Master thesis

"What drives people to accept unfavorable exchange rates when converting foreign currencies?"

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Abstract

This study researches individual currency conversion behavior in an ATM cash withdrawal context. The purpose of this paper is to explain the seemingly irrational behavior that people display when confronted with Dynamic Currency Conversion (DCC), a service to pay for foreign prices in your own currency. Existing literature finds that reference prices and imposed markups upon exchange rates have no impact on the usage of DCC. By using behavioral economic theory this study attempts to give more insights in the driving factors of currency conversion behavior. A total of 423 respondents filled out an online survey, where an ATM withdrawal was simulated. The respondents were randomly divided over different treatment groups, testing for markup, nudging and effects of behavioral attitudes. The main findings are that the level of ambiguity aversion is positively related to DCC usage when there is a nudge, relative to when there is no nudge. Second, a markup of 20% significantly reduces DCC usage relative to 0% markup. Thirdly, there is weak evidence of a negative effect of a nudge upon DCC usage. Lastly, nudging seems to influence the decision process that people go through during DCC withdrawals. Attitudes towards risk, ambiguity and time are not related to DCC usage. Policy makers can use these outcomes to regulate the use of DCC, authorities or banks can use these insights to inform or advice people and DCC providers can use these insights to optimize their business models.

Introduction

Imagine you are in Budapest for a city trip and you just had a tasteful Goulash soup for dinner at a local restaurant. When you ask the waiter to bring the bill, he asks you to pay in cash or by card. Since you just spent your last Hungarian cash in a thermal bath, you decide to pay by card. Once you have entered your PIN password, the card terminal offers you to pay for the Goulash soup in Euros. This seems like a very convenient service, you immediately know what the dinner costs in your own currency and you don't have to make any difficult conversions using the 300-Hungarian-forints-to-1-Euro exchange rate to figure this out. You accept to pay in Euros and continue for a nice stroll along the Danube River.

This example illustrates the use of Dynamic Currency Conversion (DCC), which is the service to pay for foreign prices in your own currency. It is offered by for example (web) shops, restaurants, hotels and automated teller machines (ATMs) and it is presented as

service towards the customer, as he can pay in his own currency. Accepting DCC means that the conversion, in my example from Hungarian forints to Euros, is done by the provider of DCC. You will be confronted with an exchange rate and/or a price in Euros, and this amount in Euros will be debited from your bank account if the DCC withdrawal is accepted. Alternatively, your own bank does the conversion, against their exchange rate and against their foreign transaction tariffs. Although it may seem convenient to pay in your own currency, the offered exchange rate is often more unfavorable, i.e. more expensive, than the exchange rate that is used by your own bank. The offered DCC exchange rate includes a markup, making this exchange rate more unfavorable and usually making a DCC-transaction more expensive. Once you return home from Budapest, you may be in for an unpleasant surprise when you check your bank account.

Existing studies on currency conversion behavior stress the importance of internal reference prices, which are used to evaluate the attractiveness of an observed foreign price (Kalyanaram & Winer, 1995; Juric, Lawson & McLean, 2002). This is in line with prospect theory, where gains and losses are compared to a neutral reference point (Kahneman & Tversky, 1979). People cannot always accurately develop these reference prices, which leads to uncertainty (Dehaene & Marques, 2002). A model was created to show how travelers reduce this uncertainty (Pettigrew, Daly, Lee, Soutar & Manning, 2010) and it proposes that knowledge about the exchange rate and the total costs for a transaction are among the determining factors. A recent study (Gerritsen, Rigtering, Bouw & Vonk, 2015) tested consumer behavior when confronted with DCC on an ATM. Surprisingly, the results indicate that there is no association between DCC usage and both the markup on the exchange rate as well as the consumer's reference price for a conversion. Gerritsen et al. (2015) argue that their evidence rejects rational behavior by travelers.

The purpose of this paper is to explain the seemingly irrational behavior that people display when confronted with DCC, by using behavioral economic theory. Gerritsen et al. (2015) already suggested extending their study by researching framing effects and psychological characteristics. Framing outcomes in terms of losses or gains has already proven to influence human decision making (Tversky & Kahneman, 1981) and Thaler and Sunstein (2008) argue that decision making processes can be steered by creating nudges. ATM owners may tactfully display or leave out important information in such a way that consumers are nudged towards accepting it. Psychological characteristics, such as risk aversion (Pratt, 1964), ambiguity aversion (Ellsberg, 1961; Fox & Tversky, 1995) and time preferences (Frederick,

Loewenstein & O'Donoghue, 2002), may possibly influence the willingness to accept DCC. The salience of risk and ambiguity may even strengthen the effects of risk- and ambiguity aversion (Bordalo, Gennaioli and Shleifer, 2012; Muthukrishnan & Wathieu, 2009). By letting respondents fill out incentivized multiple choice lists, attitudes towards risk (Holt & Laury, 2002), ambiguity (Sutter, Kocher, Glätzle-Rützler & Trautman, 2013) and time preferences (Meier & Sprenger, 2010) can be elicited. Furthermore, as previous studies (Juric et al., 2002; Pettigrew et al., 2010) relied on interviews, studying simulated currency conversion behavior may provide more valuable insights.

The main research question of this study is: *what drives people to accept unfavorable exchange rates when converting foreign currencies?* Gaining more insights in the driving factors for currency conversion behavior helps us understand why consumers would accept DCC. Existing literature has not found an answer to this question yet (Gerritsen et al., 2015). These insights can help policy makers to design better regulations for providers of DCC, authorities and retail banks can use these insights to inform citizens or customers, and it will help providers of DCC to optimize their business models. Furthermore, answering this question may give another interesting insight into how people make decisions under uncertainty. Lastly, this study may provide evidence supporting the external validity of earlier models (Juric et al., 2002; Pettigrew et al., 2010) and behavioral, experimental measures (Holt & Laury, 2002; Meier & Sprenger, 2010; Sutter et al., 2013).

I replicated and extended the Gerritsen et al. (2015) study, by creating a survey including an experiment where a withdrawal at a foreign ATM machine is simulated. In the experiment, participants are confronted with DCC on an ATM and they are asked to make a withdrawal decision. Once again, the effects of markups and reference prices upon the willingness to accept DCC were tested. To extend upon the existing literature, effects of nudging were tested by introducing a non-nudging DCC screen into the experimental design. Attitudes towards risk, ambiguity and time preferences upon the willingness to accept DCC were also tested. These attitudes were elicited by providing incentivized choice lists. Additionally, effects of the confidence about reference prices, the level of understanding the DCC screen and travel experience were tested.

My findings show that there is strong evidence that the level of ambiguity aversion is positively related to DCC usage when there is a nudge, relative to when there is no nudge. Furthermore, a markup of 20% has negative impact upon DCC usage, relative to a markup of

0%. Additionally, there is weak evidence that the presence of a nudge negatively influences DCC usage. Moreover, the presence of a nudge seems to influence the decision making process that people go through when withdrawing money, as the different nudging treatments trigger different withdrawal conversion rationales. Lastly, individual attitudes towards risk, ambiguity and time are not found to be related to DCC usage. Reference prices, confidence about reference prices, the level of understanding the DCC screen and travel experience do not influence DCC usage.

The rest of this paper is organized as follows. In section I, I give an overview of the existing currency conversion literature, other relevant decision making literature and I develop hypotheses. Section II presents a detailed description of my methodology, including details about the used choice lists and the different treatment groups. In section III, I present my results and statistical analyses. In the final section, section IV, main findings are discussed, as well as the implications, limitations and future recommendations of my study.

Section I – Literature review and hypotheses

Currency conversion

When making economic transactions that are denoted in an unfamiliar currency, one must convert this foreign currency to a familiar currency in order to understand the value of this transaction. To convert a foreign currency to one's home currency the exchange rate must be known. However, as exchange rates fluctuate over time, it may be cheaper (more expensive) to convert currencies tomorrow if the exchange rates becomes more (less) favorable, ignoring interest rates and inflation. This implies that risk is involved when converting currencies, or arguably uncertainty or ambiguity, because the probability of a certain future exchange rate is unknown (Ellsberg, 1961). This uncertain nature of converting foreign currencies makes this an interesting behavioral economic phenomenon. The currency conversion process mainly applies to travelers or tourists visiting other countries. On the other hand, it may also apply to consumers and organizations. Consumers may encounter foreign prices when visiting online web shops (e.g. Amazon) and organizations may encounter foreign prices when interacting with foreign suppliers, customers or other organizations.

The introduction of the Euro (€) in 2002 has triggered some economists, psychologists and other researchers to study the field of currency conversion. Most studies put a focus on the

nominal value of foreign currencies. The term 'money illusion', "the tendency to think in terms of nominal rather than real monetary values" (Shafir, Diamond & Tversky, 1997, p. 341), is used to explain currency conversion behavior. Raghubir and Srivastava (2002) use this tendency to explain why consumers over (under) spend money for low (high) denomination currencies, as they are biased towards the facial value of a foreign currency. They call this the 'face value effect' and a more recent study (Raghubir, Morwitz & Santana, 2012) finds that this effect is externally valid as well: tourist spending in Eurozone countries increased after adopting the Euro in 2002, compared to non-Eurozone countries. The reason for the increased spending is that in eleven of the twelve initial Eurozone countries, the new Euro denomination was lower than the original currency denomination (e.g. the Netherlands, where: €1.00 = *f*2.20371). However, consumers are able to adapt to new currencies rapidly (Mussweiler & Englich, 2003). Besides, this 'face value effect' can be moderated when people have more time to process exchange rate information or when they are more experienced with a foreign currency (Raghubir & Srivastava, 2002). Other studies (Callow & Lerman, 2003; Gaston-Breton, 2006) also show that gaining experience with a certain currency can moderate judgmental biases. Desmet & Gaston-Breton (1999) find that prices are perceived to differ less if they are denoted in a smaller denomination (e.g. in Euros instead of Dutch Guilders). A practical implication of this finding is that it can cause consumers to increase their willingness to pay for expensive products with many features (Gamble, Gärling, Västfjäll & Marell, 2005).

Another important concept in the currency conversion field is an internal reference price, "an internal standard against which observed prices are compared" (Kalyanaram & Winer, 1995, p. G161). In order to understand the real value of a foreign price, consumers compare a converted price to an internal reference price (Juric, Lawson & McLean, 2002). For example, a Dutch tourist in Poland pays 8 Polish złoty for a draft beer, which converts to roughly €1.90, at the time of writing. Compared to the internal reference price of €2.50 for a draft beer in the Netherlands, the Dutch tourist perceives the Polish draft beer as being rather cheap. However, as people are not always able to accurately generate these internal reference prices, uncertainty arises (Dehaene & Marques, 2002). A study based on interviews with international travelers investigated how travelers reduce this uncertainty (Pettigrew, Daly, Lee, Soutar & Manning, 2010). The authors constructed a model that identifies the determining factors of travelers' currency conversion behavior. In line with other studies (Callow & Lerman, 2003; Gaston-Breton, 2006), Pettigrew et al. (2010) find that experience

with a foreign currency influences currency conversion behavior, along with, amongst others, the currency ratio, cost of product and information about conversion rates. This ultimately leads to a conversion strategy choice, namely avoidance, simplification or exact calculation. Lemaire and Lecacheur (2001) already found that people prefer fast conversion strategies, but that younger adults are faster and more accurate than older adults.

Dynamic Currency Conversion

Whereas the Juric et al. (2002) and Pettigrew et al. (2010) studies rely on interviews, a recent study (Gerritsen, Rigtering, Bouw & Vonk, 2015) actually tested traveler currency conversion behavior by simulating an ATM cash withdrawal where the so-called 'Dynamic Currency Conversion' (DCC) service was offered. DCC is a service that allows consumers to execute foreign transactions in their own currency, when paying with a debit/credit card. Examples of DCC providers are (web)shops, hotels and taxis, although the most well known example is DCC offered on ATMs provided by banks. In most cases, DCC works as follows: an ATM or PIN-terminal recognizes a foreign debit/credit card and it automatically offers DCC to the paying customer. The customer is offered the choice to pay in his own currency and alternatively he can pay using the local currency. In the former case the ATM does the conversion and in the latter case the consumer's own bank does the conversion. Typically, accepting DCC is more expensive, as the exchange rate that is offered is often less favorable than the consumer's home bank offers, despite the small costs that home banks charge when paying/withdrawing money abroad.

The following real life example illustrates very well how DCC works on foreign ATMs. On July 22nd, 2015, an attempt was made to withdraw Polish złotys (PLN) from a Euronet ATM in the city centre of Warsaw, Poland, using a Dutch debit card from ING Bank. After selecting the withdrawal amount, the 'DCC screen', as can be seen in appendix A, was presented. The consumer was given the choice to accept the withdrawal 'without conversion' or to accept the withdrawal 'with conversion'. In the former case, only the account charge in Polish złoty (PLN) was given. In the latter case, the withdrawal amount, the corresponding exchange rate and the account charge in Euros (EUR) was given. Eventually, the consumer chose to withdraw 'without conversion', such that the home bank executed the conversion (see appendix B). Table 1 gives an overview of the total costs for withdrawing different amounts of Polish złotys, for the different withdrawal options, on the mentioned day at the mentioned ATM.

Table 1: DCC example (Euronet ATM, Warsaw, Poland, July 22nd, 2015)

	Accept without conversion	**Accept with conversion (=DCC)**
Conversion done by	ING Bank, the Netherlands	Euronet ATM, Warsaw, Poland
Exchange rate (PLN/EUR)	4,1230298*	3,7523
Commission	1%	0%
Fixed costs (EUR)	€ 2,25	€ 0.00
Total costs for withdrawing 60 PLN	€ 16,80	€ 15,99
Total costs for withdrawing 64 PLN	€ 25,05	€ 25,05
Total costs for withdrawing 250 PLN	€ 62,89	€ 66,63
Total costs for withdrawing 600 PLN	€ 147,77	€ 159,90
Total costs for withdrawing 1000 PLN	€ 244,79	€ 266,50

*Including 1% commission

As can be seen in table 1, the exchange rate that was offered by the ATM was much less favorable than the exchange rate that ING Bank uses, as it imposes a markup making it 9.88% more expensive. Although ING Bank charges 1% commission over any transaction in a foreign currency and a fixed amount of € 2.25 when withdrawing foreign currencies at an ATM, it is often more expensive to accept DCC. Table 1 shows that for withdrawing small amounts of money, accepting DCC is actually cheaper. However, for withdrawals larger than 64 PLN, accepting 'without conversion' is cheaper. Given that Dutch travelers in 2012 withdrew on average €152 from foreign ATMs (Gerritsen & Rigtering, 2014), this example shows that accepting DCC is generally more expensive. Overall, the total costs for accepting DCC always depend on the amount of money to be withdrawn/paid, home bank foreign transaction tariffs, the type of card (credit/debit), the DCC provider (ATM or shop/restaurant/taxi/etc.) and the exchange rate offered by the provider of DCC.

Gerritsen et al. (2015) find that markup levels on the DCC exchange rate up to 10% are unrelated to consumer DCC usage. In other words, people do not respond to a larger markup level by accepting the 'without conversion' alternative more often. Furthermore, the perceived exchange rate, functioning as a reference price, was also found to be unrelated to consumer DCC usage, even though people could compare their perceived exchange rate directly to the DCC exchange rate offered by the ATM. There was evidence that age and gender were significant variables, as older respondents as well as female respondents were

more likely to choose DCC. The authors state that there is empirical evidence of irrational behavior by travelers, because the markup level and reference prices are unrelated with DCC usage. This raises the question, *what drives people to accept unfavorable exchange rates when converting foreign currencies?* Gerritsen et al. (2015) propose to extend their research by researching framing effects and psychological characteristics. Behavioral economic theory can therefore possibly explain these findings.

Effects of Markup

As the total account charge for withdrawing money at an ATM while accepting DCC are fully known, there is no risk or uncertainty with regard to the costs. When accepting an ATM withdrawal 'without conversion', the total costs depend on the exchange rate used by the home bank and on other determinants. As this information is not given on the ATM screen when DCC is offered, accepting a withdrawal 'without conversion' is risky, or uncertain/ambiguous. Given that accepting DCC is generally more expensive, risk averse agents are expected to accept DCC if the displayed costs associated with DCC are not too high. To be more precise, the costs must be equal to or less than their certainty equivalent, which is the amount of money that makes an agent indifferent between the risky and risk free option, such that both options yield an equal level of utility (Pratt, 1964). The difference between this certainty equivalent and the expected monetary costs of the risky option is called the risk premium (Pratt, 1964). In this case, the risk premium is equal to the price differential between accepting with or 'without conversion'.

As the markup on the exchange rate associated with the DCC option increases, so does the risk premium. Holding the level of risk aversion constant, this implies that as the markup increases, individuals are less likely to accept DCC, because the expected utility level associated with accepting DCC decreases. Knowledge about the exchange rate is associated with currency conversion behavior (Pettigrew et al., 2010). Gerritsen et al. (2015) already found that the markup level was not associated with DCC usage. However, in that study the largest markup was only 10% and this may be too little, considering all factors that determine the relative cost of DCC (e.g. home bank tariffs, type of card, etc.). Therefore, I develop the following hypothesis:

> Hypothesis 1: P*eople are less likely to accept DCC if a markup of 20% is imposed on the DCC exchange rate, compared to when 0% markup is imposed.*

Effects of nudging

Kahneman and Tversky (1979) developed prospect theory, a descriptive model that served as critique of the expected utility model, a normative model for rational choice. Within the expected utility model, final states of assets or welfare determine derived utility. In the prospect theory model, gains and losses, relative to a neutral reference point, determine the utility that is derived. By framing a certain decision problem in a different way, a decision maker may evaluate the relative desirability of the decision problem differently because of a change in perspective (Tversky & Kahneman, 1981). Tversky and Kahneman use the example of an Asian disease to illustrate the effects of framing, by framing outcomes either in the number of lives saved (gains) or number of deaths (losses). They find that people prefer saving 200 people for sure over a 1/3 probability that 600 people are saved. However, when this same situation is framed differently, they find that people prefer a 1/3 probability that 0 people die over a certain death of 400 people. In all of the mentioned situations, the expected number of deaths (or people saved) is equal, namely 200 die (and 400 live).

Similar to framing, nudging shows how the presentation of information can be used to influence decision makers. Nudging is making use of "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid" (Thaler & Sunstein, 2008, p. 6). Well known examples of nudging include houseflies printed on the inside of men's urinals intended to improve aiming or default options on organ donation forms intended to save more lives. Such nudges encourage pro-social behavior and the people subject to the nudge may even derive utility from this as well, surely it will not cost them utility. However, nudges may also be used to serve mainly or solely the interest of the nudger. In supermarkets, for example, expensive products are displayed at eye level, to stimulate revenue. Likewise, when drawing a parallel to the choice architecture on ATMs that offer DCC, there may be a nudge as well. One may argue that this is not desired from a more ethical perspective, as consumers might be misled.

The exposure to a foreign price is an important phase of a currency conversion process (Juric et al., 2002; Pettigrew et al., 2010) and Gerritsen et al. (2015) presume that banks may steer consumers towards accepting unfavorable exchange rates by framing the DCC information. Although Gerritsen et al. (2015) believe that framing effects may play a role in a DCC context, I believe that testing the effects of nudging makes more sense. Framing implies that

the exact same information is presented either in terms of gains or in terms of losses, but this is not applicable in this context. The typical DCC screen that ATMs present (see Appendix A) may possibly contain a nudge already. Simply by providing additional information for the DCC withdrawal, namely the exchange rate and associated costs, consumers might be triggered to prefer withdrawing 'with conversion' over withdrawing 'without conversion'. Much less information is given for this latter option. The provision of additional information does not change the economic meaning of the different withdrawal options. Besides, consumers can easily and freely choose between the two withdrawal options, so the criteria to count as a nudge are met. Furthermore, the potential nudge may be strengthened by phrases such as "This ATM offers conversion to your home currency" and "Withdrawal with conversion". To test whether typical DCC screens successfully nudges consumers towards accepting DCC, I develop the following hypothesis:

> Hypothesis 2: *Typical DCC screens include a nudge which causes people to accept withdrawals 'with conversion' (i.e. accepting DCC) more often compared to DCC screens where the nudge is taken away.*

Behavioral attitudes towards risk, ambiguity and time in behavioral economic literature

Individual behavioral attitudes towards risk, ambiguity and time have the ability to predict field behavior in recent behavioral (economic) studies. For instance, an individual's level of risk aversion influences occupational choice, as risk averse people less likely to become an entrepreneur (Cramer, Hartog, Jonker & Van Praag, 2002) and more likely to take on jobs that have low earnings risk (Bonin, Dohmen, Falk, Huffman & Sunde, 2007). Other examples show that attitudes towards ambiguity and time may predict smoking behavior, as more ambiguity averse people are less likely to smoke (Sutter et al., 2013) and smokers show higher levels of impatience than non-smokers (Khwaja, Sloan & Salm, 2006).

As behavioral attitudes may serve as predictor of field behavior, there is also reason to believe that these attitudes can be used to explain behavior in the currency conversion domain. Gerritsen et al. (2015) already proposed to investigate the effects of psychological characteristics on currency conversion behavior. After all, the choice between accepting 'with conversion' or 'without conversion' is simply a choice between a risky, ambiguous prospect and a risk-free, unambiguous prospect. In addition, the belief that time preferences may play a role in the currency conversion domain is strengthened by studies that relate time preferences to individual financial decision making. Meier and Sprenger (2013) relate time

preferences to financial literacy and they find a positive relationship between present-biased individuals and the likeliness to have a (higher) credit card debt (Meier & Sprenger, 2010).

Effects of risk aversion

As mentioned earlier, the DCC option is a risk free option, as the total withdrawal costs are displayed on the screen. The option to withdraw 'without conversion' is a risky one, as the fluctuating exchange rate and other factors determine the total withdrawal costs. Risk averse people are willing to insure themselves against this risk, by paying a risk premium (Pratt, 1961). This suggests that they will prefer the risk free, more expensive DCC withdrawal over the risky, cheaper non-DCC withdrawal. The costs associated with the DCC withdrawal serve as certainty equivalent. The difference in costs between both withdrawals serves as risk premium. Therefore, I hypothesize the following:

Hypothesis 3: *As people are more risk averse, they are more likely to accept DCC.*

Effects of ambiguity aversion

Ellsberg (1961) defined the difference between risk and uncertainty. Risk arises in situations where the probabilities of different outcomes are known and we speak of uncertainty, or ambiguity, if the probabilities of different outcomes are unknown. Because the probability of a certain future exchange rate is unknown, the option to withdraw 'without conversion' can also be regarded as uncertain or ambiguous, instead of solely risky. The comparative ignorance hypothesis (Fox & Tversky, 1995) states that ambiguity aversion arises when people evaluate both clear and vague prospect simultaneously. This is the case when people are presented a DCC withdrawal where accepting 'with conversion' is a very clear prospect, whereas accepting 'without conversion' is rather vague. For this latter option, no information is given and people may not understand what actually happens when this option is selected. Furthermore, Fox and Tversky argue that this contrast makes the less (more) familiar prospect less (more) attractive. This also applies for the DCC withdrawal, as it serves as a familiar prospect by including a reference of the home currency. Therefore, I hypothesize the following:

Hypothesis 4: *As people are more ambiguity averse, they are more likely to accept DCC.*

Interaction effects of risk- and ambiguity aversion with nudge

Possibly, the effects of the level of risk- and ambiguity aversion are larger when the risk and ambiguity are more salient on the ATM screen. Research has shown that people respond to salience by overweighing more salient outcomes (Bordalo, Gennaioli and Shleifer, 2012) and increasing ambiguity's salience is even found to be related to more ambiguity aversive behavior (Muthukrishnan & Wathieu, 2009). Hypothesis 2 already tests the effects of nudging, by introducing a DCC screen without nudge. This non-nudging DCC screen possibly makes the risk and ambiguity less salient, as it provides more information about the 'without conversion' withdrawal option. Therefore, the level of risk- and ambiguity aversion may interact with the nudge. Thus, I construct the following hypotheses:

> Hypothesis 5: *The impact of risk aversion on DCC usage is larger when there is a nudge, relative to when there is no nudge.*

and,

> Hypothesis 6: *The impact of ambiguity aversion on DCC usage is larger when there is a nudge, relative to when there is no nudge.*

Effects of time preferences

People's preferences can change over time, such that a preference is inconsistent with earlier preferences, a phenomenon called dynamic inconsistency (Thaler, 1981). When choosing today between receiving €10 in a year and €11 in a year and one day, most people will choose the latter. However, when people are given the chance to reconsider in 364 days, some people will switch to receiving the €10 instead of waiting the extra day to receive €11, because they discount the future. These tendencies are called present-biased preferences (O'Donoghue & Rabin, 1999). Discount rates for losses are found to be smaller than for gains and this explains why present biased people prefer to incur costs immediately rather than delaying them (Frederick, Loewenstein & O'Donoghue, 2002). Furthermore, people experience an immediate 'pain of paying' when making a purchase and when people consume a particular item they link this to its payment (Prelec & Loewenstein, 1998). However, people think about future or current payments only, such that past payments do not cause any pain of paying. In other words, people perceive consumption that has been prepaid for as if it were free. Besides, people are debt averse (Prelec & Loewenstein, 1998), which also explains why prepaying is preferred. Basically people prepay for their withdrawal when

accepting DCC, as they first are informed about its costs before the money is withdrawn, hence not causing any debt aversion or pain of paying. In contrast, the costs for accepting 'without conversion' are known and incurred only after the withdrawal, in most cases the home bank even calculates the exact costs overnight. This all suggests that present biased people should be more willing to accept DCC, as the associated costs are known immediately. In addition, many people do not check their finances every day and when travelling this may only be done once returning home. Therefore, I hypothesize the following:

Hypothesis 7: *As people are more present biased, they are more likely to accept DCC.*

Effects of reference price

Internal reference prices play an important role when travelers convert foreign currencies, as it can help travelers to understand the real value of a foreign price when this is compared to an internal reference price (Kalyanaram & Winer, 1995; Juric et al., 2002). In order to evaluate the attractiveness of the exchange rate offered by the DCC service, consumers may compare the DCC exchange rate to the perceived exchange rate, the latter therefore serves as reference price. The offered DCC exchange rate reflects the cost for a unit of foreign currency and the cost of product is one of the determinants influencing currency conversion behavior (Pettigrew et al., 2010). Since the DCC exchange rate is actually displayed on the ATM screen, this comparison should be very simple. For example, when a British person believes the €/£ exchange rate to be about 1.25 and the DCC service offers a €/£ exchange rate of 1.33, then this person will perceive this rate as rather good and he is expected to accept DCC. Vice versa, when this reference exchange rate is higher than the offered exchange rate, then the latter will be regarded as unfavorable and DCC will be rejected. Hence, I construct the following hypothesis:

Hypothesis 8: *As people overestimate (underestimate) the exchange rate more, they are less (more) likely to accept DCC.*

However, people may not always be accurate when it comes to knowing the exact exchange rates. The inability to accurately generate these reference prices produces uncertainty (Dehaene & Marques, 2002). Therefore, as people are more uncertain about the perceived exchange rate, uncertainty increases and the certainty equivalent and risk premium are expected to increase. Thus, I hypothesize the following:

Hypothesis 9: *As people are surer of their perceived exchange rate, they are less likely to accept DCC.*

Effects of understanding

An overload of information may cause travelers to make a foreign purchase without any conversion (Pettigrew et al., 2010). Consumers may experience an overload of information when they do not understand the DCC screen and the difference between the two options. Hence, they are expected to make the withdrawal without any conversion, which in terms of withdrawing money at an ATM translates to a random decision between accepting DCC or not. In contrast, people that fully understand the DCC screen may be more aware that the offered exchange rate is unfavorable and that accepting 'without conversion' will lead to a more favorable conversion done by the home bank. Therefore, I develop the following hypothesis:

Hypothesis 10: *People that understand the DCC screen are less likely to accept DCC.*

Effects of travel experience on exchange rate information searches

Earlier studies showed that people adapt to new currencies rapidly (Mussweiler & Englich, 2003) and that experience with a currency influences conversion behavior as it can moderate judgmental biases (Callow & Lerman, 2003; Gaston-Breton, 2006). Pettigrew et al. (2010) state that travelers with limited foreign currency experience are more likely to search for exchange rate information prior to a trip. Experienced travelers are more experienced with foreign currencies, so therefore, I hypothesize that:

Hypothesis 11: *As people have less travel experience, and therefore less foreign currency experience, they are more likely to engage in pre-travel exchange rate information searches.*

Section II – Methodology

Participants

The target population for this study consists of people who currently face economic transactions which are executed in another currency than their home currency, as well as people who have recently faced such transactions. The former group I call 'current travelers'

and the latter group I call 'past travelers'. Facing transactions in a different currency requires a currency conversion process, which makes this a suitable target population, because this group is able to (have) encounter(ed) the ATM screen where DCC is offered. I created an online survey for my target population, which included a simulation of an ATM withdrawal where DCC is offered to the consumer.

I decided to focus on non-Eurozone people visiting the Eurozone, as well as Eurozone people visiting a non-Eurozone country. In particular, I focused on American, British and Chinese people travelling to the Netherlands, as well as Dutch and German people travelling to the United Kingdom. The most recent research about tourism in Amsterdam shows that the largest non-Eurozone share of all overnight hotel stays in the Dutch capital is taken by British (15%) and American (9%) people (Gemeente Amsterdam, 2014). The third biggest non-Eurozone group exists of Asian travelers and as there is a large share of Chinese people studying in the Netherlands, I decided to include Chinese people as well. As this study is conducted in the Netherlands, Dutch people were also included. On top of that, because Germany is the largest Eurozone country and because there is a large share of German students in the Netherlands, German people were included in my target group as well. I selected the United Kingdom as destination, because this is the non-Eurozone destination to which most airplanes fly to from the largest Dutch and German airports[1].

To sample my target population, in particular 'current travelers', I went to two different places in Amsterdam, the Netherlands, where my target population was likely to be found. The first place was Schiphol Airport, where American, British, Chinese, German and Dutch travelers can be found, especially near the departures area. The second place was a famous tourist attraction in downtown Amsterdam, the *Anne Frank Huis*, where people are often queuing on the streets. On both places I distributed small flyers, where a request to fill out my survey was printed on, including a short link to the survey and a notification that €10.00 could be won. The rationale behind this was that people could fill out my survey as they were waiting for their plane or entrance to the Anne Frank Huis, or alternatively at home/in the hotel. I decided not to actually interview the respondents myself or handout physical surveys, as this would be too time-consuming. This would also generate some practical issues, as people at these two venues were on the move, either towards their plane or towards the Anne Frank House entrance.

[1] According to the departures overviews from the official websites of Schiphol Airport, Eindhoven Airport, Frankfurt Airport and Munich Airport.

Second, the survey was distributed online, to sample in particular 'past travelers'. I joined multiple Facebook groups in which my target population was likely to be found (e.g. American online marketplaces, British university student groups, Dutch travel groups, German trade groups, etc.). I requested people to fill out my survey and I informed them about the possibility to win €10.00. A clear limitation of this approach is that selection bias is likely to occur, as active Facebook users are likely to be younger than the average person from my target population. Furthermore, the limitation of targeting 'past travelers' is that their visit may have been some time ago, increasing the chance to include noise (e.g. the perceived exchange rate is distorted). I do control for this noise by including control variables into my analyses, but it is clear that past travelers as target group are inferior to current travelers.

A total of 423 people started the survey and filled out at least one of the survey questions. Of this number, 30 respondents could not continue the survey because their nationality was not one of the target nationalities. A further 9 American respondents could not continue the survey because they had never visited the Eurozone before and another 9 Dutch respondents could not continue the survey because they had never visited the United Kingdom before. Of the remaining 375 respondents, 369 respondents filled out the demographical questions and a number of 223 successfully filled out every single survey question. This means that 152 respondents either partly filled out the survey or did not correctly fill out the choice lists, resulting in an incomplete survey. Unfortunately, I was not able to find Chinese people willing to take my survey. Table 2 provides a socio-demographic profile of the respondents. The realized sample does not seem to be fully representative of the target population, as young, female respondents and people that have only finished secondary school are overrepresented.

Table 2: Socio demographic profile

Nationality	**n**	**%**
American	104	24.59
British	127	30.02
Dutch	152	35.93
German	10	2.36
Other	30	7.09
Total	423	100.00

Gender	**n**	**%**
Male	106	28.73
Female	263	71.27
Total	369	100.00

Age	**n**	**%**
<18	29	7.86
18-25	216	58.54
26-35	56	15.18
36-45	32	8.67
46-55	23	6.23
>55	13	3.52
Total	369	100.00

Education	**n**	**%**
Primary school	2	0.54
Secondary school	195	52.85
Vocational/technical school	38	10.30
Associate degree	41	11.11
Bachelor degree	54	14.63
Master degree	32	8.67
PhD or post MSc	4	1.08
Other	3	0.81
Total	369	100.00

Table 3 provides an overview of the respondents' travel and general currency conversion behavior. A large majority of the respondents visited the target country whilst on holiday and more than half of the respondents visited the target country at least within the last year. Currency conversion at an ATM is the most popular currency conversion method, which acknowledges the importance of this study.

Table 3: Travel and general currency conversion behavior

Usual reason for visit to target country (Eurozone/UK)	**n**	**%**
Holiday	205	68.79
Business	17	5.70
Study	39	13.09
Family	28	9.40
Residence	4	1.34
Other	5	1.68
Total	298	100.00

Moment of last visit to target country	**n**	**%**
Currently visiting	15	5.17
During last week	11	3.79
During last month	15	5.17
During last six months	53	18.28
During last year	77	26.55
During last five years	96	33.10
More than five years ago	23	7.93
Total	290	100.00

Usual conversion method	**n**	**%**
Never converted before	13	4.81
Prior trip, via own bank	43	15.93
Prior trip, via exchange office	72	26.67
During trip, via ATM	78	28.89
During trip, by paying with card	45	16.67
During, via exchange office	15	5.56
Other	4	1.48
Total	270	100.00

2x2 design

To test whether the markup or nudging effects influence consumer behavior when withdrawing cash, I constructed a 2x2 design with four different treatment groups, as can be seen in table 4. Subjects in each treatment group would be presented a different version of the

ATM screen where DCC is presented. I based the ATM screens on the similar screen used for the experiment by Gerritsen et al. (2015).

Table 4: 2x2 design

	0% markup	**20% markup**
Without nudge	A	B
With nudge	C	D

Subjects would either see an ATM screen with the actual exchange rate (group A and C) or a screen with an exchange rate including a 20% markup (group B and D), to test for markup effects. I updated the exchange rates in my survey every day I would actively collect data. I used the actual exchange rates used by the largest retail banks to determine the exchange rates that I used in my survey. For Dutch subjects, the average exchange rates of the Netherlands' three biggest banks were used to compose the 'actual' exchange rate. For British subjects, the average exchange rates of the United Kingdom's two biggest banks were used. Similarly, the actual exchange rates for American, German and Chinese subjects were constructed. For the used exchange rates, see appendix C.

To test for nudging effects, subjects were either presented a 'typical' ATM screen where DCC is offered including a nudge (group A and B), as can be seen in figure 1. Alternatively, subjects were presented a non-nudging DCC screen where I took away the nudge (group C and D), as can be seen in figure 2. In order to take away the nudge, I made a more neutral version of the DCC screen by taking away potentially nudging elements of the typical DCC screen, simultaneously making risk and ambiguity much less salient. Two boxes were included for the 'accept without conversion' option, notifying the subject that the exchange rate and debited amount would depend on the subject's home bank, which is after all the case. Furthermore, the phrasing of '*accept without conversion*' and '*accept with conversion*' were altered into '*accept option 1*' and '*accept option 2*', respectively. Lastly, the phrase '*This ATM offers conversion to your home currency*' was deleted.

Figure 1: 'Typical' DCC screen, with nudge (0% markup)

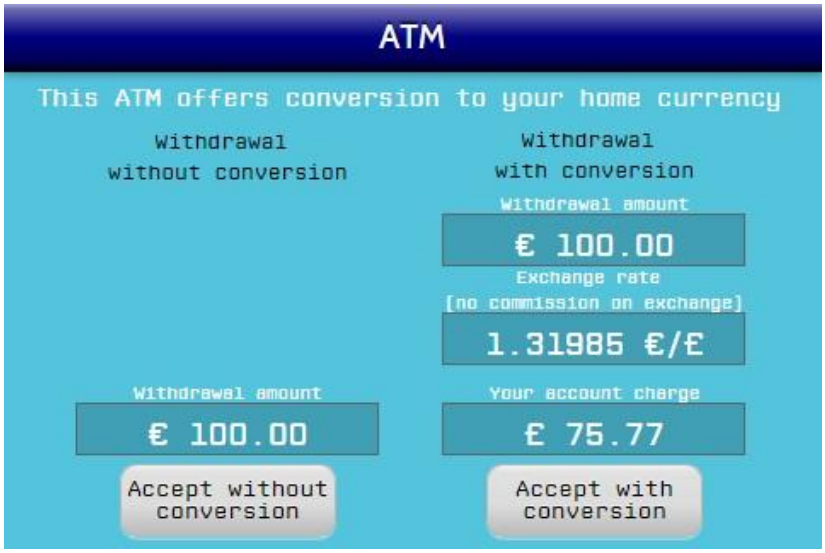


Figure 2: Non-nudging DCC screen, nudge taken away (0% markup)

Survey

Data was collected between June 18th and July 15th, 2015, through an online survey. Participants reached my survey by entering a short URL in their web browser or by clicking on the URL link via Facebook. The survey consisted of eight different screens and was created using survey software Qualtrics. The survey was pre tested on some students from Erasmus University Rotterdam as well as Utrecht University. The entire survey can be found in Appendix D.

On the first screen respondents were given a short introduction to my survey, both in Dutch and English. The topic of the survey was stated, as well the estimated duration and the possibility of winning €10.00. Then, respondents were asked to choose their nationality. As discussed, I focused on American, British, Chinese, German & Dutch people. Respondents were able to select 'Other', but this would end their survey as other nationalities were not included in my survey. Dutch people would see the Dutch version of the survey, whereas all other people would see the identical English version.

Respondents were asked to state demographical information on the second screen. Furthermore, Dutch and German respondents were asked whether they had ever visited the United Kingdom. If 'No' was selected, the survey would end. Alternatively, American, British and Chinese respondents were asked which Eurozone country they visited most recently. If 'I have never visited a Eurozone country before' was selected, the survey would end.

On the third screen, respondents had to state their estimation of the current exchange rate. Furthermore, they had to state relevant information about their travel experience and behavior about searching for exchange rate information.

The ATM cash withdrawal simulation started on the fourth screen. Respondents were informed that they were in the United Kingdom/their most recent visited Eurozone country and that they were about to withdraw £/€ 100.00 at an ATM, using a debit/credit card from their home bank.

On the fifth screen, respondents faced the ATM screen where DCC was offered. The survey software would randomly distribute the respondents among the four different groups from the 2x2 design and they would see the corresponding ATM screen. Respondents were asked to select the option they would choose, 'without conversion'/'option 1' or 'with conversion'/'option 2'. The survey software would measure the time it took each respondent to make a choice and to move on to the next screen.

Respondents were asked why they made this choice and to what extent they understood the ATM screen, on the sixth screen. Additionally, they were asked to state past currency conversion behavior.

On the seventh screen, four incentivized choice lists were presented in order to elicit risk, ambiguity and time preference attitudes (see figure 3-6 for excerpts and Appendix D for all

choice lists). Respondents would first read a small instruction about the choice lists and the incentives. Then, they could fill out the four different choice lists. The order in which the choice lists were presented was randomized, to control for order effects. Finally, respondents were asked to state their lucky number, ranging from 1 to 20, in order to be eligible to win money.

On the eighth and final screen the respondents were thanked for their participation. Lastly, I informed the respondents that I would contact them in case they won money.

Choice lists

The first choice list was used to elicit attitudes towards risk and it was based on the choice list used by Sutter et al. (2013). Subjects were presented a series of eleven decision tasks, each containing a risky prospect, namely a 50% chance to win €10.00, and a certain win that increased monotonically from €0.00 to €10.00. The decision tasks were arranged in a list, where the 50%-gamble and the sure win were displayed horizontally. Subjects were asked to choose between playing the gamble or the sure win. Figure 3 shows an excerpt from this choice list. By observing the switching point, the certainty equivalent could be measured, by taking the average of the sure wins where the respondent switched from gamble to sure win. Then, the level of risk aversion r can be measured, by using

$$r = 1 - CE_R/\pi$$

where CE_R denotes the certainty equivalent of the risky prospect and π denotes the prize in the risky prospect. Values of r larger than 0.5 indicate risk aversion, values of r smaller than 0.5 indicate risk loving and when r equals 0.5 this implies risk neutrality. The first and the last decision task in this choice list contained a default option. For the first decision task, the gamble was by default preferred over winning €0.00 for sure. For the last decision task, winning €10.00 for sure was preferred over the gamble. People could still select the other choice, but I assume that any person would share these preferences. Moreover, the default options serve as a subtle nudge towards switching from gamble to sure win only once.

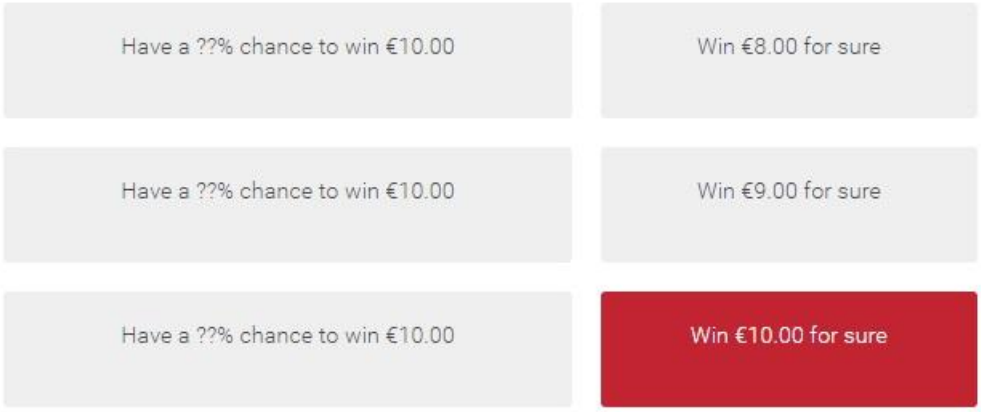
Figure 3: Risk aversion choice list (including default option for first decision task)

The second choice list was used to elicit attitudes towards ambiguity and it was also based on the choice lists used by Sutter et al. (2013). Furthermore, the *'??% chance'* part that I used to imply ambiguity was based upon the ambiguity choice lists as used by Holm, Opper and Nee (2013). Subjects were presented a series of eleven decision tasks, each containing an ambiguous prospect, namely an unknown chance to win €10.00, and a certain win that increased monotonically from €0.00 to €10.00. The decision tasks were again arranged in a list and subjects were asked to choose between playing the ambiguous gamble or the sure win. Figure 4 shows an excerpt from this choice list. Again, the certainty equivalent could be measured by observing the switching point. Then, the level of ambiguity aversion a can be measured, by using

$$a = \frac{CE_R - CE_A}{CE_R + CE_A}$$

where CE_R again denotes the certainty equivalent of the risky prospect and CE_A denotes the certainty equivalent of the ambiguous prospect. Values of a between -1 and 0 indicate ambiguity loving, values of a between 0 and 1 indicate ambiguity aversion and when a is equal to 0 this implies ambiguity neutrality. For this choice list, default options were again used for the first and last decision task.

Figure 4: Ambiguity aversion choice list (including default option for last decision task)



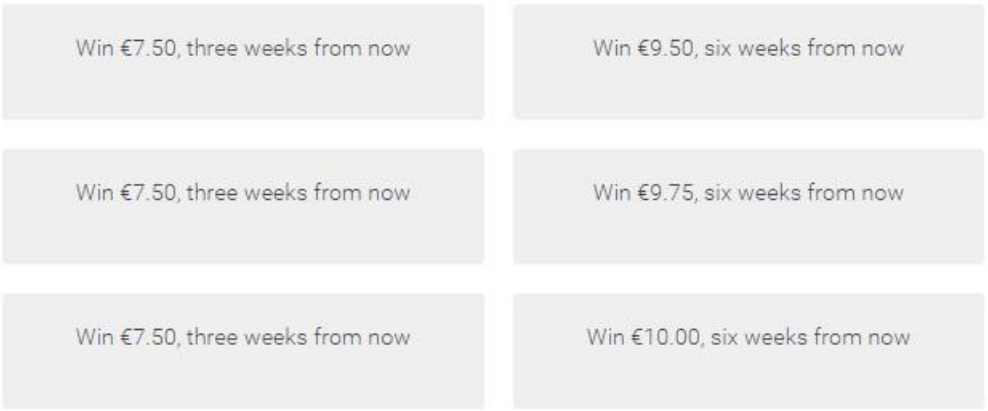
The third and fourth choice lists were used to elicit attitudes towards time preferences and these were again based on the choice lists used by Sutter et al. (2013). In the third choice lists, subjects were presented a series of eleven decision task, each containing a sure, early win of €7.50 today and a sure, delayed win three weeks from now, that increased monotonically from €7.50 to €10.00. The fourth choice list was similar, however the three week delay was shifted forward by three weeks, such that the early payment was three weeks from now and the delayed payment was six weeks from now. The decision tasks were again arranged in a list and subjects were asked to choose between playing the early or the delayed win. Figure 5 and 6 show excerpts from these choice lists. By observing the switching point, the future equivalent for both choice lists could be measured, by taking the average of the two later wins where the respondent switched from the earlier to the later win. Then, the level of present bias pb can be measured, by using

$$pb = \frac{(FE_1 - FE_2)}{(\pi_{max} - \pi_{min})}$$

where FE_1 denotes the future equivalent of the present bias choice list and where FE_2 denotes the future equivalent of the forward shifted present bias choice list. Furthermore, π_{max} denotes the maximum prize for the delayed prospects and π_{min} denotes the minimum prize for the delayed prospects. Values of pb between -1 and 0 indicate future biased preferences, values of pb between 0 and 1 indicate present biased preferences and when pb is equal to zero this implies time preference neutrality.

Figure 5: Present bias choice list

Figure 6: Present bias choice list, shifted forward



Payment

Every day a random number for all new respondents was generated. If this random number was equal to the respondent's lucky number, I applied the Random Lottery Incentive (Starmer & Sugden, 1991; Cubitt, Starmer & Sugden, 1998) to determine which decision task would be paid out, by randomly selecting one of the decision tasks and observing the corresponding respondent's decision. Depending on the respondent's decision, the gamble would be played or the sure win (today or delayed) would be won. I would then immediately inform the winning participant about the amount of money that he/she won and I would request the necessary information to transfer the winnings. Immediate winnings I would transfer as soon as I received the necessary information, delayed winnings I would transfer three/six weeks after I received the necessary information. The maximum amount of money to be won was €10.00.

Section III – Results

Table 5 provides an overview of the used survey measures and the accompanying means, standard deviations, medians and number of observations. The first four variables indicate that the sample consists of frequent travelers, but it must be noted that the survey could only be completed if the respondent had visited the target country at least once. The results indicate that the respondents were quite accurate with regard to estimating the exchange rate. As a group, the respondents slightly overestimated the exchange rate (μ=0.02%, SD=0.26%) whereas the average deviation between the perceived and actual exchange rate, in absolute terms, was 15% (SD=0.22%). Almost halve of the respondents accepted an ATM withdrawal 'with conversion', hence accepting DCC, during the simulation in the experiment (μ=0.49, SD=0.50). The results indicate that the respondents were risk neutral (μ=0.50, SD=0.21), somewhat ambiguity averse (μ=0.20, SD=0.32) and slightly present biased (μ=0.03, SD=0.21).

Table 5: Descriptive statistics

Variable	Mean (SD)	Median	n
# Visits target country, past 12 months	1.57 (4.48)	1	297
# Visits target country, past 5 years	4.24 (7.62)	2	295
# Visits other countries with foreign currency, past 12 months	1.29 (4.10)	0	298
# Visits other countries with foreign currency, past 5 years	3.98 (9.34)	2	296
Usual info search *(1=yes, 2=no)*	0.83 (0.37)	1	290
Recent info search *(1=yes, 2=no)*	0.23 (0.42)	0	298
Did you understand *(1=not at all, 7=fully)*	4.79 (1.89)	5	277
Corrected[2] difference perceived rate – actual rate *(in %)*	0.02 (0.26)	0.03	297
Corrected[2] absolute difference perceived rate – actual rate *(in %)*	0.15 (0.22)	0.09	297
How sure *(1=very unsure, 7=very sure)*	4.00 (1.54)	4	298
Time on DCC screen *(in seconds)*	29.29 (35.52)	23.06	291
Seen DCC screen before *(1=yes, 2=no)*	0.37 (0.48)	0	277
DCC usage *(1=yes, 2=no)*	0.49 (0.50)	0	293

[2] When asked about the perceived exchange rate, some respondents stated the inverted exchange rate (e.g. when they were asked *"How much € will you get for £1.00?"* a proper answer would be *"1.30"*. However, some people answered this question with *"0.80"*, as if they read *"how much £ will you get for €1.00?")*. I re-inverted these to compensate for this mistake, leading to the corrected (absolute) difference perceived rate – actual rate, in %, variables.

Level of risk aversion *(0=risk loving, 1=risk averse)*	0.50 (0.21)	0.55	225
Level of ambiguity aversion *(-1=ambiguity loving, 0=ambiguity neutral, 1=ambiguity averse)*	0.20 (0.32)	0.10	225
Level of present biased preferences *(-1=future biased, 0=neutral, 1=present biased)*	0.03 (0.21)	0.00	226

Notes: The number of observations may not be equal, because respondents did not finish the survey, respondents gave inconsistent answers (e.g. multiple switching points for the choice lists), a question was optional or because of the removal of severe outliers.

Table 6 provides an overview of the answers to the survey's only open question, categorized into fourteen different categories.

Table 6: Reported rationales for the chosen withdrawal option, categorized

Rationale chosen option	**n**	**%**
I trust my own bank better	41	14.80
I do not trust my own bank	7	2.53
I do not trust the ATM/DCC option	14	5.05
The displayed exchange rate is favorable	11	3.97
The displayed exchange rate is unfavorable	21	7.58
This option provides me more certainty	50	18.05
This option provides me more information	21	7.58
The option I chose is cheaper	25	9.03
This option prevents any additional fees/commission	19	6.86
I need the local currency instead of my own currency	15	5.42
This option is easier/quicker	12	4.33
I am not willing to exert effort to make the best possible decision	7	2.53
Guess/I do not know	25	9.03
Other	29	10.47
Total	297	107.22%

Notes: The total number of observations count up to 297, however only 277 respondents filled out this question. This is due to the fact that some respondents reported multiple rationales for their withdrawal behavior, which leads to a cumulative percentage of 107.22%.

As the dependent variable is a dummy for DCC usage, I created three probit models. Model 1 contains all relevant independent control and demographic variables. Most hypothesis-related

variables were added to Model 2. In the third model, I included four extra variables to test for interaction effects. Table 7 lists the models' coefficients, standard errors are in brackets.

Table 7: Probit analyses for DCC usage

	Model 1	Model 2	Model 3
Variable	Coefficients (SE)	Coefficients (SE)	Coefficients (SE)
Age	0.0157** (0.0077)	0.0135 (0.0091)	0.0154 (0.0094)
Male	0.0237 (0.1771)	0.0666 (0.2178)	0.1150 (0.2244)
U.K.	0.7643** (0.1987)	0.4903** (0.2346)	0.4958** (0.2386)
U.S.A.	0.3904 (0.2240)	0.3391 (0.2664)	0.4197 (0.2749)
Germany	0.2201* (0.4418)	0.6190 (0.5827)	0.5325 (0.5881)
Bachelor or higher	-0.2512 (0.1979)	-0.1899 (0.2341)	-0.1895 (0.2401)
Holiday	-0.0699 (0.1755)	-0.0374 (0.2035)	-0.0079 (0.2072)
Travel experience	-0.0080 (0.0052)	-0.0120 (0.0133)	-0.0092 (0.0136)
Info search usually	-0.3372 (0.1897)	-0.5113 (0.2523)	-0.5980 (0.2624)
Info search recently	0.1108* (0.2152)	0.3793** (0.2814)	0.4140** (0.2840)
Nudging		-0.3425 (0.2636)	-1.0817* (0.5540)
Markup		-0.5304** (0.2624)	-0.5543** (0.2670)
Nudging * Markup		0.2829 (0.3642)	0.3497 (0.3721)
Level of risk aversion		-0.0827 (0.4427)	-0.7547 (0.9886)
Level of ambiguity aversion[3]		-0.1158 (0.2928)	-0.9290 (0.6320)
Level of present bias		0.0176 (0.4235)	0.0602 (0.4337)
Corrected difference perceived rate – actual rate		0.0740 (0.4799)	0.2232 (0.4935)
How sure		-0.0877 (0.0701)	-0.1406 (0.1112)
Understand DCC screen		0.0525 (0.0524)	0.0274 (0.0855)
Level of risk aversion * nudging			0.7918 (0.9190)
Level of ambiguity aversion * nudging			1.5897*** (0.5943)
How sure * understand screen * level of risk aversion			0.0123 (0.0321)

[3] Small differences between CE_R and CE_A can be enlarged by dividing this term also by $CE_R + CE_A$. Therefore, I measured ambiguity aversion using the following alternative formula: $a = CE_R - CE_A$ to check for robustness. The results did not change, so in the analyses I use the formula us used by Sutter et al. (2013): $a = \frac{CE_R - CE_A}{CE_R + CE_A}$.

How sure * understand screen * level of ambiguity aversion			-0.0003 (0.0207)
n	281	213	213
McFadden R^2	0.0343	0.0814	0.1086

Note: The travel experience variable was created as follows: *# Visits target country, past 12 months + # Visits target country, past 5 years + # Visits non-target countries, past 12 months + # Visits non-target countries, past 5 years*. The number of observations is lower for the second model, as only respondents that successfully filled out all three choice lists are included in this analysis.

*** significant at the 1 percent level

**significant at the 5 percent level

*significant at the 10 percent level

Effects of markup and nudging

The first hypothesis focuses on the effects of a markup on the DCC exchange rate upon the likeliness to accept a DCC withdrawal. An increased markup makes a DCC withdrawal more expensive, so people are expected to accept DCC less often in this case. The second hypothesis focuses on the effects of nudging upon the likeliness to accept a DCC withdrawal. By tactfully displaying and leaving out important information people may be nudged towards accepting DCC. To test for these two effects, a 2x2 experimental design was created. In table 8 the DCC usage in absolute numbers for the different treatment groups is given and the means are reported in brackets.

Table 8: DCC usage per treatment group (as a percentage of the total)

	0% markup	**20% markup**	**Total**
Without nudge	22.18 %	24.57 %	46.76 %
With nudge	26.28 %	26.96 %	53.24 %
Total	48.46 %	51.54 %	100.00 %

The probit estimation output from table 7 shows that there is statistical evidence that the markup treatment is associated with a lower willingness to use DCC, both in model 2 (p=0.0432) and model 3 (p=0.0379). This is in line with my first hypothesis, so H_1 is supported in the data. One possible explanation for this finding is that respondents recognized the unfavorable exchange rate as offered by the DCC withdrawal option. When asked to state the rationale behind the chosen withdrawal option in the experiment, respondents that were in a 20% markup treatment reported significantly more often that the displayed exchange rate

was too unfavorable (one sided t-test, p=0.0014), compared to respondents that were in the 0% markup treatment.

The negative sign for the nudging treatment implies that, contrary to what I hypothesized, nudging information on the DCC screen has a negative effect on DCC usage. This effect is insignificant in model 2 (p=0.1939), so model 2 provides no evidence supporting H_2. However, there is weak evidence of a negative relationship between nudging and DCC usage in model 3 (p=0.0509). This means that model 3 provides evidence in favor of H_2, although only at the 10% level. The remarkable finding that the effect of nudging on DCC usage is negative may be explained by distrust in home banks. Respondents from the non-nudging treatment reported distrust in their own bank as withdrawal rationale significantly more often than those facing the original DCC screen (one sided t-test, p=0.0356). This makes sense, as the non-nudging screen literally mentions the consumer's home bank, whereas the typical DCC screen including nudge leaves this unmentioned.

Apart from the weak evidence of the effect of nudging upon DCC usage, the stated withdrawal rationales also show some additional evidence of a relationship between the nudging treatment and the withdrawal behavior. Some respondents incorrectly believed their own currency would be issued instead of the foreign, local currency when accepting 'without conversion', a phenomenon I would like to call 'DCC fallacy'. This was reported significantly more often under the nudging treatment (one sided t-test, p=0.0002). Besides, respondents from the non-nudging treatments reported significantly more often that they trusted their own bank better to perform the conversion (one sided t-test, p=0.0000). This could be an indication that people do not know that their own bank does the conversion when they choose to accept to withdraw 'without conversion' when they are confronted with a typical DCC, although I did not test for this. Lastly, one sided t-tests indicate that respondents from the non-nudging treatments reported significantly more often that a favorable displayed exchange rate (p=0.0167) and absence of additional fees/commission (p=0.0481) was the rationale for their chosen withdrawal option. Concluding, the DCC-nudge seems to influence the decision making process that people go through when confronted with a DCC screen.

Lastly, the interaction effect the markup and nudging treatment is insignificant in model 2 (p=0.4372) and 3 (p=0.3472), so there is no evidence of an interaction between the markup and the nudge.

Effects of behavioral attitudes towards risk, ambiguity and time

Hypotheses three, four and five focus on individual attitudes towards risk, ambiguity and time, respectively. These attitudes were measured through incentivized choice lists. The level of risk (ambiguity) aversion is expected to positively influence DCC usage, as a choice between a risky (ambiguous) and risk (ambiguity) free option is given. The level of present biased preferences are expected to positively influence DCC usage, because present biased people prefer incurring costs immediately over delaying theme, minimizing the effect of 'pain of paying'. The level of risk aversion is higher for people that are present biased (OLS regression, p=0.0101) and ambiguity averse (p=0.0457). Present biased people are not more ambiguity averse (p=0.2275). Other demographic variables do not seem to influence individual attitudes towards risk, ambiguity and time.

In model 2, the level of risk aversion has a negative sign, which is not in line with Hypothesis 3. However, the probit estimation provides no evidence of a significant relationship between the level of risk aversion and DCC usage (p=0.8519). This is somewhat surprising, as more certainty is the most frequent stated rationale for withdrawal behavior. Possibly, the effects of the level of risk aversion are moderated by how sure people are about their perceived exchange rate and to what extent they understand the DCC screen. After all, if a person is very sure about what the exchange rate is and he understands the difference between the two withdrawal options, he perceives less risk with regard to the 'without conversion' withdrawal. Therefore, in model 3 I included an interaction term between the level of risk aversion, the variable measuring how sure people are about their perceived exchange rate and the variable measuring to what extent they understand the DCC screen. Including this interaction term does not change the effect of the level of risk aversion (p=0.4453). The interaction term itself also has no effect on DCC usage (p=0.7024). Therefore I do not find evidence supporting H_3 in models 2 and 3.

In model 2, the level of ambiguity aversion has a negative sign, which is in not line with Hypothesis 4. The probit estimation however provides no evidence of a significant effect of the level of ambiguity aversion upon DCC usage (p=0.6925). Again, it is possible that the effects of the level of ambiguity aversion are moderated by how sure people are about their perceived exchange rate and to what extent they understand the DCC screen. A person may perceive less ambiguity if he knows the exchange rate and if he understands the difference between the two withdrawal options. Therefore, in model 3 I also included an interaction

term between the level of ambiguity aversion, the variable measuring how sure people are about their perceived exchange rate and the variable measuring to what extent they understand the DCC screen. Including this interaction term does not alter the effect of the level of ambiguity aversion (p=0.1416). The interaction term itself also has no effect on DCC usage (p=0.9871). Hence, models 2 and 3 provide no evidence supporting H_4.

The level of present biased preferences has a positive sign in both models, which is in line with Hypothesis 5. However, the effect is insignificant in model 2 (p=0.9668) and model 3 (p=0.8896). Therefore, H_5 is not supported in models 2 and 3.

Interaction effects of risk- and ambiguity aversion with nudge

Risk and ambiguity is more salient in the typical, nudging DCC screen compared to a DCC screen where the nudge is taken away. Therefore, the effects of risk- and ambiguity aversion may be larger when risk and ambiguity are more salient. In other words, the level of risk- and ambiguity aversion may interact with the nudge. In model 3, two interaction terms were added to test for these effects, which are formulated in hypotheses six and seven.

The interaction effect between the level of risk aversion and the nudge has a positive sign, as hypothesized, however the effect is insignificant (p=0.3889). Therefore, model 3 does not provide any evidence in favor of H_6.

As hypothesized, the results show strong evidence of a positive interaction effect between the level of risk aversion and the nudge (p=0.0075). Therefore, H_7 is supported by the evidence from model 3. This means that the ambiguity aversion increases DCC usage when there is a nudge, relative to when there is no nudge. As discussed, the ambiguity is much less salient on the non-nudging DCC screen, where more information is given about the 'without conversion' withdrawal option. On the typical DCC screen, where a nudge is present, the ambiguity is much more salient, which explains why the level of ambiguity aversion interacts with the nudge. I conducted a Wald test for coefficient restrictions to test whether ambiguity aversion also increases DCC usage when there is a nudge in absolute terms, but there is no evidence for that (p=0.2828).

Effect of reference prices

The eighth hypothesis concerns the effect of reference prices on the willingness to accept DCC. People compare foreign prices to internal reference prices, which in this case is the

perceived exchange rate. If people over (under) estimate the exchange they are expected to be more (less) likely to accept DCC. Hypothesis nine focuses on how confident people are about their perceived exchange rate. If people are more confident of their perceived exchange rate, they are expected to accept DCC less often.

There is no evidence of a significant effect of reference prices upon DCC usage, both in model 2 (p=0.8875) and model 3 (p=0.6317). Hence, there is no evidence supporting H_8. A Kruskal-Wallis test shows that the confidence level of the respondents' perceived exchange does not influence DCC usage (p=0.2959). The results from probit Model 2 also give no evidence of a significant relationship between confidence and DCC usage (p=0.2401), so H_9 is not supported in the data. The findings do indicate that recent exchange rate information searches are likely to influence the confidence level of the perceived exchange rate (ordered logistic regression, p=0.0000).

Effects of understanding

The tenth hypothesis focused on the understanding of the DCC screen and the relationship with DCC usage. Understanding the DCC screen makes it easier to realize that accepting an unfavorable exchange rate is more expensive than letting the home bank do the conversion. Therefore, if people do understand the DCC screen, they are expected to accept DCC less often.

A Kruskal-Wallis test was conducted to test the effect of the level of understanding the DCC screen upon the DCC usage, but the results show no significant relationship (p=0.5228). The results from model 2 (p=0.3162) model 3 (p=0.8526) provide similar results. Hence, models 2 and 3 provide no evidence for H_{10}. The results do provide weak evidence that the presence of a nudge on the DCC screen contributes to a worse understanding of the screen (ordered logistic regression, p=0.0796).

Effects of travel experience on exchange rate information searches

The eleventh hypothesis focuses on the effects of travel experience upon the effect of pre-travel exchange rate information searches. If people travel more, they obtain more experience with foreign currencies and they are expected to engage less in pre-travel exchange rate information searches.

A probit estimation with a dummy variable for usual information searches prior to a trip as dependent variable (see Appendix E) shows that all four travel experience variables are not related with usual information searches (p=0.4151, p=0.5794, p=0.6037 and p=0.8256). It shows that there is evidence that American people are more likely to usually search for exchange rate information prior to a trip than Dutch people (p=0.0258) and that there is weak evidence that people with at least a Bachelor degree are more likely to do usual information searches (p=0.0599).

Repeating the same estimation with a dummy variable for recent information searches as dependent variable provides similar results (see Appendix F). None of the four travel experience variables are related with recent exchange rate information searches (p=0.4749, p=0.8529, p=0.5820 and p=0.9706). There is again weak evidence that American people are more likely to have recently search for exchange rate information compared to Dutch people (p=0.0524). There is stronger evidence that British people have engaged in recent exchange rate information searches relative to Dutch people (p=0.0154) and that age is positively related to recent exchange rate information searches (p=0.0024).

Concluding, I find no evidence supporting H_{11} in the data. There was no hypothesis for the effect of travel experience on DCC usage. Nonetheless, a combined variable for travel experience was included in models 1, 2 and 3, but the effects on DCC usage was insignificant (p=0.1256, p=0.3674 and p=0.4997, respectively)

Miscellaneous effects

As table 7 shows, there is evidence in probit Model 1 that older people (p=0.0405) select DCC more often and that British (p=0.0495) and German (p=0.0836) people are more likely to opt for a DCC withdrawal than Dutch people, although the effect for German sample is very weak and the sample is too small (n=6) to draw any conclusions. Furthermore, there is weak evidence that people whom recently searched for exchange rate information are less likely to select the DCC withdrawal (p=0.0755). In Model 2, the same effect for British people is found (p=0.0367). Also, recent exchange rate information searches (p=0.0427) are found to have a somewhat larger, negative effect upon DCC usage. In model 3, again there is evidence that British people are more likely to accept DCC than Dutch people (p=0.0377) and that recent exchange rate information searches negatively influences DCC usage (0.0226). The finding that British people are more likely to accept DCC compared to Dutch people is consistent over all three models. A possible explanation could be that the British

respondents within my sample show greater levels of ambiguity aversion than Dutch people (OLS regression, p=0.0350) and as my results indicated already, ambiguity aversion in combination with a nudge positively influences DCC usage.

Section IV – Discussion

The main purpose of this study was to find an explanation for the seemingly irrational behavior that people perform when confronted with Dynamic Currency Conversion at foreign ATMs. Previous literature on this domain shows that there is no significant difference in DCC usage when different markups of 0%, 5% or 10% were used and there is no relationship between reference prices and DCC usage (Gerritsen et al., 2015).

This study contributes to the existing literature, by introducing behavioral economic theory to explain behavior on the domain of currency conversion, specifically by trying to explain why people show seemingly irrational behavior when confronted with DCC on ATMs. Furthermore, I contribute to the literature by testing existing, interview-based currency conversion models (Juric et al., 2002; Pettigrew et al., 2010). Policy makers and DCC providers can use the outcomes of this paper to design policy or to optimize business models, respectively.

Summary of findings

There is strong evidence that the level of risk aversion interacts with the presence of a nudge. The results show that the level ambiguity aversion increases DCC usage when there is a nudge, relative to when there is no nudge. On the typical DCC screen where a nudge is present, the ambiguity of the 'without conversion' withdrawal option is much more salient relative to the non-nudging DCC screen. This finding is in line with earlier research, where the salience of ambiguity is positively related with ambiguity aversive behavior (Muthukrishnan & Wathieu, 2009). There is no evidence that the level of ambiguity aversion increases DCC usage when there is a nudge in absolute terms.

Secondly, my results indicate that people who are given a 20% markup on the DCC exchange rate are significantly less likely to accept a withdrawal 'with conversion', in comparison to people who are given a 0% markup on the DCC exchange rate. This in line with the concept of risk aversion, which predicts that under a constant level of risk aversion people are willing

to pay a maximum risk premium in order to insure against risks (Pratt, 1964). If the markup on the DCC exchange rate exceeds an individual's risk premium, he is expected to take the risky prospect. Gerritsen et al. (2015) found that using markups up to 10% did not significantly influence DCC usage. My results indicate that a 20% markup leads to significantly less DCC usage, so apparently there is a switching point somewhere between 10% and 20%.

The third major finding is that there is a weak, negative relationship between the presence of a nudge on the withdrawal screen and DCC usage. This is remarkable, because by taking away the nudge in the non-nudging treatment, I expected DCC usage to decrease. However, in the non-nudging treatment it is mentioned that the consumer's home bank does the conversion. Respondents from this treatment reported significantly more often that they did not trust their own bank. This may explain why people from the non-nudging treatment accept DCC more often than people from the nudging treatment.

Furthermore, including a nudge influences the respondents' reported rationale behind their decision. Including a nudge is related to the 'DCC fallacy', which is the incorrect believe that a person's home currency is issued when not accepting the DCC withdrawal (i.e. when accepting the 'without conversion' withdrawal option). Additionally, excluding a nudge is also related to rationales of trusting the home bank better to do the conversion. Lastly, excluding a nudge is related to rationales of a favorable exchange rate and absence of additional fees/commission. Concluding, the nudge also seems to impact the cognitive process that people go through when confronted with a DCC screen, so this is in line that with the proposition that nudges influences decision making (Thaler & Sunstein, 2008).

There is no evidence of a relationship between risk aversion and DCC usage. This is not in line with risk aversion theory, which predicts that more risk averse agents are willing to pay more to insure themselves against risk (Pratt, 1964). A possible explanation for the irrelevance of the level of risk aversion in a DCC context is that the stakes are rather small. The example in Table 1 shows that when withdrawing an amount of 600 PLN, which is approximately the average ATM withdrawal amount, the price differential between the two options is only €12.13. People are relatively risk neutral when small stakes are involved (Arrow, 1971; Rabin, 2000), so this may explain the insensitivity of individual risk aversion levels on DCC usage.

Ambiguity aversion and DCC usage are not related, according to my results. This is not in line with the comparative ignorance hypothesis, which states that a vague prospect is considered less attractive when evaluated simultaneous with a familiar prospect (Fox & Tversky, 1995). A potential explanation could be that the withdrawal 'with conversion' is not that familiar after all. People may recognize their own currency, but evaluating the complex 'with conversion' option and converting currencies in general may still be very unfamiliar or vague to many people. The majority of the respondents indicated they had never seen the DCC screen before, so perhaps people are actually making a decision between two vague prospects here, which moderates the effects of ambiguity aversion.

The results show no evidence of a relationship between time preferences and DCC usage. Literature suggests that present biased people prefer incurring costs immediately rather than delaying them (Frederick, Loewenstein & O'Donoghue, 2002). Also, people prefer prepaying for consumption because they are debt averse and they suffer less 'pain of paying' when consumption is prepaid (Prelec & Loewenstein, 1998). Nonetheless, my results do not support these findings. A possible explanation may be that the delay in this context is too small, as the total costs for ATM withdrawals are usually known within 24 hours (see Appendix B for example).

References prices do also not seem to be related to DCC usage, according to my results. This is in line with earlier findings (Gerritsen et al., 2015), although earlier studies showed that people compare observed prices to reference prices (Kalyanaram & Winer, 1995). The importance of reference prices is also stressed in currency conversion models (Juric et al., 2002; Pettigrew et al., 2010), but in this study I cannot confirm its relevance. Confidence about the perceived exchange rate, which serves as reference price, is also not related to DCC usage. This is not in line with literature, which suggests that uncertainty arises if people cannot accurately generate reference prices (Dehaene & Marques, 2002).

There is no evidence that the level of understanding the DCC screen relates to DCC usage. Given the complex nature of the DCC screen, people may experience an overload of information. This may cause people to make foreign purchases without converting (Pettigrew et al., 2010), but the results are not in line with this. Overall, the respondents indicated that they understood the screen, but I did not measure what they meant by understanding. Therefore, the way I measured understanding may be imperfect, as I am still somewhat

unsure whether they actually understood the difference between the two withdrawal options and its implications.

Travel experience related variables are not related to usual- and recent exchange rate information searches, according to my results. This is not in line with existing literature on currency conversion, where experience with a foreign currency is said to influence conversion behavior (Callow & Lerman, 2003; Gaston-Breton, 2006). Possibly, my respondents' travel experience is not recent enough, as about two thirds of my respondents have visited the target country more than one year ago. Therefore, the effects of travel experience upon currency conversion behavior may be very weak. Furthermore, experience with a foreign currency can influence currency conversion behavior in less complex situations, when buying souvenirs for example. However, when exchanging foreign currencies very specific, highly fluctuating information about exchange rates is needed, which people may only absorb when they are actually abroad. Therefore, the composition of my sample may cause the absence of a relationship between travel experience and exchange rate information searches. I did find some evidence that people with at least a Bachelor degree are more likely to usually search for exchange rate information and that American people are more likely to do so than Dutch people. Also, American and British people are more likely to have recently searched for exchange rate information and age is also positively related to recent exchange rate information searches.

Lastly, there is evidence that British people are more likely to accept DCC than Dutch people. British respondents within my sample show greater levels of ambiguity aversion than Dutch people. This, in combination with the presence of a nudge on the ATM screen, may explain why British people accept DCC more often. Besides, people whom recently searched for exchange rate information are less likely to select the DCC withdrawal. Some retail banks and travel organizations already warn their customers about DCC. People that have recently searched for exchange rate information might also have encountered these warnings. Although I did not ask or measure this in my survey, this potentially explains why recent exchange rate information searches negatively influence DCC usage.

Summarizing, my results provide meaningful insights into the driving factors of currency conversion in an ATM context where DCC is provided. Gerritsen et al. (2015) reject rational behavior by people that are subject to DCC when withdrawing money at a foreign ATM, because there is no significant difference in DCC usage when different markups of 0%, 5%

and 10% are imposed upon the exchange rate and because internal reference prices do not influence DCC usage. My results indicate that the maximum markup used by Gerritsen et al. (2015) was too low, because a 20% markup does significantly decrease DCC usage, relative to 0% markup. Furthermore, consumer behavior in this context can be explained by ambiguity aversion, which positively influences DCC usage when ambiguity is very salient on the DCC screen, relative to a DCC screen where ambiguity is less salient. Lastly, my results provide weak that the typical DCC screens nudges people away from accepting withdrawals 'with conversion'. Moreover, I found that the typical DCC screen triggers different decision making processes than a non-nudging DCC screen. In line with Gerritsen et al.'s (2015) findings, I do not find a relationship between reference prices and DCC usage.

Managerial implications

It is debatable whether or not providing DCC as a service is righteous or ethical. Advocates of DCC can argue that it is an extra service towards customers, because it allows them to perform transaction in their own currency and it can take away risks or uncertainties. My study justifies this claim as the results show that people are willing to pay a risk premium of 10% to 20%. Higher risk premiums result into significantly lower DCC usage. Opponents of DCC may argue that it is misleading and that ATM owners exploit this at the expense of unwitting customers. My results counter that theorem, as there is weak evidence that nudging negatively influences DCC usage. However, this study also finds some evidence in favor of this claim, as the typical DCC screen definitely impacts the decision process that people go through when withdrawing money. The nudge may for example result in the 'DCC fallacy', whereas people from the non-nudging treatment realize very well that their own bank does the conversion.

Policy makers can use my outcomes to determine whether DCC is a desired service to be offered to customers, from a more ethical perspective. As my results indicate that the nudge interacts with ambiguity aversion, policy makers could try to protect consumers by enforcing providers of DCC to make the withdrawal options less ambiguous, for example by providing more information relating to the 'without conversion' withdrawal option. Alternatively, policy makers could enforce a maximum markup on the DCC exchange rate.

On the other hand, DCC providers such as ATM owners, restaurants and (web)shops may use the results of this study to further optimize their DCC business model. The interaction effect between ambiguity aversion and the nudge can be exploited by providers of DCC, by making

ambiguity related to the 'without conversion' withdrawal option more salient relative to the 'with conversion' option. Furthermore, as my analysis suggests that the risk premium for DCC lies between 10% and 20%, DCC providers should try to align the markup they impose on the DCC rate with the optimal risk premium, in order to maximize revenues.

The outcomes of this study may also be used to inform travelers about the implications of the different options that are offered on DCC screens. Retail banks have an economic incentive to inform their customers about DCC, as it is in their interest that their consumers accept withdrawals 'without conversion' when they are abroad. If consumers do so, the bank can do the conversion and scoop the additional fees and commission (as can be seen in Table 1). Secondly, if authorities and governments believe that DCC is misleading and therefore not righteous, they can use the results of this study to set up small scale awareness campaigns to inform people about DCC. Lastly, travel agencies, startups, travel guides (e.g. Lonely Planet) and also retail banks can take this opportunity to build mobile applications for travelers. For example, they can inform customers about the exchange rate on a daily basis and provide information about DCC along the way.

Limitations and directions for future research

The main limitation of this study is that my sample is not fully representative of the population it is drawn from. This is due to selection bias as a result of my sampling method, mainly by sampling online via Facebook. A substantial part of my sample consists of university students, there are twice as many female respondents as male respondents and only a small part of my sample consists of current travelers. Another implication is that my main variable of interest, namely DCC usage, is not incentivized in my experiment. Incentives give control, which is needed in experiments in order to make causal inferences (Smith, 1982). A third limitation is that the used incentive for the choice lists was not very strong, as respondents only had a one-in-twenty chance to win at most €10. This may reduce the reliability of the elicited behavioral attitudes.

Future researchers are encouraged to study currency conversion behavior outside an ATM context. For example, restaurants and hotels using DCC sometimes use a default option, such that people actually have to opt out to accept a payment 'without conversion' (i.e. such that the home bank does the conversion). Nudging by making use of default options is known to have a strong impact on human decision making (Kahneman, Knetsch & Thaler, 1991; Thaler & Sunstein, 2008) so the effects of nudging are possibly stronger and positively related to

DCC usage in such contexts. A second possible direction for future research would be to use actual transaction data from DCC providers, because such data is expected to be more valuable than experimental data.

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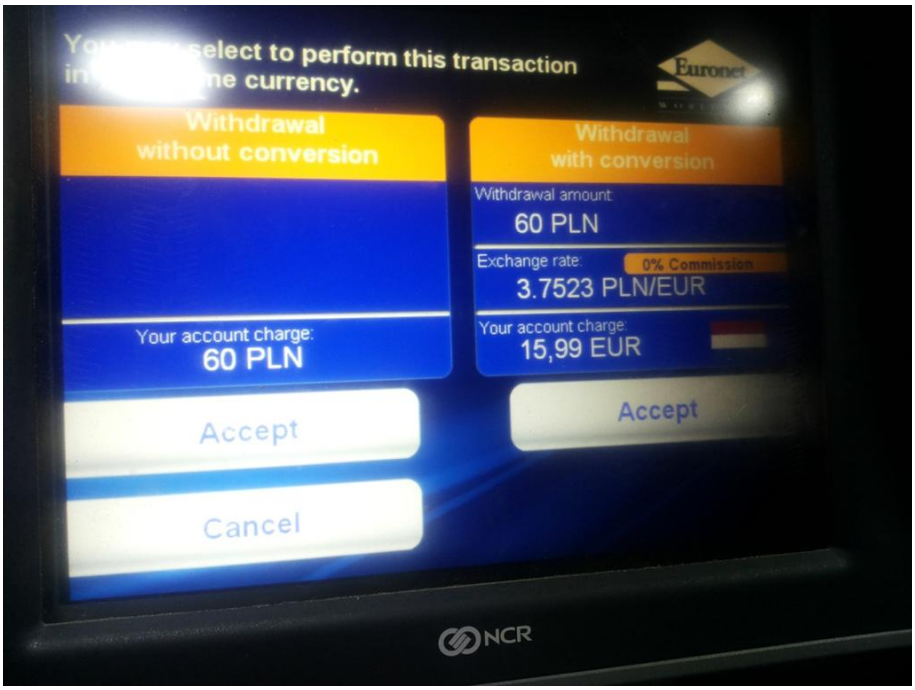
Appendix

Appendix A: DCC screen Euronet ATM (Warsaw, Poland, July 22nd, 2015)



Appendix B: Bank account details after converting 'without conversion'

Details af- en bijschrijving

Betaalrekening
[redacted]

Naam/Omschrijving/Mededeling
PLNC1166 WARSZAWA POL
Pasvolgnr:004 22-07-2015 22:35
Transactie:822026 Term:PLNC1166
Valuta:PLN 60,00
Koers:4,1230298 Kosten:2,25

Datum
Donderdag 23 Juli 2015

Bedrag
-€16,80

Tegenrekening

Mutatiesoort
Geldautomaat

Appendix C: Exchange rates used by retail banks[4]

UK	**17-6-2015**	**18-6-2015**	**23-6-2015**	**25-6-2015**	**30-6-2015**	**2-7-2015**	**7-7-2015**
Barclays	1.31140	1.31490	1.32350	1.32220	1.32800	1.33100	1.33420
Royal Bank of Scotland	1.32820	1.32820	1.33020	1.34540	1.35070	1.34940	1.34520
avg 0% rate (€/£)	1.31980	1.32155	1.32685	1.33380	1.33935	1.34020	1.33970
0%, charge (in £)	75.76906	75.67	75.37	74.97	74.66	74.62	74.64
avg 20% rate (€/£)	1.05584	1.05724	1.06148	1.06704	1.07148	1.07216	1.07176
20%, charge (in £)	94.71132	94.59	94.21	93.72	93.33	93.27	93.30
USA							
Wells Fargo	1.1861	1.1861	1.1983	1.1799	1.1757	1.16500	1.16330
Bank of America	1.1891	1.1986	1.1894	1.1837	1.1791	1.16850	1.16390
avg 0% rate ($/€)	1.1876	1.19235	1.19385	1.1818	1.1774	1.16675	1.1636
avg 0% rate (€/$)	0.842034	0.83868	0.83763	0.84617	0.84933	0.85708	0.85940
0%, charge (in $)	118.76	119.24	119.39	118.18	117.74	116.68	116.36
avg 20% rate (€/$)	0.673627	0.67094	0.67010	0.67693	0.67946	0.68567	0.68752
20%, charge (in $)	148.45	149.04	149.23	147.73	147.18	145.84	145.45
NL							
ING Bank	0.71210	0.71210	0.71430	0.70850	0.70350	0.70450	0.70500
Rabobank	0.71624	0.71475	0.71168	0.71094	0.70829	0.70603	0.70442
ABN AMRO	0.71110	0.71110	0.70990	0.70460	0.70020	0.70580	0.70500
avg 0% rate (£/€)	0.71315	0.71265	0.71196	0.70801	0.70400	0.70544	0.70481
0%, charge (in €)	140.2236	140.32	140.46	141.24	142.05	141.75	141.88
avg 20% (£/€)	0.57052	0.57012	0.56957	0.56641	0.56320	0.56435	0.56385
20%, charge (in €)	175.2795	175.40	175.57	176.55	177.56	177.19	177.35
DE							
Deutsche Bank	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.70390
Commerzbank	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.70700
avg 0% rate (£/€)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.70545
0%, charge (in €)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.56436
avg 20% (£/€)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	141.75
20%, charge (in €)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	177.19
CN							
Bank of China	7.0296	7.0547	N.A.	N.A.	N.A.	N.A.	6.8409
ICBC	7.0137	7.0488	N.A.	N.A.	N.A.	N.A.	6.8364
avg 0% rate (¥/€)	7.02165	7.05175	N.A.	N.A.	N.A.	N.A.	6.83865
avg 0% rate (€/¥)	0.142417	0.141809	N.A.	N.A.	N.A.	N.A.	0.146228
0%, charge (in ¥)	702.165	705.175	N.A.	N.A.	N.A.	N.A.	683.865
avg 20% (€/¥)	0.113933	0.113447	N.A.	N.A.	N.A.	N.A.	0.116982
20%, charge (in ¥)	877.7063	881.4688	N.A.	N.A.	N.A.	N.A.	854.8313

[4] These exchange rates were obtained via the official websites of the mentioned retail banks.

Appendix D: Used survey

Screen 1

ENGLISH
Welcome to my survey and thank you very much for helping me out. This survey is about cash withdrawing behaviour at foreign ATMs and will take no more than 5 minutes of your time. Besides, you have the chance to win €10.00*.

**Or the equivalent in pound sterling or US dollars.*

NEDERLANDS
Welkom bij mijn vragenlijst en hartelijk bedankt voor uw hulp. Deze vragenlijst gaat over pin-gedrag bij buitenlandse pinautomaten en zal niet meer dan 5 minuten van uw tijd in beslag nemen. Bovendien maakt u kans om €10,00 te winnen.

ENGLISH
What is your nationality?

NEDERLANDS
Wat is uw nationaliteit?

- American
- British
- Chinese
- Dutch (Nederlands)
- German
- Other

>>

Screen 2

What is your gender?

- Male
- Female

What is your age?

What is the highest level of education you have completed?

- Primary school
- High school
- Vocational/technical school
- Associate degree
- Bachelor's degree
- Master's degree
- Other, namely:

Which Eurozone country (i.e. a country where the *Euro (€)* is used as currency) did you visit most recently?

>>

Screen 3

When did you last visit the Netherlands?

- I am currently visiting the Netherlands
- During the past week
- During the past month
- During the past six months
- During the last year
- During the last five years
- More than five years ago

How many times did you visit a Eurozone country (i.e. a country where the *Euro (€)* is used as currency), in the...

past twelve months? ☐
past five years? ☐

How many times did you visit a country where neither the *Euro (€)* or the *pound sterling (£)* is used as currency (e.g. Denmark or the United States of America), in the...

past twelve months? ☐
past five years? ☐

What was usually the reason for a visit to a Eurozone country?

- Holiday
- Business
- Study

Family

Residence

Other, namely:

What do you think the current exchange rate is between the *Euro (€)* and the *pound sterling (£)*?

(In other words: how much € will you get for £1.00?)

On a scale from 1 to 7 how sure are you about your answer to the previous question *(1=very unsure, 7=very sure)*?

1	2	3	4	5	6	7
○	○	○	○	○	○	○

Did you recently search for information regarding the exchange rate between the *Euro (€)* and the *pound sterling (£)*?

Yes

No

Do you usually search for exchange rate information prior to or during a visit to a country that uses a different currency than the *pound sterling (£)*?

Yes

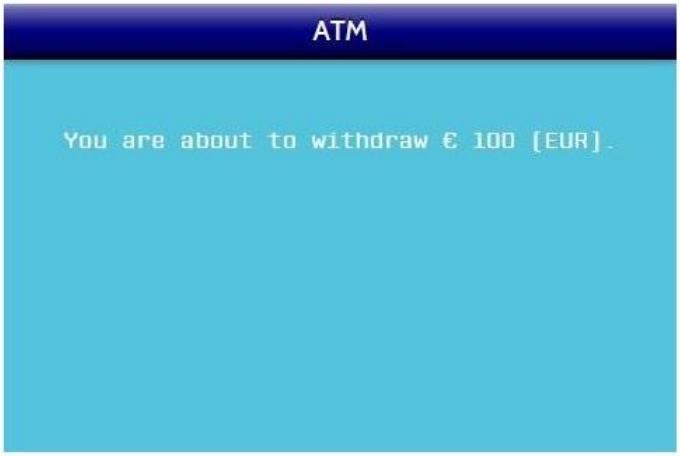
No

>>

Screen 4

On the next screen you are going to simulate a cash withdrawal at an ATM in the Netherlands.

You are in **the Netherlands** and you are about to withdraw **€100.00 (EUR)** using a debit/credit card from your home bank in the United Kingdom.



<< >>

Screen 5

Please select which option you would choose

Accept option 1 | Accept option 2

>>

Screen 6

Why did you make this decision?

On a scale from 1 to 7, to what extend did you understand the previous ATM-screen *(1=did not understand at all, 7=fully understood)?*

1 2 3 4 5 6 7

Did you choose the same option as you just did, in the majority of the previous times you saw this or a similar ATM-screen?

- Yes
- No
- I have never seen this or a similar screen before

How do you usually convert your own currency to foreign currencies?

- I have never converted my currency to a foreign currency before
- Prior to my trip, via my own bank
- Prior to my trip, via a currency exchange office (e.g. Travelex or a 'bureau de change')
- During my trip, via a currency exchange office (e.g. Travelex or a 'bureau de change')
- During my trip, via foreign ATMs
- During my trip, by paying with my credit/debit card
- Other, namely

>>

Screen 7

This is the final screen.

You will now see four sets of questions, each including eleven decision tasks. For every decision task please select which choice you prefer.

Lastly, please tell me your lucky number. If you are lucky, one of the decision tasks will be randomly selected by the computer and executed according to the choice you made. If you win any money*, you will be contacted via e-mail.

**All prices are denoted in Euros, but you can win the equivalent in pound sterling or US dollars as well.*

Please consider the following decision tasks. Each task involves a lottery which gives you a 50% chance of winning €10.00, and nothing otherwise.

In each line you are asked to choose between this lottery and a sure amount of money. Please indicate your choice on each line.

Have a 50% chance to win €10.00	Win €0.00 for sure
Have a 50% chance to win €10.00	Win €1.00 for sure
Have a 50% chance to win €10.00	Win €2.00 for sure
Have a 50% chance to win €10.00	Win €3.00 for sure
Have a 50% chance to win €10.00	Win €4.00 for sure
Have a 50% chance to win €10.00	Win €5.00 for sure
Have a 50% chance to win €10.00	Win €6.00 for sure
Have a 50% chance to win €10.00	Win €7.00 for sure
Have a 50% chance to win €10.00	Win €8.00 for sure
Have a 50% chance to win €10.00	Win €9.00 for sure
Have a 50% chance to win €10.00	**Win €10.00 for sure**

Please consider the following decision tasks. Each task involves a lottery which gives you a chance of winning €10.00, and nothing otherwise. The probability of winning is unknown and it will randomly be chosen by the computer.

In each line you are asked to choose between this lottery and a sure amount of money. Please indicate your choice on each line.

Have a ??% chance to win €10.00	Win €0.00 for sure
Have a ??% chance to win €10.00	Win €1.00 for sure
Have a ??% chance to win €10.00	Win €2.00 for sure
Have a ??% chance to win €10.00	Win €3.00 for sure
Have a ??% chance to win €10.00	Win €4.00 for sure
Have a ??% chance to win €10.00	Win €5.00 for sure
Have a ??% chance to win €10.00	Win €6.00 for sure
Have a ??% chance to win €10.00	Win €7.00 for sure
Have a ??% chance to win €10.00	Win €8.00 for sure
Have a ??% chance to win €10.00	Win €9.00 for sure
Have a ??% chance to win €10.00	Win €10.00 for sure

Please consider the following decision tasks. Each task involves a sure win, either today or three weeks from now.

In each line, you are asked to choose between these two wins. Please indicate your choice on each line.

Win €7.50 today	Win €7.50, three weeks from now
Win €7.50 today	Win €7.75, three weeks from now
Win €7.50 today	Win €8.00, three weeks from now
Win €7.50 today	Win €8.25, three weeks from now
Win €7.50 today	Win €8.50, three weeks from now
Win €7.50 today	Win €8.75, three weeks from now
Win €7.50 today	Win €9.00, three weeks from now
Win €7.50 today	Win €9.25, three weeks from now
Win €7.50 today	Win €9.50, three weeks from now
Win €7.50 today	Win €9.75, three weeks from now
Win €7.50 today	Win €10.00, three weeks from now

Please consider the following decision tasks. Each task involves a sure win, either three weeks from now or six weeks from now.

In each line, you are asked to choose between these two wins. Please indicate your choice on each line.

Win €7.50, three weeks from now	Win €7.50, six weeks from now
Win €7.50, three weeks from now	Win €7.75, six weeks from now
Win €7.50, three weeks from now	Win €8.00, six weeks from now
Win €7.50, three weeks from now	Win €8.25, six weeks from now
Win €7.50, three weeks from now	Win €8.50, six weeks from now
Win €7.50, three weeks from now	Win €8.75, six weeks from now
Win €7.50, three weeks from now	Win €9.00, six weeks from now
Win €7.50, three weeks from now	Win €9.25, six weeks from now
Win €7.50, three weeks from now	Win €9.50, six weeks from now
Win €7.50, three weeks from now	Win €9.75, six weeks from now
Win €7.50, three weeks from now	Win €10.00, six weeks from now

What is your lucky number (ranging from 1 - 20)?

Please provide your e-mail address** if you want a chance to win money. I will only use your e-mail address to contact you in case you have won. In that case, I will transfer your winnings as quickly as possible.

*** optional*

<< >>

Screen 8

The survey has now come to an end. Thank you very much for participating!

If you have won any money, I will contact you as soon as possible via the e-mail address you provided.

If you have any questions, remarks or comments you can send an e-mail to: atm.study@gmail.com.

Have a nice day!

Appendix E – Probit model usual exchange rate information searches

Variable	Coefficients (SE)
# Visits target country, past 12 months	-0.0679 (0.0833)
# Visits target country, past 5 years	0.0155 (0.0280)
# Visits non-target country, past 12 months	-0.0324 (0.0623)
# Visits non-target country, past 5 years	0.0050 (0.0227)
Male	-0.0259 (0.2170)
Age	0.0037 (0.0090)
U.K.	0.2764** (0.2352)
U.S.A.	0.6134 (0.2752)
Germany	0.3310 (0.5756)
Bachelor or higher	0.4682* (0.2488)

*** significant at the 1 percent level

**significant at the 5 percent level

*significant at the 10 percent level

Appendix F – Probit models recent exchange rate information searches

Variable	Coefficients (SE)
# Visits target country, past 12 months	0.0485 (0.0678)
# Visits target country, past 5 years	0.0041 (0.0222)
# Visits non-target country, past 12 months	-0.0294 (0.0534)
# Visits non-target country, past 5 years	0.0007 (0.0196)
Male	0.1201 (0.1909)
Age	0.0248*** (0.0082)
U.K.	0.5366** (0.2215)
U.S.A.	0.4885* (0.2518)
Germany	0.6737 (0.4443)
Bachelor or higher	-0.1655 (0.2112)

*** significant at the 1 percent level

**significant at the 5 percent level

*significant at the 10 percent level