EUROPEAN CENTRAL BANK

EUROSYSTEM

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INTEGRATION AND INNOVATION

WORKING PAPER SERIES

NO 1141 / DECEMBER 2009

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In 2009 all ECB publications feature a motif taken from the €200 banknote.

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Retail payments: integration and innovation

"Retail payments: integration and innovation" was the title of the joint conference organised by the European Central Bank (ECB) and De Nederlandsche Bank (DNB) in Frankfurt am Main on 25 and 26 May 2009. Around 200 high-level policy-makers, academics, experts and central bankers from more than 30 countries of all five continents attended the conference, reflecting the high level of interest in retail payments.

The aim of the conference was to better understand current developments in retail payment markets and to identify possible future trends, by bringing together policy conduct, research activities and market practice. The conference was organised around two major topics: first, the economic and regulatory implications of a more integrated retail payments market and, second, the strands of innovation and modernisation in the retail payments business. To make innovations successful, expectations and requirements of retail payment users have to be taken seriously. The conference has shown that these expectations and requirements are strongly influenced by the growing demand for alternative banking solutions, the increasing international mobility of individuals and companies, a loss of trust in the banking industry and major social trends such as the ageing population in developed countries. There are signs that customers see a need for more innovative payment solutions. Overall, the conference led to valuable findings which will further stimulate our efforts to foster the economic underpinnings of innovation and integration in retail banking and payments.

We would like to take this opportunity to thank all participants in the conference. In particular, we would like to acknowledge the valuable contributions of all presenters, discussants, session chairs and panellists, whose names can be found in the enclosed conference programme. Their main statements are summarised in the ECB-DNB official conference summary. Twelve papers related to the conference have been accepted for publication in this special series of the ECB Working Papers Series.

Behind the scenes, a number of colleagues from the ECB and DNB contributed to both the organisation of the conference and the preparation of this conference report. In alphabetical order, many thanks to Alexander Al-Haschimi, Wilko Bolt, Hans Brits, Maria Foskolou, Susan Germain de Urday, Philipp Hartmann, Päivi Heikkinen, Monika Hempel, Cornelia Holthausen, Nicole Jonker, Anneke Kosse, Thomas Lammer, Johannes Lindner, Tobias Linzert, Daniela Russo, Wiebe Ruttenberg, Heiko Schmiedel, Francisco Tur Hartmann, Liisa Väisänen, and Pirjo Väkeväinen.

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CONTENTS

Abstract: Card issuers have mainly relied on rewards programs as their main strategic driver to increase electronic payments. However, there is scarce evidence on the effectiveness of rewards programs. This paper offers novel evidence on two key issues: i) it measures the impact of rewards programs on the use of payment cards; and ii) it quantifies their economic impact in terms of the cash substitution. The results show that rewards may significantly modify preferences for card payments, their economic impact vary significantly across types of rewards and merchant activities and rewards seem to be more effective on average for debit cardholders.

Classification JEL: G20, D12, E41.
Keywords: payment cards, rewards, preferences, merchants, cardholders.

1. Introduction

In recent years, some studies have highlighted the cost and convenience benefits of using retail electronic payments and, in particular, card payment instruments[1]. However, cash and other paper-based payment instruments are still being largely used by consumers in most developed countries. Card issuers have incurred substantial costs to launch incentive programs to stimulate payments with debit and credit cards, presumably assuming that these rewards would significantly increase the use of these cards based on standard comparisons[2]. However, card issuers are facing a great uncertainty on how to allocate the resources to make the incentive programs as effective as desired. On a microeconomic basis, little is known on how to encourage consumers to increase the use of debit and credit cards. Thus, understanding how rewards programs affect consumers' preferences for payment instruments has become a key strategic question in the financial industry[3]. This limited knowledge is, at least partially, due to the lack of comprehensive microeconomic data on consumers' preferences towards payment instruments and on the related role of incentive-related mechanisms.[4]

The main goal of this paper is to empirically examine both the effects of incentive programs on payment preferences and the impact on the substitution of cash by cards. The contributions of this study are twofold: i) this is the first empirical study considering different types of rewards to estimate the relative impact of these rewards

[1] Humphrey *et al.* (2001,.2003) estimate that "if a country moves from a wholly paper-based payment system to close to an all electronic system, it may save 1% or more of its annual GDP once transaction costs are absorbed". Similar benefits have been estimated for Spain in Carbó *et al.* (2003).

[2] For example, yearly average purchases with a standard Visa card (with no access to incentive programs) in the US are $5,200, while yearly average purchases with VISA cards incorporating reward programs are $26,100 (Levitin, 2008)

[3] Levitin (2008) notes that cards incorporating any type of reward in the U.S have risen from less than 25% of total cards in 2001 to nearly 60% in 2005. Two-thirds of all US cardholders had a reward card in 2005 and 80% of credit card transactions in 2005 were made with rewards cards.

[4] Most of the previous studies on the choice of payment instruments have been based on aggregate household surveys offering limited information on attitudes towards cards and no information on the role of incentives. See, for example, Kennickell and Kwast (1997) Carow and Staten (1999), Stavins (2001), Hayashi and Klee (2003) and Zinman (2009).

on the preferences for cards relative to cash; ii) it offers an estimation of the aggregate economic impact of reward programs on the use of cards across merchant activities. In order to address these goals, this paper uses unique survey data to investigate how incentive programs change cardholder preferences combining demand and comprehensive information on rewards programs across different merchant activities.

The paper is structured as follows. The main theoretical and empirical contributions on the role of rewards programs and, in particular, the relevance of these programs in the payment cards market are addressed in Section 2 along with the main hypotheses of this study. An econometric model of rational consumer choice is presented as the main empirical framework in section 3. Data and the specific estimation methodology are explored in section 4. In section 5, we estimate binomial logit models of card (vs. cash) usage for different types of merchant activities. Using the main estimates of logit models as an input, section 6 offers simulations on the expected shifts from cash to cards by cardholders when incentive programs are applied. These simulations help us evaluate the economic impact of the rewards programs. The paper ends with a brief summary of the main conclusions in section 7.

2. Background and hypotheses

As prior research and common wisdom suggest, consumers are tempted by suggested benefits and rewards. Most studies on the role of rewards programs for general purchases (not specifically for card purchases) have been undertaken from a behavioral perspective using laboratory or survey evidence. The assumption that many consumers are sensitive to the influence of promotions and rewards is dependent on the relationship between the persuasion quality of these incentives and the way consumers cope with these persuasion attempts as suggested in largely known contributions in this area such as, inter alia, Kahneman and Tverski (1979) or Hines and Thaler (1995). These relationships, however, become more complex when incentives are related to the adoption of a technology itself and when consumers' knowledge on the product and the incentives are diverse (Friestad and Wright, 1994). This is likely the case of card payment instruments.

Most of these behavioral studies have shown significantly large and positive effects of incentive programs (reward points, discounts, and cash-back) for general purchases (Hsee *et al.*, 2003). Rewards in certain products have also been shown to produce spillover effects in other related products, a result that also may pose important implications for the election between paper-based and card-based payment instruments. In particular, Heilman *et al.* (2002) show that when consumers are provided with unexpected cents-off coupons for the purchase of one product in a store they do not only increase demand for that single item but also enhance spending overall. Similarly, Janakiraman *et al.* (2006) examined how unexpected changes in the marketing mix of one product in a retail setting can influence demand for other, unrelated items. Where incentive programs were understood as a strategic variable in the marketing mix, the consumer response to both positive and negative changes in either the price or quality of a given product was such that positive changes increased total spending on other items and negative changes reduced it.

Among these behavioral studies, there is only few dealing with preferences towards cards, although none of them particularly examine the role of incentive programs in card payments. Some early research in the area of consumer behavior already offered intriguing findings for card payments. In particular, Feinberg (1986) and Soman (2001) use survey data on consumer transactions to compare the spending of consumers who paid with credit cards with those who used cash or checks, and they find that the former spend more. These studies also find that consumers are more likely to use credit cards to purchase durable products rather than short-lived products, suggesting that preferences for payment instruments differ significantly across merchant activities. These studies also suggest that the choice of a payment mechanism is often driven by simpler considerations like convenience, acceptability, accessibility and habit.

In the banking literature, however, although some studies have examined preferences towards payment cards, most of them have not referred to rewards programs. Gross and Souleles (2002a and 2002b) have shown that consumers' preferences towards cards are not linear and they may vary considerably when contractual conditions (such interest rates, repayment schemes or rewards programs) change. In the case of credit cards, these changes in contractual conditions may well explain the stickiness of the use of credit cards to interest rates (Ausubel, 1991; Calem and Mester, 1995). These contractual conditions have been also shown to modify the rationality of the use of cards (Brito and Hartley, 1995). Carow and Staten (1999) estimate the probability of using debit cards, credit cards, and cash for gasoline purchases in relation to demographic and economic characteristics of the consumers. The results show that consumers are more likely to use cash when they are middle age and have lower levels of schooling, lower income and hold less credit cards. Kennickell and Kwast (1997) analyze the influence of demographic characteristics on the likelihood of electronic payment instrument usage. These studies find that consumer-level variables such as schooling or financial wealth increase the likelihood of electronic payment instrument usage. As shown by Chakravorti and Roson (2004) from a theoretical standpoint some of the benefits provided in card networks for different consumers and merchants may be related to incentive programs provided by different issuer banks. Similarly, Arango and Taylor (2006) found that aggressive competition in the credit card industry in Canada has meant that consumers actually pay zero or even negative transaction fees through rewards, discounts and other programs. These authors suggest that the purpose of these incentives is to encourage consumer spending and increase card issuer revenue in the form of finance charges and interchange fees. Other recent empirical studies have also explored consumer preferences towards payment instruments using surveys on household finances (Hayashi and Klee, 2003; Mester, 2003; Klee, 2006; Rysman, 2007 and Zinman, 2008). These surveys generally have information on household income, assets and demographics, which are found to be good predictors of the preferences for different payment instruments. To our knowledge, only Ching and Hayashi (2008) identify some general effects of rewards on consumer choice of payment instruments. They find that consumers with credit card rewards use credit cards more intensively than those without rewards.

Our main empirical hypothesis is that rewards programs may significantly affect the use of cards relative to other payment instruments. We also hypothesize that the effects of these rewards may vary across merchant activities and on the type of incentive applied. Unlike Ching and Hayashi (2008) -which only identify cardholders using cards with and without rewards- we provide information on the type of rewards, the relative impact of these rewards on the preferences for cards relative to paper-based instruments and the aggregate economic impact of the effects of reward programs across merchant activities.

3. An Econometric Model of Rational Consumer Choice

In order to place our hypotheses, the general empirical framework is based on hedonic models of demand in markets with differentiated products (Lancaster, 1971 and McFadden, 1974). These models allow for heterogeneous preferences for card usage relative to other payment instruments based on their comparative attributes. Consumers have two options for payment: i) paper-based payment instruments (cash)[5] and ii) electronic-based payment instruments (e.g. credit or debit card). Our behavioral model of consumers' choice incorporates cards' incentive programs to the standard consumer characteristics and consumer perceptions. Considering this set of variables, the model assumes that cardholders will use at the checkout the payment instrument (cash or cards) with a higher utility:

$$\begin{aligned} &V_{ijk} = \gamma X_i + \beta Z_{ij} + \phi C_{ij} + \delta G_k \\ &\forall i = 1,\ldots,m \\ &\forall j = 1,\ldots,n \\ &\forall k = 1,\ldots,r \end{aligned} \tag{1}$$

Where V_{ijk} is the consumer *i*'s utility of using the payment instrument *j* considering a set of *k* variables showing consumer's perceptions. The vector x_i includes a set of cardholders characteristics, Z_{ij} is a vector of attributes[6] of the payment instrument *j* that can be observed by consumer *i*. The vector C_{ij} controls if the payment instrument *j* used by the consumer *i* incorporates any type of incentive program. Finally, vector G_k includes variables showing consumer's perceptions that could affect payment behavior at the checkout. $\gamma, \beta, \phi_j, \delta$ are the parameters to be estimated .

The random utility theory (McFadden, 1974; ,Domencich and McFadden, 1975 and Louviere *et al*., 2000) assumes that one part of the utility function is deterministic in each of the individual utility functions. This portion of the utility function is known with certainty by the consumer who takes a decision. A second part of the utility function embodies a random component that groups measurement errors and non-observable

[5] According to the *Blue Book of Payments* of the European Central Bank (http://sdw.ecb.europa.eu/browse.do?node=2745), only 4.2% of all retail payment transactions in Spain in 2005 were undertaken with checks and they are mostly employed in real estate purchase contracts and not for payment transactions at the point of sale.

[6] Similar to Ching and Hayashi (2008), this type of data allows us to control for unobserved consumer heterogeneity that could lead to considerable bias in estimates of the effect of rewards programs.

attributes of the consumers' decisions. Additionally, the error term in the econometric specification is assumed to be jointly distributed according to the extreme value distribution. With these ingredients, the specification of consumer utility *i* is:

$$U_{ijk} = V_{ijk} + \varepsilon_{ijk} = \gamma X_i + \beta Z_{ij} + \phi C_{ij} + \delta G_k + \varepsilon_{ijk} \tag{2}$$

A latent dichotomous variable y_{ijk} is also added and takes the value "1" if the cardholder *i* uses the payment instrument *j* (cards) given a set of *k* variables showing consumer’s perceptions, and zero otherwise. Hence, the probability that an individual chooses a certain payment alternative *j* is the probability that this alternative offers higher utility to the cardholder:

$$U_{ijk}(y_{ijk} = 1, X_i, Z_{ij}, C_{ij}, G_k) \geq U_{iwk}(y_{iwk} = 0, X_i, Z_{iw}, C_{iw}, G_k) \quad \forall \mathrm{j} \neq \mathrm{w} \tag{3}$$

The estimation method is a logit model with the following specification:

$$y_{ijk} = f(X_i, Z_{ij}, C_{ij}, G_k) + \varepsilon_{ijk} \tag{4}$$

In equation (4) consumers choose the payment instrument that they prefer for every type of transaction and that offers them the higher utility, given a set of preferences and the role of incentive programs. We assume that consumers have access to all payment options.

4. Data and estimation methodology

4.1 Logit estimation procedure

In order to analyse consumers’ preferences for payment instruments and the role of incentive programs, equation (4) is estimated as a binary mixed logit model. The mixed logit model combines a multinomial logit (characteristics of the cardholders in our case) and a conditional logit (characteristics of the preferences for the payment instrument in our case). Since the empirical analysis basically compares (debit and credit) cards with cash transactions, the respective probabilities of usage add up to one for any given transaction. A mixed logit regression analysis isolates the effects of the individual characteristics and incentive programs on the use of payment instruments (cards versus cash), when other factors are held constant. The dependent (binomial) variable shows whether a consumer uses a payment card or cash at different types of merchant outlets. In the case of payment cards we also control whether cardholders enjoy any type of rewards. Equation (4) is also estimated for different merchant activities and for each payment instrument separately.

According to the logit model the probability that a consumer prefers cards to cash ($y_i = 1$) is given by the following non-linear function:

$$P(y_i = 1 | x_i) = \exp(\alpha + \beta x_i) / (1 + \exp(\alpha + \beta x_i)) \quad (5)$$

The logit model fits the best possible curve to the data, given this functional form and higher values of α and β correspond to higher success probabilities. In order to interpret the results appropriately, the logit results are presented in terms of marginal effects[7], which are computed as $\partial \Pr(y_i = 1 | x) / \partial x_i$, where $\Pr(y_i = 1 | x)$ is the probability of using the given electronic payment instrument given the changes observed in variable x_i. Our specification includes two main sets of explanatory variables. The first set corresponds to consumer characteristics: income, age, education, sex, members of the household that financially contribute to household expenditures, frequency of the use of a car, travel frequency and population of the territorial area where the consumer lives. The second set includes card-specific attributes: the availability of debit and/or credit rewards programs; the type of rewards (discounts, points, gifts and cash-back) and the attributes of the payment instruments that determine consumer preferences towards these

[7] The marginal effects for one variable are estimated holding the rest of the variables constant at their mean values.

instruments (convenience[8], habits, control of domestic expenditure,…). A critical control in the second group is the easiness and availability of cash withdrawal delivery channels (ATMs) as well as the acceptance of the card at the point of sale (POS) by merchants. The decision on whether to use cash or cards is conditional on the availability cash delivery channels. As noted by Saloner and Shepard (1995), the lower the geographic dispersion of ATMs (POS) the greater the benefits to cardholders wishing to use cash (cards), who are able to access ATMs (POS) in a wide variety of locations. We also include regional dummies as controls for the geographical location of the cardholders. All the variables are defined in the Appendix.

4.2 Data and main variables

In order to study, we rely on survey evidence obtained from a set responses to a 2005 national survey of 2,961 individuals using cards.[9] The individuals were asked 150 questions on the use of three payment instruments: debit cards, credit cards and cash. The survey includes information on consumers' demographic characteristics, payment behavior, self-reported payment preferences, attitudes towards incentive programs, and frequency of use of the different payment methods by merchant sector and perceptions on comparable attributes of the different payment methods (comfort, convenience, speed, safety, etc.).

The responses were coded as binary-choice variables taking the value 1 if the answer was "yes" and 0 if the answer was "no". Table 1 provides a statistical summary of the variables included in the empirical analysis including both consumer characteristics and attitudes toward the different payment instruments. As for the

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[8] Convenience incorporates a group of questions in the survey where consumers expressed their perceptions on the price of cards vs. cash. Therefore, attitudes towards payment instruments based upon cost perceptions are controlled for.

[9] This survey was undertaken by one of the major card networks in Spain, Euro6000 (which in 2005 represented a 39% of all card transactions at the point of sale in Spain).

different type of rewards considered and their relative importance, Table 2 shows that 30.6% of cardholders in the sample receive discounts, 42.45 % receive points, 7.23% receive gifts and 10.64 % receive cash-back. Approximately 16.1% of consumers receive points from debit cards only; 10.6% of consumers receive cash-back; and 11.48% of consumers receive discounts from debit cards only, 34.11% of cardholders which use only debit cards with some type of incentive program while 56.81 % of credit cardholders enjoy some type of reward.

Our data also contains information on consumers' preferences towards payment instruments across merchant activities. Heterogeneity of the preferences across these activities may also determine the relevance of undertaking the analysis using a breakdown by merchant sector. Figure 1 shows the share of different payment instruments across merchant activities in 2005 according to the survey data[10]. The percentages are based on the preferences expressed by every respondent. Merchant customers mainly use cash in grocery stores (92.3%), supermarkets (58.0%), gas stations (54.0%), restaurants (74.1%) and parking/toll ways (86.4%). However, cards are the preferred method of payment in department stores (70.9%) and hotels and travel (55.3%). There is an intuitive and anecdotal explanation for these differences. In particular, there are merchant sectors (e.g. grocery stores) in which due to idiosyncratic reasons and to the (usually small) size of transactions, the acceptance of card payments is very low. There are other groups (e.g. department stores) where the use of cards is widespread. Finally, there is another group in between where both cards and cash may be alternatively used (e.g. supermarkets, gas stations, restaurants, hotels and travel) and, therefore, consumer preferences may play a more significant role on the choice of the payment instrument than other idiosyncratic reasons. Considering the heterogeneity

[10] In the case of cards, the percentage values shown in Figure 1 exclusively correspond to cards provided by bank issuers and not those provided by certain merchants such as department stores.

across sectors, it seems to be relevant to exploit this information in our sample and to quantify the total impact of incentive programs on the use of cards across different merchant outlets.

5. Incentive Programs and consumer payment preferences: Logit results

There are two set of logit results. The first refers to the estimations for all sectors and the effects of rewards programs overall (without distinguishing the type or reward or the merchant activity). The second set of results summarizes the main coefficients of the rewards parameters when the estimations are undertaken for different type of merchant activities and/or different type of rewards program.

Table 3 shows the results for all sectors and distinguishing between all cardholders, credit and debit cardholders. These results show the effects of enjoying rewards programs no matter the type of reward. Marginal effects for unit increase in *x* are shown as "*m.e*" in the tables. All coefficients related to the role of incentive programs are positive and significant and exhibit one of the highest marginal effects on the probability of using a card instead of cash for consumption purposes. In particular, cardholders enjoying rewards programs may increase the probability of using cards (relative to cash) by 3.8%. This marginal effect, however, is found to be larger for debit cardholders (5.0%) that for credit cardholders (2.1%).

Among demographic characteristics, age is negatively and significantly related to the use of cards relative to cash, showing an average marginal effect of 6.9%. The square of the log age variable is significant and positive and suggests that the relationship between age and the use of cards reaches a maximum and then turn to be negative (lower use of cash for the older cardholders). Similarly, the level of schooling is positively and significantly related to the use of debit cards. In particular, debit cardholders with university studies present a marginal effect of 5.9% on the probability of using cards relative to cash.

The use of cars and the frequency of travel also have a positive and significant impact on the probability of using cards (1.5% and 0.5%, respectively). This is also the case of cardholders living in the larger cities in terms of population (Madrid and Barcelona) where the marginal effect on the probability of using cards relative to cash increases by 2.2%.

As for the characteristics of the payment instruments, the control of domestic spending (variable P2_T) is found to be negatively and significantly related to the use of cards (-0.6%). This effect seems to be higher for debit cardholders (-1.4%) than for credit cardholders (-0.2%). Similarly, habits (variable P4_T) also reduce the probability of using cards relative to cash for consumption purposes (-1.4%) and this effect is again found to be larger in absolute terms for debit cardholders (-2.5%) than for credit cardholders (-0.6%). As expected, the easiness of using ATMs (variable P5_T) is found to be negatively and significantly related to the probability of using cards relative to cash while the acceptance of the card (variable P6_T) at the point of sale is positively and significantly related to the use of cards with the marginal effects being -0.4% and 0.4%, respectively.

Table 4 shows the logit results distinguishing different types of incentive programs and/or merchant activities. In this second set of estimations, only the parameters corresponding to rewards programs are shown. The rest of the parameters are not shown for simplicity although they are in line with those obtained in the baseline estimations shown in Table 3[11]. Panel A in Table 4 shows the effects of the different

[11] The full estimations are available upon request. Overall, the results by merchant activities confirm that card usage (relative to cash) appears to be mainly determined by incentive programs, age, education and, to a lesser extent, by sex and geographical variables (such as population or regional dummies). Interestingly, cardholders with an irregular source of income are more inclined to use cards. These results

type of rewards programs for all cardholders, debit cardholders and credit cardholders. Discounts, points and cash-back are generally found to have a positive and significant effect on the use of cards relative to cash while gifts are not significant. Cash-back incentives exhibit the higher marginal effect (4.1%) being larger for debit cardholders (3.9%) than for credit cardholders (3.5%). The differences in the effect of rewards between debit and credit cardholders are even larger in the case of discounts (3.4% for debit and 0.2% for credit) and points (2.5% for debit and 1.5% for credit).

Panel B shows the average effect of rewards (without distinguishing the type of reward) by merchant activity. Rewards are found to affect preferences for cards (relative to cash) for consumption purposes in 6 out of the 8 sectors considered. In particular, the breakdown by sector permits to identify a high positive and significant effect of rewards of card usage in department stores (8.5%), hotels and travel (6.9%), supermarkets (6.7%), gas stations (4.5%), restaurants (3.4%) and boutiques (3.1%).

Panel C shows the effects of the different type of rewards by merchant activities. These results confirm that cash-back appears to be the most effective incentive to foster the use of cards relative to cash. In particular, the marginal effects of cash-back are found to be positive and significant in supermarkets (6.4%), department stores (7.0%), boutiques (1.1%), gas stations (0.9%) and parking and tolls (3.7%). Similarly, discounts exhibit a positive and significant marginal effect on the probability of using cards in department stores (5.0%), gas stations (1.1%) and hotels and travel (6.2%) while point have a positive and significant marginal effect on department stores (4.0%), gas stations (6.2%) and restaurants (3.6%). However, no significant effect is found for gifts.

These estimations reveal that incentive programs have a high potential in promoting the use of cards instead of cash for consumption purposes although there are

are in line with those found by Kennickell and Kwast (1997), Carow and Staten (1999), and Stavins (2001).

significant differences depending on the type of reward and the merchant activity. However, we also wonder what is the aggregate economic impact of these factors and, in particular, a key unexplored issue: to what extent rewards program contribute to the substitution of cards for cash in the economy.

6. Economic impact of the incentive programs

6.1 Methodology

The economic impact of the substitution of cash by electronic payment instruments has received substantial attention in studies considering the effects of new technologies based on comparisons between users and non-users of the technology. These studies have mainly relied on Baumol-Tobin models of the demand for currency (e.g. Avery, 1986; Mulligan, 1997; Mulligan and Sala-i-Martin, 2000). Attanasio et al (2002) have even considered the adoption of new transaction technologies on the demand for currency and, in particular the effects of ATM transactions. In these models, the effects of new technologies is based on comparisons between users and non-users of the technology or simply introduced as a control variable. However, the economic impact of the role of incentive programs in the demand for cash has not been yet studied. In this section, we investigate the economic impact of incentive programs on the use of payment instruments comparing the use of cards (relative to cash) between cardholders enjoying any type or rewards and those without rewards. In order to perform this analysis, the main ingredients are the predicted usage shares assigned to cards relative to cash from previous logit estimations. The main aim of this empirical analysis is to extrapolate the sample estimations of the impact of rewards on cards vs. card usage to i) specific groups of population: all cardholders, debit cardholders and credit cardholders; and ii) eight different merchant sectors. We then need to compute the average shares for each one of these groups using a representative weighting factor across these groups in Spain. According to logit estimations age seems to be an appropriate discriminating factor and it is the only continuous variable within the set of explanatory factors. To compute this average, we first compute the share of card usage (relative to cash) for consumers of different ages year by year from 17 to 70 years old. Secondly, we compare the (age) weighted average for reward receivers and non-reward receivers[12]. Estimating card usage shares for both groups reveals to what extent reward receivers use their payment cards relative to non-reward receivers. To analyze differences between both types of consumers, the quantitative indicator Reward impact (RI) is then computed as the difference between the weighted average of the card share of cardholders with incentive programs and the weighted average of the card share of cardholders without incentive programs:

$$\mathrm{RI} = \sum_{m=17}^{n=70} \text{weighted card share (with incentives)}_{ij} - \sum_{m'=17}^{n'=70} \text{weighted card share (without incentives)}_{ij} \quad (6)$$

Only if RI>0, the incentive programs will be useful tool to change the preferences of consumers to increase payment cards usage relative to cash. We then examine the total impact by merchant sectors (RIS)[13]:

$$\begin{aligned} &RIS_j = \sum_{i=1}^{4} (RI_{ij} * \text{share of reward } i \text{ in sector } j) \\ &\forall j = 1,....8 \text{ (commercial sectors)} \qquad (7) \\ &\forall j = 1,....4 \text{ (incentive programs)} \end{aligned}$$

The RIS is also estimated for different types of rewards across merchant sectors (RIR)[14]:

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[12] The weights correspond to percentages of population in Spain using an age range from 18 to 70 years (Source: Spanish Statistical Office, *Instituto Nacional de Estadística*).
[13] The weights correspond to the share of each type of incentive program in our sample.
[14] The weight for each merchant sector corresponds to the percentage of this sector in the GDP (2005). These values have been normalized by 1.

$$RIR_j = \sum_{j=1}^{8} (RIS_{ij} * GDP \text{ of merchant activity } j \text{ over aggregate GDP})$$
$$\forall j = 1,...,8 \text{ (commercial sectors)} \qquad (8)$$
$$\forall i = 1,...,4 \text{ (incentive programs)}$$

Finally, we will estimate the total cash substitution effect (total impact) across sectors and individuals as the sum of all the previous effects.

6.2 The effect of the incentive programs on cash substitution by merchant sector (RIS)

Table 5 shows the predicted share of card usage relative to cash across merchant sectors for three different categories of cardholders (all cardholders, debit cardholders and credit cardholders). As expected, the average use of cards relative to cash appears to be larger for cardholders holding cards with incentive programs. Debit and credit cardholders buying at department stores that may benefit from points, gifts and cash-back exhibit a significantly higher use of cards, with the RI indicator being 3.7%, 4.9% and 6.8%, respectively. Mean-difference tests reveal that differences across type of rewards are statistically significant at 5% level (not shown for simplicity). Other groups showing a high economic impact of rewards on cards vs. cash are cardholders buying at gas stations where they can benefit from discounts and cash-back (11.2% and 9.3%) as well as debit cardholders paying at gas stations where they can potentially benefit from cash-back options (13.5%). The differences across these sectors and type of rewards are also found to be statistically significant at 5% level according to mean-difference tests.

Table 5 also shows that the effect of rewards on the use of cards also varies depending on the type of rewards and depending on the type of card employed. As for the aggregate effect of rewards by sector (RIS) and type of card, the positive effect of rewards on the usage of cards relative to cash is found for all merchant activities and for debit and credit cardholders with the only exceptions of both debit and credit cardholders buying at grocery stores and supermarkets[15].

6.3 The impact of rewards programs by type of reward and sectors: controlling for merchant's acceptance

The choice of a payment instrument for consumption purposes is highly dependent on the type of merchant where the consumer is shopping as we already have shown in Figure 1. The effects of rewards on the choice and usage of a payment instrument in certain merchant sectors may be idiosyncratically conditional on merchant's acceptance (Whitesell, 1992; Locke, 2007, Amromin and Chakravorti, 2008). Table 6 analyzes the impact of both the type of rewards and the type of card for three different groups of sectors depending on merchant's acceptance[16]. Grocery stores and parking and tolls are considered in group 1 with very low use of cards due to merchant acceptance and related idiosyncratic reasons such as the small value of payments in those stores. Supermarkets, boutiques and clothing, gas stations, restaurants, hotels and travel and leisure are jointly considered in group 2. This is potentially the benchmark group since both cash and cards are generally accepted by merchants and, therefore, preferences may play a more significant role in the choice of the payment instrument. Finally, group 3 incorporates department stores and superstores where card payments are typically far more frequent than cash, mainly as a consequence of the larger size of transactions.[17]

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[15] A possible explanation for this unexpected result is that some big supermarkets issue their own cards and rewards programs. These cards are not included in our survey.

[16] This classification is in line with similar merchant sector groups employed by the Bank of Spain Payment Systems' Division with the correspondence being (Bank of Spain classification in parentheses) as follows: grocery stores (chemists, drugstores, retailers and low-value categories), parking and tolls (toll-highways), supermarkets (supermarkets), boutiques and clothing (jewellery), gas stations (petrol stations), restaurants (restaurants), hotels and travel and leisure (hotels, travel agencies, transportation, car rental, casinos and entertainment), department stores and superstores (large supermarkets).

[17] There may also be idiosyncratic reasons in group 3 since these types of merchants very often offer "express" or "fast" tracks for card users at the checkout.

As shown in Table 6, the impact of rewards is 8.7% and 8.6% for cardholders enjoying rewards programs in groups 2 and 3, respectively. The differences between both groups are not found to be statistically significant according to mean-difference tests (not shown). However, as expected, the impact is considerably lower (1.4%) in merchant sectors under group 1 and the differences with the other two groups are found to be statistically significant. The results also show differences in the behavior of debit and credit cardholder across sectors. The impact of rewards seems to be considerably higher for debit cardholders than for credit cardholders and, in particular, in groups 3 where cardholders enjoying rewards programs and using debit may increase their use of cards relative to cash by 11.1% while credit cardholders would increase their use by 6.0%, the differences being statistically significant between both types of cardholders.

As for the type of rewards, cash-backs, points and discounts are found to exert, on average, a positive influence on card usage relative to cash. Gifts exhibit a more limited impact on the use of cards relative to cash being even negative for cardholders making transactions at merchant outlets in group 1. The highest positive impact corresponds to cash-back, ranging from 3.4% in group 1 to 6.8% in group 3. Again, rewards are found to be, on average, more effective in substituting cash by cards for debit cardholders than for credit cardholders.

We also quantify the monetary value of the total impact of rewards in the substitution of cash transactions by card transactions. Based on 100 transactions with card or cash[18], we can observe that credit cardholders with rewards make 8.4 transactions more than those who do not receive those incentives. In the case of debit cards, we observe that cardholders with rewards make 7.3 transactions more than those without rewards. In terms of volume, debit cardholders with rewards increase the value

[18] We analyze only group 2 since it represents the merchant' sectors where both cash and card transactions are very frequent. The other two groups (group 1 and group 3) show a clear preference for just one payment method.

of purchases by 326.9 Euros for every 100 transactions they make. In the case of credit cards, this value of extra sales is 531.1 Euros. These higher sales and potential merchant profits appear to be far higher than the cost estimates of the reward programs per transaction shown in other related studies[19].

7. Conclusions

The substitution of cash by card (and other electronic) payments represent one of the main goals of both economic planners and financial industry participants since this transition may imply significant private and social benefits. From a card issuer perspective, the main strategic way to promote the use of cards has been offering rewards programs. However, little is known on the effectiveness of these programs in promoting card usage relative to paper-based payment instruments. This paper offers novel evidence on the impact of card rewards programs on the preferences for the use of cards relative to cash. To undertake this analysis, we perform several empirical tests using a unique survey of consumers' preferences for payment instruments in Spain. We isolate the effect of rewards from the usual set of demographic and behavioural variables employed in most previous studies. As far as the demographic and behavioural characteristics are concerned, our results are mostly in line with the existing literature. However, we show that rewards programs can also significantly affect the preferences for cards relative to cash payments and that the marginal effect of these programs is the higher among the posited set of explanatory factors. Importantly, the effects of these rewards vary significantly among merchant sectors. Our results also show that the impact of rewards on card usage is higher for debit cardholders that for credit cardholders.

[19] The industry study by Carbo-Valverde *et. al.* (2009) shows that the average cost of reward programs per 100 transactions is 0,65 Euros for debit cards and 1,86 Euros for credit cards in Spain.

Our results may have important implications for both policymakers and card issuers. The former will have to have a closer look at the structure of incentives in the payment industry and the path of substitution of cash by card payments assigning the proper weights to demographic, business and behavioural factors to accurately develop new policies to increase the rate of substitution of cash by cards which, in many countries, is being slower than expected. At the same time, the large expenses that card issuers undertake on incentive programs need to be confronted with the effectiveness of the different rewards programs on card usage (relative to cash) across merchant activities. Therefore, more research is needed on the evaluation of the effectiveness of rewards programs and on the proper way to stimulate card payments both from the public and the private side.

References

Amromin, G., and Chakravorti, S., (2009), "Whither Loose Change? The Diminishing Demand for Small-Denomination Currency," Journal of Money, Credit and Banking, Blackwell Publishing, vol. 41(2-3), pages 315-335, 03.

Arango, C. and V. Taylor (2006), Merchant Acceptance, Costs and Perceptions of Retail Payments: A Canadian Survey, Department of Banking Operations. Bank of Canada.

Attanasio, O. P., Guiso, L. and T. Japelli (2002), The demand for money, financial innovation, and the welfare cost of inflation: An analysis of household data. *Journal of Political Economy*, 110: 317–351.

Ausubel, L.M., (1991), The failure of competition in the credit card market. *The American Economic Review,* 81(1), 50-81.

Avery, R. V., Elliehausen, G. E., Kennickell, A. B. and P.A. Spindt (1986), The Use of Cash and Transaction Accounts by American Families, *Federal Reserve Bulletin*, 72: 87-108.

Brito, D.L. and P.R. Hartley (1995), Consumer rationality and credit cards. *Journal of Political Economy*, 103(2): 400-433.

Calem, P.S. and L.J. Mester (1995), Consumer behavior and the stickiness of credit-card interest rates. The American Economic Review, 85(5): 1327-1336.

Carbó, S. Humphrey, D. and R. López del Paso (2003), The falling share of cash payments in Spain, *Moneda y crédito*, Nº 217: 167-189.

Carbó, S., Humphrey, D., Liñares, J. and Francisco Rodríguez (2009), A cost-benefit analisis of a two-sided card market, *Moneda y crédito*, Nº 227: 7-36.

Carow, K.A. and M.E. Staten (1999), Debit, Credit or Cash: Survey Evidence on Gasoline Purchases, Journal of Economics and Business, 51: 409-421.

Ching A. and F. Hayashi (2008), "Payment Card Rewards Programs and Consumer Payment Choice" SSRN Research Papers, 4247.

Chakravorti, S. and R. Roson (2004), "Platform Competition in Two-Sided Markets: The Case of Payment Networks" (July 2004). FRB of Chicago Working Paper.

Domencich, T., McFadden, D., (1975), *Urban Travel Demand: A Behavioural Analysis*. North Holland, Amsterdam.

Feinberg, R. A., (1986), Credit Cards as Spending Facilitating Stimuli: A Conditioning Interpretation". *Journal of Consumer Research*, 13: 348–356.

Friestad, M. and P. Wright (1994), "The Persuasion Knowledge Model: How People Cope with Persuasion Attempts," *Journal of Consumer Research*, 21 (1): 1-31.

Gross, D.B. and N.S. Souleles (2002a), An empirical analysis of personal bankruptcy and delinquency. *The Review of Financial Studies*, 15(1): 319-347.

Gross, D.B., Souleles, N.S., (2002b), Do liquidity constraints and interest rates matter for consumer behavior? Evidence from credit card data. *The Quarterly Journal of Economics,* 117(1): 27-52.

Hayashi, F. (2006), Pricing and welfare implications of payment card network competition, Payments System Research Working Paper PSR WP 06-03, *WPs Federal Reserve Bank of Kansas City*.

Hayashi, F. and E. Klee (2003), "Technology Adoption and Consumer Payments: Evidence from Survey Data," *Review of Network Economics*, 2(2): 175-190.

Heilman, C., Nakamoto, K. and A. Rao (2002), "Pleasant Surprises: Consumer Response to Unexpected In-Store Coupons," *Journal of Marketing Research*, 2: 242-52.

Hsee K., Yu, C. F., Zhang, J. and Z. Yan (2003), Medium Maximization, *Journal of Consumer Research*, 30: 1-14.

Hines, J.R. Jr. and R. Thaler (1995), The flypaper effect, *Journal of Economic Perspectives*, 9: 217-226.

Humphrey D., Kim M. and B. Vale (2001), Realizing the Gains from Electronic Payments: Costs, Pricing, and Payment Choice, *Journal of Money, Credit and Banking*, 33(2): 216-234.

Humphrey D., Willeson, M. Lindblom, T. and G. Bergendahl, (2003), What does it Cost to Make a Payment?, *Review of Network Economics*, 2: 106-143.

Janakiraman, N., Meyer, J. and A. C. Morales (2006), Spillover Effects: How Consumers Respond to Unexpected Changes in Price and Quality, *Journal of Consumer Research*, 33: 361-370.

Kahneman, D. and A. Tverski (1979), "Prospect Theory: An Analysis of Decision Under Risk", *Econometrica*, 47: 263-291.

Kennickell, A.B. and M.L. Kwast (1997), Who Uses Electronic Banking? Results from the 1995 Survey of Consumer Finances, *Proceedings from the 33rd Annual Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago: 56-75.

Klee, E. (2006), Families' use of payment instruments during a decade of change in the U.S. payment system, *Finance and Economics Discussion Series* 2006-01, Board of Governors of the Federal Reserve System (U.S.).

Lancaster, K. (1971), *Consumer Demand: A New Approach*, New York: Columbia University Press.

Levitin, A. (2008), "Priceless? The Social cost of credit card merchant restraints", UCLA Law Review, Vol. 55, p. 1321.

Louviere, J.J., Hensher, D.A., Swait, J.D., (2000), *Stated Choice Methods—Analysis and Applications.* Cambridge University Press, University, UK.

Locke, Y. (2007), Determinants of Merchant Participation in Credit Card Payment Schemes, *Review of Network Economics*, 6(4): 474-494.

McFadden, D. (1974), Conditional Logit Analysis of Qualitative Choice Behavior, in Paul Zarembka, ed., *Frontiers of Econometrics*, New York: Academic Press.

Mester, L. J. (2003), Changes in the use of electronic means of payment: 1995-2001, *Business Review*, Federal Reserve Bank of Philadelphia, issue Q3: 18-28.

Mulligan, C. B. (1997), Scale Economies, the Value of Time, and the Demand for Money: Longitudinal Evidence from Firms, *Journal of Political Economy*, 105: 1061-79,

Mulligan, C. B, and X. Sala-i-Martin (2000), Extensive Margins and the Demand for Money at Low Interest Rates, *Journal of Political Economy*, 108: 961-91.

Rysman, M. (2007), "An Empirical Analysis of Payment Card Usage", *Journal of Industrial Economics*, 55:11-31.

Saloner, G., Shepard, A. (1995), Adoption of technologies with network effects: an empirical examination of the adoption of automated teller machines. *The RAND Journal of Economics*, 26(3): 479- 501.

Stavins, J. (2001), Effect of Consumer Characteristics on the Use of Payment Instruments, *New England Economic Review*, 16: 20-33.

Soman, D. (2001), Effects of Payment Mechanism on Spending Behavior: The Role of Rehearsal and Immediacy of Payments, *Journal of Consumer Research*, 27(4): 460–474.

Whitesell, W. (1992), Deposit banks and the market for payment media, *Journal of Money, Credit and Banking*, 24(4), 483-498.

Zinman J., (2009), Debit or credit?, *Journal of Banking and Finance*, 33(2), February, pp. 358-366.

APPENDIX: Description of main survey variables

Dependent variable:

- P*(TYPE OF COMMERCIAL OUTLET): Equals 1 if the cardholder usually pays with payment cards (with or without incentive programs) and 0 if the cardholder usually pays with cash. This variable was computed for each type of merchant activities. Our database allows us to control among eight types of merchant activities: Grocery stores (psmall), Supermarkets (psuper), Department stores and superstores, etc. (pbig), Boutiques of clothes and shoes (pboutiques), gas stations (pgas), Restaurants (prestau), Parking and tolls (pparking) and Hotels and travel (photel).

Consumer features:

- INCOME: Equals 1 if the cardholder has a regular source of income and 0 otherwise.
- AGE: The respondent's age. In the estimations, we employ the logarithm of squared age to capture non-linearities.
- EDUCATION: Equals 1 if the respondent has less than elementary school education, 2 if the respondent has completed elementary school, 3 if the respondent has a high school degree, 4 if the respondent has a technical degree, 5 if the respondent has a college degree, 6 if the respondent has not finished the university studies and 7 if the respondent has a university degree.
- SEX: Equals 1 if the respondent is male, 0 if female.
- SOURCEFIN: Number of members of the household that financially contribute to household expenditures.
- CARUSE: Equals 1 if the cardholder drives three or more times per week and 0 otherwise.
- TRAVEL: Equals 0 if the respondent travels outside of his/her place of residence less than once every 3 months, 1 if he/she travels 1 or more times every 3 months, 2 if he/she travels once or twice a month and 3 if the respondent travels every week.
- SIZE_PLACE: It takes five values according to the population of the respondent's place of residence: 1 if population is lower than 10,000 inhabitants, 2 if the population ranges between 10,001 and 50,000 inhabitants, 3 for the range 50,001 to 200,000 inhabitants, 4 if population is higher than 200,000 inhabitants and 5 in the cases of Madrid and Barcelona.

Rewards and types of rewards programs:

REWARDS: Equals 1 if the payment card offers any of the abovementioned incentive programs and 0 otherwise. There are also four variables showing the specific type of rewards that the cardholders may (or may not) enjoy:

a. DISCOUNTS: Equals 1 if the payment card provides cardholders with discounts on card purchases.

b. POINTS: Equals 1 if the payment card offers points to get extra products or services.

c. GIFTS: Equals 1if the card provides cardholders with direct gifts on card purchases.

d. CASH-BACK: Equals 1 if the card provides cardholders with cash-back on card purchases.

Perceptions towards payment instruments:

- REGARDING PAYMENT CARDS (AMONG CARDHOLDERS WHO PREFER TO PAY WITH CARDS): The next options range from 1 (nothing) to 5 (a lot) the degree to which customers value certain characteristics in order to pay with cards instead of cash:

P1_E. A quick, simple and easy payment instrument (payment card).
P2_E. Convenience.
P3_E. It is possible to have money available anywhere.
P4_E. Habits.
P5_E. Payment cards offer control of domestic spending.
P6_E. Payment cards give the possibility of buying goods in the event of liquidity restrictions (differed payments).
P7_E. They allow expensive purchases avoiding the need to carry a lot of currency in the pocket.

- REGARDING CASH PAYMENTS (AMONG CARDHOLDERS WHO PREFER TO PAY WITH CASH): The next options quantify from 1 (nothing) to 5 (a lot) the degree to which customers value certain characteristics in order to pay with cash instead of cards:

P1_T. A quick, simple and easy payment instrument (cash).
P2_T. Cash payments offer good control of domestic spending.
P3_T. To avoid unnecessary expenses.
P4_T. Habits.
P5_T. It is very easy to withdraw money in ATM´s.
P6_T. Most of the commercial establishments where the respondent usually shops do not accept payment cards.
P7_T. Generally the prices of the items purchased are small.

Regional control variables:

- CCAA: It ranges 1 to 17 controlling for the region where the cardholder lives: Andalusia (1), Aragon (2), the Canary Islands (3), Cantabria (4), Castille and Leon (5), Castille-La Mancha (6), Catalonia (7), Madrid (8), Navarra (9), Comunidad Valenciana (10), Extremadura (11), Galicia (12), the Balearic Islands (13), La Rioja (14), The Basque Country (15), Asturias (16) and Murcia (17).

Figure 1. Share of payment instruments by merchant sectors in Spain (2005)

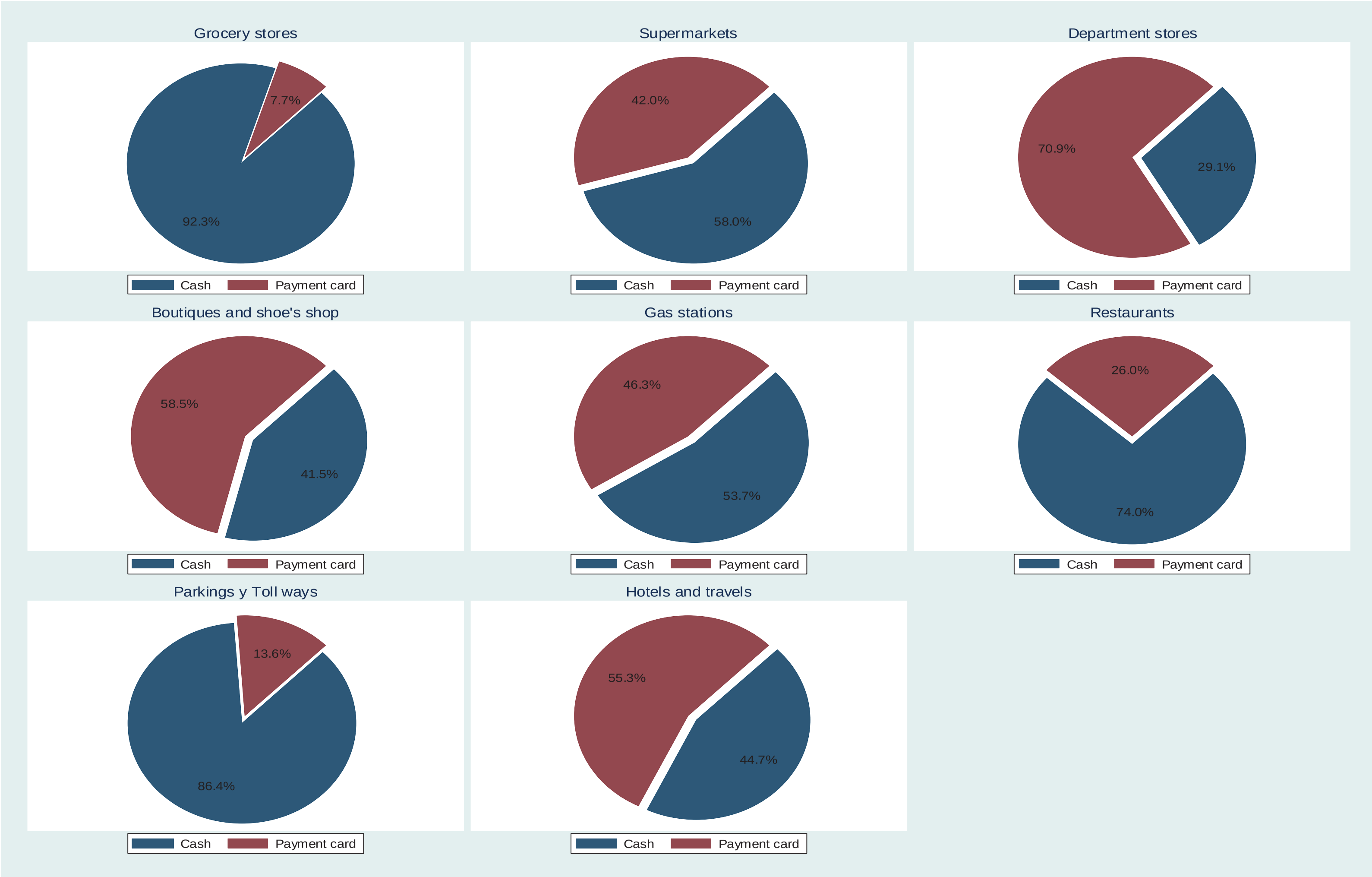

Table 1. Survey variables: summary statistics

Variable	Mean	Std. Dev.
Psmall	0,08	0,27
Psuper	0,42	0,49
Pbig	0,71	0,45
pboutiques	0,58	0,49
pgas	0,46	0,50
prestau	0,26	0,44
pparking	0,14	0,34
photel	0,55	0,50
disc	0,31	0,46
points	0,42	0,49
gifts	0,07	0,26
cash-back	0,11	0,31
income	0,93	0,25
Age	41,26	14,20
LAgesq	7,31	0,72
educ	3,81	1,90
sex	0,48	0,50
sourcefin	1,77	0,85
caruse	0,69	0,46
travel	1,70	1,20
sizeplace	2,35	1,21
P1_E	1,85	2,18
P2_E	2,01	2,32
P3_E	1,94	2,26
P4_E	1,60	1,96
P5_E	1,53	1,94
P6_E	1,69	2,08
P7_E	1,93	2,26
P1_T	2,30	2,20
P2_T	2,25	2,18
P3_T	2,17	2,15
P4_T	2,25	2,19
P5_T	2,22	2,17
P6_T	1,51	1,70
P7_T	2,18	2,16
LATMSQ	2,39	0,96
ccaa	7,51	4,54

Note: The definition of the variables is shown in the Appendix.

Table 2. Sample distribution of incentive programs

		Debit cardholders (1,342 obs.)	% of Debit cardholders	% of the sample	Credit cardholders (1,619 obs.)	% of Credit cardholders	% of the sample	All cardholders (2,961 obs.)	% of the sample
Discounts	No	1,002	74.7	33.8	1,053	65.0	35.6	2,055	69.4
	Yes	340	25.3	11.5	566	35.0	19.1	906	30.6
Points	No	865	64.5	29.2	839	51.8	28.3	1,704	57.5
	Yes	477	35.5	16.1	780	48.2	26.3	1,257	42.5
Gifts	No	1,268	94.5	42.8	1,479	91.4	49.9	2,747	92.8
	Yes	74	5.5	2.5	140	8.6	4.7	214	7.2
Cash-back	No	1,223	91.1	41.3	1,423	87.9	48.1	2,646	89.4
	Yes	119	8.9	4.0	196	12.1	6.6	315	10.6
Any type of rewards	No	639	47.6	21.6	522	32.2	17.6	1,161	39.2
	Yes	703	52.4	23.7	1097	67.8	37.0	1,800	60.8

Table 3. Logit results (All sectors)

		All cardholders		Debit cardholders		Credit cardholders	
			m.e		m.e		m.e
Rewards		0.7*** (6.15)	0.038	0.69*** (4.34)	0.050	0.63*** (3.63)	0.021
Income		0.18 (0.9)	0.010	0.08 (0.29)	0.006	0.35 (1.2)	0.012
Age		-0.07*** (-2.9)	-0.003	-0.1*** (-3.03)	-0.007	-0.03 (-0.78)	-0.001
Log(Age²)		1.38*** (3.1)	0.069	1.82*** (3.01)	0.127	0.69 (0.92)	0.020
Elementary school		0.25 (0.84)	0.012	0.59 (1.47)	0.039	-0.58 (-1.04)	-0.019
High School		0.55* (1.71)	0.024	0.89* (2)	0.050	-0.34 (-0.59)	-0.011
Technical education		0.82** (2.26)	0.031	0.8* (1.67)	0.044	0.47 (0.72)	0.012
Pre-university school		0.95** (2.43)	0.034	1.53*** (2.93)	0.064	-0.23 (-0.34)	-0.008
Some university studies		0.69* (1.97)	0.027	0.81* (1.67)	0.044	0.02 (0.03)	0.000
University studies		1.21*** (3.37)	0.043	1.19** (2.46)	0.059	0.75 (1.17)	0.018
Sex		-0.12 (-0.99)	-0.006	-0.19 (-1.13)	-0.014	-0.12 (-0.64)	-0.004
Family members		0.11 (1.57)	0.005	-0.05 (-0.62)	-0.004	0.41*** (3.26)	0.012
Use of cars		0.28** (2.14)	0.015	0.24 (1.31)	0.017	0.3 (1.45)	0.010
Frequency of travels		0.09* (1.8)	0.005	0.11 (1.57)	0.007	0.07 (0.96)	0.002
10.001 to 50.000 inh.		-0.28* (-1.87)	-0.015	-0.28 (-1.35)	-0.021	-0.26 (-1.18)	-0.008
50.001 to 200.000 inh.		-0.18 (-1.13)	-0.009	-0.3 (-1.46)	-0.022	0.11 (0.41)	0.003
> 200.000 inh.		0.03 (0.15)	0.001	-0.02 (-0.07)	-0.001	0.09 (0.31)	0.003
Madrid and Barcelona		0.55* (1.78)	0.022	0.77 (1.53)	0.040	0.37 (0.9)	0.009
Perceptions towards payment cards	**P1_E**	-0.27 (-0.82)	-0.014	0.17 (0.38)	0.012	-0.67 (-1.41)	-0.020
	P2_E	0.53 (1.6)	0.026	0.4 (0.79)	0.028	0.97* (1.82)	0.029
	P3_E	0.25 (0.88)	0.013	-0.15 (-0.3)	-0.011	0.51 (1.2)	0.015
	P4_E	0.37 (1.44)	0.018	0.76** (2.01)	0.053	0.07 (0.19)	0.002
	P5_E	-0.14 (-0.59)	-0.007	-0.56 (-1.56)	-0.039	0.23 (0.65)	0.007
	P6_E	-0.32 (-1.12)	-0.016	-0.49 (-1.17)	-0.035	-0.19 (-0.45)	-0.006
	P7_E	0.21 (0.75)	0.011	0.38 (1.08)	0.026	-0.13 (-0.25)	-0.004
Perceptions towards cash payments	**P1_T**	-0.06 (-1.08)	-0.003	-0.06 (-0.79)	-0.004	-0.06 (-0.65)	-0.002
	P2_T	-0.13** (-2.12)	-0.006	-0.2** (-2.43)	-0.014	-0.06 (-0.65)	-0.002
	P3_T	-0.01 (-0.29)	-0.001	0.03 (0.39)	0.002	-0.04 (-0.47)	-0.001
	P4_T	-0.27*** (-4.99)	-0.014	-0.36*** (-4.41)	-0.025	-0.19** (-2.52)	-0.006
	P5_T	-0.08* (-1.69)	-0.004	-0.03 (-0.5)	-0.002	-0.11 (-1.54)	-0.003
	P6_T	0.09* (1.99)	0.004	0.04 (0.61)	0.003	0.13** (2.02)	0.004
	P7_T	0.08 (1.56)	0.004	0.06 (0.88)	0.004	0.08 (1.1)	0.002
Regional Dummy		0.01 (0.68)	0.000	0.01 (0.65)	0.001	0 (0.14)	0.000
Log likelihood		-962.32544		-502.24043		-433.19456	
LR Chi- square		716.02***		392.54***		328.86***	
Pseudo-R2		0.2712		0.281		0.2751	
Nº of observations		2934		1329		1605	

*****, **. * Statistically significant at 1 %, %5 and 10% level ,respectively.**
z statistic in parentheses.

Table 4. Logit results by type of reward and sectors

Panel A. Effect of rewards by type of rewards program: all cardholders, debit cardholders and credit cardholders

	All cardholders	m.e	Debit cardholders	m.e	Credit cardholders	m.e
Discounts	0.33** (2.33)	0.015	0.55** (2.59)	0.034	0.07 (0.34)	0.002
Points	0.49*** (4)	0.023	0.38** (2.17)	0.025	0.54*** (2.99)	0.015
Gifts	0.72 (1.43)	0.027	0.47 (1.11)	0.027	1.05 (1.28)	0.020
Cash-back	0.52** (2.08)	0.041	0.49** (2.38)	0.039	0.66* (1.79)	0.035
Log likelihood	-695.8		-1249.8		-1119.1	
LR Chi- square	451.8***		329.7***		918.8***	
Pseudo-R2	0.21		0.22		0.23	
Nº of observations	2934		1329		1605	

Panel B. Effect of rewards program by merchant activity

	Grocery Stores	m.e	Supermarkets	m.e	Department stores	m.e	Boutiques	m.e	Gas stations	m.e	Restaurants	m.e	Parking and tolls	m.e	Hotels and travel	m.e
Rewards	-0.16 (-0.96)	-0.006	0.28*** (2.93)	0.067	0.53*** (5.27)	0.085	0.13** (.37)	0.031	0.51*** (5.4)	0.045	0.21* (1.99)	0.034	0.17 (1.23)	0.016	0.28*** (2.85)	0.069
Log likelihood	-698.1		-1437.5		-1089.2		-1698.6		-1911.8		-1321.2		-847.7		-1321.6	
LR Chi- square	297.8***		998.7***		846.1***		1157.0***		577.8***		566.16***		166.6***		547.9***	
Pseudo-R2	0.16		0.26		0.27		0.28		0.16		0.17		0.10		0.18	
Nº of observations	2691		2825		2778		2794		2502		2674		2282		2316	

Panel C. Effect of rewards program by merchant activity and type of reward

	Grocery Stores	m.e	Supermarkets	m.e	Department stores	m.e	Boutiques	m.e	Gas stations	m.e	Restaurants	m.e	Parking and tolls	m.e	Hotels and travel	m.e
Discounts	0.04 (0.23)	0.001	0.16*** (2.84)	0.039	0.32*** (2.70)	0.05	-0.02 (-0.14)	-0.004	0.46*** (4.49)	0.114	0.04 (0.35)	0.006	0.06 (0.41)	0.006	0.26** (2.37)	0.062
Points	-0.34** (-2.14)	-0.012	0.12 (1.24)	0.028	0.24** (2.32)	0.04	0.12 (1.27)	0.029	0.25*** (2.69)	0.062	0.22** (2.13)	0.036	0.18 (1.40)	0.018	0.08 (0.85)	0.021
Gifts	-0.18 (-0.59)	-0.006	0.02 (0.1)	0.004	0.35 (1.59)	0.05	0.1 (0.52)	0.022	0.22 (1.26)	0.054	0.15 (0.86)	0.026	-0.21 (-0.86)	-0.019	0.07 (0.36)	0.017
Cash-back	0.19 (0.84)	0.008	0.26*** (3.73)	0.064	0.49** (2.54)	0.07	0.52*** (3.16)	0.113	0.38** (2.53)	0.095	-0.11 (-0.68)	-0.017	0.34* (1.80)	0.037	0.07** (2.45)	0.018
Log likelihood	-606.4		-1459.6		-1235.1		-1394.3		-1453.9		-1244.9		-822.3		-1318.9	
LR Chi- square	251.6***		924.7***		879.4***		1005.1***		546.7***		574.3***		172.6***		546.9***	
Pseudo-R2	0.17		0.2406		0.26		0.26		0.15		0.18		0.09		0.17	
Nº of observations	2691		2825		2778		2794		2502		2674		2282		2316	

***, **. * Statistically significant at 1 %, %5 and 10% level ,respectively

z statistic in parentheses.

Table 5. Rewards' Impact (RI & RIS) by reward type and merchant sectors

Merchant sectors	Type of cardholder	RI				RIS
		DISCOUNTS	POINTS	GIFTS	CASH-BACK	REWARDS
Grocery Stores	All cardholders	0.001	-0.012	-0.006	0.008	-0.006
Supermarkets	All cardholders	0.037	0.027	0.004	0.061	0.064
Department stores, superstores, etc.	All cardholders	0.048	0.037	0.050	0.068	0.086
Boutiques and clothing stores and footwear	All cardholders	-0.004	0.028	0.022	0.113	0.031
Gas stations	All cardholders	0.112	0.061	0.053	0.094	0.123
Restaurants	All cardholders	0.006	0.036	0.026	-0.017	0.034
Parking and tolls	All cardholders	0.006	0.018	-0.019	0.037	0.016
Hotels and travel	All cardholders	0.062	0.020	0.016	0.018	0.069
Grocery Stores	Debit cardholders	0.000	-0.006	-0.003	0.006	-0.001
Supermarkets	Debit cardholders	0.029	0.051	-0.017	0.062	0.057
Department stores, superstores, etc.	Debit cardholders	0.084	0.043	0.082	0.069	0.111
Boutiques and clothing stores and footwear	Debit cardholders	0.056	-0.023	-0.074	0.123	0.035
Gas stations	Debit cardholders	0.058	0.057	0.145	0.135	0.091
Restaurants	Debit cardholders	-0.008	0.054	0.007	0.005	0.056
Parking and tolls	Debit cardholders	-0.011	0.039	-0.021	0.014	0.016
Hotels and travel	Debit cardholders	0.067	-0.011	-0.033	0.030	0.058
Grocery Stores	Credit cardholders	0.001	-0.012	-0.007	0.008	-0.008
Supermarkets	Credit cardholders	0.036	0.011	0.012	0.061	0.069
Department stores, superstores, etc.	Credit cardholders	0.019	0.028	0.025	0.066	0.060
Boutiques and clothing stores and footwear	Credit cardholders	-0.038	0.063	0.066	0.118	0.026
Gas stations	Credit cardholders	0.133	0.053	0.017	0.058	0.128
Restaurants	Credit cardholders	0.014	0.018	0.025	-0.038	-0.001
Parking and tolls	Credit cardholders	0.021	-0.003	-0.014	0.038	0.011
Hotels and travel	Credit cardholders	0.063	0.039	0.031	0.018	0.076

Table 6. Aggregate rewards impact indicator by groups and type of rewards

		RIR				TOTAL IMPACT
		DISCOUNTS	POINTS	GIFTS	CASH-BACK	OF REWARDS
All cardholders	Group 1	0.006	0.015	-0.018	0.034	0.014
	Group 2	0.070	0.045	0.036	0.059	0.087
	Group 3	0.048	0.037	0.050	0.068	0.086
Debit cardholders	Group 1	-0.010	0.035	-0.019	0.013	0.014
	Group 2	0.044	0.040	0.062	0.087	0.073
	Group 3	0.084	0.043	0.082	0.069	0.111
Credit cardholders	Group 1	0.019	-0.004	-0.013	0.035	0.009
	Group 2	0.080	0.041	0.023	0.038	0.084
	Group 3	0.019	0.028	0.025	0.066	0.060

Group 1: grocery stores and parking and tolls
Group 2: supermarkets, boutiques and clothing, gas stations, restaurants, hotels and travel and leisure
Group 3: department stores and superstores

Note: The weight for each merchant sector corresponds to the percentage of this sector in the GDP (2005): grocery stores (.002%), supermarkets (0.049%), Department stores (0.445%), boutiques (0.033%), gas stations (0.265%), restaurants (0.099%), parking and tolls (0.023%), hotels and travel (0.083%). These values have been normalized by 1 in each group.

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