Order Fulfilment and Consumer Behaviour in Online Retailing

Nguyen, D.H.

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Chapter 4: Cheaper, closer, better? Preferences for shipping fee structures and delivery methods in online retailing

Abstract

Retailers offer a variety of delivery methods and shipping fee policies in modern retailing. However, it is not clear which combinations of these factors are most appreciated by online consumers. Understanding consumer perception is vital for retailers and logistics service providers to effectively implement or adapt delivery strategies, which are an important driver of sales in e-commerce. Through a laboratory experiment, we investigate how consumers value delivery methods, shipping fee structures, order value, and consumers' travel time, in terms of online purchase intention. The results show a significant interaction effect between shipping fee structures and order value on online purchase intention, such that a higher order value has a different effect on online purchase intention for threshold-based free shipping from that for unconditional free shipping and flat-rate shipping. An interaction between travel time and delivery method also shows that consumers prefer the short travel time for delivery at a collection point or retail store to the long travel time for the delivery service. Last, given the longer opening times, delivery to a collection point is preferred over delivery to a retail store. Our findings support online retailers and logistics service providers in providing better and more effective service offerings and designing delivery strategies.

1. Introduction

The development of the Internet and mobile devices is moving retailing into an omni-channel world (Bell et al., 2014; Verhoef et al., 2015). These days, online retailers offer consumers a variety of shipping fee structures (e.g., unconditional free shipping, threshold-based free shipping, and flat-rate shipping) and delivery methods (e.g., attended delivery and unattended delivery) (Global Webshop Logistics, 2014; IMRG, 2015a). Still, little is known about how these factors affect the shipping decisions of consumers. Understanding consumer needs is an essential step to help companies arrange their logistics capabilities to achieve supply chain agility (Gligor and Holcomb, 2012; Gligor, 2014). The purpose of this research is to understand how consumers respond to different combinations of shipping fee structures and delivery methods. Thirumalai and Sinha (2009) indicated that customization strategies according to consumer behaviour are very important in online retailing. Our findings will not only help retailers and logistics service providers provide better e-fulfilment services, but also to design delivery strategies more effectively.

Shipping fees are an important means by which online retailers recover fulfilment costs (Lewis, 2006). At the same time, from a marketing standpoint, charging low (or no) shipping fees can be an effective tool for influencing a consumer's purchase decision. Shipping fee structures are known to significantly affect consumer purchase patterns in terms of order incidence and size, thus influencing consumer acquisition and retention (Becerril-Arreola et al., 2013; Lewis, 2006; Lewis et al., 2006). Koukova et al. (2012) found that consumer evaluations of shipping fee structures (including threshold-based free shipping and flat-rate shipping) are based mainly on order value compared to a free shipping threshold. However, these prior studies focused on attended home delivery, which is generally only one of the options from which customers can choose. Agatz et al. (2008) discussed two additional and frequently used last-mile delivery methods: unattended delivery to a specified address, and delivery via manned or unmanned pickup points, which have received limited investigation, e.g., Punakivi et al. (2001), Punakivi and Tanskanen (2002), McLeod et al. (2006), and Weltevreden (2008). The scholarly attention devoted to these methods does not reflect the frequency with which these methods, alongside home delivery, are used in practice (Colliers International, 2015; MetaPack, 2015).

Fear of a missed delivery due to no one being present at home to receive the product, together with competitive delivery fees for alternative delivery methods, currently drive consumers to consider alternative delivery options (IMRG, 2015b; MetaPack, 2015). Alternative delivery

methods such as lockers and pickup points are fast-growing solutions in Europe (Morganti et al., 2014) therefore a number of studies have focused on these alternatives (Goethals et al., 2012; Morganti et al., 2014; Iwan et al., 2016). For example, Goethals et al. (2012) found that store distance, shopping duration, and shopping pleasure have a significant impact on consumer interest in unattended home delivery for e-grocery retailing. Morganti et al. (2014) demonstrated that pickup points are a good alternative to home delivery in France, as long as pickup point networks are designed in line with public transportation nodes and population density. And in Poland, proper location of parcel lockers was considered the most important factor to utilize this delivery method efficiently (Iwan et al., 2016). These studies provide valuable insights; however, prior research has not yet explored shipping fee structures in combination with delivery methods. Doing so is essential because consumer preferences depend upon which delivery options are available. Nguyen et al. (2017) suggest that online consumers trade off alternative delivery options, simultaneously considering different factors (e.g., shipping fee and lead-time). A study on the magnitudes of impact of all delivery options, when considered simultaneously, would improve understanding of consumer behaviour in the new retailing landscape.

The primary question driving this research is how consumers respond to shipping fee structures (i.e. unconditional free shipping, threshold-based free shipping, and flat-rate shipping) and delivery methods (i.e. home delivery, delivery to a retail store, and delivery to a collection point) in terms of their online purchase intentions. Our study expands on previous research by examining impacts of delivery methods, in relation to all available shipping fee structures, on consumer purchase intention. In addition, we examine the effect of factors such as order value (lower or higher than a threshold for free shipping) and travel time (short or long from a consumer's place of residence to the nearest pickup point) that may moderate impacts of shipping fee structures and delivery methods on consumer purchase intention. Based on a recent literature review on the relationship between last-mile delivery and consumer behaviour by Nguyen et al. (2018), our study will consider both the influence of shipping fee structures and delivery options. As a result, this paper aims to contribute to the literature in marketing and logistics, and to support online retailers and logistics service providers in providing better offerings effective delivery strategies.

The remainder of this paper is organized as follows: the next section provides the theoretical background and presents the research hypotheses; we present the research methodology

followed by results, discussion, and implications; and in the final section, conclusions are discussed, including limitations and future research.

2. Theoretical background and hypotheses

2.1. Shipping fee structures

Various shipping fee structures exist, and several researchers have studied the impacts of particular shipping fee structures on consumer preferences for an online offer, retailer's profit, and online sales in specific contexts. According to Schindler et al. (2005), unconditional free shipping (also known as "bundled pricing") and flat-rate shipping (also known as "unbundled pricing") result in different preferences, depending on the degree of consumer shipping-fee skepticism and the presence of external reference prices. Motivated by Schindler et al. (2005) and the concept of shipping-fee skepticism (i.e. the extent to which consumers are skeptical of any shipping fees and view them as a means to enhance retailers' profits), Gümüs et al. (2013) developed an analytical model to understand how online retailers implement unconditional free shipping and flat-rate shipping structures. They found that product prices, retailer popularity, and product characteristics are important factors in choosing between these two shipping fee structures to maximize profit. Lantz and Hjort (2013) found that unconditional free delivery leads to an increase in the total number of online orders and a decrease in the average value of purchased products. These findings are in line with Lewis (2006), who identified that a free delivery policy increases order frequency per consumer and decreases order amounts. Lewis et al. (2006) demonstrated that unconditional free shipping and threshold-based free shipping are effective in inducing online sales. Using experiments to examine threshold-based free shipping and flat-rate shipping structures, Koukova et al. (2012) found that online consumers evaluate the two shipping structure offers differently, depending on whether order value is lower or higher than a predefined threshold. In addition, they also showed that the presence of a product price discount moderates the interaction effect between the two shipping structures. Focusing on threshold-based free shipping, Boone and Ganeshan (2013) and Becerril-Arreola et al. (2013) used optimization models and simulation to find optimal threshold levels to maximize profits. Huang and Cheng (2015) found that the presence of information about shipping fees and time restrictions placed on an online shipping promotion moderated consumer purchase intention with regard to two forms of threshold-based free shipping structures (i.e. piece-based and dollar-based). In this study, we examine three main shipping fee structures commonly used in the B2C e-commerce market: (i)

unconditional free shipping, under which consumers pay zero shipping fees on all orders; (ii) threshold-based free shipping, under which consumers pay no shipping fee if order value is equal to or higher than a threshold predefined by retailers; and (iii) flat-rate shipping, under which consumers pay a fixed shipping fee regardless of order value. Based on prior studies of different shipping fee structures, we argue that consumers will prefer an online offer with unconditional free shipping over threshold-based free shipping, followed by flat rate shipping; and that these preferences may be moderated by specific factors that affect purchase decisions (e.g., a price discount, a presence of shipping fees and time restrictions, and delivery methods).

2.2. Delivery methods

Last mile delivery is said to be the most expensive and critical stage in the supply chain for online retailers (Agatz et al., 2008). Barclays (2014) reported that home delivery was the most popular option with a high percentage of consumers choosing it in the USA (95.9%), the UK (94.9%), Germany (87.2%), and France (79.6%). However, this delivery method was also found to pose problems, such as security and not-at-home concerns, that increase delivery costs substantially (Gevaers et al., 2011; Visser et al., 2014; Edwards et al., 2011; McLeod and Cherrett, 2009). According to Song et al. (2009), first-time home delivery failure rates vary from 10% to 50% in the UK. From a consumer point of view, 58% of respondents were reluctant to shop online due to risk of failed delivery when they were not at home, according to a 2015 UK study (IMRG, 2015b). Thus online retailers have begun to offer such alternative methods as unattended delivery to an intended address and delivery via pickup points (Allen et al., 2007; Ishfaq and Raja, 2017). In this study we examine two additional and popular methods to home delivery: delivery to a retail store and delivery to a manned/unmanned collection point.

As its name implies, delivery to a retail store offers consumers the option to collect an online order from one of the retailer's own stores, where consumers might also get support service. Another advantage of this method is possible in-store sales effects (Agatz et al., 2008). Delivery at a manned collection point offers consumers the option to pick up an online order at one or more staffed collection points, such as convenience stores or gas stations. Advantages of this method are typically the longer opening hours of such points as compared to those of the retailer's own stores (e.g., from 8:00 to 21:00 vs from 9:00 to 17:00) and the

wide network of collection points provided. The number of manned collection points has been increasing in a number of places, including in the UK, USA, Australia, the Netherlands, Germany, Norway, and Sweden (Global Webshop Logistics, 2014). Delivery at an unmanned collection point offers consumers the option to collect an online order at an automated parcel locker. The advantage of this method over the previous two methods as is that these conveniently located lockers are accessible 24 hours a day, seven days a week. Amazon Locker in the UK, Packstation in Germany, and Parcel4Me in the Netherlands are just a few of the well-known organizations providing such services. According to Barclays (2014), the percentage of consumers using delivery to a retail store or manned/unmanned collection point varied across countries in 2014: the UK (19.1% vs 2.2% respectively), the USA (12.1% vs 3.4%), France (9.5% vs 55.8%), and Germany (8.4% vs 12.8%). In 2013 around 4,500 collection points existed in the Netherlands, approximately five times as many as in 2006 (Visser et al., 2014). Alternative delivery options are still growing rapidly as both online retailers and consumers continue to shift to an omni-channel world (Deloitte, 2015; DHL, 2015).

A significant amount of scholarly attention has been paid to home delivery over the past years. For example, Rao et al. (2011b) found that order delays in home delivery decrease order frequency and size, and therefore significantly affect future purchase patterns of consumers; Ramanathan (2010) demonstrated that risk, defined in terms of product price and ambiguity (i.e. the degree to which a product's description is accurate), is not a moderator between on-time home delivery and repurchase intention; and a number of studies have indicated that home delivery is an important factor of e-fulfilment (Koufteros et al., 2014; Rao et al., 2011a; Xing et al., 2010). One of the challenges faced by online retailers offering attended home delivery is how to manage delivery time slots, as there is a trade-off between delivery costs and service (Agatz et al., 2013). While offering narrow time slots for home delivery leads to more convenience for consumers and thus improved customer service, it also leads to higher delivery costs for online retailers as it reduces routing efficiency (Boyer et al., 2009).

Previous studies focusing on alternative delivery methods are relatively scarce (Goethals et al., 2012; Weltevreden, 2008). Punakivi and Tanskanen (2002) found that using lockers helps retailers cut delivery costs by 55-66% when compared to home delivery. However, high initial investment coupled with low utilization rates makes it difficult for retailers to lower their

costs overall. An empirical study on manned and unmanned collection points in the Netherlands by Weltevreden (2008) described the current situation, including the adoption of these two types of delivery method. He presented advantages and disadvantages of lockers versus service points, including among many others: opening hours, use of public space, ease of use, and time needed to collect the package. Chatterjee (2010) investigated consumer behaviour in 'order online, pick up in-store' and found that preferences for delivery at a retail store depend upon the price-consciousness or purchase horizon of consumers. Daduna and Lenz (2005) categorized consumer behaviour into three different dimensions (i.e. substitution, complementary, and induction) related to personal shopping travel behaviour in online or offline channels. Based on the recent overview of delivery methods in online retailing, as well as prior studies on these delivery methods, we argue that home delivery is the preferred delivery method for online purchases, and that consumers prefer delivery to a manned/unmanned collection point over pick-up at a retailers' store because the opening times of the former are longer than the latter. In the previous section, we argue that shipping fee structures may be moderated by important interfering factors (e.g., a price discount, the presence of shipping fees, or time restrictions) in an online purchase. Delivery methods can be one of these interferences. Consumer willingness to purchase products online (online purchase intention) has been well investigated in prior research in online retailing (Nguyen et al., 2018). Taken together, we can hypothesize that:

H1a. With regard to online purchase intention for an online offer, home delivery outperforms delivery to a manned/unmanned collection point, followed by a retail store.
H1b. A two-way interaction between shipping fee structures and delivery methods exists, such that unconditional free shipping leads to a higher online purchase intention than threshold-based free shipping or flat-rate shipping for home delivery, but not for delivery to a retail store or collection point.

Previous research indicated that locations of pickup points affect consumer delivery method choice (Collins, 2015; Iwan et al., 2016). Surprisingly, an empirical study by Goethals et al. (2012) in Lille (France) did not find a positive relation between consumer willingness to pay for home delivery service and consumer distance to a grocery store. In a study examining a pickup points network (excluding automatic lockers) in Seine-et-Marne (Paris region, France), Morganti et al. (2014) investigated the average distance between consumer location and the nearest pickup point. Their study revealed an average distance for inhabitants of the region of 1.6 km in urban areas and 6 km in rural areas. They also found that a large number

of pickup point sites were located near train stations. McLeod et al. (2006) investigated the use of collection and delivery points for failed first-time home delivery in Winchester (UK) and found that the average road distance from the studied households to their nearest collection and delivery point was 2 km. Weltevreden (2008) found that consumers are more willing to use a manned or unmanned collection point if it is close to their homes. In a range test of time distance by car (of 5-45 minutes), the author suggested that a five-minute car ride seemed to be the most critical factor for online retailers or service providers in successfully implementing this service—a result leading to a more dense network of collection points. Boyer and Hult (2005) found that consumer perceptions about saving time—including ordering time and delivery time in an online grocery purchase is positively related to future purchases. Boyer and Hult (2006) indicated that the consumer perceptions about saving time vary between delivery at a retail store and delivery at a distribution center. Specifically, consumers perceive that delivery to a retail store saves more time than delivery to a distribution center. Given the importance of collection and delivery point locations, we argue that travel time to the nearest retail store or collection point influences purchase intention. Specifically, we hypothesize that:

H2a. For home delivery, online purchase intention is higher if travel time from consumer place of residence to the nearest retail store or collection point is long, compared to when travel time is short.

H2b. For delivery at a retail store or at a collection point, online purchase intention is higher if travel time from consumer place of residence to the nearest pickup point is short, compared to when travel time is long.

The relationship between shipping fees and order value was found to influence consumer purchase behaviour in online shopping. Shipping fee structures have significant impacts on a consumer's purchase pattern in terms of order incidence and size (Becerril-Arreola et al., 2013; Lantz and Hjort, 2013; Lewis, 2006; Lewis et al., 2006). Lewis et al. (2006) found that unconditional free shipping reduces order value, while threshold-based free shipping encourages consumers to increase order value to a threshold level in order to enjoy free shipping. On consumer evaluations of online offers, Koukova et al. (2012) found that order value moderates impacts of two shipping fee structures, threshold-based free shipping and flat-rate shipping. Specifically, offer evaluations are less (more) favorable with threshold-based free shipping compared to flat-rate shipping when order value, in the absence of price

discount, is lower (higher) than a threshold for free shipping. Huang and Cheng (2015) demonstrated that threshold-based free shipping with a piece-based threshold results in a higher purchase intention than threshold-based free shipping with a dollar-based threshold. However, according their findings, the effect of the two threshold-based free shipping structures is moderated by the presence of information about shipping fees and time restrictions placed on shipping promotions. As such we can conclude that prior studies take only limited account of the available shipping fee structures in examining their interactions with order value. We therefore propose that:

H3. There is a two-way interaction between order value and shipping fee structures, such that the effect on online purchase intention of order value with threshold-based free shipping is different from the effect of order value with unconditional free shipping and flat-rate shipping.

Figure 1 displays our conceptual model and provides an overview of all hypotheses.

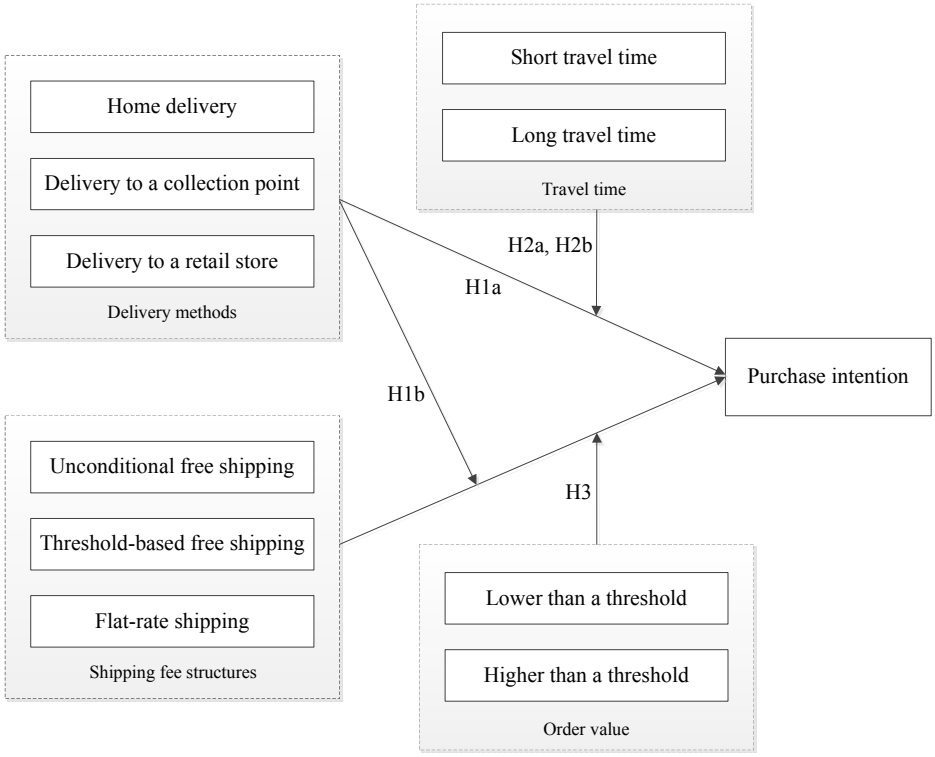


Figure 1: Conceptual model

3. Methodology

To test the hypotheses related to shipping fee structure, delivery method, order value, and travel time, we conducted a laboratory experiment.

3.1. Participants

In exchange for course credit, 204 undergraduate students from a Dutch university registered for a computer-based study on consumer preferences. The use of student samples in behavioural experiments has proven to deliver valid and generalizable findings in the context of logistics research (Thomas, 2011). Being considered the most active online users, college students have been used in previous studies in online retailing (e.g., Collier and Bienstock (2006); Koufteros et al. (2014)). Furthermore, more than 80% of the individuals between 16-25 years old frequently shops online in the Netherlands (CBS, 2016), and the perception of Dutch students in our study therefore represents the perception of a major share of current and future e-commerce consumers. We ensured that all participants had experience with online shopping. A total of 194 students had ordered a product online at least once. Of these, 53.1% were female and 46.9% were male. Most participants (98.5%) were between 18 and 24 years old.

3.2. Procedure

The experiment was conducted in a computer lab in sessions with at most twelve students. Participants, sitting in isolated booths with a computer, entered their responses to scenarios using a mouse and keyboard as if they were shopping in a fictitious web shop. They were asked to complete a questionnaire consisting of three main parts: pre-experiment questions about their online shopping experiences, experimental scenarios, and post-experiment questions about demographics. Each participant was shown twelve scenarios representing a typical shopping experience to replace a broken coffee maker. The choice of using a coffee maker for the experiment was motivated by the fact that students are generally familiar with this product.

3.3. Manipulations and measures

This experiment used a 3 x 3 x 2 x 2 mixed design (between-subject factor: shipping fee structure; within-subject factors: delivery method, order value, and travel time).

3.3.1. Shipping fee structure

We examined three shipping fee structures that represent the most common structures in the B2C e-commerce market: unconditional free shipping, threshold-based free shipping, and flat-rate shipping. Participants were randomly assigned to one of the three groups: 65 participants saw scenarios with unconditional free shipping, 64 participants saw scenarios with threshold-based free shipping, and 65 participants saw scenarios with flat-rate shipping. We chose a threshold for free shipping at €50 and a shipping fee (i.e. flat-rate) at €4 as these levels were comparable to those most applicable in the B2C e-commerce market in the Netherlands at the time of study.

3.3.2. Delivery method

In each scenario, participants also encountered three delivery methods commonly offered in the Netherlands: home delivery, delivery to retail store, and delivery to manned/unmanned collection point. Characteristics of these pickup points (i.e. opening hours of retail stores and collection points) were clearly explained before participants could view scenarios.

3.3.3. Order value

Given the free-shipping threshold of €50, two price levels were selected for the new coffee machine, €46.99 and €56.99. By looking at the order value, participants would know if their order qualified for free shipping.

3.3.4. Travel time

For each scenario, when participants selected a delivery method, they saw the travel time from their place of residence to the nearest pickup point (i.e. a retail store or a collection point). The travel time of 5/10 minutes and 15/30 minutes away by car/bike is considered short and long respectively. Because a bike is a popular mode of transportation in the

Netherlands, we added it to the travel time evaluation scenarios. Table 1 summarizes all scenarios.

	5 minute						15 minute					
	<= threshold			>threshold			<= threshold			>threshold		
	Home	Store	CP	Home	Store	CP	Home	Store	CP	Home	Store	CP
UN	**1**	**5**	**9**	**3**	**7**	**11**	**2**	**6**	**10**	**4**	**8**	**12**
TH	**1**	**5**	**9**	**3**	**7**	**11**	**2**	**6**	**10**	**4**	**8**	**12**
FL	**1**	**5**	**9**	**3**	**7**	**11**	**2**	**6**	**10**	**4**	**8**	**12**

UN: Unconditional free shipping
TH: Threshold-based free shipping
FL: Flat-rate shipping
CP: Collection point

* Figure in bold: the number of scenarios

Table 1: Scenarios in the experiment

In each scenario, participants were asked (i) to assess whether or not the online offer was reasonable, using a seven-point rating scale ranging from 1= "Extremely unreasonable" to 7= "Extremely reasonable" borrowed from Koukova et al. (2012), and (ii) to rate the likelihood that they would shop at this online store, using a seven-point rating scale ranging from 1 = "Extremely unlikely" to 7 = "Extremely likely" borrowed from Howard and Kerin (2006). The correlation between offer reasonability and online purchase intention was strong at 0.69 ($p<0.001$). In this study, we focus on understanding consumer purchase intention (i.e. the second scale).

We also included possible covariates in our study. We borrowed scales from Konus et al. (2008) to measure participants' perceptions of the costs and benefits of multichannel search and purchase in terms of retailer loyalty (4 items), shopping enjoyment (2 items), time pressure (2 items), and price consciousness (2 items). We also collected age, gender, yearly income, online purchase frequency, and monthly online spending. Other than yearly income, these variables did not have significant effects on purchase intention and were excluded from further analysis. In the analyses we controlled for the effect of yearly income.

3.4. Model choice

Each participant evaluated twelve scenarios, and therefore participant evaluations across these scenarios were not independent. To assess the influence of the dependence among multiple subjects per participant, we compared a model with random intercepts (accounting for differences between individuals) to a model without this random intercept using likelihood-ratio tests based on Maximum Likelihood estimation (West et al., 2014). The result showed

that the change in –2 log likelihood was significant (likelihood ratio = 725.0652, $p<0.001$) and the model with the random intercept had smaller AIC and BIC than those of the model without the intercept. This test confirmed that a random intercept accounting for participant-specific effects explains a significant part of the variance in the dependent variable (i.e. consumer purchase intention). We therefore used a linear mixed-effects model with random participant intercept, accounting for the multiple subjects per participant and the hierarchical characteristics of the dataset. Furthermore, the impact of the travel time to the nearest pickup point differs between home delivery and delivery at that pickup point. In home delivery, purchase intention is likely lower for short travel time than for long travel time, whereas purchase intention for short travel time is likely higher than that for long travel time in delivery to a retail store or a collection point. Therefore, we do not include this independent variable (i.e. "travel time") in the model with main effects to be estimated (Equation 1). This variable was added only when we introduced a three-way interaction among shipping fee structure, delivery method, and travel time.

$$Y_j^i = \beta_0 + \beta_1 \times \mathrm{STRUCTURE_{ij}} + \beta_2 \times \mathrm{METHOD_{ij}} + \beta_3 \times \mathrm{ORDER\_VALUE_{ij}} + \beta_4 \times \mathrm{INCOME_{ij}} + u_{0j} + \varepsilon_{ij} \qquad (1)$$

Where

Y_j^i: purchase intention of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

β_0: the intercept for purchase intention

$\mathrm{STRUCTURE_{ij}}$: shipping fee structure of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

$\mathrm{METHOD_{ij}}$: delivery method of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

$\mathrm{ORDER\_VALUE_{ij}}$: order value of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

$\mathrm{INCOME_{ij}}$: yearly income of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

β_1, β_2, β_3, β_4: the slopes for main effects of the predictors shipping fee structure, delivery method, order value, and yearly income respectively

u_{0j}: the variability in the intercept β_0

ε_{ij}: random error for subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$)

We introduced interaction terms in our linear mixed-effects model ($\mathrm{STRUCTURE_{ij}} \times \mathrm{METHOD_{ij}}$, $\mathrm{STRUCTURE_{ij}} \times \mathrm{ORDER\_VALUE_{ij}}$, $\mathrm{STRUCTURE_{ij}} \times \mathrm{METHOD_{ij}} \times \mathrm{TRAVEL\_TIME_{ij}}$) to test the formulated hypotheses where $\mathrm{TRAVEL\_TIME_{ij}}$: travel time of subject *i* ($i = 1,\ldots, n_j$) of scenario *j* ($j = 1,\ldots,12$). We used the linear mixed-effects models fit

with the "nlme" package (Pinheiro et al., 2016) in R 3.1.3 (R Core Team, 2015) to predict main and interaction effects of the mentioned predictors on purchase intention.

4. Results

A visual check of histograms and normal probability plots illustrated an approximately normal distribution of residuals produced by the models. Results of the linear mixed-effects models are presented in Table 2.

Variables	Model 1	Model 2	Model 3	Model 4
Intercept	1812.976**	1809.851**	1811.413**	1802.821**
Shipping fee structure	6.360**	6.349**	6.355**	6.325**
Delivery method	79.710**	79.896**	83.686**	82.423**
Order value	58.317**	58.453**	61.225**	60.301**
Travel time				6.005*
Shipping fee structure × Delivery method		2.159		
Shipping fee structure × Order value			53.971**	
Shipping structure × Delivery method × Travel time				0.408
Marginal R^2	0.11	0.11	0.13	0.13
Conditional R^2	0.44	0.44	0.47	0.47

* Significant at 95% confidence level.
** Significant at 99% confidence level.

Table 2: Main effects and interaction effects of shipping fee structure, delivery method, order value, and travel time on purchase intention (F-value)

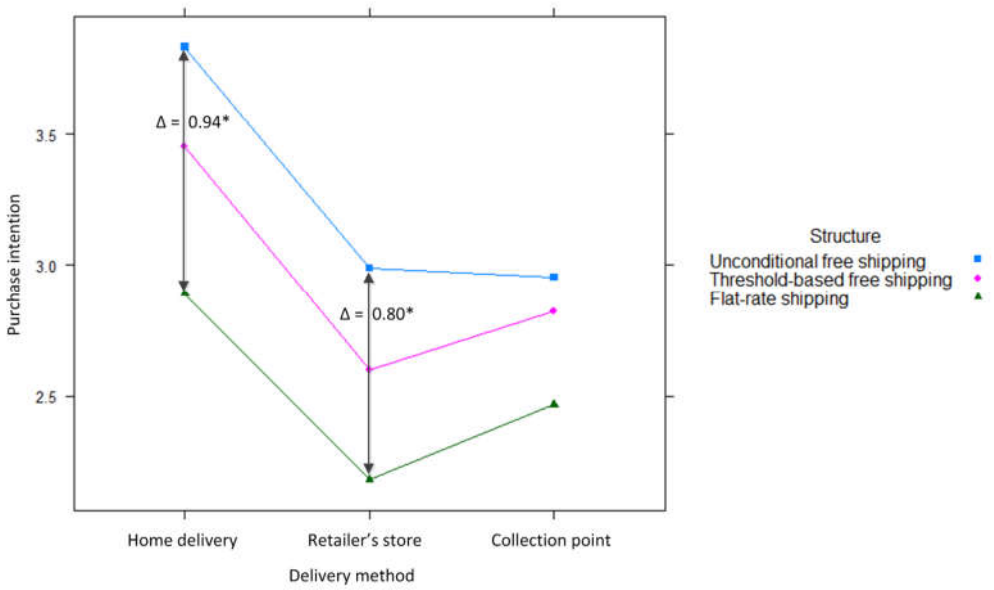
The results showed statistically significant main effects of shipping fee structure, delivery method, and order value (Model 1). As the two-way interaction between shipping fee structure and order value was significant (Model 3), pairwise comparisons between levels of each variable, instead of results of main effects, would provide true effects of the two variables.

4.1. Online purchase intention with delivery methods and shipping fee structures

Regarding the statistically significant main effect of delivery method in Model 1 ($F_{(2, 2131)}$=79.710, p<.001), home delivery is the most preferred method ($M_{\text{home delivery}}$ = 3.39, CI=[3.12, 3.65]), followed by delivery at a collection point ($M_{\text{collection point}}$ = 2.75, CI=[2.48, 3.01]) and delivery at a retail store ($M_{\text{retail store}}$ = 2.59, CI=[2.32, 2.85]), in support of H1a.

Even though the two-way interaction effect between shipping fee structures and delivery methods is not significant ($F_{(4, 2127)}$=2.159, p>.05), the plot in Figure 2 reveals that online

purchase intention for unconditional free shipping is higher for home delivery and delivery at a retail store. For delivery at a collection point this difference is not significant (H1b not supported). Figure 2 shows two significant contrasts, between unconditional free shipping and flat-rate shipping, to home delivery with Δ=0.94 and to a retail store with Δ=0.80.



* Significant at 99% confidence level.

Figure 2: Two-way interaction between shipping fee structure and delivery method

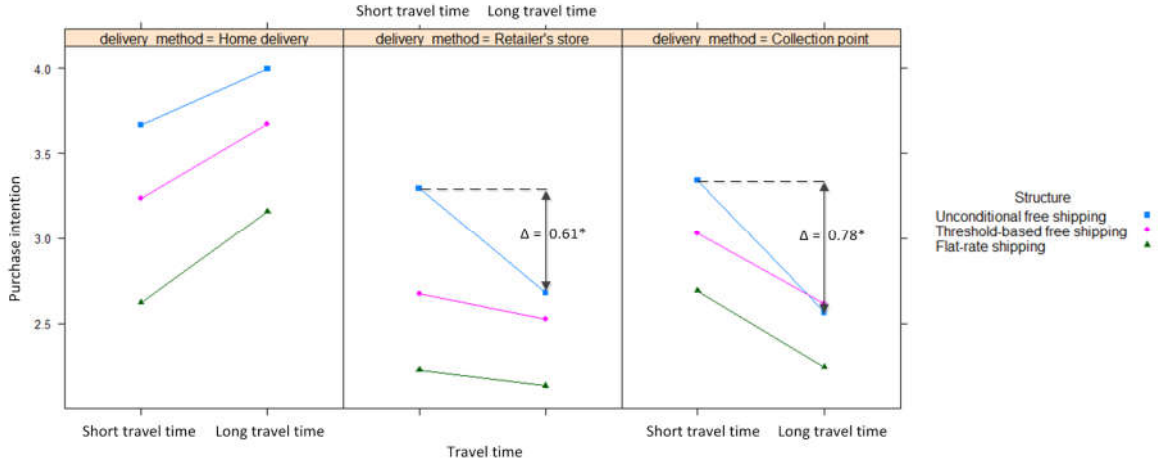
4.2. Online purchase intention with delivery method and travel time

The three-way interaction among shipping fee structures, delivery methods, and travel time is not statistically significant (p>.05), suggesting that online purchase intention across shipping fee structures is not dependent on an interaction between delivery methods and travel time. However, specific pairwise comparisons from the three-way interaction results are used to test for differences between short and long travel time in different delivery methods (results of testing H2a and H2b).

H2a, which states that for home delivery online purchase intention is higher if travel time from consumer place of residence to the nearest retail store or collection point is long compared to when travel time is short, is not supported, as no significant differences are found (p>.05).

H2b, which states that for delivery at a retail store or at a collection point online purchase intention is higher if travel time from consumer place of residence to the nearest pickup point

is short, compared to when travel time is long, is partially supported. Specifically, with delivery at a retail store and at a collection point, purchase intention for unconditional free shipping significantly differs between short and long travel time ($M_{\text{retail store, unconditional free shipping, short travel time}} = 3.29$ vs $M_{\text{retail store, unconditional free shipping, long travel time}} = 2.68$, $\Delta = 0.61$, $p<.01$; $M_{\text{collection point, unconditional free shipping, short travel time}} = 3.34$ vs $M_{\text{collection point, unconditional free shipping, long travel time}} = 2.56$, $\Delta = 0.78$, $p<.01$). For threshold-based free shipping and flat-rate shipping no such effect of travel time on purchase intention was identified. Figure 3 shows the results of pairwise comparisons of purchase intention between short and long travel time in three delivery methods. Panel 1 (home delivery) of Figure 3 shows no significant differences of purchase intention between two levels of travel time for three shipping fee structures. Panel 2 (delivery at a retailer's store) indicates a significant difference of purchase intention (Δ = 0.61) between two levels of travel time for unconditional free shipping. Panel 3 (delivery at a collection point) indicates a significant difference of purchase intention (Δ = 0.78) between two levels of travel time for unconditional free shipping.



* Significant at 99% confidence level.

Figure 3: Purchase intention between short and long travel time in three delivery methods

4.3. Online purchase intention with shipping fee structure and order value

H3, which states that a two-way interaction between order value and shipping fee structures exists, such that the effect of order value for threshold-based shipping on online purchase intention is different from the effect of order value for unconditional free shipping and flat-rate shipping, is supported. The results indicate a significant interaction effect ($F_{(2, 2129)}=53.97$, $p<.001$).

Plotting the interaction effect (Model 3), Figure 4 shows that the effect of order value on purchase intention differs between shipping fee structures. With unconditional free shipping and flat-rate shipping, purchase intention goes down when order value goes up; however, with threshold-based shipping purchase intention goes up if order value is higher than the threshold for free shipping (as compared to an order value below the threshold).

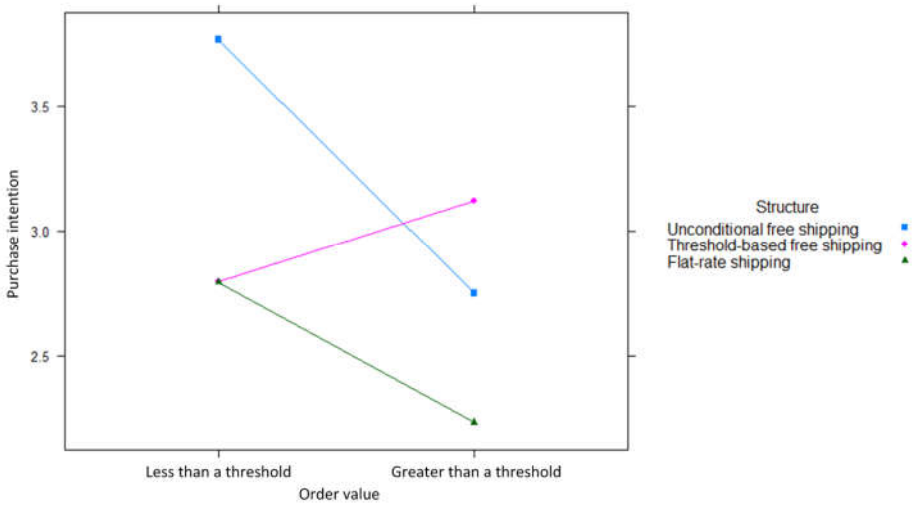


Figure 4: Interaction plot between order value and shipping fee structures

Table 3 presents an overview of all hypothesis testing results.

H	In terms of online purchase intention	Support
1a	Home delivery > Delivery at a retail store > Delivery at a manned/unmanned collection point	Yes
1b	Home delivery: Unconditional free shipping > Threshold-based free shipping/Flat-rate shipping Delivery at retail store or a collection point: Unconditional free shipping < Threshold-based free shipping/Flat-rate shipping	No
2a	Home delivery: Short travel time < Long travel time	No
2b	Delivery at a retail store or at a collection point: Short travel time > Long travel time	Partial
3	The effect of order value for threshold-based free shipping is different from the order value for unconditional free shipping and flat-rate shipping	Yes

Table 3: Overview of hypothesis testing results

5. Discussion and implications

Using an experiment in a hypothetical online shopping setting, we examined the main effects and interactions of shipping fee structures, delivery methods, travel time, and order value on

online purchase intention. Our study indicates main effects of delivery methods and a significant interaction effect between shipping fee structures and order value on online purchase intention. The current study also shows a significant difference between short and long travel time for delivery at a pickup point with unconditional free shipping. We note that the differences in average scores between levels of the variables found in this study are statistically significant but small in absolute terms making it difficult to assess and generalize the magnitude and managerial relevance of the significant differences observed.

First, we found that consumer online purchase intention is greatest for home delivery (H1a). This is in line with descriptive statistics from various industry reports (e.g., Barclays (2014); Colliers International (2015); MetaPack (2015)), and confirms that home delivery is still the preferred delivery method for online shopping. Our research also shows that online purchase intention for delivery at a collection point is higher than that for delivery at a retail store (H1a). We argue that this is due to the longer opening times of manned/unmanned collection points as compared to retail stores. This finding is practically important for online retailers and logistics service providers in designing a pickup network effectively as well as allocating logistics resources appropriately based on the consumer perceptions. Home delivery is no longer the only choice among delivery strategies in the omni-channel world, as also indicated in previous research by Weltevreden (2008) and industry reports (Deloitte, 2015; DHL, 2015).

Second, although the impact of shipping fee structures on purchase intention did not depend on delivery methods (H1b not supported), we found significant differences in purchase intention between, on the one hand, delivery with unconditional free shipping and flat-rate shipping and, on the other hand, home delivery and delivery to a retail store (results from testing H1b). Our study contributes to the literature on shipping methods as previous studies, e.g., Lewis (2006) and Koukova et al. (2012), have not examined the relationship between the two structures.

Third, in the case of unconditional free shipping, we found that purchase intention is higher when travel time from consumer place of residence to the nearest pickup point is short rather than long (H2b). This finding is consistent with previous studies (Collins, 2015; Iwan et al., 2016) stating that locations of pickup points – and thus travel times – are an important factor for consumers in online purchase decisions. Our results are also consistent with findings by Weltevreden (2008) that short travel times (5 minutes) lead to the greatest purchase intention

in online purchases. Thus online retailers and logistics service providers should place a special emphasis on locating pickup-points as close as possible to areas with high residential density. In addition, we found that online purchase intention for short travel time is affected by shipping fees since online purchase intention was higher only with unconditional free shipping.

Fourth, our research showed that the impact of shipping fee structures on purchase intention depends on a comparison between different levels of order value and a threshold for free shipping (H3). We build on the research of Koukova et al. (2012) who indicate that, in the absence of price discounts, purchase intention for threshold-based free shipping is higher than for flat-rate shipping if total order value is above the free-shipping threshold. We demonstrate that a higher order value (when compared to a threshold for free shipping) has a different effect for threshold-based free shipping than for unconditional free shipping and flat-rate shipping.

The use of a laboratory experiment allowed us to confirm industry reports that home delivery is the most preferred delivery method. Online retailers should therefore always offer this delivery service. Furthermore, we find that consumers prefer delivery of their online orders to a collection point rather than to a retail store. If online retailers are interested in promoting delivery service at pickup points, they should reduce the shipping fee for this option. This strategy is in line with the finding by Nguyen et al. (2017) that consumers are sensitive to shipping fee. Pricing schedules therefore need to favor pickup service. In addition, promoting in-store pickup can lead to a relative increase in in-store sales (Agatz et al., 2008). In this study we did not find significant differences in online purchase intention between different lengths of travel time for threshold-based free shipping and flat-rate shipping structures (H2b). As a result, if consumers need to pay a fee for delivery at a pickup point (with threshold-based free shipping or flat-rate shipping), the travel time to this pickup point does not seem to impact purchase intention.

6. Conclusions, limitations and future research

Shipping fee structures and delivery methods are important factors for both retailers and consumers in online retailing. Our study contributes to the existing literature and practical settings by empirically exploring an underrepresented topic of shipping fee structures and delivery methods in the context of consumers and by providing good guidance to retailers about what to focus on in online offers and on how to implement delivery strategies properly.

This study is not without limitations that may offer avenues for future research. First, we did not incorporate information on in-stock availability, timeslots, or carrier names in our study. Second, our study focused on one specific product (i.e. a coffee maker). It is noted that different products in terms of weights, sizes, and quality may require different delivery methods. Future research might explore different product categories to generate more comprehensive understanding of the topic. Third, the study is conducted in one country, the Netherlands. Future research should be examined in a cross-country context, since international online retailers are confronted with diverse shopping habits and consumer preferences. Last, although the current study investigated the three most popular shipping fee structures, our study did not incorporate a growing type of shipping fee structure in the current e-commerce market: membership (e.g., Amazon Prime). Future work should take into account this new shipping fee type.