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How do different payment methods deliver cost and credit efficiency in electronic commerce?

Robert Maximilian Grüschow *, Jan Kemper, Malte Brettel

RWTH Aachen University, Germany

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ABSTRACT

Using unique data consisting of more than 16.3 million sales transactions provided by a leading European fashion e-commerce company, this study evaluates several payment instruments, including invoices, credit cards, PayPal payments, and prepayments, from an online retailer's perspective in terms of cost and credit efficiency. The authors identify the transaction size, allowance costs for fraudulent customers, and type of credit card provider that influence retailer transaction costs. Moreover, the results reveal that, for small transaction sizes, invoices are the most cost-efficient payment method, while prepayments dominate for large transaction sizes. Electronic payments in terms of both credit card and PayPal cause higher payment costs, and do not show scale efficiency in e-commerce. Furthermore, this research illustrates differences in the collection time of accounts receivable across payment methods, implying the cost of capital that arises for the retailer. The results lead to the conclusion that prepayments and PayPal payments are associated with the lowest cost of capital.

1. Introduction

The mode of payment that is offered to customers is important for a retailer's marketing and financial objectives, and has direct implications for a firm's profitability (Ingene and Levy, 1982). In particular, the increasing volume of worldwide transactions due to a still growing number of Internet shoppers (Pozzi, 2013), substantial innovations in payment technology and infrastructure (Kahn and Roberds, 2009), and significant changes in consumer payment habits (Pimentel, 2013; Schuh and Stavins, 2010) require new ways of handling payments in business-to-consumer markets in e-commerce (Stroborn et al., 2004).

Considering this background, it is not surprising that researchers have examined why individuals and firms use different payment instruments (Garcia-Swartz et al., 2006a; ten Raa and Shestalova, 2004). Although this is highly relevant for academics and practitioners, empirical evidence regarding payment costs and its influence on the payment choice is scarce (Hancock and Humphrey, 1998; Klee, 2008). The perspective of a retailer has yet to be explored in depth due to the absence of appropriate data (Dahlberg et al., 2008; Grewal and Levy, 2007). Previous studies on the economics of payment instruments used survey data (Garcia-Swartz et al., 2006a,b; Hayashi and Keeton, 2012) or aggregated statistics (ten Raa and Shestalova, 2004), but did not have access to transaction-level data (Kahn and Roberds, 2009). Depending on the granularity of the data available, prior research has reported a wide variance in cost rankings and contradictory results, as well as divergent managerial conclusions (Hayashi and Keeton, 2012; Shampine, 2009, 2007). This topic has been identified as an important area for future research, since the two main questions "What does it cost to make a payment?" (Humphrey et al., 2003) and "Which payment instrument turns out to be the least expensive depending on the transaction size?" still have not been answered (Humphrey, 2010). Specifically, researchers have called for further research involving the collection of detailed data on an individual consumer and bank level to examine the complexity of financial payment instruments and consumer behavior (Scholnick et al., 2008). The dependency of the payment choice on the transaction value requires a detailed analysis of the market place and the associated transaction costs with regard to each payment method (Shy and Tarkka, 2002).

As a consequence, this study analyzes how retailers can provide cost and credit-efficient payment services in e-commerce. We offer three main contributions to the field.

* Corresponding author at: RWTH Aachen University, Kackertstraße 7, 52072 Aachen, Germany.
E-mail address: grueschow@time.rwth-aachen.de (R.M. Grüschow).

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From a conceptual viewpoint, we expand the well-established *transactions demand for cash framework* by Baumol (1952) and Tobin (1956) to an e-commerce environment by introducing Internet-specific payment instruments, such as invoices, credit cards, PayPal payments, as well as prepayments. We also include online payment systems-related transaction costs components, such as customer payment default costs and cost of capital. Compared to previous research, our estimation model gives a more holistic picture of the transaction costs retailers incur when providing payment services in their Internet businesses, and hence it offers opportunities for retailers in terms of lowering customer servicing costs and achieving greater efficiency (Kalaignanam et al., 2008; ten Raa and Shestalova, 2004). We also add to the Finance literature that has called for research into the relationship between different payment instruments, deposit reactions, and profitability (Bounie and Gazé, 2009; Santomero, 1984; Shy and Tarkka, 2002).

From an empirical viewpoint, we make a contribution by testing this theoretical model and deriving cost rankings of online payment instruments on the basis of a proprietary dataset from an online fashion retailer. It consists of more than 16.3 million actual customer sales transactions. This approach is unique, since existing research on the economics of payment instruments has not focused on the retailer's perspective or electronic transaction methods due to the scarcity of proprietary, transaction-level, supply-side data (Kahn and Roberds, 2009; ten Raa and Shestalova, 2004).

Ultimately, this research explores the differences in the collection time of the accounts receivable across payment methods and its respective influence on a firm's profitability. We consider the cost of capital as a component of the relevant transaction cost for retailers when they offer payment services in e-commerce. Thus, for the first time, we have connected payment and working capital management – two business disciplines often treated separately by operations management (Balakrishnan, 2011; Protopappa-Sieke and Seifert, 2010). Our regression results enhance retailer knowledge about how much capital is tied up in open customer transactions. This detailed knowledge is important in that it is useful towards initiating significant cost savings and working capital reductions to increase a firm's profitability and shareholder value (Kieschnick et al., 2013; Lieber and Orgler, 1975).

2. Conceptual framework and hypotheses development

2.1. Literature review

Drawing on the transaction cost theory, researchers have modeled the demand of cash by applying an inventory-theoretic approach in which money and goods are treated symmetrically in budget constraints (Baumol, 1952; Tobin, 1956). These models follow the assumption that transactions demand for cash, represented by the "*holder's inventory of the medium of exchange*," increases with the transaction size and the withdrawal conversion cost between cash and deposits, but decreases with the interest rate on the deposits (Baumol 1952, p. 545). Consumer choice theory examines the relationship between individual consumer preferences focusing on the consumption of goods and services with regard to consumer expenditure constraints. Based on a utility model, rational individuals choose competing and substituting products when trying to maximize their overall satisfaction (Lancaster, 1966; Thaler, 1980; Uzawa, 1960). Building on the transactions demand for cash framework by Baumol (1952) and Tobin (1956), researchers have incorporated profit-maximizing consumer behavior and successively expanded it for more complex situations. Those include additional payment instruments besides cash (Santomero and Seater, 1996; Santomero, 1979; Whitesell, 1992). For instance, Whitesell (1992) assumes that rational customers choose payment instruments that minimize associated transaction and holding costs. Next to the strict cost-based approach, researchers identify a number of non-pecuniary determinants of payment choice with individual preferences towards, for example, convenience, reliability, safety, speed of transaction and, recordkeeping (Borzekowski et al., 2008; Fusaro, 2013).

2.2. Hypotheses development

Following the lead of Baumol (1952) and Tobin (1956), we start our hypothesis development with the core transactions demand for cash framework. According to this traditional cost-based approach, Whitesell (1989) assumes that consumer transaction costs – and thus the choice of payment – solely depends on the size of the respective transaction (Whitesell, 1992). Analyzing transaction costs to merchants in traditional retailing, ten Raa and Shestalova (2004) found strong evidence that the costs of making a payment increase with the number of transactions as well as their respective value. Further empirical research in brick-and-mortar retailing illustrates that average costs of making a payment crucially depend on the amount purchased, and vary widely across transaction instruments (Bergman et al., 2007; Boeschoten, 1998; Brits and Winder, 2005; Garcia-Swartz et al., 2006a,b). The first hypothesis follows Baumol (1952), Tobin (1956), and Whitesell (1989, 1992) and builds on the empirical results shown in offline retailing expecting that:

- *Hypothesis 1 (The Transaction Size-Payment Cost Relationship Hypothesis).* The transaction size has a positive influence on retailer payment costs in e-commerce.

In order to evaluate competing payment instruments in terms of cost efficiency and derive respective cost rankings, researchers divide transaction costs into a fixed and a variable component (Brits and Winder, 2005; Guibourg and Segendorff, 2007). Fixed costs incur each time a transaction is carried out, including, for example, bank charges, costs of payment equipment or software provision, expenses for credit card authorization and verification processes, and the costs of time allocated for bookkeeping or handling the dunning process (Bounie and Gazé, 2009; Chou et al., 2004; Koivuniemi and Kemppainen, 2007). Variable costs arise every time an exchange is made and depend on the value of the transaction (Chou et al., 2004; White, 1975). Payment methods differ in variable transaction costs in terms of (i) transaction fees charged to merchants by payment service providers, (ii) the cost of theft, and (iii) interest expenses on the transaction size during the time interval between the transaction date and receipt of money into the merchant's account (Bounie and Gazé, 2009; Chakravorti and To, 2007; ten Raa and Shestalova, 2004). Following Shy and Tarkka's (2002) hypothesis implying each payment instrument will dominate a particular transaction size, we expect that payment methods in e-commerce also differ in terms of fixed and variable transaction costs.

According to Guibourg and Segendorff (2007) as well as Bleyen et al. (2010), both invoice and prepayment can be categorized as paper-based credit transfers in which customers instruct their account-holding bank to push money to a seller's account (Leibbrandt, 2010; Stroborn et al., 2004). To process paper-based credit transfers, fixed setup costs to the merchant are low, since the payments are made through a bank's infrastructure, and no installation of new technologies or security devices are needed by the retailer (Stroborn et al., 2004). Since money in these cash-equivalent payments is physically mailed from the customer to the retailer (Zhang and Li, 2006), variable costs are high as a result