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Do Consumers Pay More Using Debit Cards than Cash? An Experiment

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Abstract

We conduct an incentivized experiment to test whether the willingness to pay is higher for debit cards compared to cash for three consumer products. Our findings support this conjecture also after controlling for cash availability, spending type, price familiarity and consumption habits of the products. The evidence thus suggests that different representations of money matters for consumer behavior.

JEL classification: D03; D010; E42

Key words: payment methods; debit cards; cash; willingness-to-pay

1. Introduction

Conventional economics assumes that consumer valuations of products and services are independent of how money is represented, yet there is growing evidence that suggests that the payment method affects spending behavior (e.g. Hirschman, 1979, Feinberg, 1986, Prelec and Simester, 2001, Raghurir and Srivastava, 2008, 2009, Soman, 2001, 2003, Vandroos, 2012). One strand of this research focuses on the differences between cash and gift certificates (“scrip money”), between cash and pre-paid cards, or between different denominations of cash (Felsö and Soetevent, 2014, Mishra et al. 2006, Raghurir and Srivastava, 2008, 2009, Soman, 2003, Vandroos, 2012). These studies find differences in spending behavior between the payment method and cash as well as within the domain of cash. They suggest that the format of money matters but apart from cash denominations, many of these payment methods are restricted to certain purchases (e.g. pre-paid cards are often used for smaller purchases, transportation, such as the Oyster card in the UK, or prepaid phone cards) or to certain stores/locations. Thus, they may not be treated as

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substitutes for cash (see Felsö and Soetevent, 2014) and their impact on aggregate consumer spending is limited.

The majority of the literature however studies credit cards and spending behavior (e.g. Hirschman, 1979, Feinberg, 1986, Prelec and Simester, 2001, Raghubir and Srivastava, 2008, Soman, 2003) but few investigate debit cards even though these have become increasingly popular. For example, debit cards are by far the most popular payment card in the Scandinavian countries (Sveriges Riksbank, 2013) and in the US the share of debit card transactions surpassed the share of credit card transactions in 2004 (CPSS, 2005). In addition, debit cards do not wrestle with the fact that consumption and payment are temporally separated nor that transactions are lumped together into a single bill upon payment, both which may induce differences in spending (Prelec and Loewenstein, 1998, Hafalir, and Loewenstein, 2009). Debit card payments are both ubiquitous and immediate.

In this note, we investigate whether consumers pay more for identical products using debit cards compared to cash. We conduct an incentivized experiment in Denmark where debit cards, typically the local debit card Dankort, is the most common payment method in terms of transaction value and 82 percent of the population between 15-79 years old owns a Dankort (Nationalbanken, 2011). Our experiment further controls for the possibility that participants may not carry enough cash on them at the time of the purchase and would have to incur the cost of going to the ATM if they wanted to spend more, one reason why spending might be lower with cash.

2. Debit Cards and Spending

The evidence on whether debit cards incur higher spending than cash (or other payment methods) is sparse. In a field experiment, Soetevent (2011) finds that conditional on choosing to donate money, debit cards lead to higher donations compared to cash. Since only 9 percent of the approached households choose to donate money in the debit treatment, compared to 67 percent in the cash treatment, this difference may however be caused by household characteristics of those who choose to donate. A propensity score matching estimator suggests that households with similar characteristics tend to donate more using debit card than cash. Soman (2003) argues that the transparency of a payment method (the salience of parting with money) affects spending and consumption behavior (see also Prelec and Loewenstein, 1998) and finds that payment methods that differ in transparency lead to differences in consumption. Soman does not test debit cards but ranks them as low in transparency compared to cash which is ranked as the most transparent payment method. Thus, the lower salience of debit cards compared to cash suggests that paying with debit card should lead to higher spending.

Since debit and credit cards are similar in terms of the salience of the form and the amount paid (Soman, 2003) and debit cards often come decorated with the same logos from payment service providers such as Visa and Mastercard, some of the related studies on credit cards should be mentioned. Feinberg (1986) uses a lab experiment showing that simply

exposing students to the MasterCard logo and replicas of actual MasterCards increase cash donations to a charity. Simester and Prelec (2001) conduct two incentivized experiments comparing credit cards to cash by selling sports tickets, which are of uncertain value, and a dinner certificate with a stated value. They find that those who are instructed to pay using credit cards and exposed to their credit card have a higher willingness to pay for the sports tickets than cash payers who are not exposed to their credit cards. For the dinner certificate, this finding is not replicated but they find a difference among credit card and cash payers who are both exposed to their credit cards and that those cash payers who are exposed to their credit card do not have a higher willingness to pay compared to those cash payers who are not exposed to their credit card. Their results suggest that the payment method itself matters, not only the logo effect. How uncertainty of the value of the product interacts with the results is unclear since their two experiments differ in more aspects than the type of product. In any case, it suggests that it is important to control for consumers' beliefs of how much a product costs.

3. Does Willingness to Pay Differ Due to Payment Method?

To test whether the willingness to pay for identical products differs between debit cards and cash, we sell three consumer products varying the payment method. To ensure that participants reveal their reservation prices, we use the Becker-DeGroot-Marschak mechanism (see also Prelec and Simester, 2001). We further control for cash availability, order effects, spending type, price familiarity and consumption of the products, and we make immediate transactions using new payment technology.

3.1 Experimental Design

We elicit willingness to pay using the incentive-compatible Becker-DeGroot-Marschak mechanism. With this mechanism, participants make bids for each of the three products. For each product, a participant's bid is randomly selected and a sale price is randomly drawn. If the selected participant's bid is higher or equal to the sale price, she buys the product for the sale price. If her bid is lower than the sale price, there is no purchase and a new participant's bid and sale price is drawn until all products are sold. To control for that participants may not be carrying enough cash at the time of the experiment, we pay them 100 DKK (\approx US\$17.5) which they can use in the experiment. Bids are therefore restricted to a maximum of 100 for each product.¹

The selected products are a clip card for ten beers at a student pub (cost 170), a clip card for six coffees from the full selection of coffees at a student café (cost 100), and a clip card for ten black coffees at the same café (cost 40). Both the student pub and the café are

¹ All numbers henceforth refer to Danish crowns, DKK.

located in the participant pool's university building. To control for order effects (see e.g. Kahneman and Knetsch, 1992), the order in which the products are presented to the participants vary in four ways always keeping the coffee items together.

Our three treatments differ along two dimensions. First, we vary the payment method. In the *cash* treatment, the successful participants pay for the products using cash while in the *card/cash* treatment, they pay using debit card. Thus, if participants are willing to pay more for a product using debit card compared to cash, we should observe that bids are higher in the *card/cash* treatment. Second, we vary how we pay the 100. In the *card/account* treatment, instead of paying the money in cash as in the *card/cash* treatment, we transfer them using PayPal.

The inclusion of the *card/account* treatment is for exploratory purposes since the expected outcome is ambiguous. The main reason for including it is to find out whether simply showing cash depresses bids for card payers. For example, the logo effect (Feinberg, 1986) suggests that if cash is associated with lower valuations then seeing the 100 available to spend in cash may decrease bids. In this case, bids should be higher in *card/account* than in *card/cash*. On the other hand, if spending is lower in *card/account* than in *card/cash* it might be due to an earmarking effect. Studies show that, for example, contributions to taxes increase when these taxes are earmarked for specific purposes (e.g. Hundsdoerfer et al. 2013, Sclen and Kallbekken, 2011) and that child benefits are related to higher spending on child related products (e.g. Kooreman, 2000, Del Boca and Flinn, 1994). In the *cash* and *card/cash* treatment, all the participants see the money available to spend in the experiment. In the *card/account* treatment the money never materializes but goes directly into participants' accounts which therefore may reduce the feeling of the money being earmarked for the experiment. Since cash availability is a real concern in the Danish case, we did not include a cash/account treatment.

3.2 Procedure

82 master level students (37 female, 45 male, average age 27) at the IT University in Copenhagen participated. The experiment lasted 30-40 minutes and was conducted during lecture time on April 4, 5 and 8, 2013. The students had received an email in advance with some general information about the experiment including that everyone would receive 100 DKK for their participation. No course credits were given.²

In all treatments, we first handed out receipt forms for the participation remuneration and gave the general instructions, orally and written, together with specific instructions for each treatment. In the *cash* treatment we informed the students that we would pay for their participation upfront in cash and we asked them to keep the 100 DKK banknote that they received on the desk in front of them. In the *card/cash* treatment we instead asked them to put the banknote in their pocket and to put their debit card on the desk in front of them as they would need it during the experiment. This was done to ensure that everyone had a debit

² Instructions are available on Emma Runnemark's web page.

card and that they would be exposed to the payment method. We also checked that all cards were indeed debit cards when we handed out the money.^{3,4}

The *card/account* treatment proceeded as the *card/cash* treatment but instead of paying the students in cash we informed them that we would transfer 100 DKK via Paypal using the email address that they wrote on the receipt. We further informed them that our assistant, who was sitting at a desk next to the experimenter, would make the transfers directly during the session. We did this to ensure that the students felt they had the money available to spend.

We then proceeded with the instructions for the auction. To ensure that everyone understood the BDM mechanism, students answered control questions regarding the procedure which we announced the right answers to before they wrote down their bids. After collecting the bid forms we made the draws to sell the products in front of the class. Those students whose bids were successful paid the experimenter directly using cash in the cash treatment and using card via iZettle⁵ in the card treatments. A student who had already had a successful bid would not partake in subsequent draws.

After completing the sale, we elicited how much the subjects thought each clip card cost since this may affect their bids. This part was incentivized by paying one subject, randomly selected at the end of the experiment, 20 for each correct guess. The students also rated themselves on the spendthrift-tightwad scale (Rick et al. 2008), which captures whether they feel that they have difficulty controlling spending or if they tend to hold on to tight to their money. The experiment ended with background questions including consumption habits for beer and coffee and payment habits.

4. Results

It is worth noting that among the participants 23 percent carried no cash on them at the time of the experiment and 65 percent carried less than 100. This suggests that cash constraints could indeed have played a role in bids had we not controlled for this. The participants are highly familiar with using debit cards: the median of participants' share of transactions with

³ We ran the *cash* and the *card/cash* treatment simultaneously on April 4 and 8. To do this, we first divided the class into two groups. The *cash* treatment stayed in the classroom and the *card/cash* treatment was directed to another classroom. The experimenters used a manuscript to ensure that all subjects received the same information in their respective treatments. For practical and administrative reasons, we did not divide the class for the *card/account* treatment. However, since all participating students belonged to the same study programs, but not the same course, we tested for possible session effects using Wilcoxon-Mann-Whitney tests in the *cash* and *card/cash* treatments but did not find any differences between the participants.

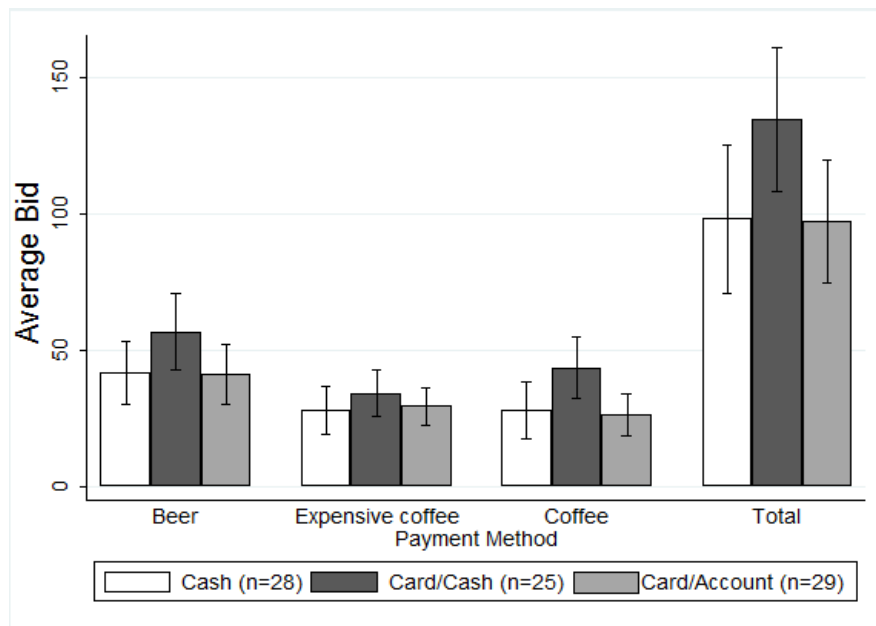
⁴ Five students could not participate in the card treatments as they did not have a debit card on them.

⁵ iZettle is a payment dogle that is plugged into any iPhone or Android based mobile phone. It converts the mobile into payment card terminal.

debit cards is 90 percent, for cash it is only 5 percent. Thus, if we do find a difference it is unlikely that it depends on inexperience with card payments.

Figure 1 shows the average of participants' bids for each of the three products and the average of the sum of the bids for each participant. The figure clearly shows that average bids are higher in the *card/cash* group than the *cash* group. Univariate statistical tests show that coffee (black coffee only) and the total are significantly higher in the *card/cash* group than in the *cash* group and weakly significantly higher for beer (Wilcoxon-Mann-Whitney tests (WMW), two-sided, $n=53$, beer: $p=0.086$, expensive coffee: $p=0.173$; coffee: $p=0.023$, total: $p=0.035$). These findings indicate that payment form does matter for consumer valuations of products. Figure 1 further shows that bids for coffee are significantly lower in *card/account* than in *card/cash* and weakly significantly lower for beer and total which points to an earmarking effect (WMW, two-sided, $n=54$, beer: $p=0.083$, expensive coffee: $p=0.378$; coffee: $p=0.019$, total: $p=0.056$). There are no significant differences between *cash* and *card/account* (WMW, two-sided, $n=57$, beer: $p=0.994$, expensive coffee: $p=0.446$; coffee: $p=0.923$, total: $p=0.762$).

Figure 1: Average bids in the Cash, Card/Cash and Card/Account group



To control for additional factors that may affect bids, we use Seemingly Unrelated Regressions since this method produces more efficient estimates than single regressions when we have product specific variables and the regression errors are correlated for a given individual but not across individuals. Table 1 shows that the results remain but are stronger: bids are significantly higher in the *card/cash* group than in the *cash* group and significantly lower in the *card/account* group than in the *card/cash* group for beer and coffee. Contrary to our expectations, there is also a small and negative effect of spending personality on beer bids, captured by the variable “Type”. It suggests that a participant who perceives she has

difficulty controlling spending bids slightly lower for beer. There is also a small but positively significant effect of participants' beliefs about the cost of the items captured by the variable "Value". A participant who believes that coffee costs more also bids slightly more for coffee.

Table 1: Regression Results

	Beer	Expensive Coffee	Coffee
Cash	-17.439** (7.900)	-1.281 (6.205)	-13.988** (6.994)
Card/Account	-15.917** (8.049)	-1.625 (5.612)	-13.925** (6.873)
Type	-1.884** (0.865)	0.125 (0.657)	-0.960 (0.746)
Value	-0.081 (0.074)	0.164** (0.688)	0.102*** (0.040)
Consumption	0.111 (0.647)	0.541 (1.231)	0.644 (1.580)
Constant	82.252*** (21.673)	11.749 (13.536)	31.820** (13.172)
Order	YES	YES	YES
<i>No of obs.</i>	82	82	82

Robust standard errors in parentheses. *, **, *** denotes significance on 10, 5, and 1 percent level respectively.

5. Discussion and Conclusions

The way money is represented clearly influences consumers' willingness to pay for identical products. While this effect has been studied before using credit cards, it is easy to argue that the temporal separation of payment and consumption may be driving the results. Thus, we control for this by comparing debit cards to cash. Another reason for why valuations may be lower when paying with cash is simply that participants may not be carrying enough cash and are reluctant to incur the cost of going to the ATM if they wish to spend more. Our experimental set-up controls for this as well as several other factors that might explain why differences may occur. When we change the way we remunerate participants by transferring the money via PayPal, we find no differences between debit cards and cash. We suggest that this is due to an earmarking effect and thus a consequence of the experimental design. The reason for not including a cash/account treatment, which would be the natural comparison group to minimize differences due to earmarking, was that we wanted to control for cash availability and we did find that most of the participants had less than 100 DKK on their person at the time of the experiment. The reason for including the transfer treatment was that we wished to learn whether simply showing cash when paying with card would depress bids. It is possible that such an effect is present but that it is much smaller than the earmarking

effect. Thus, an avenue for future research is to investigate the effect of payment methods on spending in the presence of several alternatives. Considering the vast number of payment methods available today, consumers can choose between payment methods kept in their physical wallet and/or in their smart phones and this selection may affect their spending behavior.

This note complements the existing evidence on credit cards, gift certificates and pre-paid cards by using debit cards which are physically different from cash but just as cash are both ubiquitous and involve immediate transactions. The findings suggest that the format of money matters and that one rationale for why cash is still widely used despite the desire to reduce the costly use of cash (see e.g. Bergman et al. 2008) is that cash makes it easier to control spending and that this effect is not solely due to cash-on-hand constraints.

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