SHOW ME HOW YOU BUY AND I WILL TELL YOU HOW YOU PAY: THE SITUATIONAL EFFECT ON PAYMENT METHOD CHOICE IN E-COMMERCE

Research paper

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Abstract

This article builds on the theory of money demand to extend the literature stream of payment method choice. Our results indicate that the situation in which a customer places an order has significant influence on her or his payment decision. Especially the customer's very first order at the merchant, express delivery orders, and ordering basic items, increase the likelihood of paying with well-known payment methods (i.e., credit card) compared to more deferred ones (i.e., invoice). Other factors like product familiarity, sales promotion or the customer's solvency score play a subordinate role. Our results are based on an exclusive dataset containing close to a million actual customer transactions in 2016/17 from a leading European online fashion retailer. We suggest a re-interpretation of the transaction demand for money theory in the absence of cash. Online payment deferral represents a new choice the consumer faces compared to what formerly has been the cash vs. card payment decision. By offering deferred payment methods, e-commerce companies implicitly extend their business model to financing services. In practice, merchants should anticipate consumers' payment preferences, which eventually reduces complexity for the seller and increases convenience for the buyer.

Keywords: E-commerce, payment choice, consumer behavior, money demand.

1 Introduction

People increasingly get used to shop online (Kozlenkova et al., 2017). 9% of global retail spending is generated on the web, growing twice as fast as overall retail sales (eMarketer, 2016). Consumers are adopting new online channels of existing retailers (Li et al., 2015) as well as buying from digital pure players.

Of course, each online purchase has to be paid somehow, and consumers can choose between several ways of how to do this. Mainly building on theories of money demand, previous studies on payment methods have distinguished between cash and card payments as found in offline purchase situations (Klee, 2008; Schuh and Stavins, 2010; Wang and Wolman, 2016). Adoption of non-cash payment methods have been studied in offline settings (Koulayev et al., 2016) but it remains for us to find out how this relates in an online context with the absence of a cash payment option.

Online payments are crucial for merchants and consumers alike because of the physical separation of buyer and seller (Zhang and Li, 2006). Relationships between consumer payment choice and spending behavior are different online, as both the consumer and the merchant can actively intervene along the buying process. On the one hand the consumer may easily choose to abandon the shopping process (by closing the browser) and on the other the merchant may limit the payment offerings for each customer individually (depending on different parameters like solvency score, basket size, IP address, etc.) Both scenarios are very unlikely to happen in a brick and mortar shop. In other words, the consumer can reveal his or her preferences more freely online, without the pudicity of a face-to-face store interaction.

Moreover, online payment options are more diverse than offline, including payment methods as PayPal and electronic invoice (i.e., deferred payment via bank transfer). New digital business models that focus

on online payments are emerging (e.g., Klarna, ApplePay) depicting interdependencies between technical, human, and market factors (Pousttchi, 2008). E-commerce companies amend their business model from providing goods to also providing financing services of their merchandise (via deferred payments). That is why we try to extend the payments literature from cash and card to online and deferred payments.

Besides that, the payment method choice is generally important for merchants as it also influences the way a consumer perceives a product (Chatterjee and Rose, 2012), how much he or she spends (Soman, 2001; Runnemark, Hedman and Xiao, 2015), what he or she buys (Thomas, Desai and Seenivasan, 2011), as well as the post-transaction connection to the product (Shah et al., 2016).

A research question that remains to be answered and which stands at the center of this article is: How large is the effect of a specific purchase situation when making online payment decisions?

The motivation behind this paper is to generate insights that e-commerce companies may use to shape the way they approach the customer in the payment process. A better understanding of human interaction with information systems ultimately improves digital customer experience. Providing a variety of payment methods may seem unproblematic at first, but each payment method comes with associated risks (solvency or fraud) and transaction costs. Narrowing down the payment selection set to the methods each customer prefers not only makes the checkout process faster and seamless for the customer but also reduces cost for the merchant. In practice, merchants could use our findings to anticipate consumers' payment preferences and offer a limited or pre-selected choice which would reduce transactions costs (in form of time and money) as well as complexity on both sides. As example, locking in the consumers' previous payment method as default (not having to choose again how to pay), increased the conversion rate by 1% in a field experiment (A/B test) recently conducted by the merchant. This translates to millions in foregone revenue.

Access to data has been identified as a major roadblock in payments literature to model the microeconomic behavior of consumers (Kahn and Roberds, 2009). Whereas studies in the past have relied on surveys (Zinman, 2009; Schuh and Stavins, 2010; Koulayev et al., 2016) and experiments (Arango, Huynh and Sabetti, 2015; Camera, Casari and Bortolotti, 2016) to assess behavioral intend, we are fortunate to observe actual behavior in form of 1 million orders placed at an online shop across 1 year. Moreover, we are able to compute specific buyer information like familiarity of items in the shopping basket by accessing the whole customer history in that shop. To our knowledge we are the first ones to use such a huge dataset with purchase information over such a long-time period.

With our analysis we help to understand "the deep and proximate drivers of consumer payment choice" by combining observed consumer choices with buyer's information for the same transaction – as suggested by Zinman (2009, p.365). Finally, we follow research calls of Darley et al. (2010, p.112) on online choice behavior, attitude formation, and "the differences in consumers' behaviors in the contexts of brick-and-mortar versus online outlets".

2 Theory and Hypotheses

The theory of money demand is the starting point in developing our conceptual framework, as it has been for notable studies before (Klee, 2008; Schuh and Stavins, 2010; Wang and Wolman, 2016). A differentiating factor of our work is the consumer perspective on payments as last step of the online consumer decision process. Moreover, the shift of the payment process from offline to online, is an interesting example of a business model innovation opportunity.

2.1 Related Literature and Theory

From an economical perspective money is a medium of exchange (the other two commonly accepted functions being store of value and unit of account). Each holder of money faces a tradeoff between liquidity and return on investment from his or her monetary base (the faster an asset can be disposed, the lower its average return). Models dating back to Baumol (1952) and Tobin (1956) formalized this inventory-theoretic approach. Opportunity costs in the form of foregone interest were the starting point of this framework, but were soon extended by other costs that vary by individual – such as costs of

banking services, risk of robbery and so on (Wang and Wolman, 2016). As payment technology advanced, the theory was further developed to include non-cash payments (Whitesell, 1992). We take another step and study the situational effects of online only payments. Online payments are different as the merchant and consumer are physically separated and there is a time lag between payment and delivery of the goods. This means that a higher trust barrier must be overcome. Deferred payment methods are a way the merchant can lower this bar for its customers. Whereas in the original model the fixed costs imply a consumer-specific threshold above which cash payments are avoided, in our e-commerce setting this threshold represents the tipping point where more deferred payment methods (e.g., invoice via bank transfer) are preferred to ones known from offline point of sales (e.g., debit card).

From a consumer behavior perspective, a purchase can only be completed with the decision to pay the good or service at hand. Thus the payment method choice in retail is the final step of the overall purchase decision process (Soman, 2001, p. 462; Karimi, Papamichail and Holland, 2015, p. 9). Researchers started to model this "complex decision problem" (Stroborn et al., 2004, p. 1434) with different associated costs (Grüschow, Kemper and Brettel, 2016), intertemporal tradeoffs (Patrick and Park, 2006) and uncertain cash flows (Pavlou, 2003) from a retailer's perspective.

The overall process is influenced by environmental factors and individual differences, as originally described by Engel et al. (1978). Numerous studies investigated the influence of these individual differences. Important factors include habits (Dahlberg and Öörni, 2007; Kosse and Jansen, 2013; Shah, Kumar and Kim, 2014), demographics (Ching and Hayashi, 2010; Schuh and Stavins, 2010; Koulayev et al., 2016), convenience and perceived risk (Zinman, 2009) of the consumer. In this study we focus on the latter two, convenience and perceived risk, dependent on the purchase situation. Demographics are popular predictors, but alone only explain payment choices partly (von Kalckreuth, Schmidt and Stix, 2014). Depending on the purchase situation, the "financial terms of the deal" (Thaler, 1983, p. 229), i.e., the transaction itself, will be more or less important compared to the possession of the good.

The merchant activities as payment facilitator is also interesting from a business model concept perspective. In the terminology of Veit et al. (2014) an “IT enabled or digital business model”. Traditionally, the business model of an offline retailer is to be an intermediary between producer and consumer. The merchant displays the products and resells them with a margin. Now that this process is moving online new capabilities are required. This gives birth to a new product: the risk assessment (solvency and fraud) of the online consumer. The new product (risk assessment) goes hand in hand with a new value network (other merchants), a new revenue model (risk assessment fee), and value delivery (white label checkout). These four components make up a business model (Osterwalder, Pigneur and Tucci, 2005; Ojala, 2016).

2.2 Hypotheses

As described above, each payment situation represents a different (opportunity) cost tradeoff for the customer. Our hypotheses are formulated to capture different dimensions of these situations in which the customer has to make a payment decision. Often, implicit costs are not directly observable (latent variables as trust or convenience). Therefore, we start by describing the situation with the following variables: First order, basket size, product familiarity, basic/non-seasonal item, items on sales share, express delivery. Figure 1 shows the conceptual framework graphically. Complementary to these observable variables, we conducted a consumer survey in order to rank the payment methods by perceived security and convenience (see Table 2).

An important decision factor is perceived risk (safety) of the purchase situation (Zhang and Li, 2006; Schuh and Stavins, 2010). Multiple interactions and previously successful transactions reduce uncertainty and increase trust. Therefore, convenience factors during the payment process may be considered less important compared to security factors on the first purchase.

H1. New customers on their first purchase preferably choose secure payment methods (i.e., invoice) compared to subsequent purchases.

E-retailers in sectors with higher product risk (e.g., when selling customized products) are more likely to require safer 'pay in advance' instruments – such as debit cards (Hove and Karimov, 2016). We assume that this also holds from a consumer perspective. The more perceived risk in a purchase, the safer the

payment choice. Familiarity of items bought reduces uncertainty about fit and liking of the product and thus increases the likelihood of keeping the item. The same applies to basic articles (e.g., essentials like white t-shirts). We hypothesize that the consumers preferably choose non-deferred, ad-hoc payment methods like credit card or PayPal when purchasing familiar or basic items (i.e., same product category and brand purchased before).

Basket volume seems to be an important factor when substituting away from cash to electronic forms of payment (Wang and Wolman, 2016). We take this insight from the theory of money demand and apply it to payment deferrals. Larger baskets represent more risk, which again makes deferred payment methods like invoice more attractive.

H2a. Large and unfamiliar baskets are more likely to be paid with deferred payment methods (i.e., invoice).

H2b. Basic/non-seasonal products are more likely to be paid with non-deferred payment methods (i.e., credit card, PayPal).

The purchase decision for products on sales is faster than for regular items, driven by impulse purchases (Spears, 2006). The same holds for express deliveries, where the customer clearly signals urgency. At the same time, he or she is more committed to acquire the goods as express delivery is at an extra charge. We hypothesize that this also reflects onto the payment method choice. As the purchase decision is faster and based on positive connotations (discount) or urgency (express delivery), we hypothesize that the purchase is already concluded in the customers head and that it is therefore okay to use more binding payment methods. Binding payment methods are transparent and non-deferred like (rather credit card or PayPal than invoice) and as a result more secure from the merchant's perspective.

H3. Non-discounted products and express deliveries are rather paid with more binding (i.e., rather transparent, non-deferred) payment methods (i.e., credit card, PayPal).

Using credit scores to anticipate consumer behavior is novel due to the sensibility of the data. Customers with higher solvency have higher propensity to spend. Both solvency and consumption increases with income. Aguiar & Bils (2015) for example report Engel curve elasticities of 1.09-1.19 for shoes and other apparel. We therefore think that a low solvency score reinforces H1 and H2a, namely the customers' decision to purchase via invoice on first time orders and when baskets are large and unfamiliar

H4. Low solvency customers are stronger influenced by purchase situations (H1-2) compared to other customers.

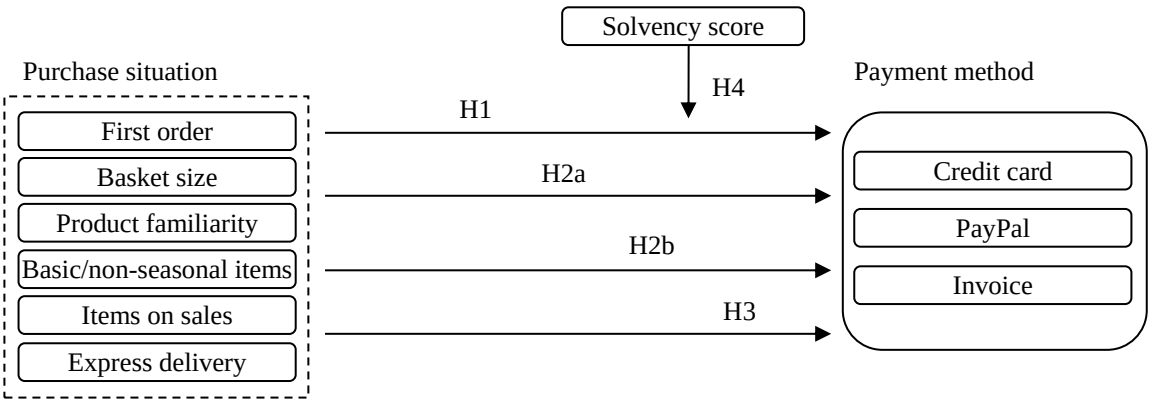

Figure 1. Conceptual framework with respective hypotheses.

3 Data and Methodology

We use a discrete choice model to analyze the data and to test the hypotheses developed earlier. Most importantly, actual customer transactions provide us with the purchase situation input variables and the respective customer choices. Complimentary to that we conducted a consumer survey to rank the payment methods in terms of security and convenience.

3.1 Data

Basis of our empirical analysis are actual orders from a leading European online fashion retailer. These transactions span over one full year across three countries (Germany, Belgium, Norway), representing ~30 million fulfilled orders. The target market of the online retailer consists of around 70 million online shoppers in the three countries combined (eMarketer, 2017). The combined market share of this merchant is estimated to be 10-15% (both in terms of online shoppers and online apparel/footwear sales). Given this market power, which makes it the leading online fashion retailer in the region, the results from this study are acceptably generalizable.

The consumer had to decide on a payment method (credit card, PayPal, or invoice) in each of these orders. For better comparison of choices, we only consider orders with unrestricted payment offering. That means orders where customers were offered the full spectrum of payment methods available at the merchant (this is not always the case because of risk management, as described later). Finally, we took a random sample of 1/3 million orders in each country to have an equal share across countries. This random sampling also had the side effect of not having multiple orders per customer in our sample – as the underlying population is so large.

For each of these orders we compile the purchase situation variables derived in the hypotheses section. Basket size and the express delivery flag are readily available. The share of items on sale and the share of basic/non-seasonal articles are computed by dummy coding the respective value of the items on sale in the basket and taking the average over each order. An item is considered to be on sale if the price has been reduced compared to the initial listing and this discount is displayed accordingly on the website. The classification of basic/non-seasonal products is conducted by the purchasing department. Examples for basic/non-seasonal articles are white t-shirts or black socks – items that can be bought all year long regardless of seasonality. Even though the sample does not cover all orders a customer has ever placed at the merchant we still know the consecutively order count to identify whether the order is the first or not. Similarly, product familiarity is defined on item level and then averaged by order. A product is considered to be familiar for the customer if he or she has ordered an item in the same product category and from the same brand at the merchant before.

By taking random samples over a full year time frame, we implicitly control for time-variant influences observed in previous studies like time in a month, weekends as well as seasonality (Soman, 2001; Thomas, Desai and Seenivasan, 2011).

Variable	Min	Max	Mean	Std. dev.	N
Credit card	0	1	0.22		983,431
PayPal	0	1	0.09		983,431
Invoice	0	1	0.69		983,431
First order	0	1	0.07		983,431
Basket size (std.)	-1.1	14.4	0.00	1.0	983,431
Product familiarity	0	1	0.26		983,431
Basic/non-seasonal item	0	1	0.11		983,431
Items on sales	0	1	0.34		983,431
Express delivery	0	1	0.01		980,355
Solvency score (std.)	-9.4	8.6	0.00	1.0	494,246

Table 1. Summary statistics. Solvency score not available for all customers.

3.2 Payment Method Characteristics

The merchant where we have our data from generally offers three payment methods at the checkout – credit card, PayPal, or invoice (i.e., deferred bank transfer). We do not consider a fourth, pre-payment fallback payment method which accounts for less than 1% of transactions in our sample. With the three

payment methods at consideration, the merchant addresses most of the e-commerce market. Other payment methods seen in those markets are (instant) online bank transfer and direct debit. Yet, these are not offered at this merchant. Emerging payment methods like ApplePay and alike or cryptocurrencies have not found high adoption rates in fashion e-commerce yet.

Payment methods have been ranked across different dimensions in the Survey of Consumer Payment Choice (SCPC) of the Federal Reserve Bank of Boston (2014). These dimensions include convenience (at the time of purchase) and security next to cost and speed. The survey has already been source to various academic publications (Schuh and Stavins, 2010; Koulayev et al., 2016). In a more recent publication, Hedman et al. (2017) use the repertory grid technique to get an extensive characterization of payment methods. They clustered these characteristics into four categories (the so called "4P taxonomy"): purchase, personal, payment instrument and physical technology. PayPal and invoice were not mapped to any characteristics in publications so far. Based on other studies (TSYS, 2016), interviews, and our own survey (Table 2) we were able to close this gap.

Payment method	Very inconv.	Inconvenient	Neither	Convenient	Very conv.	N
Credit card	3%	5%	18%	27%	47%	900
PayPal	2%	1%	7%	15%	74%	1,438
Invoice	1%	2%	6%	12%	79%	2,268
	Very unsec.	Unsecure	Neither	Secure	Very secure	
Credit card	4%	9%	26%	30%	29%	897
PayPal	2%	2%	10%	26%	60%	1,432
Invoice	0%	1%	3%	11%	84%	2,259

Table 2. Consumer payments survey: Convenience and risk assessment of payment methods. Delta to 100% responded "don't know". Different N because survey participants were able to skip questions.

Credit card, PayPal, and invoice differ in terms of perceived convenience and risk to allow an assessment of consumers' situational choices. Invoice is considered to be the most secure method, before PayPal and credit card. When offered invoice at the checkout, a customer only has to provide a delivery address to trigger the order. Transfer of cash flow then only happens after the customer actively transfers the money via wire transfer. The payment target is 2-4 weeks after delivery, depending on the market. That means that the merchant is not able to obtain the payment other than soliciting for it. This is clearly a higher risk for the merchant compared to credit card or PayPal payments and therefore the less risky payment method for the counterparty (the consumer). With credit card or PayPal payments, the merchant may capture the amount after goods have been shipped (usually after 1-2 days already). Depending on the terms and conditions of the card issuing bank, the funds may only be collected at the end of the respective or next month from the customer.

On the other hand, invoice is also perceived as the most convenient payment method, before PayPal and credit card. When choosing invoice, the payment steps are deferred after delivery, when the customer gets the invoice and in most cases has to navigate to his or her online banking account to transfer the funds. For a PayPal transaction only a 1-click confirmation is needed (if logged in, otherwise the e-mail password combination is needed as well). For credit card purchases, the credit card number and CVV have to be entered. Less than 40% of surveyed participants use the option to store credit card or PayPal credentials in the browser.

Invoice (for private retail shoppers) and PayPal are payment methods that gained popularity with the rise of e-commerce. In the German market for example, invoice is the preferred B2C payment method online (EHI, 2016). Compared to that, card payment is a payment method, which has been already popular for offline transactions in the countries of our sample. (We do not distinguish between debit and credit card.) Invoice per se is an old invention (Niall Ferguson, 2008), but normally in brick-and-mortar stores payment takes place directly at the point-of-sale (POS). Invoice is rather used for large B2B transactions.

To have an overview of payment method characteristics from the consumer perspective, we provide a classification of exemplary factors influencing payment choice using the 4P taxonomy (Table 3). The context of the purchase is the same in our case, regardless of the payment method chosen: the online shop of the merchant. We use the risk and convenience assessment from our survey to map these factors. Transparency is added to the taxonomy from Soman (2003), which is similar to what Hedman et al. (2017) call "control". The time component is also mentioned in the original taxonomy as part of the purchase category. We rather refer to it as "deferment" and see it part of the payment instrument characteristics. Finally, the physical technology differs in the sense what information is needed to trigger the payment.

Payment method	Purchase	Personal		Payment instrument		Physical technology
	Context	Risk/ security	Control/ transparency	Convenience	Deferment	
Credit card	Online shop	Secure	Transparent	Very convenient	Deferred	Card number
PayPal	Online shop	Very secure	Transparent	Very convenient	Deferred	Account credentials
Invoice	Online shop	Most secure	Less transparent	Most convenient	Most deferred	Online banking

Table 3. Classification of payment methods with the Hedman et al. (2017) 4P taxonomy.

3.3 Discrete Choice Model

We use a multinomial logistic regression (MNL) model for our analysis as seen in other publications of payment method choice (Klee, 2008; Ching and Hayashi, 2010; Arango, Huynh and Sabetti, 2015).

Ching & Hayashi (2010) would be closest to our methodological approach. They also use MNL regression to explain payment method choice. In their case the focus is on consumer characteristics and payment card reward programs. With MNL, one coefficient is estimated per individual specific variable (e.g., first purchase, solvency score) for all the payment alternatives except one (the base/reference category). We choose invoice as reference category, as it is the payment method chosen in most of times. Our model comprises of only individual specific variables but has an alternative specific intercept included. We use the *mlogit* package in R to operationalize the multinomial logistic regression. We looked at both odds ratios as well as marginal effects, but follow Ching & Hayashi (2010) and only report regression coefficients for simplicity.

Explanatory variables that we use mainly describe the purchase situation. A dummy variable shows whether it is the first purchase of the customer. Three additional variables indicate the shares of familiar items, basic articles and items on sale respectively. Besides that we also include an express delivery dummy and the basket size (= volume) of the order. Demographics are very common explanatory variables in consumer choice research (Klee, 2008; Schuh and Stavins, 2010; Kosse and Jansen, 2013). We use the customers' solvency score as interaction term. The solvency score is a credit rating provided by an external agency. As the absolute figures of the ratings vary by provider and thus differ from country to country, we use standardized values for our model. This also makes intercepts and predictors easier to interpret.

The central variable in our analysis is the payment method choice *j* a customer makes at the checkout, among a set of alternatives *J = {invoice, credit card, PayPal}*. The customer chooses the alternative *j* that maximizes his or her transaction utility. To formalize these kind of decisions, the multinomial logit model is extensively used in discrete choice literature. The probability of selecting option *j* conditional on the choice set J_i for subject *i* can be represented as

$$p_j(x_i) = \frac{\exp(\beta' x_{ij})}{\sum_{h \in J_i} \exp(\beta' x_{ih})}$$

(Agresti, 2002, p. 299). Where *x* denotes the values of the explanatory variables. A customer may only evaluate a subset $M \in J$ of the offered choices J. There is an uncertainty about the composition of *M*, the individual adoption of payment methods, because we do not know which payment method a customer may be able to use. For example, not every customer has registered for a credit card. But also the offered set *J* may vary among subjects. Because of risk management, some alternatives are denied to certain customers depending on historical purchase behavior or other customer information available to the merchant. This is a crucial difference between online and offline shopping. Luckily, we were able to get a data set that only contains those transactions were the full alternative set J was offered to the customer, so that $J_i = J, \forall i$.

As for independence of errors, cases of our data are not related as we do not include more than one decision (i.e., order) per customer. Finally, we control for country fixed effects via dummy variables.

Other publications in payment literature (Klee, 2008; Schuh and Stavins, 2010; Koulayev et al., 2016) use two-stage models similar to those introduced by Heckman (1979) and Hausman & McFadden (1984) to take account of a possible (self) selection bias. There, the first-stage discrete choice (adoption) is captured by a probit or multinomial logit model respectively, while the second-stage outcome equation (intensity of use) is estimated using OLS. In contrast to that, the focus of our research does not lie on the adoption of (new) payment methods, neither on the intensity of usage in terms of monetary payment mix. We rather want to explore the binary choice (yes or no) of established payment methods (invoice, credit card, PayPal) in the different online shopping situations. Arango et al. (2015) use multinomial probit (MNP) instead of MNL to circumvent the independence of irrelevant alternatives (IIA) assumption. This is useful in their case as debit as well as credit cards are included in the choice set, two very similar payment methods. However, this is not the case in our setting.

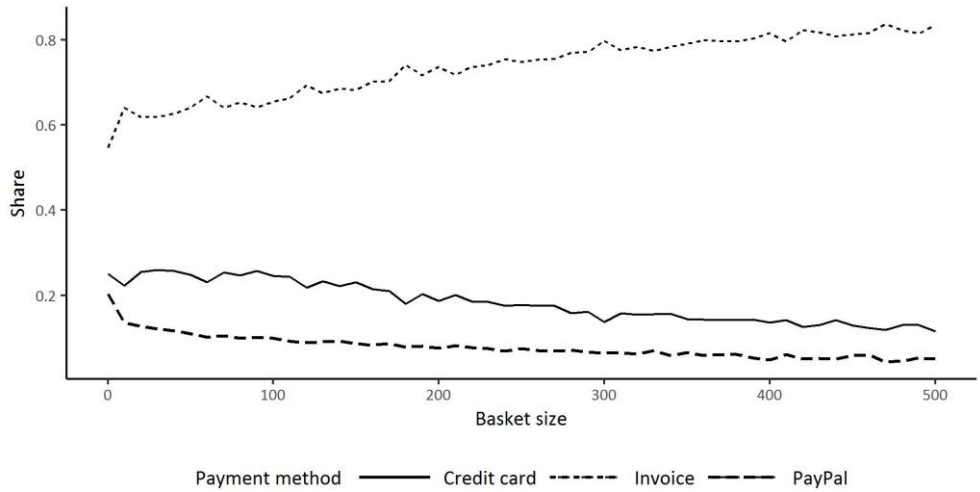

Figure 2. Payment mix per basket size (EUR).

4 Empirical Results

Output from our models generally suggest that payment method choice seems to be strongly influenced by the purchase situation variables. Table 3 shows the coefficients for the main effects of the discrete choice model.

In terms of statistical significance all our explanatory variables hold. P-values in the MNL are much smaller than 0.001. However, the discussion of effect sizes and not only statistical significance (i.e., p-values) is equally important in analyses with such large sample sizes as ours (Lin and Lucas, 2013).

In terms of magnitude, the first purchase dummy has by far the largest influence on payment method choice, followed by the express delivery flag and the basic article share. Other variables like basket size

and product familiarity have a significant, yet less strong impact. Whether items are on sale or not has a negligible effect on payment method choice.

The probability that customers who order for the first time (and are offered the full range of payment methods) choose invoice decreases by 15 percentage points compared to following orders. Differently speaking, the odds of choosing credit card on the first purchase instead of invoice is almost 3x as high compared to the following purchases. This result is surprising and we have to reject **H1**. Instead of using safer payment methods like invoice, the customer chooses the classical credit card overproportionally often on the first purchase. This effect gradually diminishes on the subsequent orders.

As expected, orders with large basket size are preferably paid with a deferred payment method (invoice). For example, the odds to choose PayPal vs. invoice are 25% lower if the basket size is one standard deviation larger than the mean. Familiar products are generally more likely to be paid via invoice. Choosing credit card or PayPal is three and two percentage points less likely, respectively. This is surprising, as literature suggests that non-deferred payment methods are used in situations with less uncertainty. However, if we take a closer look and include order count as interaction term we see that this effect only holds for customers with few orders. For customers with high order count, product familiarity is an indicator for invoice payments. Figure 3 shows the predicted probabilities for credit card choice, dependent on order count and order familiarity share. The graph for PayPal predicted probabilities looks quite similar. Taking these insights into account, **H2a** seems to hold in parts.

Basic/non-seasonal products are more likely to be paid via credit card or PayPal than via invoice. Odds are 25% lower in both cases. **H2b** seems to hold. This effect shows how the consumer signals his or her uncertainty with regard to product choice via the payment method chosen. The fancier the basket (i.e., non-basic) the higher the risk of disliking the product once holding it in your hands. This effect is mentally compensated by a less binding (i.e. deferred) payment option like invoice.

Orders with express delivery are more likely to be paid via credit card or PayPal. The odds are twice as high compared to invoice payment. Whether an item is on sale or not does not affect a customer's choice of how to pay. **H3** seem to hold only partly.

Whereas the direct effect of solvency score is significant (yet small), interaction terms with other explanatory variables are not. Customers with a solvency score of one standard deviation lower than average have ~10% decreased odds of paying via PayPal or credit card compared to invoice. The marginal effects in terms of probability are evanescent however. So **H4** is rejected.

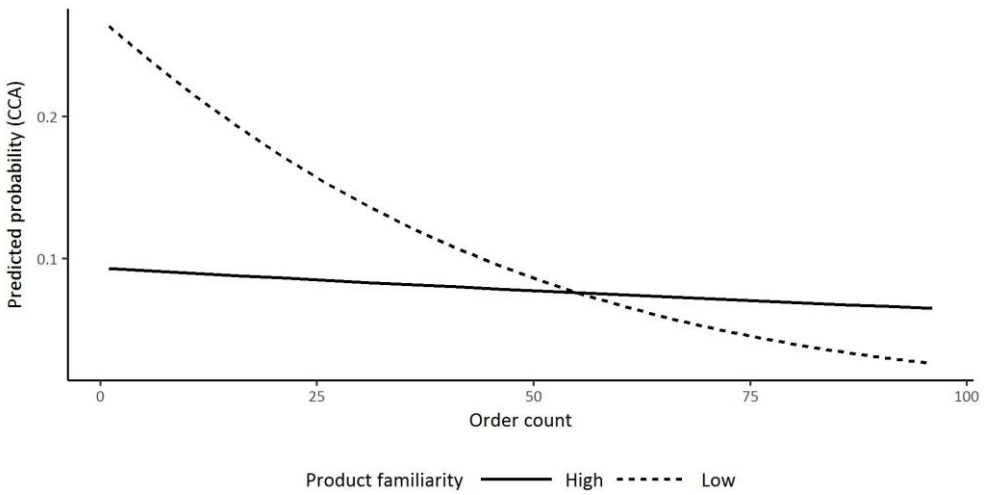

Figure 3. Interaction of order count with product familiarity.

The McFadden pseudo R-squared statistic of our model is satisfactory when compared to similar studies (e.g., Klee 2008). A fair amount of the variation in the dependent variable is explained by our explanatory factors.

Multicollinearity does not seem to be an issue, all pairwise Pearson correlation coefficients are smaller than |0.2|. Not surprisingly, the strongest (negative) correlation is observed between the new customer dummy and familiarity share. All other pairwise correlations are negligible.

Variable	Credit card		PayPal	
Intercept	-1.11***	(0.01)	-2.56***	(0.01)
First order	0.97***	(0.01)	0.44***	(0.01)
Basket size (std.)	-0.13***	(0.00)	-0.27***	(0.00)
Product familiarity	-0.29***	(0.01)	-0.28***	(0.01)
Basic/non-seasonal item	0.42***	(0.01)	0.45***	(0.01)
Items on sales	0.02*	(0.01)	0.15***	(0.01)
Express delivery	0.71***	(0.02)	0.65***	(0.03)
Sample size	980,355			
Country controls	Yes			
McFadden R^2	0.11			

*Table 3. MNL coefficients of different purchase situations. Invoice as reference level, time control effects tested but not reported. ***, * denotes significance at the 0.1%, and 5% level respectively.*

5 Discussion

Most of our derived hypotheses hold, but rejection of H1 (results showing that new customers do not prefer safer payment methods) and H4 (results showing that lower solvency score does not interact with payment method situations) are surprising. A potential explanation for the rejection of H1 could be that customers are not familiar with invoice as a payment method in fashion e-commerce at the beginning of the customer-merchant relationship. In support of this explanation, invoice adoption gradually rises with subsequent orders. Another explanation could be the increasing general familiarity with online shopping and the reputation of the merchant. In Germany, Belgium, and Norway the combined digital buyer penetration is as high as 80% (eMarketer, 2017). The merchant's (aided) brand awareness is over 90% in respective markets. This effect might reduce the importance of the security dimension of a payment method. However, for smaller or newer merchants H1 might still hold.

We mentioned earlier that we only consider orders where all payment methods were offered to the customer to choose from to make choices comparable. This is the case for around 90% of orders. The other 10% (with denied payment methods) include credit card blacklists but also invoice denials for customers with low solvency score. So it may still hold that these low solvency customers are especially sensitive to payment situations (H4). Customers in our sample however do not pay differently based on their solvency score.

Strong evidence against deferred payment usage are the express delivery flag and the basic article share next to large basket sizes. Respective hypotheses (H2a, H2b, H3) hold and show how interlinked product attributes, order circumstances and payment choice are.

Credit card and PayPal seem to be substitutes in a respective purchase situation (same prefix for all the MNL coefficients), whereas invoice as deferred payment method is fundamentally different.

5.1 Academic Contribution and Managerial Implications

We contribute to academic literature by showing how transaction situations apart from transaction size influence payment method choice. With roots in the theory of transaction demand for money (Baumol,

1952), transaction size has been seen as major factor when considering payment cost and decision (Whitesell, 1992). Starting by formulating theoretical models of cash holdings, payment method choice literature has empirically tested payment method choice between cash, card, and cheque (Klee, 2008; Wang and Wolman, 2016). We empirically analyze payment method choice in e-commerce in the absence of a cash payment option. Parallel to cutoff points in transaction size observed in previous studies (Klee, 2008) where probabilities shift from one payment method to another, we hypothesize substitution away from card and PayPal payments to deferred payment options (invoice). Our results show that there are no clear cutoff points where customers choose to defer payment, but the trend is evident – large, familiar baskets are preferably paid via invoice.

In practice, managers of e-commerce payment divisions will know in which situations customers do value deferred payment methods. With the findings of this study merchants can understand consumer payment preferences better, and will be able to foresee their choice. Pre-selecting the right default payment methods would increase convenience for the customer as she or he saves time during the checkout. In a second step they could estimate whether this customer preference is worth the higher risk of offering the respective payment method. If the shop knows consumer payment preferences it may better estimate conversion or sales declines when one payment method is not available (e.g., due to system malfunctions or too high transaction costs). It will also be possible to reduce complexity of payment systems by reducing the amount of payment methods to those that the customer really wants.

The findings also have implications for business model concepts in information system management and strategy. The move of the payment process from the offline to the online world is a prime example of newly emerging business models facilitated by technological change. Newly emerging risks that arise with remote deferred payments (i.e., customer solvency and fraud issues), can be converted to a competitive advantage by knowing customer preferences and risk profiles. In this article we show how consumer decisions are predictable based on the purchase situation and consumer characteristics. Deviations thereof are the exception and may be flagged as suspicious by the risk engine. Thereby, information systems (like a payment page in our case) are the gateway to get to know know and steer customers.

5.2 Limitations and Areas for Further Research

Evidently, a potential extension of this study could try to include additional explanatory variables. Second, a detailed comparison of choices across markets would have potential for a cross-cultural study. In different markets the payment offerings and adoptions vary strongly. For example, in Italy and Spain cash on delivery is offered by some merchants – a payment method not offered any more in other countries.

A/B testing and measuring conversion rates would shed more light on causal effects if certain payment methods would no longer be offered (to save costs). Customers then may either convert with another payment method or not convert at all. The results would be an indication of how important the payment step is within the whole buying decision journey. Another idea that goes into a similar direction would be to examine the impact of the ordering of the payment methods on the checkout screen. Again, if the ordering has an influence on the payment mix, then this would be evidence for the importance of payments in the buying process.

Further examination of habit as influencing factor as well as the influence of payment method choice on spending behavior (e.g., basket size or return rate) could be studied with a longitudinal data set. Further research could also try to combine the theory of money demand into the technology acceptance model (TAM) by observing adoption of newly emerging payment methods. Mobile only payments will be the next frontier, we already see these methods on the rise in Asia (e.g., Alibaba's Alipay or Tencent's WeChat Pay).

Limitations of this study are given due to our single data source. The external validity across different retail segments besides clothing (e.g., white goods) would be of interest. Shopping of experience goods like apparel is inherently tied to personal taste and fit, making the payment decision relatively more important.

5.3 Conclusion

In this article we apply concepts from the theory of money demand to online only, cash-free payments. First, we consider novel explanatory variables like product familiarity besides established metrics like transaction size. Second, instead of switching from cash to card or cheque, the consumer has the choice of switching from card and PayPal to less binding deferred payment methods like invoice. We show how this payment choice depends on the purchase situation. Especially the customer's very first purchase at an online shop seems to be special compared to the following ones. Basic and urgently needed products (ordered via express delivery) are preferably paid with one-off payment methods (PayPal, credit card) rather than via deferred payment methods (invoice). Whether products are on sale or whether the customer has a good credit score is only of limited importance. We find that deferred payment methods are becoming more popular in Europe, especially for repurchases and large baskets. Credit card, a well-known payment method at the brick-and-mortar POS as well as in e-commerce, is preferred for first purchases, basic items, and time critical express deliveries.

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