$

reported adopters and a population-wide adoption rate estimate of $p_t[q] = \frac{x_t[q]}{N_t}$.

In practice, researchers rarely have the resources to conduct a full census. Instead, they rely on a random sample from the population. Consider $\mathcal{S}_{nt}$ to be a set of n randomly chosen individuals in year t, for each of whom we observe $x_{it}[q]$. If a simple random sample is used to select respondents, the number of adopters in the sample, given by

$$x_t[q,n] \;=\; \frac{1}{n}\sum_{i\in\mathcal{S}_{nt}} x_{it}[q],$$

follows a Hypergeometric distribution. Specifically,

$$x_t[q,n] \sim \text{Hypergeometric}\left(N_t, x_t[q], n\right),$$

where Hypergeometric(N, K, n) is the distribution of the number of successes in a draw of size n from a population of size N featuring K total successes.

From an experimental point of view, we are interested in making inferences about $p_t[q]$, the reported adoption rate based on survey question q, based on the sample statistic, $x_t[q,n]$. A natural point estimate is given by

$$\hat{p}_t[q,n] \;=\; \frac{x_t[q,n]}{n}, \tag{1}$$

which corresponds to the maximum likelihood estimate under the Hypergeometric distribution. Interestingly, if N_t is sufficiently larger than n, the distribution of the sample statistic is well approximated by the more tractable Binomial distribution (Johnson, Kemp, and Kotz 2005):

$$x_t[q,n] \;\sim\; \text{Binomial}(n, p_t[q]).$$

As a result, standard errors for the estimate in (1) are estimated by

$$\hat{\mathrm{s}}_t[q,n] \;=\; \sqrt{\frac{\hat{p}_t[q,n](1-\hat{p}_t[q,n])}{n}}.$$

If n is large enough (conservatively, greater than 50), the distribution of $\hat{p}_t[q,n]$ is well approximated with a Normal distribution (Box, Hunter, and Hunter 2005), so that a 95 percent confidence interval for $p_t[q]$ takes the form:

$$\text{95 percent confidence interval} \;\approx\; \hat{p}_t[q,n] \pm 1.96\hat{\mathrm{s}}_t[q,n].$$

Hypothesis tests comparing $p_t[q]$ and $p_{t'}[q']$ can also be conducted using the Normal approximation via a two-sample proportion test (Agresti 1996). Perhaps the most natural comparison is that in which $t = t'$, translating to a direct comparison of the survey question effect absent any time-related trends. In such a case, if a random sample of a finite population received question version q and a different sample of the same population received question version q' within the same year, statistics based on $x_t[q,n]$ and $x_t[q',n']$ would not be independent, since knowledge about $x_{it}[q]$ for individual i likely sheds light about $x_{it}[q']$ for the same individual. For example, if an individual indicates adoption in a less disaggregated version of a question, it is likely he will do the same in a longer version of the question. However, it is not obvious how to model this relationship. Furthermore, if n and n' are much smaller than N_t, the effect of any dependence will be relatively small. Thus, the assumption of independence should not affect inference in any significant way.

5 2010 – 2012 SCPC

The experiment in the 2011 version of the SCPC was conducted in order to get a better sense of the extent to which prepaid card adoption rate estimates were subject to the choice of survey question. The experiment involved randomly assigning one of two prepaid card adoption questions with varying degrees of disaggregation to each respondent. Randomization within a year provides direct insight into the effect of disaggregation on reported adoption.

Below we provide more details about the evolution of the prepaid card adoption question in the 2010 – 2012 SCPC and present some findings for all three years.

Question 4A, from the 2010 SCPC, asked individuals to provide binary responses indicating adoption for each of four types of prepaid categories: general purpose, merchant specific, payroll, and government issued. The four categories were presented in this exact order, and, prior to the response table, the questionnaire provided brief definitions and examples of each category (see Appendix B). The four categories are not necessarily mutually exclusive, since certain cards fall into several categories. For example, some payroll or government issued cards are general purpose cards. However, as we are mainly concerned with overall prepaid card adoption, this is not a major concern.

In 2011, about half of the SCPC respondents received a variation of the existing four-category question. The new version, question '4B,' is very similar to question '4A,' except that the four categories are re-branded and the order in which they are presented on the screen is permuted to: government issued, employer issued, general purpose, and specific purpose. The change from "payroll" to "employer issued" served to broaden the category by including incentive cards, which are given by employers but are not regular salary payments. The reshuffling placed narrower card categories earlier in the list, with the hope that cards that could be classified in several categories would be more likely to be reported in the narrowest applicable categories. A screenshot of version 4B can be found in Appendix C. Those who did not receive question 4B received question 12A (shown in Appendix E). Again, the 12 categories in version 12A are not disjoint, and it should be noted that some of the categories, namely electronic benefit transfer (EBT) and transportation cards, are listed as examples in the definitions associated with questions 4A and 4B. However, research suggests that large portions of text are often skimmed if not ignored, suggesting that mentioning card types in the definitions is fundamentally different from asking directly about their adoption (Couper 2008; Dillman, Smyth, and Christian 2009).

Finally, in 2012, the SCPC transitioned fully to a prepaid card adoption question with 13 categories, version 13A. The categories are predominantly the same as those in question 12A with two changes. The first change was the addition of a prepaid card category entitled

"Other federal, state, or local government benefit card," which was intended to better capture various EBT cards, such as Women, Infants, and Children cards (WIC), Supplemental Nutrition Assistance Program cards (SNAP), and Temporary Assistance for Needy Families cards (TANF). The second change involved adding a note to the category "General purpose prepaid card (has a logo from Visa, MasterCard, Discover or American Express)" telling respondents to "include only cards not reported above." As this category is intended to be a catch-all for cards not already counted, it was moved to the bottom of the list. Version 13A of the question is shown in Appendix F.

Overall, the changes to the prepaid card question over the years were fairly significant. We expected to see an increase in reported adoption rates as the number of categories increased. In order to facilitate comparability of responses across years, we focus the analysis on a longitudinal panel of 1,631 individuals who took the survey in all three years from 2010 to 2012. Doing so ensures that changes in sample composition across years, which might correlate with prepaid card adoption, do not bias comparisons of estimated adoption rates. Nevertheless, the unweighted panel means are similar to the weighted U.S. population estimates found in the SCPC (Foster, Schuh, and Zhang 2013; Connelly et al. 2013). Table 2 summarizes the question types for the 2010 – 2012 SCPC and shows the number of individuals who responded to each question in the three years.

	Year			
	2010	**2011**		**2012**
Survey	4A	4B	12A	13A
Sample Size	1,631	821	810	1,631

Table 2: Surveys used in 2010 – 2012 and the number of respondents in the panel assigned to each.

5.1 SCPC Results: Effect of Disaggregation

The fundamental motivation of the 2011 SCPC experiment was to measure the effect of asking a prepaid card adoption question with a higher level of disaggregation. Thus, the most obvious comparison is between estimated adoption rates in the two different versions used in 2011: $p_{2011}[4B]$ vs. $p_{2011}[12A]$. Table 3 shows the point estimates for all four question

types in the three years. Adoption rates are given for each category as well as for prepaid cards as a whole. In 2011, the group of individuals who received question 4A had an overall adoption rate of 30 percent, while the subsample who received question 12A had an adoption rate of 51 percent. This increase in adoption rate by two-thirds is sizeable, and, indeed, a two-sample proportion test reveals a p-value near 0.00 for a hypothesis of

$$\begin{aligned} H_0: &\quad p_{2011}[4B] = p_{2011}[12A] \\ H_A: &\quad p_{2011}[4B] \neq p_{2011}[12A]. \end{aligned}$$

The relative similarity of adoption rates based on the longer versions, 51 percent in 2011 and 2012, compared with the shorter versions, 37 percent and 30 percent in 2010 and 2011 respectively, supports the idea that the longer version is responsible for higher estimated adoption rates.

As noted in Section 3, it is impossible to determine whether the higher adoption rate reported under the longer version of the question is in fact more accurate. However, it seems reasonable that explicitly prompting more categories improves recall, resulting in individuals including some prepaid cards that they are otherwise more likely to forget. Because categories of prepaid cards are not mutually exclusive in any version of the question, it is difficult to map clearly categorical responses in the longer version to those in a shorter version. A flavor of the potential effect of direct prompting can be seen when considering that 34 percent of the sample claimed to own a gift card, a relatively familiar concept, when asked directly. This number alone is comparable to the overall adoption rate in the shorter versions of the question.

5.2 SCPC Results: A Puzzling Drop in Adoption Rates

While the observed increase in overall adoption with higher levels of disaggregation was expected, the data from the 2010 – 2011 SCPC also produced a puzzling result. As shown in Table 3, there is a decrease in the overall adoption from 37 percent in 2010 to 30 percent in 2011 in the four-category questions. One possibility is that this observed result is simply due to variation associated with sampling. However, a two-sample proportion test for the

	Year and Version			
	2010	**2011**		**2012**
	4A	**4B**	**12A**	**13A**
Overall Adoption	36.5	30.1	50.7	51.1
Government Issued	3.8	3.6	na	na
Employer Issued	0.9	4.3	na	na
General Purpose	22.8	11.5	na	na
Specific Purpose	23.2	20.6	na	na
Gift Card	na	na	33.5	33.6
General Purpose	na	na	8.2	8.1
Public Transportation	na	na	6.3	6.9
Phone Card	na	na	7.7	6.0
Direct Express	na	na	0.2	0.6
EBT	na	na	4.3	5.2
Payroll Card	na	na	0.5	0.7
Incentive Card	na	na	0.9	1.4
Benefit Card	na	na	7.7	8.7
Remittance Card	na	na	0.0	0.4
Rebate Card	na	na	6.1	8.8
Location Specific	na	na	1.6	2.4
Other Government Issued	na	na	na	1.9

Table 3: Estimated adoption rates (as percentages) among 2010 – 2012 longitudinal panel. 'na' means not applicable.

hypothesis,

$$H_0 : p_{2010}[4A] = p_{2011}[4B]$$
$$H_A : p_{2010}[4A] \neq p_{2011}[4B],$$

reveals a p-value of 0.00, and the confidence intervals shown in Figure 3 further highlight that the discrepancy is too great to be attributed to random sampling. In this case, because every individual who received question 4B in 2011 also received question 4A in 2010, there is clear dependence between the test statistics. However, adoption responses in consecutive years for any individual are positively correlated, so treating the samples as independent corresponds to a statistically conservative approach. As the hypothesis test and Figure 3 suggest, it is very unlikely that the observed statistics, $x_{2010}[4A, 1{,}631]$ and $x_{2011}[4B, 821]$, are observed if $p_{2010}[4A] = p_{2011}[4B]$.

While it seems reasonable to assume that $x_{it}[q]$ depends on both q and a_{it}, the nature of their

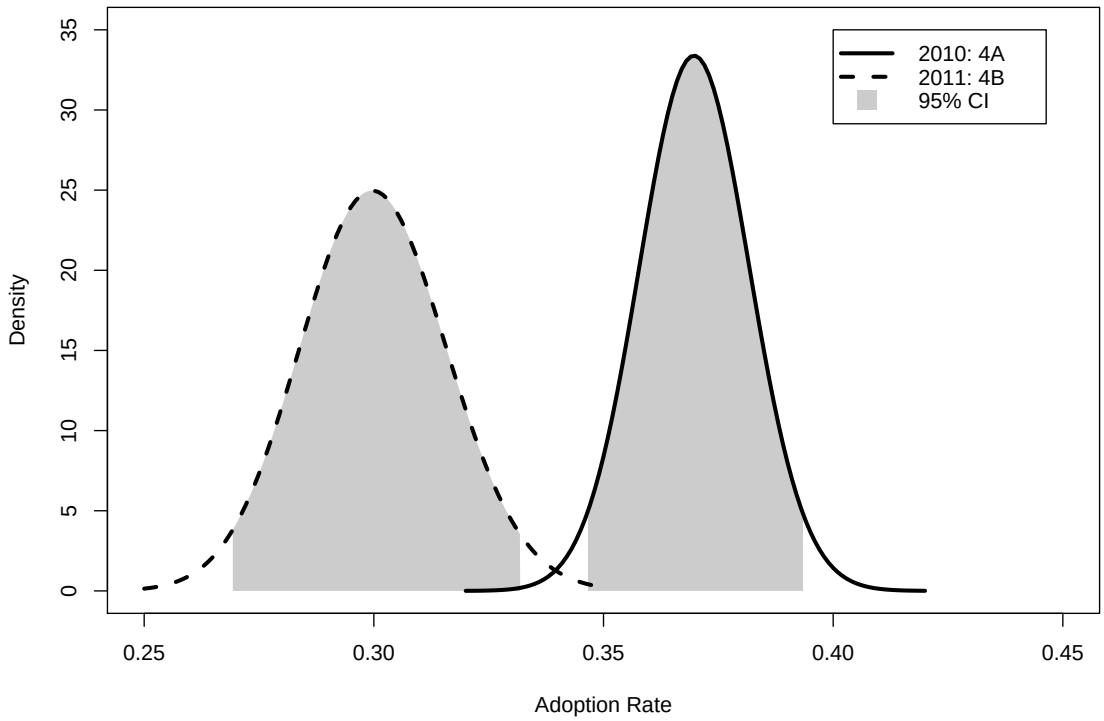


Figure 3: 99.9 (lines) and 95 (shaded) percent confidence intervals for $p_{2010}[4A]$ and $p_{2011}[4B]$.

interaction is not clear. Intuition dictates that the better the survey mode, the more likely $x_{it}[q] = a_{it}$. One simple model states that $\text{Prob}\left(x_{it}[q] = 0 \mid a_{it} = 0\right) = 1$, meaning that a nonadopter will not report adoption for any question, and that $\text{Prob}\left(x_{it}[q] = 1 \mid a_{it} = 1\right) = c_q$ for $c_q \in [0, 1]$. The value of c_q is a measure of how well the survey mode prompts proper recall for adopters, with values closer to 1 representing a more accurate questionnaire. Under such a model,

$$p_t[q] \quad = \quad c_q p_t,$$

and differences in subsequent years under two different questions take the form $p_t[q] - p_{t'}[q'] = c_q p_t - c_{q'} p_{t'}$.

Although questions $q = 4A$ and $q = 4B$ are not identical, as discussed in Section 3, they were designed with the prior belief that any changes would have minor effects on the results.

In other words, we expected that $c_{4A} \approx c_{4B}$, in which case the inferred difference takes the form $p_{2010}[4A] - p_{2011}[4B] \approx c_{4X}(p_{2010} - p_{2011})$. However, this would indicate that the likely drop in reported adoption was due to a real drop in adoption rates: $p_{2011} < p_{2010}$. Based on sources from the public sector (FRPS 2013) and the private sector (Sloane 2012), this seems very unlikely, so we must allow that the initial assumption that $c_{4A} \approx c_{4B}$ is incorrect.

To better understand the source of the change, we compare the differences from 2010 to 2011 for each of the four categories in versions 4A and 4B suggests. Hypothesis tests suggest that there is no evidence that the adoption of government issued or specific purpose cards changed significantly. On the other hand, reported adoption of employer-issued cards increased (using a 0.05 threshold), which is not a surprising result given the expected trends and the rebranding of the category. The implication is that the observed drop in overall adoption is due entirely to the significant drop in general purpose card adoption (p-value of 0.00). One possible explanation for this change is the rebranding and reordering of the categories from 2010 to 2011. Thus, determining the extent to which the branding and ordering of categories influence the categorical results served as the primary motivation for the 2013 Prepaid Card Experiment.

6 2013 Prepaid Card Experiment

While the impetus for the 2013 Prepaid Card Experiment, administered in August 2013, was the unexpected drop in reported prepaid card adoption from 2010 to 2011, the survey was designed with the additional goal of learning more about a variety of potential strategies for collecting data on prepaid card adoption. In order to prevent past experience from influencing responses, we sampled individuals from the ALP who had never participated in the SCPC, thus limiting the list of potential respondents to a little over 1,000 individuals. Thus, the final sample comprises 975 selected individuals who were added to the ALP more recently and, due to targeted recruitment into the ALP over recent years, represent a different subset of the U.S. population. Specifically, the 2013 PCE sample tends to comprise lower income and less educated individuals.

A direct result of this is that making comparisons of adoption levels from the 2013 PCE and the SCPC surveys can be nontrivial, as differences in adoption rates that are due to varying sample compositions must be considered. For example, whereas the 2013 SCPC estimates that around 10 percent of the U.S. population adopted EBT cards, around 20 percent of the individuals in the 2013 PCE sample claimed to own a prepaid card. However, this difference is fully explained when respondent income levels are considered (lower-income individuals are naturally more likely to own an EBT card), either through weights or model-based predictions. Nevertheless, the resolution of discrepancies between the surveys is not always so clear, as a variety of demographic considerations failed to account for the observed differences in the adoption of "Other general purpose cards" (10 percent according to the 2013 SCPC and 18 percent according to the 2013 PCE). This could be a result of poorly chosen post-stratification demographics or survey effects. Regardless, such cross-survey comparisons are beyond the scope of this paper: we focus on survey question effects within each sample. Unweighted sample averages and weighted averages post-stratified to the U.S. population for each survey variable in the 2013 PCE are found in the 2013 PCE Results document. More information about the construction of the weights can be found in Angrisani, Foster, and Hitczenko (2013).

In the following sections, we describe the survey design of the 2013 PCE. In Sections 6.2 through 6.4, we describe the main findings.

6.1 Survey Design

Each respondent to the survey is asked to report prepaid card adoption based on three separate questions with increasing levels of disaggregation. First, everyone is prompted with question 1A, which simply provides a short definition of a prepaid card and then asks the respondent whether he owns any (see Appendix A).

Immediately afterwards, the respondent is asked one of three adoption questions defined by disaggregation into four categories. The randomly assigned versions are 4A(utilized in the 2010 SCPC), 4B (utilized in the 2011 SCPC), and 4C, which is a hybrid of the other two

versions. Specifically, version 4C, shown in Appendix D, keeps the same order of categories as version 4A, but uses the branding of version 4C, as indicated in Table 4. By randomly assigning the three question versions to the respondents, we hope to determine whether re-branding or reordering items influences responses.

		Ordering	
		Old	New
Branding	Old	4A	
	New	4C	4B

Table 4: Ordering and branding of the four-category versions.

After answering some version of the four-category question, each respondent was randomly assigned to one of two 13-category versions. Version 13A, taken directly from the 2012 SCPC, asked for adoption through binary responses (Yes/No) for specific types of prepaid cards. Version 13B, on the other hand, is composed of the same categories, but asks for the number of cards adopted in each adopted-card category. The motivation for this is to ascertain whether version 13B can replace two sets of questions about prepaid cards: one that asks about adoption and a follow-up question that asks for the number of cards in each adopted card category. A screenshot of this version is shown in Appendix G.

The three adoption questions follow one another directly in the online questionnaire, with order defined by increasing levels of disaggregation. Before each of the last two questions there are explicit instructions not to go back to previous pages and change answers. The randomization of the question received for the four-category and 13-category questions means that there are six possible sequences of questions a respondent can receive. These sequences, along with the number of individuals to which each was given, are depicted in Figure 4.

6.2 Prepaid Card Experiment Results: Order and Branding

In order to see how the order and branding of categories effects adoption estimates in the four-category versions, we consider the hypothesis:

$$\begin{aligned} H_0 &: \quad p_{2013}[4A] = p_{2013}[4B] = p_{2013}[4C] \\ H_A &: \quad \text{At least one of } p_{2013}[q] \text{ is not equal to rest for } q = 4A, 4B, 4C. \end{aligned} \tag{2}$$

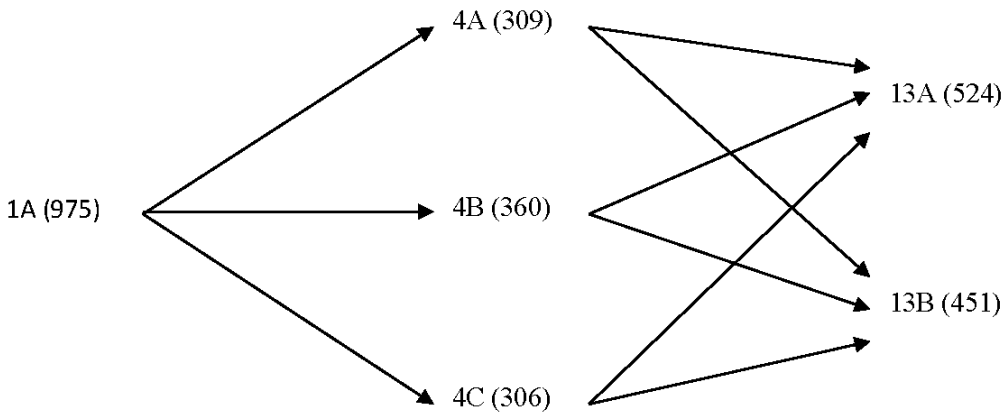


Figure 4: Structure of the 2013 Prepaid Card Experiment.

The point estimates of the adoption rates, $\hat{p}_{2013}[q, n]$, are shown in Table 5 and range from 47 percent to 52 percent. Under the null hypothesis, the estimated reported adoption rate under all three versions is simply a weighted average, with weights corresponding to the proportion of the overall sample to receive each version:

$$\hat{p}_{2013}[4X] \quad = \quad \frac{x_{2013}[4A, 309] + x_{2013}[4B, 360] + x_{2013}[4C, 306]}{975} = 0.49. \tag{3}$$

To formally test the hypothesis in (2), we use the Chi-squared test for multiple proportions for which the test-statistic is

$$X^2 \quad = \quad \sum_{q \in \{4A, 4B, 4C\}} \frac{(\text{Observed \# Adopters in } q - \text{Expected \# Adopters in } q)^2}{\text{Expected \# Adopters in } q}.$$

The expected number of adopters under the null hypothesis is determined by multiplying the sample size for each question by the estimated pooled rate of adoption, $\hat{p}_{2013}[4X]$. The distribution of X^2 is approximately that of a Chi-squared distribution with two degrees of freedom (Agresti 1996), leading to a p-value of 0.67 and the acceptance of the null hypothesis. Figure 5 shows the confidence intervals for the true adoption rates under the three questions based on the Normal approximation. The high degree of overlap suggests that there is little evidence that the branding and re-ordering of the four categories leads to

significantly different adoption rate estimates. Moreover, corresponding tests for each of the four categories suggest no significant differences in reported categorical adoption rates across the three different questions (p-values range from 0.14 to 0.54).

Overall, this is a reassuring result, since it suggests a certain amount of robustness to question design. At the same time, we are left with no legitimate reason for the drop in the reported adoption rate in the four-category questions from the 2010 SCPC to the 2011 SCPC. A brief discussion about this is provided in Section 7.

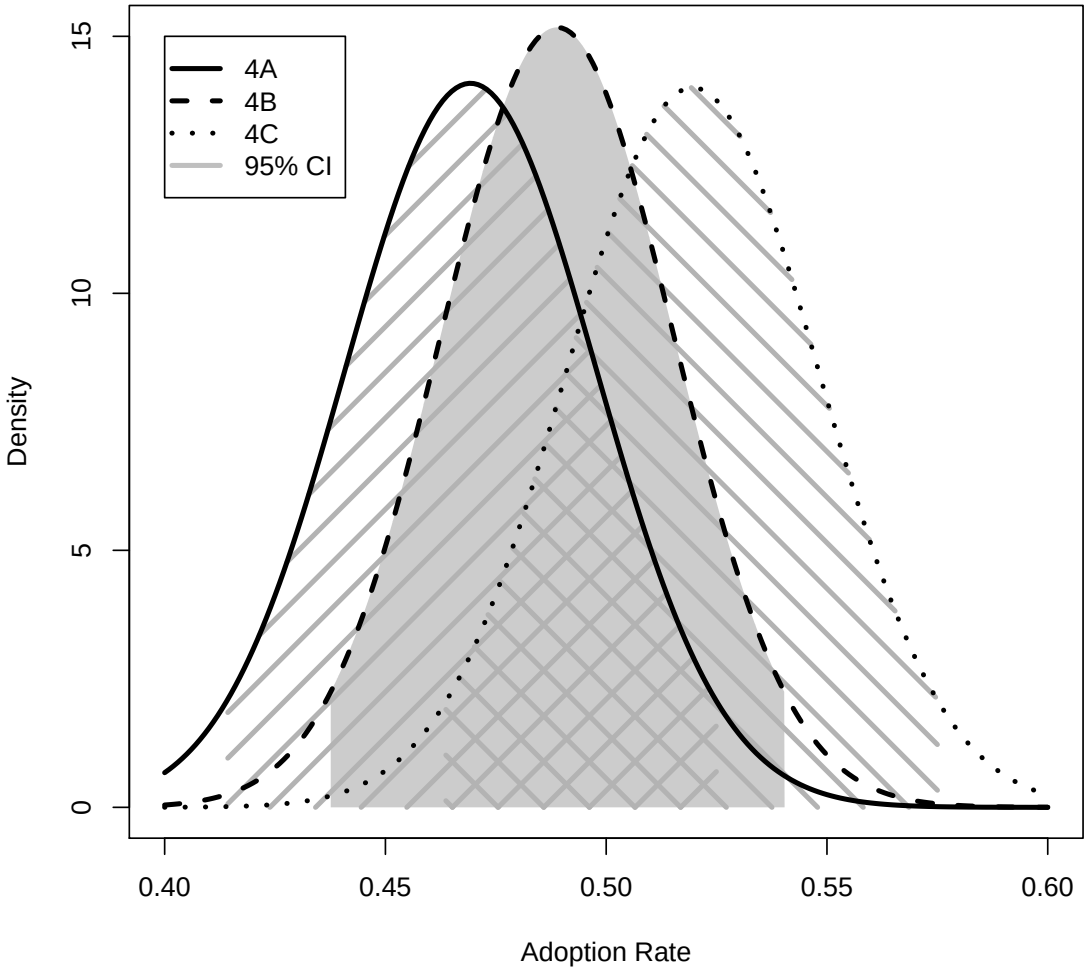


Figure 5: 99.9 (lines) and 95 (shaded) percent confidence intervals for $p_{2013}[4A]$, $p_{2013}[4B]$, and $p_{2013}[4C]$.

6.3 Prepaid Card Experiment Results: Number vs Yes/No

The 2013 Prepaid Card Experiment also pits two competing versions of the 13-category questions against each other. In this case, the category titles and order are identical, but the fundamental question being answered is different for each category in versions 13A and 13B. The latter requires more information from the individual. The sample proportions for the two versions, given in Table 5, are 61 and 64 percent, respectively. While these rates are similar, we verify this through a test of the hypothesis:

$$\begin{aligned} H_0: &\quad p_{2013}[13A] = p_{2013}[13B] \\ H_A: &\quad p_{2013}[13A] \neq p_{2013}[13B]. \end{aligned}$$

The two-sample proportion test results in a p-value of 0.37, and confidence intervals for both question versions are depicted in Figure 6. As with the experiment on re-branding and reordering, it seems that this particular structural difference in the question does not have much effect on the reported adoption rates.

This finding implies that surveys can potentially decrease the survey burden by using question 13B rather than pairing 13A with a follow-up question on the number of cards owned for each adopted category. In the 2013 PCE, respondents who were assigned the latter scheme took an average of 86.5 seconds to respond, with a standard error of 3.3 seconds, while those assigned version 13B took an average of 68.6 seconds, with a standard error of 2.4 seconds. A gain of around 20 seconds could easily allow for the inclusion of an additional question in a time-restricted survey. In addition, the respondent is faced with fewer screens and fewer instructions, hopefully reducing survey fatigue.

6.4 Prepaid Card Experiment Results: Disaggregation

A unique aspect of the 2013 PCE is the design by which the same individuals respond to increasingly disaggregated prepaid card adoption questions. This provides for insight into how the question form influences responses at the individual level. Table 5 indicates that the estimated adoption rate increased from 31 percent to 49 percent to 63 percent as the the number of categories changed from one to four to 13. Thus, over half of individuals who

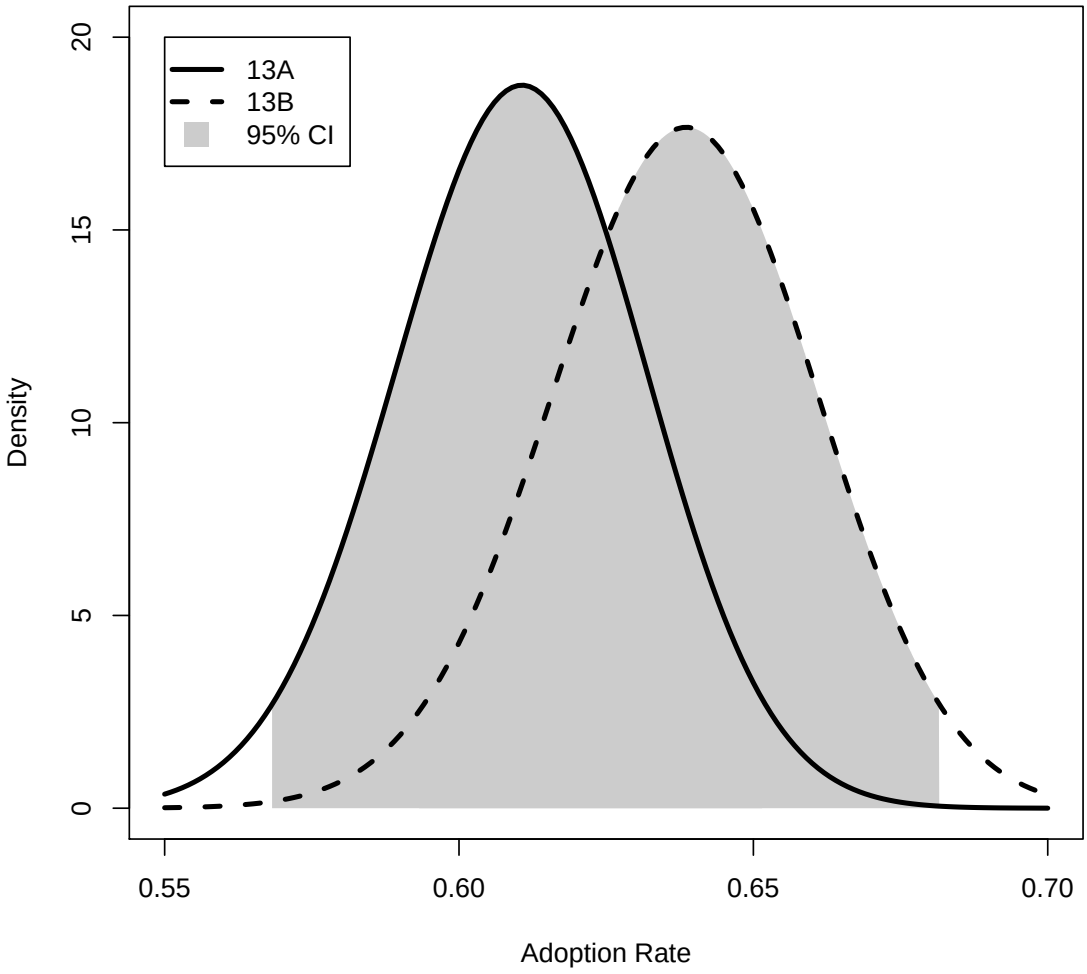


Figure 6: 99.9 (lines) and 95 (shaded) percent confidence intervals for $p_{2013}[13A]$ and $p_{2013}[13B]$.

said they have a prepaid card in the 13-category questions failed to report owning a prepaid card in the simplest version of the question. Even with four categories, around 22 percent of individuals who later claimed to have a prepaid card in 13A or 13B did not report any.

Cognitive interviews suggest that the increased levels of disaggregation prompted recall of prepaid cards that were previously ignored (de Bruin, Gutsche, and Holbrook 2014) . However, it is also possible that increased disaggregation leads to over-reporting of adoption for certain card categories. For example, in a puzzling result, among 148 individuals who

Question 1A				
	Total			
Overall Prepaid Cards	31.4			
Question 4A, 4B, 4C				
	Total	**4A**	**4B**	**4C**
Overall Prepaid Cards	49.4	47.2	49.0	52.0
Government Issued	14.9	15.5	13.9	15.6
Employer Issued	5.3	6.6	3.4	6.3
General Purpose	25.5	27.7	24.6	24.2
Specific Purpose	24.5	23.4	24.1	26.2
Question 13A, 13B				
	Total	**13A**	**13B**	
Overall Prepaid Cards	62.6	61.0	64.4	
Gift Card, Merchant, or Website	30.0	29.4	30.7	
General Purpose (has a logo)	22.2	21.5	22.9	
Public Transportation Card	12.6	10.4	15.1	
Phone Card	4.4	4.0	4.9	
Direct Express	3.6	2.5	4.9	
Electronic Benefit Transfer (EBT)	19.9	19.4	20.5	
Payroll Card	3.0	2.9	3.1	
Incentive Card	1.6	1.5	1.8	
Employer Benefit Card	8.4	8.6	8.0	
Remittance Card	0.6	0.8	0.4	
Merchant Rebate Card	6.2	6.7	5.6	
Location Specific Card	3.1	2.7	3.6	
Other Government Issued	5.5	4.2	6.9	

Table 5: Estimated adoption rates (as percentages) for the 2013 Prepaid Card Experiment.

claimed to have a general purpose card that was not an EBT card, only 56 (38 percent) claimed to have a Bluebird, NetSpend, or Green Dot card, or a general purpose card sponsored by a bank, which we expect to comprise a majority of non-government issued general purpose cards. At the same time, this result could easily reflect a lack of familiarity with general purpose card vendors. If the benefit of improved recall outweighs any false positives, as we suspect, there is strong evidence that disaggregation into 13 categories provides significantly more accurate responses than a general question about prepaid card adoption or even a question with four broad categories (though the response is likely to depend on what those categories are).

We can use the distinct structure of the 2013 PCE to learn more about the process that

drives individuals to forget or ignore adopted prepaid cards. First, we consider how the likelihood of claiming nonadoption in question 1A associates with the number of prepaid card categories later claimed to be adopted in the 13X version. Despite the fact that prepaid cards can belong to several categories, it seems that the number of adopted categories serves as a reasonable proxy for a broader use of prepaid cards. As Figure 7 shows, the likelihood of claiming nonadoption in 1A decreases as the number of categories adopted increases. Perhaps this is because individuals with more cards are more familiar with what constitutes a prepaid card, but it could also be that the likelihood of overlooking all owned cards is lower.

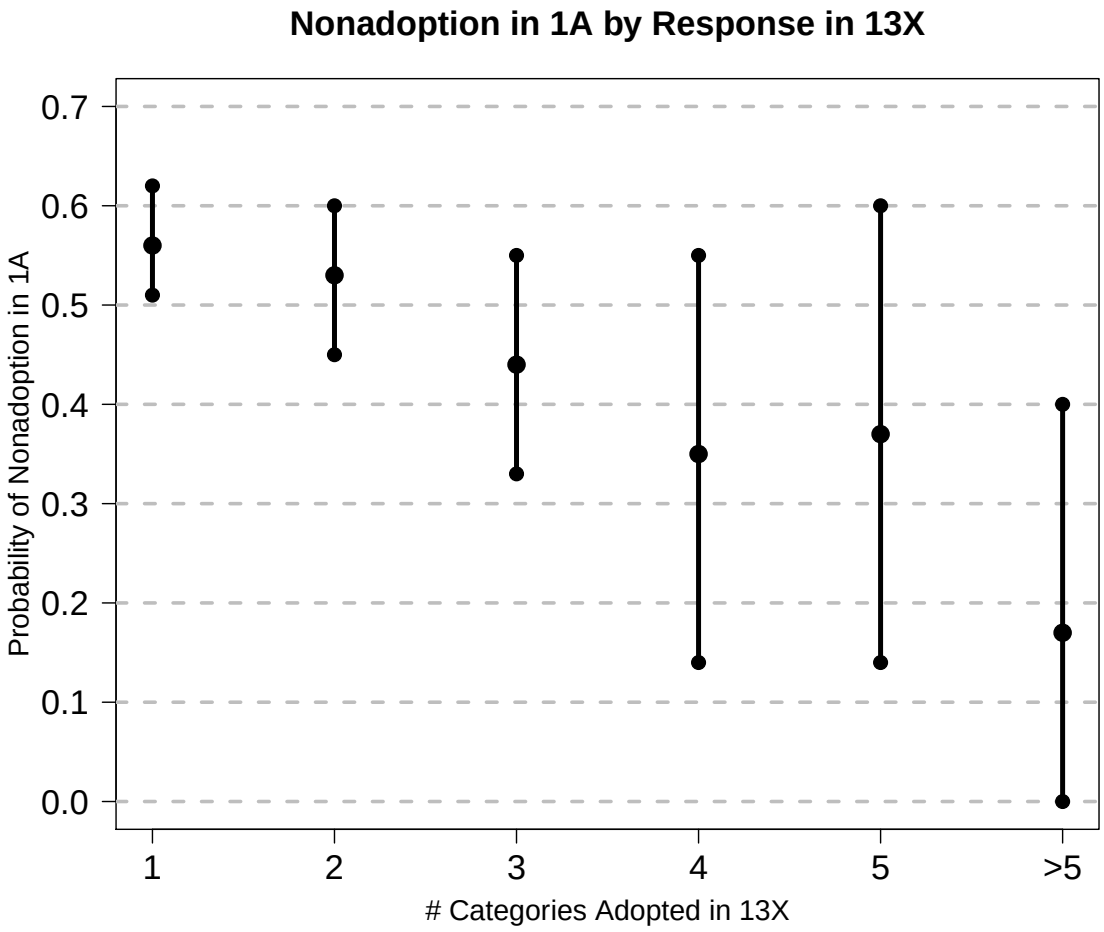


Figure 7: Probability and 95 percent confidence intervals of claiming nonadoption in 1A as a function of number of categories adopted in 13X.

Using our data, we can also estimate lower bounds for the probability of forgetting each card

type. Consider a_{ijt} to be a binary variable with a value of one, indicating that individual i adopts prepaid card category j in year t, with the categories $j = 1, \ldots, 13$, corresponding to those in questions 13A and 13B. Then, we are interested in determining

$$\text{Prob}(x_{it}[1A] = 0 \mid a_{ijt} = 1). \tag{4}$$

The probability in (4) represents a lower bound, because it is possible to forget adoption of card category j and still report $x_{it}[1A] = 1$ if the reported adoption in 1A is based on a different prepaid card category. While we do not know a_{ijt}, we use the category responses for the 13-category versions as proxies, assuming reported adoption implies true adoption. Thus, the probability in (4) is approximated by

$$\text{Prob}(x_{it}[1A] = 0 \mid x_{ijt}[13X]),$$

which is best estimated with the proportion of individuals who claim adoption in the 13-category version, but claimed nonadoption in the one-category version of the question. These probabilities, along with standard errors, are shown in Table 6 and suggest consistently high probabilities of overlooking some cards within each card category. This phenomenon could reflect the fact that people picture different card types when considering prepaid cards and that there does not exist one prevailing representative example of prepaid cards. Gift cards and other location specific cards seem least likely to be forgotten, although this could partially be due to the fact that adopters tend to have several gift cards and the probability of overlooking all of them is low. Nevertheless, assuming accurate responses to the more disaggregated questions, the relative similarity of the lower bound estimates in Table 6 suggests that it is beneficial to prompt directly for each type of card in all sample compositions, as all categories carry a high likelihood of being underestimated otherwise.

7 Discussion

This paper discusses several experiments conducted by the CPRC to better understand the effects of different forms of survey questions on the reported adoption of prepaid cards. The

Card Category	Lower Bound for Prob. of Forgetting	
	Estimate	**95% CI**
Gift Card, Merchant, or Website	.34	(.29,.40)
General Purpose (has a logo)	.41	(.34, .48)
Public Transportation Card	.56	(.47, .65)
Phone Card	.44	(.29,.59)
Direct Express	.40	(.23, .57)
Electronic Benefit Transfer (EBT)	.65	(.59, .72)
Payroll Card	.45	(.26, .64)
Incentive Card	.50	(.23, .77)
Employer Benefit Card	.63	(.52, .74)
Remittance Card	.50	(0,1)
Merchant Rebate Card	.33	(.21, .46)
Location Specific Card	.33	(.16, .51)
Other	.49	(.35, .63)

Table 6: Lower bound and 95 percent confidence interval of probability of forgetting each category of card.

original experiment was conducted within the context of the 2011 SCPC, and all others were incorporated into a 2013 survey specifically commissioned for the study of the measurement of prepaid card adoption.

Perhaps the most profound result in the set of experiments was that increased levels of disaggregation, meaning more categories of cards for which respondents have to provide an answer, lead to higher reported rates of adoption. This finding was robust in that both experiments found it to hold, and the change in adoption rates was significant. This, as noted in Section 3, is consistent with findings in other fields of research.

Of course, there remain questions to be answered. One aspect that our experiments do not allow us to address is the extent to which the adoption rates in the longer versions are accurate. It is possible that the average rates are still underestimating adoption or that the increased number of categories results in spurious reporting. Overall, more detailed experiments, likely based on in-person follow-up interviews to better determine true adoption, are necessary. A further goal of future experiments would be determining the optimal levels of disaggregation along with the corresponding categories, where optimality might be defined as accuracy of results subject to constraints on survey length.

As noted, the 2013 PCE experiment on re-branding and reordering failed to explain the reported decline in adoption rates within the four-category framework from the 2010 SCPC to the 2011 SCPC. This conclusion, of course, assumes that the results are transferable from one subpopulation to the other, which may not be the case. It is also possible that other, more subtle factors explain different reactions to questions 4A and 4B between the SCPC panel and the 2013 PCE sample. For one, the latter had taken the SCPC at least once, and often twice, prior to the 2011 SCPC. Also, there is no doubt that the surveys themselves are different. The prepaid card adoption question appears near the middle of a 30-minute survey, while the 2013 PCE is short and focused around the prepaid card adoption questions.

While the experiments described in this paper relate to a very specific economic and survey topic, we believe the results help us better understand the effect of question forms on collective responses. It should be noted that the experiments described in this paper have influenced the CPRC methodology. For one, the CPRC believes the results from the longer versions of the prepaid card question to be more accurate, and has continued using these versions in ensuing SCPC surveys. In addition, the experiment detailed in Section 6.3 has justified the condensing of two questions regarding prepaid card adoption, one binary question concerning adoption and a second concerning the number owned, into one question taking the form of question 13B. We believe these results are of interest not only to other researchers studying prepaid card adoption, but also to those studying topics concerning a diverse set of subtopics.

A Version 1A

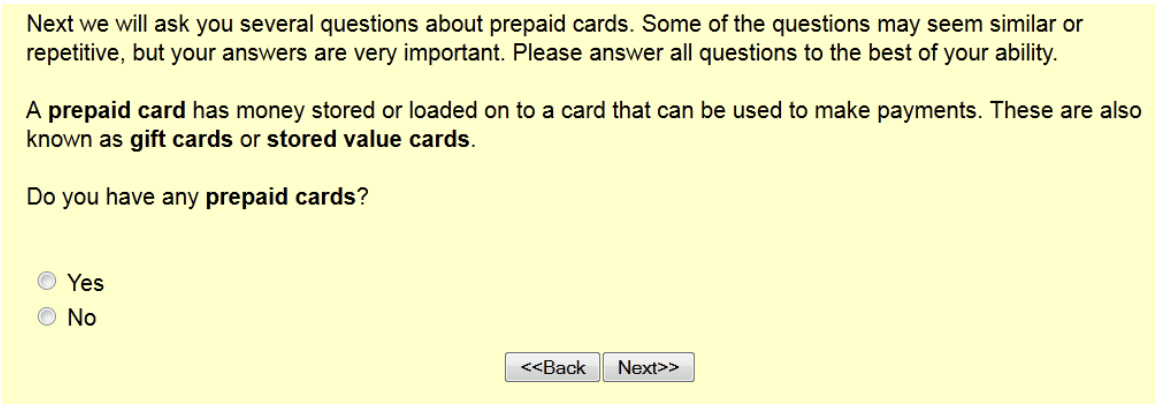


Figure 8: Featured in the 2013 PCE.

B Version 4A

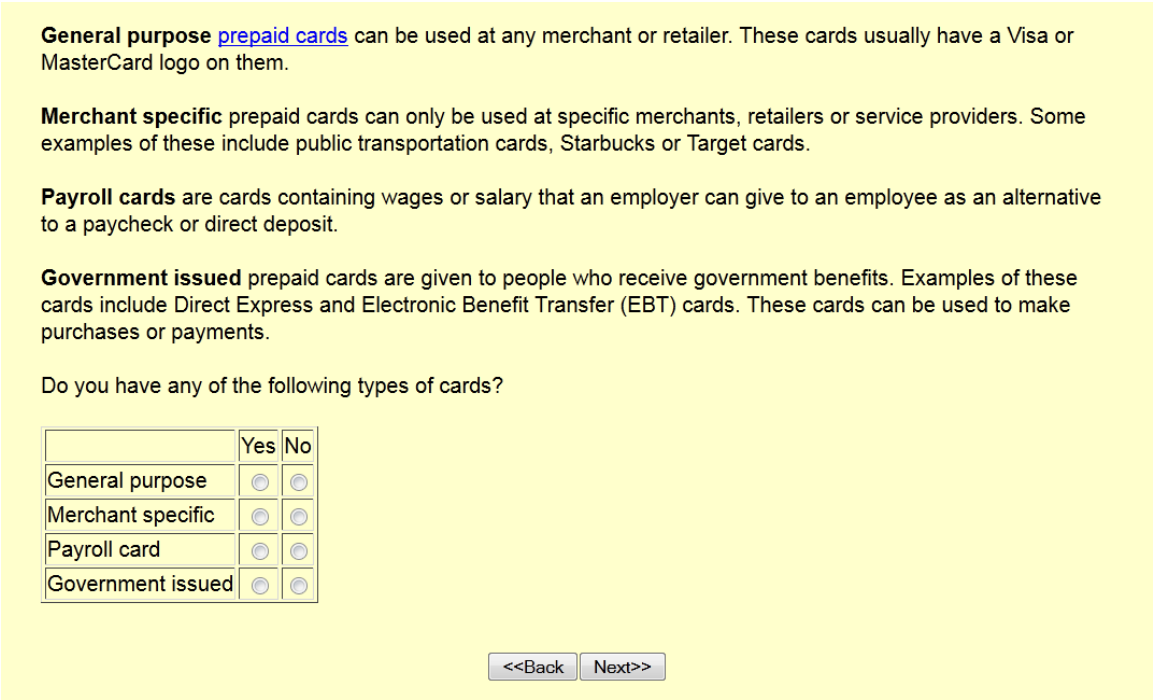


Figure 9: Featured in the 2010 SCPC and the 2013 PCE.

C Version 4B

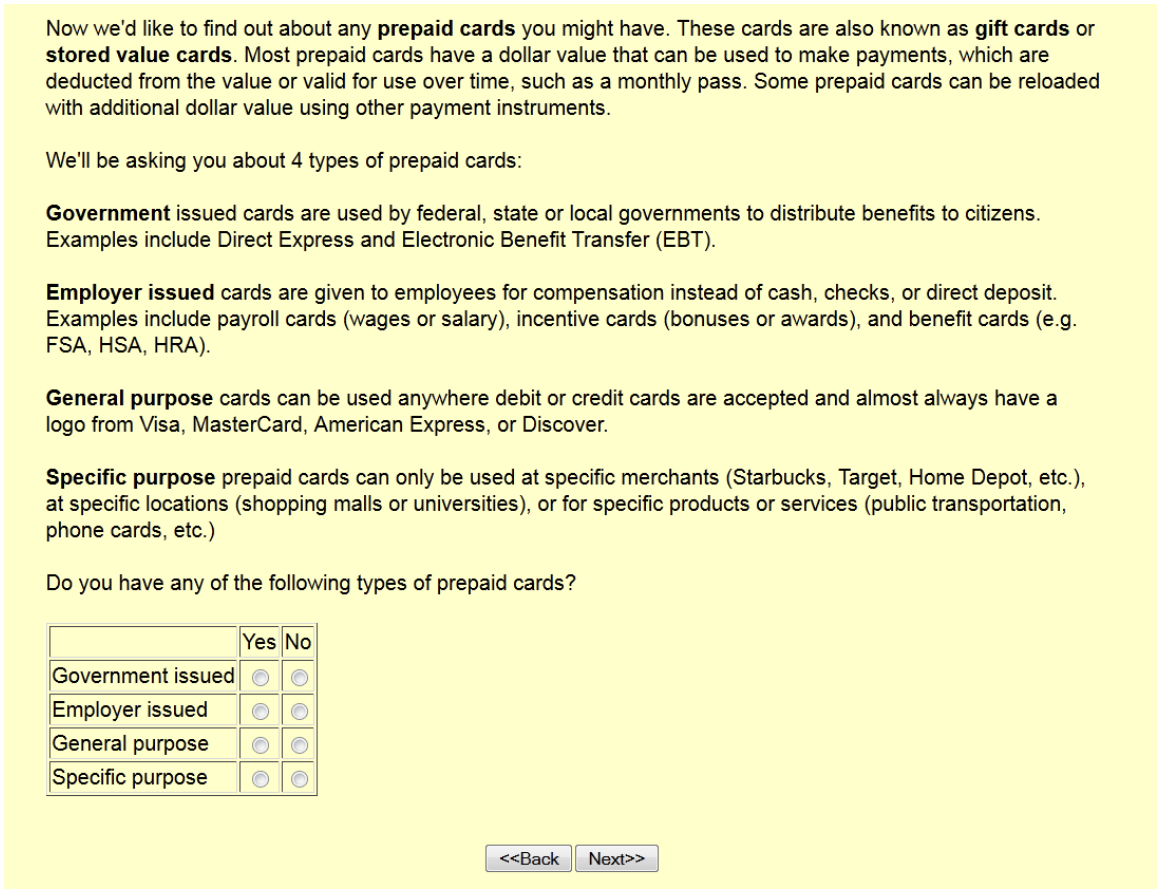
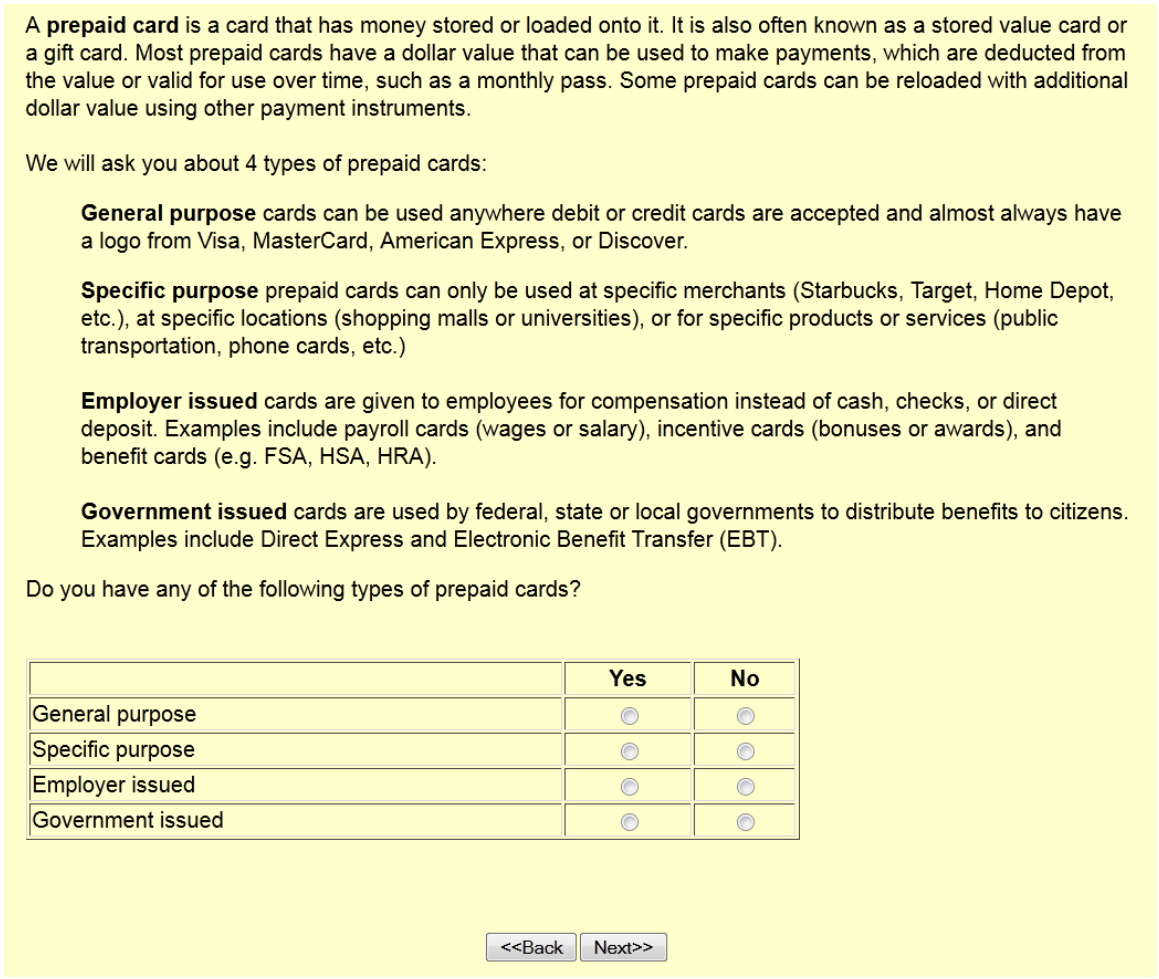


Figure 10: Featured in the 2011 SCPC and the 2013 PCE.

D Version 4C


A **prepaid card** is a card that has money stored or loaded onto it. It is also often known as a stored value card or a gift card. Most prepaid cards have a dollar value that can be used to make payments, which are deducted from the value or valid for use over time, such as a monthly pass. Some prepaid cards can be reloaded with additional dollar value using other payment instruments.

We will ask you about 4 types of prepaid cards:

General purpose cards can be used anywhere debit or credit cards are accepted and almost always have a logo from Visa, MasterCard, American Express, or Discover.

Specific purpose prepaid cards can only be used at specific merchants (Starbucks, Target, Home Depot, etc.), at specific locations (shopping malls or universities), or for specific products or services (public transportation, phone cards, etc.)

Employer issued cards are given to employees for compensation instead of cash, checks, or direct deposit. Examples include payroll cards (wages or salary), incentive cards (bonuses or awards), and benefit cards (e.g. FSA, HSA, HRA).

Government issued cards are used by federal, state or local governments to distribute benefits to citizens. Examples include Direct Express and Electronic Benefit Transfer (EBT).

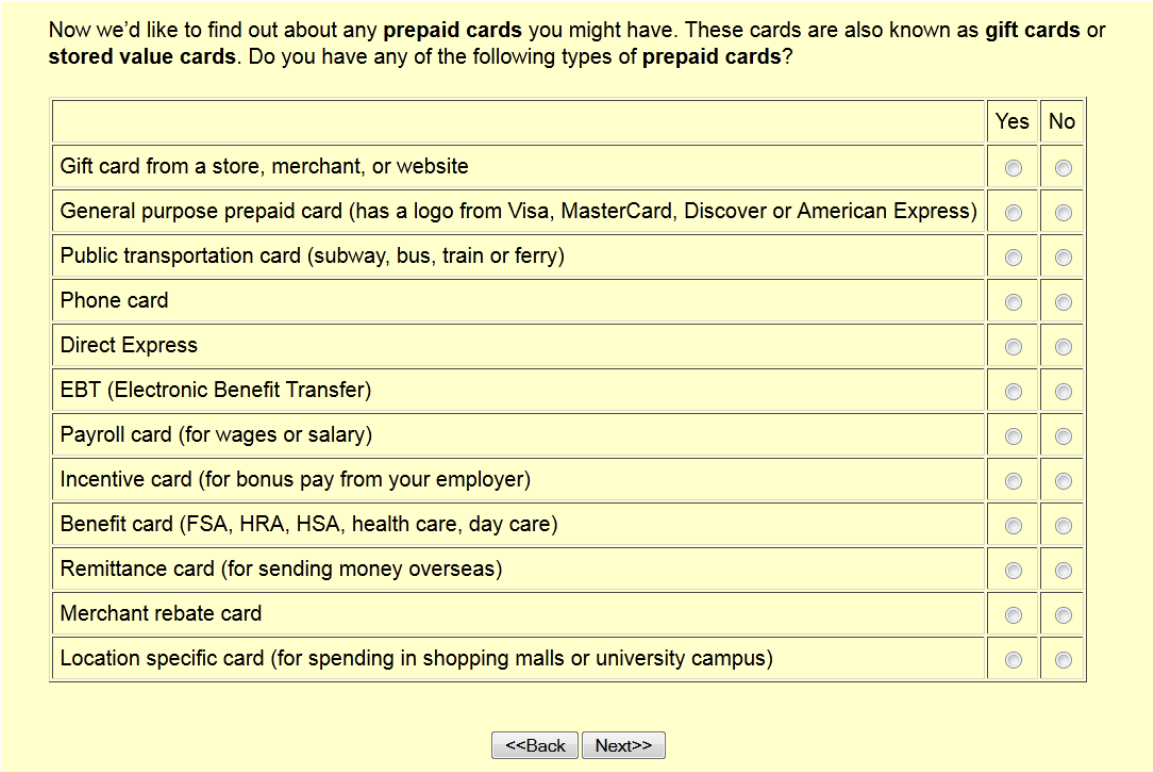
Do you have any of the following types of prepaid cards?

	Yes	No
General purpose	○	○
Specific purpose	○	○
Employer issued	○	○
Government issued	○	○

<<Back Next>>

Figure 11: Featured in the 2013 PCE.

E Version 12A


Now we'd like to find out about any **prepaid cards** you might have. These cards are also known as **gift cards** or **stored value cards**. Do you have any of the following types of **prepaid cards**?

	Yes	No
Gift card from a store, merchant, or website	○	○
General purpose prepaid card (has a logo from Visa, MasterCard, Discover or American Express)	○	○
Public transportation card (subway, bus, train or ferry)	○	○
Phone card	○	○
Direct Express	○	○
EBT (Electronic Benefit Transfer)	○	○
Payroll card (for wages or salary)	○	○
Incentive card (for bonus pay from your employer)	○	○
Benefit card (FSA, HRA, HSA, health care, day care)	○	○
Remittance card (for sending money overseas)	○	○
Merchant rebate card	○	○
Location specific card (for spending in shopping malls or university campus)	○	○

Figure 12: Featured in the 2011 SCPC.

F Version 13A

Now we'd like to find out about any **prepaid cards** you might have. These cards are also known as **gift cards** or **stored value cards**. Some of these cards may have a Visa, MasterCard, Discover or American Express logo on them, but they are not a credit or debit card. Some cards are for specific payments, like a phone card, and others work for many payments, like NetSpend or Green Dot. In addition, there are government-issued prepaid cards such as EBT, Direct Express, SNAP, and TANF. Most prepaid cards have a dollar value that can be used to make payments, which are deducted from the value stored on the card. Other types of prepaid cards may be valid for use over a specific period of time, such as a monthly public transit pass, but the value of these cards is not deducted each time the card is used.

Do you have any of the following types of **prepaid cards**?

	Yes	No
Gift card from a store, merchant, or website (examples: Home Depot, Target, Starbucks, iTunes)	○	○
Public transportation card (subway, bus, train or ferry)	○	○
Phone card	○	○
Direct Express	○	○
EBT, WIC, SNAP, or TANF	○	○
Other federal, state, or local government benefit card	○	○
Payroll card (for wages or salary)	○	○
Employee incentive card (for bonus pay, awards, or recognition from your employer)	○	○
Benefit card (FSA, HRA, HSA, health care, day care)	○	○
Remittance card (for sending money overseas)	○	○
Rebate card from store, merchant, or website	○	○
Location specific card (for spending in shopping malls or university campus)	○	○
General purpose prepaid card (has a logo from Visa, MasterCard, Discover or American Express) (include only cards not reported above)	○	○

Figure 13: Featured in the 2012 SCPC and the 2013 PCE.

G Version 13B

Please tell us how many cards of that type you have.

- *If you do not have any of a type of card, please enter 0 in the box.*
- *Please include electronic "cards" that work with a mobile phone app or to make payments on the internet.*

	Number of cards
Gift card from a store, merchant, or website (examples: Home Depot, Target, Starbucks, iTunes)	
Public transportation card (subway, bus, train or ferry)	
Phone card	
Direct Express	
EBT, WIC, SNAP, or TANF	
Other federal, state, or local government benefit card	
Payroll card (for wages or salary)	
Employee incentive card (for bonus pay, awards, or recognition from your employer)	
Benefit card (FSA, HRA, HSA, health care, day care)	
Remittance card (for sending money overseas)	
Rebate card from store, merchant, or website	
Location specific card (for spending in shopping malls or university campus)	
Other general purpose prepaid card that has a logo from Visa, MasterCard, Discover or American Express • *Include only cards not reported above.*	

Figure 14: Featured in the 2013 PCE.

References

Agresti, Alan. 1996. *An Introduction to Categorical Data Analysis*. New York, New York: Wiley.

Angrisani, Marco, Kevin Foster, and Marcin Hitczenko. 2013. "2010 SCPC: Appendix." Federal Reserve Bank of Boston, Working Paper.

Box, George, Stuart Hunter, and William G. Hunter. 2005. *Statistics for Experimenters*. Wiley, 2nd ed.

Comerford, David, Liam Delaney, and Colm Harmon. 2009. "Experimental Tests of Survey Responses to Expenditure Questions." *Fiscal Studies* 30: 419–433.

Connelly, Sean, Kevin Foster, Scott Schuh, and Joanna Stavins. 2013. "The 2011 – 2012 Survey of Consumer Payment Choice." Federal Reserve Bank of Boston, Working Paper.

Couper, Mick P. 2008. *Designing Effective Web Surveys*. New York, New York: Cambridge University Press.

DCPC. Various Years. "Diary of Consumer Payment Choice." www.bostonfed.org/economic/cprc/DCPC/.

de Bruin, Wandi Bruine, Tania Gutsche, and Mandy B. Holbrook. 2014. "Open-Ended Interviews About Payments." unpublished report.

Dillman, Don A., Jolene D. Smyth, and Leah Melani Christian. 2009. *Internet, Mail and Mixed-Mode Surveys: The Tailored Design Method*. Hoboken, New Jersey: Wiley, 3rd ed.

Federal Reserve Bank of St. Louis. 2011. "Cards, Cards, and More Cards: The Evolution to Prepaid Cards." *Inside the Vault* 16 (2).

Foster, Kevin, Erik Meijer, Scott Schuh, and Michael A. Zabek. 2011. "The 2009 Survey of Consumer Payment Choice No. 11–1." Federal Reserve Public Policy Discussion Papers.

Foster, Kevin, Scott Schuh, and Hanbing Zhang. 2013. "The 2010 Survey of Consumer Payment Choice." Federal Reserve Bank of Boston, Working Paper.

Fox, Susannah. 2002. "Pew Internet Project Data Memo: Online Banking." Technical memo. Pew Internet and American Life Project.

Hayashi, Fumiko, and Emily Cuddy. 2014. "General Purpose Reloadable Prepaid Cards: Penetration, Use, Fees, and Fraud Risks." The Federal Reserve Bank of Kansas City Research Working Papers.

House of Commons Treasury Committee. 2011. "Competition and Choice in Retail Banking." Technical report. U.K. House of Commons, London, England.

Jagger, Pamela, Marty K. Luckert, Abwoli Banana, and Joseph Bahati. 2012. "Asking Questions to Understand Rural Livelihoods: Comparing Disaggregated vs. Aggregated Approaches to Household Livelihood Questionnaires." *World Development* 40 (9): 1810–1823.

Johnson, Norman L., Adrienne W. Kemp, and Samuel Kotz. 2005. *Univariate Discrete Distributions*. Hoboken, New Jersey: Wiley.

Koulayev, Sergei, Marc Rysman, Scott Schuh, and Joanna Stavins. 2013. "Explaining Adoption and Use of Payment Instruments by U.S. Consumers." Federal Reserve Bank of Boston, Working Paper.

Menon, Geeta. 1993. "The Effects of Accessibility of Information in Memory on Judgments of Behavioral Frequencies." *Journal of Consumer Research* 20(3): 431–440.

Nilson. 2013. "The Nilson Report." Technical report. HSN Consultants Inc.

PCE. 2013. "Prepaid Card Experiment." http://www.bostonfed.org/economic/cprc/.

Schuh, Scott, and Joanna Stavins. 2010. "Why Are (Some) Consumers (Finally) Writing Fewer Checks? The Role of Payment Characteristics." *Journal of Banking and Finance* 34(8): 1745–1758.

SCPC. Various Years. "Suvey of Consumer Payment Choice." www.bostonfed.org/economic/cprc/SCPC/. Consumer Payment Research Center, Federal Reserve.

Sloane, Tim. 2012. "The Ninth Annual U.S. Prepaid Cards Markets Forecast (2012-2015)." Technical report. Mercator Advisory Group.

System, Federal Reserve. 2013. "2013 Federal Reserve Payments Study." Technical report. Federal Reserve System.

Tourangeau, Roger, Lance J. Rips, and Kenneth Rasinski. 2000. *The Psychology of Survey Response*. Cambridge, United Kingdom: Cambridge University Press.

Winter, Joachim. 2004. "Response Bias in Survey-Based Measure of Household Consumption." *Economic Bulletin* 3: 1–12.

Wishusen, Stephanie M., Robert M. Hunt, and James van Opstal. 2012. "Consumers' Use of Prepaid Cards: A Transaction-Based Analysis." Technical report. Federal Reserve Bank of Philadelphia, Philadelphia, PA.