

# Non-financial incentives to encourage sustainable decisionmaking in webshops' checkout page

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Published in Transportation Research Part D: Transport and Environment,  
<https://doi.org/10.1016/j.trd.2021.102794>

## Abstract

As more and more people are buying more and more items online, limiting the ecological footprint of e-commerce deliveries is pressing. Research suggests several initiatives for retailers and logistics service providers to take, but consumer-involvement is key. This research investigates how to encourage consumers' sustainable decision-making in the web-shop's check-out page by using non-financial incentives only. To this end, we carry out an online experiment among Belgian consumers to assess and compare the impact of four incentives: (1) information, (2) options order, (3) social media share and (4) social norm. The experiment demonstrates that providing information on the ecological footprint of delivery options is the most decisive incentive. The impact of social media shares and social norms are positive, while reversing the order of delivery options has limited effects. This research highlights the potential of consumer behaviour in enhancing sustainability and encourages further exploration of this topic.

## Introduction

Global parcel volumes reached 87 billion in 2018, with 9,3 billion parcels delivered in Europe (Ecommerce News, 2019). Parcel volumes continue to increase along with growth in e-commerce turnover from business-to-consumer transactions. In 2019, e-commerce expanded by 11% globally (Ecommerce Foundation, 2019) and by 13% in Europe (Ecommerce Europe, 2019). Without intervention, the World Economic Forum predicts that the number of delivery vehicles in the top hundred cities around the world will grow by 36% until 2030. As a consequence, emissions will increase by 32% and congestion by 21%, adding an additional eleven minutes to inhabitants' daily commutes (Deloison et al., 2020).

In the face of the global COVID-19 health crisis, these estimations are on the conservative side. During and after periods of lockdown, consumers around the world resorted online for their daily necessities and general needs. McKinsey research finds that within eight weeks' time, online consumption reached levels that were expected to manifest only in ten years (Kohli et al., 2020). In covering "a decade in days", it is more important than ever to find effective ways to tackle the environmental challenges of e-commerce delivery. Given the impressive volume of parcels that is shipped daily and the growth volumes that are expected for the future, it is possible to bring about significant environmental gains.

Research on sustainable e-commerce deliveries is ongoing. Following the triple bottom line approach, the concept of sustainability explicitly integrates social, environmental and economic lines (Alhaddi, 2015). Although transport practices related to e-commerce propose significant challenges in societal (e.g., labour conditions, traffic collisions) and economic terms (e.g., free shipping and return policies), the scope of this article is limited to their environmental implications. Nevertheless, environmental improvements often rely on efficiency measures that prove to be economically beneficial as well.

Studies on the environmental sustainability of e-commerce delivery have largely targeted one stakeholder in particular: logistics service providers. As they carry out deliveries for their retail customers, logistics service providers are suggested to renew their vehicle fleet and optimise their processes of loading, routing and synchronising with other stakeholders (Mangiaracina et al., 2015). Indeed, annual reports and sustainability statements show that the logistics sector is making significant improvements in all these areas (Buldeo Rai et al., 2018; Colicchia et al., 2013). Increasingly, retailers' potential to enhance the sustainability of e-commerce deliveries is scrutinised as well (Kotzab et al., 2011). Acting as intermediaries, retailers are able to promote sustainable behaviour among supply chain members (Adivar et al., 2019). Analysis indicates that online retailers have not come very far in the greening of distribution. The researchers suggest logistics service providers to support them in this work and accordingly involve consumers as well (Sallnäs and Björklund, 2020).

Yet when it comes to sustainable e-commerce deliveries, the potential of online consumers' decision-making has long been overlooked. As consumers are increasingly given the opportunity to weigh in on the time, price, quality and even "green" and "fair" aspects of e-commerce delivery services (DHL, 2013), they are key stakeholders to include. What's more, several studies point out that consumer behaviour determines which e-commerce delivery method is preferred from an environmental point of view (Buldeo Rai et al., 2019a; Van Loon et al., 2015; Pålsson et al., 2017). Sustainability concerns among consumers are more prevailing than ever: for the ninety days that led up to Earth Day on April 20th, Google searches related to "sustainable lifestyles" increased by 4550% (Chasan, 2020). To tap into these concerns and organise online consumption for the better, establishing reliable and effective tools is pressing. As Sallnäs and Björklund (2020) state, it is vital that logistics service providers and retailers "facilitate sound consumer choices".

For e-commerce delivery, these tools largely lack. The body of studies that jointly addresses consumer behaviour, e-commerce delivery and sustainability is limited. Published research demonstrates that consumers are not opposed to collecting their delivery in collection points, stores, delivery lockers and to waiting longer for their purchases to arrive (Buldeo Rai et al., 2019b). Alternative delivery locations (Buldeo Rai et al., 2019a), longer delivery terms (Jaller and Pahwa, 2020; Lin et al., 2017; Munoz-Villamiza et al., 2021; Siikavirta et al., 2003) and the absence of narrow delivery timeframes (Boyer et al., 2009; Manerba et al., 2018) allow logistics service providers to load and route vehicles more efficiently and deliver more sustainably, but their potential materialises only when selected in the web-shop's check-out page. In an article about sustainable strategies, the sustainability director of e-commerce logistics service provider UPS says that "small tweaks can make a big difference in fuel efficiency and miles driven" (Kaplan, 2019).

Yet, as consumers are very sensitive to delivery charges and highly reluctant to pay for delivery (Buldeo Rai et al., 2019b; Nguyen et al., 2019), retailers tend to shy away from differentiating in price and using financial incentives to steer decision-making. Even consumers that are positively inclined towards sustainable consumption do not change their behaviour when they meet economic barriers (Lehmann and Sheffi, 2020). Therefore, this study explores the impact of non-financial incentives on consumers' sustainable decision-making in an e-commerce delivery context. Specifically, we compare the potential of four non-financial incentives. In doing so, we respond to four research questions:

- (1) Does a positively formulated information message about the more sustainable delivery option influence consumers' choice for this more sustainable option?
- (2) Does the order of delivery options influence consumers' choice for the more sustainable delivery option?

(3) Does a social media sharing option influence consumers' choice for the more sustainable delivery option?

(4) Does a descriptive social norm on the more sustainable delivery option influence consumers' choice for this more sustainable option?

Our research is novel in two ways, first by explicitly investigating the perspective of consumers and involving them in the quest to limit the environmental impact of e-commerce delivery and second, by drawing on psychological principles and exploring incentives that are non-financial and therefore more appropriate for the cost-sensitive business-to-consumer e-commerce sector.

The second section of this article proposes a summary of the state of the art in sustainable e-commerce delivery, as well as an introduction to non-financial incentives that are proposed to encourage sustainable consumer behaviour. The online administered experiment applied in this study builds on findings of both bodies of literature: the proposed solution to reduce the environmental impact of e-commerce deliveries on the one hand and the proposed solutions to steer consumers towards more environmentally-friendly e-commerce deliveries on the other hand. The experiment is described in the third section, while the fourth section outlines the experiment results. The fifth section ends with concluding remarks.

## **Literature**

This study builds on two distinct bodies of knowledge: the first is situated in supply chain management and focuses on goods movements in the growing business-to-consumer online retail market, the second is situated in psychology and behavioural studies and taps specifically into behaviour of consumers. In this literature review, we propose a focused summary of both bodies of knowledge, in relation to environmental sustainability. The first section discusses environmental issues associated with e-commerce deliveries and ways in which these issues can be alleviated. The second section describes non-financial incentives that can encourage sustainable decision-making among consumers and ways in which they can be applied to create more sustainable e-commerce deliveries. With the exception of two recent studies (Agatz et al., 2020; Ignat and Chankov, 2020), research that explores the application of consumer behaviour to enhance sustainable e-commerce deliveries lacks, which is why we draw on examples of successful sustainability transitions from other fields. Both parts of the literature review are compiled based on searches on the Google Scholar, Science direct, Scopus and Web of Knowledge databases, using keywords and strings including "e-commerce", "delivery", "last mile", "sustainability", "consumer behaviour", etc.

### *Solutions for sustainable e-commerce delivery*

Home deliveries to consumers constitute the final part of the online supply chain, also termed "the last mile". The last mile starts at the final distribution centre, from which products are transported to their delivery destination (Goodman, 2005). As such, it does not refer to an exact mile or kilometre, but substantially depends on the supply chain's location and geographical configuration (Cardenas et al., 2017). Destinations can be diverse, e.g., offices, public institutions, service providers, construction sites and production plants. In the case of retail supply chains, the final delivery destination ultimately coincides with the place of consumption, i.e., end-consumers' homes.

Although the last mile represents only a small share of the e-supply chain's total distance, its importance is significant nonetheless. In terms of direct costs as well as external costs (i.e., negative side-effects of transport on society and environment), the last mile is disproportionately responsible (Rizet et al., 2010). In terms of costs, exact figures are not available. This is in part due to the sensitivity

of this information in industries that are highly cost-driven and competitive, i.e., retail and logistics. What's more, last mile costs depend on many different parameters, including customer type and customisation degree (Goodman, 2005). Goodman (2005) cites that 28% of all transport costs occur in the last mile. Based on data from the parcel sector, Gevaers (2013) found that the costs of the last mile can amount from 13% to even 75% of total logistics costs. Retailers claim that last mile deliveries are between five and twenty-three times more expensive than purchases in-store (Allen et al., 2017). In the same vein, negative environmental side-effects of transport comprise emission of global and local pollutants, congestion, accidents and noise.

For the online purchase of a flash drive in the United States, lifecycle assessment by Weber et al. (2009) found that last mile delivery constitutes 32% to CO<sub>2</sub> emissions. Based on lifecycle analysis of five online retailing methods of fast moving consumer goods in the United Kingdom by Van Loon et al. (2015), the last mile contributes on average 47% to the total carbon footprint of fulfilment. A case-study by American retailer Walmart demonstrates that emissions associated with the last mile multiply those emitted by remaining transport operations (McLaughlin, 2017). Finally, for the online purchasing of electronics in Italy, Melacini and Tappia (2018) find that home delivery produces more than half of greenhouse gas emissions per order.

In response to this "last mile challenge", many solutions are proposed, tested and implemented to enhance its efficiency and accordingly reduce costs and environmental damages. Ignat and Chankov (2020) categorise these solutions in two ways of working: first, by taking operational measures and second, by influencing online consumers to adopt more sustainable behaviours. Operational solutions include the type of (1) delivery vehicles, (2) logistics spaces and (3) vehicle routing that are used for the last mile (Viu-Roig and Alvarez-Palau, 2020).

(1) Electric vans and trucks are considered the most important alternative, although adoption remains slow and low (Morganti and Browne, 2017). Cost competitiveness is among the biggest barriers (Lebeau et al., 2019), next to anxieties related to limited vehicle range, risk of queuing at the charging station, payload restrictions caused by batteries' size and weight and unreliable local electricity supply (Morganti and Browne, 2017). Nonetheless, the recent rise of start-up companies announce change. These start-ups collaborate directly with large e-commerce players and built customised and affordable vehicles for delivery (Brooks, 2020). While electrified vans and trucks are unable to solve rising congestion issues, bikes are. In fact, electrically-assisted bikes with cargo carrying capacity (i.e., "cargo bikes") currently stand out as most mature technology (Koning and Conway, 2016).

(2) The use of alternative vehicles however requires a reconfigured supply chain that relies on new types of logistics spaces. Incorporating micro warehouses in the city ("urban warehouses") allows to organise shorter delivery rounds and to store and charge delivery vehicles. Historically developed in Asia (Dablanc et al., 2017), large e-commerce players are introducing urban warehouses in cities around the world (Moriset, 2018). Although finding affordable and sufficient space remains a key issue (Buldeo Rai et al., 2019c), several logistics service providers succeeded in setting up a network of micro-hubs that is fully operational (van Rooijen, 2018).

(3) Finally, much of the literature on environmental sustainability of the last mile is dedicated to route optimisation, which is promising as well to achieve savings in distances travelled, vehicle usage, energy consumption and emissions. As Viu-Roig and Alvarez-Palau (2020) state in their literature review on the impact of e-commerce related last mile logistics in cities, the general idea is that optimised routes not only entail a positive environmental impact, but also create greater operational efficiency. Better routing allows one logistics service provider in the parcel market to save twelve kilometres per driver per day, or more than one-hundred million vehicle kilometres in a year (Kaplan, 2019).

While operational improvements are important in reducing the environmental impact of e-commerce delivery, logistics service providers remain bound to the delivery service conditions that their customers (i.e., retailers) have agreed to with their customers (i.e., consumers) (Sallnäs and Björklund, 2020). Accordingly, solutions to influence online consumers' sustainable behaviour are formulated in regards to three aspects of the last mile (Buldeo Rai et al., 2019b; Ignat and Chankov, 2020): i.e., (1) delivery speed, (2) delivery time and (3) delivery location. These aspects received considerable attention as ways to reduce the environmental impact of e-commerce deliveries, in response to the industry standard: free, next day delivery to an address of choice, on regular office hours during the week and with a free return possibility in a local collection point (Buldeo Rai et al., 2019b). They are supported by the principle of bundling or consolidation, which enables logistics service providers to increase the drop density, i.e., the number of parcels delivered in an area. In e-commerce, drop density is one of the most important parameters (Allen et al., 2018).

(1) Early on, speed of delivery service was considered as one of the key factors in the e-commerce success. Increasing the speed of delivery has been a fixation by large players, raising the bar for consumer expectations and forcing other retailers to keep up. Today's consumers expect to receive their orders the next day of purchase (Buldeo Rai et al., 2019b; Janjevic et al., 2019; Nguyen et al., 2019), while delivery within a few hours or "instantly" is becoming increasingly common as well (Dablanc et al., 2017). Ever faster deliveries impede to fully load vehicles and optimise delivery rounds, which leads to higher delivery frequencies and an increase in transport demand overall. In their study on e-grocery in Finland, Siikavirta et al. (2003) find that the most environmentally-friendly concept carries out deliveries once a week and sorts orders by postal code evenly among all delivery days. Lin et al. (2017) establish that emissions decrease as the economies of scale increase. Investigating the environmental implications of delivery speed, they find that on-demand deliveries generate more vehicle trips and kilometres travelled, and thus produce more emissions. Munoz-Villamiza et al. (2021) simulate the CO<sub>2</sub> emissions associated with fast shipping and find increases by 15%. Based on an analysis of vehicle kilometres travelled per delivery stop, Jaller and Pahwa (2020) conclude that the responsibility for reducing externalities from e-commerce starts with consumers. They suggest consumers to consolidate their online purchases as well as retailers and logistics service providers to consolidate as many consumers as possible on a single delivery tour.

(2) In terms of delivery time, standard service concentrates on weekdays and regular office hours. During this time, consumers tend to be at work and unable to receive these deliveries at home. Depending on the source, delivery failure rates vary from 2% to 60% and cause a second redelivery in some cases (Buldeo Rai et al., 2019d). In addressing these inefficiencies, timeframes are diversified by offering deliveries on evenings and weekends when consumers are actually at home and by cropping time windows to one-hour or two-hour timeslots so consumers can organise themselves better (Boyer et al., 2009). While these interventions help to avoid delivery failure, redirecting parcels from regular rounds to dedicated evening or weekend rounds and rescheduling rounds to meet delivery windows also hinder delivery efficiency (Boyer et al., 2009). Manerba et al. (2018) show for example that an increase in time windows from two to six hours, implies a decrease of 3615 km on average per day.

(3) In terms of delivery location, collection points are proposed as more sustainable alternative to delivery at home. Collection points are local proximity stores (e.g., florists, tobacco shops, press kiosks) that organise pick-up for parcel deliveries and drop-off for parcel returns (Morganti et al., 2014). Also unattended collection points or "delivery lockers" are available now in various cities across Europe and the United States. Both attended and unattended collection points allow to avoid delivery failure and to improve consolidation and efficiency. In doing so, they reduce vehicle-kilometres, transport-time, fuel consumption and operational costs (Buldeo Rai et al., 2020). Yet research on the environmental

advantages of collection points outlines that they achieve these benefits only if consumers' collection trips are walked, biked or carried out as part of a multi-purpose journey (Buldeo Rai et al., 2019a). This is however far from always the case for collection point pick-up (Buldeo Rai et al., 2020), let alone for the increasingly popular click-and-collection solution in which online purchases are collected in-store (Buldeo Rai et al., 2019a).

Ultimately, the most important feature of delivery is its price. Over and over, this statement is confirmed by consumer surveys: in Belgium (Buldeo Rai et al., 2019b), the Netherlands (Nguyen et al., 2019), France (SprintProject, 2020), China, Bolivia and Brazil (Janjevic et al., 2019). One strategy to bypass consumers' unwillingness to pay for delivery is offering subscription-based services for an annual fee. More and more retailers are experimenting with such services, which are considered highly effective. A well-known example is Amazon Prime: "There are more than 150 million Prime members worldwide and they spend twice as much as other customers" (Grasland and Moutot, 2020). Research in Belgium (Buldeo Rai et al., 2021) and France (SprintProject, 2020) shows that consumers are particularly open to this type of service. Although subscription-based services often include additional advantages in terms of speed, time or location of deliveries, initiatives to enhance efficiency and sustainability are there too on the rise (e.g., "Amazon Day" and "No-Rush Shipping"). Despite its increasing significance on consumers' purchase decisions, delivery is underrated as a service in terms of what consumers are willing to pay for it. To enhance the sustainability of e-commerce delivery, an open question remains whether non-financial incentives can encourage consumers to make more sustainable choices in the web-shop's check-out page and which one is most impactful.

#### *Non-financial incentives for sustainable consumer behaviour*

Research on consumer behaviour proposes several incentives to ease the transition towards more sustainable production and consumption. Trudel (2018) identifies four areas of scientific inquiry that dominated research in the past twenty years: (1) cognitive barriers, (2) the self, (3) social influence and social norms and (4) product characteristics. In line with the research objective, we only discuss incentives of non-financial nature that we subjectively estimate to be appropriate and useful for delivery services (thus excluding the fourth scientific area on product characteristics).

(1) In reference to cognitive barriers, Trudel (2018) describes two process types that are differentiated in psychology: the first system makes fast automatic decisions largely based on familiarity and memory, while the second makes decisions after careful consideration of the available information. These processes are challenging for sustainable consumer behaviour, as it almost always involves overriding the first system. Two concepts address cognitive barriers: "future focus" and "nudging".

A first concept is "future focus", which responds to the fact that the benefits and consequences of sustainable behaviour are distant, abstract and uncertain, making them difficult to grasp (Trudel, 2018). In response, informative messages that are meaningful or tangible for consumers are promising. On recycling, Park and Ha (2014) find that consumers' awareness of the consequences positively influences their attitude towards recycling, as well as their motivation to effectively do so. White et al. (2011) presented consumers with implications in terms of tonnes of paper and school buses full of plastic wasted or saved and millions of trees lost or conserved. It resulted in more positive attitudes toward recycling and increased actual recycling behaviour. Indeed, not only the message in itself is important, of relevance as well is the frame. In their research on energy and biofuels, Van De Velde et al. (2010) find that instead of stressing the gravity of problems, the focus needs to be drawn to possibilities to overcome them. Positively formulated messages increase consumers' perceived effectiveness, especially when it comes to consumers who are less informed on and less engaged towards solving environmental issues (Van De Velde et al., 2010).

Kostadinova (2016) finds that knowledge is a predictor of consumers' environmental behaviour. When it comes to sustainable e-commerce deliveries, research by B2C Europe (2018) and Buldeo Rai et al. (2019c) shows wide gaps in consumers' awareness about the environmental issues at hand and their knowledge on sustainable solutions. In a stated-preference survey, Ignat and Chankov (2020) displayed the environmental impacts of last mile deliveries in terms of CO2 emissions (from 15 to 400 g). They conclude that information sharing leads to consumers being more likely to choose for sustainable delivery.

A second concept is "nudging", or adapting consumers' choice architecture with the aim of influencing their behaviour (Thaler and Sunstein, 2008). Critical to nudging is that it changes the framing of the choice, but leaves available options or financial implications unaltered (Croson and Treich, 2014). To clarify the concept, Thaler and Sunstein (2008) introduce an example of a cafeteria setting, in which the director can choose to display healthy food at the front or at the eye level to encourage consumers into eating more healthily, instead of banning unhealthy foods altogether. In relation to sustainability, the concept is stretched towards "green nudges". Such nudges are used to motivate consumers in adopting environmentally-friendly behaviour (Croson and Treich, 2014). In the area of green energy, Pichert and Katsikopoulos (2008) demonstrate that significantly more participants opt for green utility when it is the default than when "grey" electricity serves as default. Defaults have proved to be an effective way to influence behavioural change: consumers often prefer to take the easy option (Trudel, 2018). They also work because of consumers' preference of the current state ("status quo bias") and perception of the default as implicit recommendation (Trudel, 2018).

When it comes to sustainable e-commerce deliveries, consumers' choice architecture can be changed by presenting the more sustainable delivery option first or by selecting the more sustainable delivery option as default. Hardly any research exists on the potential of nudging in this context, although it might be the most commonly applied in practice. Agatz et al. (2020) created an experiment with green labels that indicate environmentally-friendly time windows for delivery, based on examples by online grocery retailers (e.g., Ocado, Peapod). They conclude that green labels are an effective tool to steer consumers toward a more sustainable delivery option.

(2) Research on environmental and sustainable behaviour shares the common underlying premise that consumers act sustainably to be consistent with and express their environmental beliefs (Trudel, 2018). Baca-Motes et al. (2013) demonstrate the concept of "the self": when hotel guests made a commitment to practice environmentally-friendly behaviour during their stay and received a label pin to symbolise it, they were more likely to hang their towel for reuse. Incentives related to the "the self" also built on social media. In investigating the impact of social media on sustainable consumer behaviour, Stevens et al. (2016) refer to "hypes" on agro-food sustainability issues. Saeed et al. (2019) established that sustainability-related information on social media significantly influences consumers' intention to purchase sustainable products. When it comes to sustainable e-commerce deliveries, a master thesis also hints the potential of social media (Mirosnicenko, 2018): the study shows that enabling consumers to share their choice for environmentally-friendly time windows for delivery on social media, strengthens their motivation to do so.

(3) Finally, "social influence" is the change in attitude or behaviour resulting from the influence of others, common types of social influence are "social norms" (Trudel, 2018). Specifically, social norms are unwritten codes and informal agreements that determine what we expect from others and what others expect from us (Young, 2015). They motivate by providing evidence on what is likely to be effective and adaptive action: "if everyone is doing or thinking or believing it, it must be a sensible thing to do or think or believe" state Cialdini et al. (1991). Norms are either descriptive (i.e., "what most others do") or injunctive (i.e., "what ought to be done") (Cialdini et al., 1991). Studies show that

behaviours of others shape our interpretation of a situation, and in turn our responses to it (Goldstein et al., 2008). A descriptive social norm is applied in the study of Goldstein et al. (2008), again on the participation of hotel guests in environmental conservation. The study shows that social norms stating that the majority of guests reuse their towels, proved more effective than traditional appeals that focus only on environmental protection. When it comes to sustainable e-commerce deliveries, an indication of desirable consumer behaviour can be added in the web-shop check-out page by using social media shares. To date, no research exists on the potential of social norms in this context.

## **Methodology**

The objective of this research is to identify if non-financial incentives can encourage consumers to choose for a more sustainable delivery option. In our study, we frame slow delivery as more sustainable delivery option, compared to next day delivery as less sustainable delivery option. Three arguments support this choice:

(1) Studies have established that longer delivery terms enable better consolidation and more efficient routing (Jaller and Pahwa, 2020; Lin et al., 2017; Munoz-Villamiza et al., 2021; Siikavirta et al., 2003), without pointing out reverse effects.

(2) Studies have shown that consumers have a latent willingness to wait longer for a delivery to arrive (Buldeo Rai et al., 2019b; Ignat and Chankov, 2020; Nguyen et al., 2019).

(3) Studies highlight a lack of knowledge on the way in which delivery speed and environmental impact relate. 80% of e-consumers are not aware of the fact that fast delivery has a more negative impact on the environment than slow delivery, of which 32% even believes slow delivery to be more negative than fast delivery (B2C Europe, 2018).

We chose to explore non-financial incentives, given the price-sensitiveness of e-commerce delivery: despite becoming increasingly customer-centric, convenience-oriented and thus expensive, consumers remain largely unwilling to pay for it (Buldeo Rai et al., 2019b; Nguyen et al., 2019). Based on the literature, we selected four non-financial incentives to assess and compare:

(1) "Future focus": an information message about the more sustainable delivery option.

(2) "Nudge": a reversed order of delivery options.

(3) "The self": a social media share option.

(4) "Social influence" and "social norm": a descriptive social norm on the more sustainable delivery option.

We explore these incentives through an experiment among Dutch-speaking consumers in Belgium that made an online purchase in the last year and are aged between 18 and 45. This age group is found to contain the most frequent online buyers, according to a survey by research centre Imec (Vandendriessche and De Marez, 2019). Because two out of four pre-defined incentives relate to social media, the experiment excludes consumers who do not have an active Facebook profile. Facebook is still the most frequently used network among our population (Vandendriessche and De Marez, 2019). The experiment consists of a survey imitating a shopping basket, developed in the survey software Qualtrics: one control group with an ordinary shopping basket and four experimental groups with a shopping basket adapted slightly to the pre-defined incentives.

To select an appropriate product for the shopping basket featured in the experiment, we set up a preliminary investigation. For both experiment and preliminary investigation, we contacted



respondents through e-mail, social media and a snowballing technique, in which respondents solicited contacts in their network to participate too. We encouraged participation to the experiment by organising a raffle. The design and sample of the preliminary investigation (organised from March 25th to April 1st, 2020) and the experiment (organised from April 22nd to May 1st, 2020) are described in the next sections.

### *Preliminary investigation*

To select the most appropriate product type to feature in our experiment, we surveyed consumers on their willingness to buy a specific product online, their likeliness of receiving the product at home and their willingness to wait longer. The survey developed for this purpose contained an introduction outlining the research context and respondents' anonymity protection, a set of socio-demographics to determine respondents' suitability to the study (i.e., age, online shopping experience, gender) and four questions related to product types. Questions were limited to four product types that Belgian retail federation Comeos (2018) established as most frequently bought online: i.e., apparel, electronics, books and household appliances. We showed respondents images of a pair of shoes, a smartphone, a book and a coffeemaker to concretise the product types, while stressing their sole exemplary purpose.

Of the initial 130 surveys, seven respondents left prematurely. Two respondents did not make an online purchase in the last year and four respondents did not meet the age requirements (i.e., 18–45). As such, they were excluded from the survey. Accordingly, we considered a total of 117 completed surveys for analysis. Table 1 summarises the descriptive results. Based on the combined results of the preliminary questions, we opt for shoes as the most appropriate product type to feature in our experiment. In their case-study on the environmental impact of online and omnichannel retail, Buldeo Rai et al. (2019a) investigate shoes as well. Apparel in general is an often-used product type in studies related to e-commerce, given its online maturity and environmental impact in sourcing, delivery and return (Hischier, 2018; Mangiaracina et al., 2016; Wiese et al., 2012). Regardless of the product type chosen, consumers' preferred delivery conditions also depend on their personal preferences and situation circumstances.

	(1) Willingness for online purchase		(2) Preference for delivery option		(3) Willingness for slow delivery		(4) Likeliness for online purchase			
	Yes	No	Standard	Slow	Yes	No	1	2	3	4
Shoes	102	15	65	37	65	0	51	27	10	29
Smartphone	73	44	54	19	50	4	19	25	30	43
Book	102	15	65	37	64	1	32	39	25	21
Coffeemaker	86	31	56	29	53	3	15	26	52	24

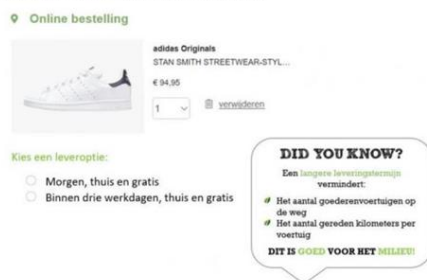
Table 1. Results from the preliminary investigation.

### *Experiment*

We set up the experiment as a semi-experimental design, based on a control group and four experimental groups. Each experimental group received another incentive in accordance with the pre-defined research questions, which are then compared separately to the control group. Working with only one test per group avoids testing effects (Sekaran and Bougie, 2016), which occur when previously studied material facilitates performance on a subsequent test (Mulligan et al., 2016). The survey software randomly assigns respondents to one of the five groups. Randomisation is important to create equal groups and avoid differences beyond the experiment set-up (Sekaran and Bougie, 2016).

Similar to the preliminary investigation, the survey developed for this purpose contained an introduction outlining the research context and respondents' anonymity protection and a set of socio-demographics to determine respondents' suitability to the study (i.e., age, online shopping experience, Facebook account). All groups are presented with an average online shopping basket that features a pair of shoes, in which respondents are asked to choose a delivery option. Two delivery options are offered: the standard "next day, free, home delivery" and the more sustainable "within three days, free, home delivery". Based on the extant literature, we expect most respondents to choose for the standard fast delivery option in the control group. More socio-demographics followed after the experiment, including gender, place of residence and exact age. The four experimental groups are adapted as follows and visualised in their original version in Figure 1.

Experiment (1) information message



Experiment (2) order of delivery options



Experiment (3) social media sharing option



Experiment (4) descriptive social norm



Figure 1. Print screens of experiments.

(1) To investigate the impact of a positively formulated information message, we added a "did you know?" pointing to the more sustainable delivery option, stating that longer delivery terms reduce the number of goods vehicles on the road and kilometres driven per goods vehicle.

(2) To investigate the impact of the order of delivery options, we placed the delivery options in the reverse order with the more sustainable delivery option positioned first.

(3) To investigate the impact of a social media sharing option, we added a message and a Facebook share button next to the more sustainable delivery option: "I choose for sustainable delivery by waiting longer. You too? #Sharingiscaring!".

(4) To investigate the impact of a descriptive social norm, we added the message and Facebook share button applied in the third experiment next to the more sustainable delivery option, while informing that the message had been shared more than one-thousand times.

With reference to the fourth experimental group, Demarque et al. (2015) discuss ethical issues on social norms that rely on unverifiable assertions or factually incorrect information, such as our statement on the one-thousand social media shares. Despite being arguably acceptable in the context of an experiment, it potentially raises issues for retailers to implement in practice. Retailers can choose to only display such statements when a certain threshold of shares is reached or attach a promotional campaign to encourage social media sharing. Of the initial 517 completed surveys, 33 respondents left prematurely. 81 respondents were excluded from the survey because they did not meet the requirements. Accordingly, we considered a total of 403 completed surveys for analysis.

An overrepresentation of young females from East Flanders (both urban and nonurban) skews our sample and possibly limits the generalisability of our findings. Although a detailed profile of the “e-consumer” lacks, a Belgian survey shows that young French-speaking males made most internet purchases in 2019 (Comeos, 2020). While our sample clearly deviates from that description, it is also worth noting that the COVID-19 health crisis caused a shift in online consumption patterns across all demographics (Arora et al., 2020). In contrast, our sample better reflects the profile of the “sustainable consumer” (White et al., 2019). While it makes sense to target responsive socio-demographics with sustainability appeals, it also urges caution in interpreting our research findings. Table 2 summarises the descriptive results. The impact of the four non-financial incentives is tested by comparing each experimental group with the control group, using contingency tables, Chi-square tests and Phi and Cramer’s V tests, in IBM SPSS. While Chi-square tests indicate the relationship between variables, Phi and Cramer’s V tests indicate the strength of these relationships (Baarda et al., 2012). Because our contingency tables surpass  $2 \times 2$ , we use Phi tests. Values of the Phi test vary between 0 and 1: while values close to 0 indicate weak association, values close to 1 indicate strong association.

	Total	Age			Gender		Residence					
		18-24	25-34	35-45	M	F	Antwerp	Brussels	East Flanders	Flemish Brabant	Limburg	West Flanders
Control group	81	48	18	15	21	60	2	0	56	2	2	19
Group 1	82	52	18	12	16	66	4	2	53	10	1	12
Group 2	82	46	20	16	17	65	8	2	57	6	2	7
Group 3	82	43	17	22	18	64	2	0	56	5	3	16
Group 4	76	43	17	16	21	55	2	0	60	4	2	8
Total	403	232	90	81	93	310	18	4	282	27	10	62

Table 2. Respondents sample of the experiment.

## Findings

The objective of this research is to identify if non-financial incentives can encourage consumers to choose for a more sustainable delivery option, i.e., slower delivery instead of standard next day delivery. Figure 2 demonstrates the differences in delivery choice between the four experimental groups and the control group. The figure shows that more respondents selected the standard next day delivery instead of the slow delivery option, as compared to respondents in the four experimental groups. These results suggest that (1) an information message, (3) a social media sharing option and (4) a descriptive social norm can influence more than half of consumers to choose for a more sustainable delivery option, while (2) changing the order of delivery options cannot. More detailed results are discussed in the sections that follow.

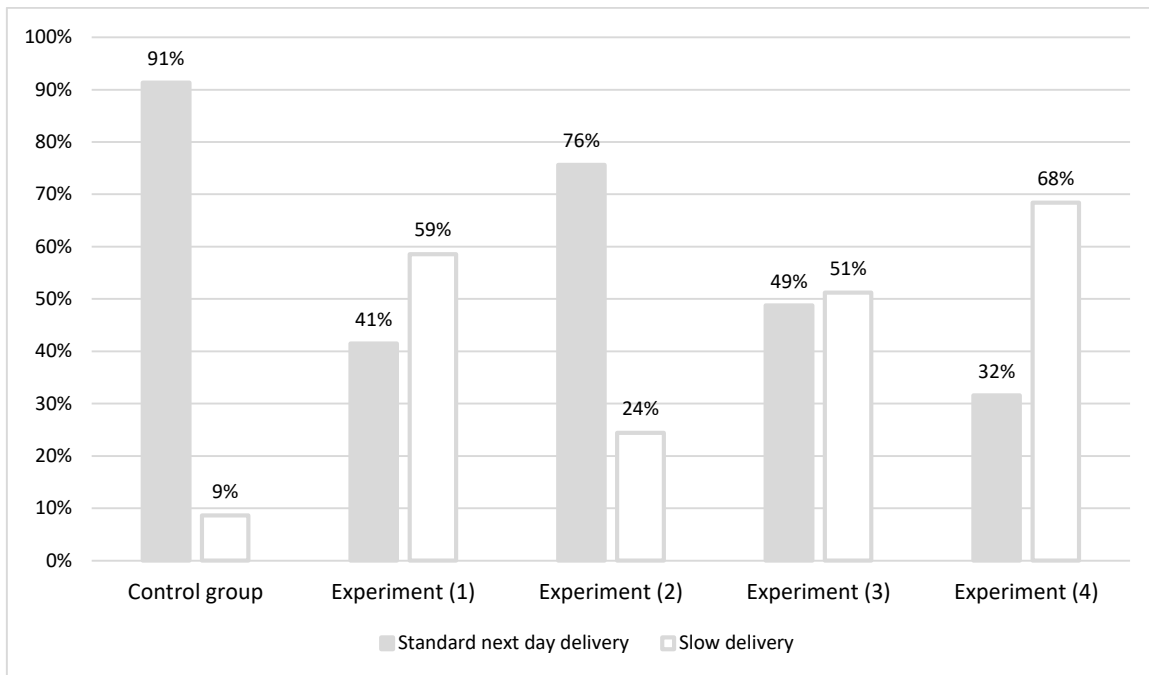


Figure 2. Results of the control group versus the four experimental groups.

### *(1) Information message*

To investigate the impact of a positively formulated information message, we added a “did you know?” pointing to the more sustainable delivery option, stating that longer delivery terms reduce the number of goods vehicles on the road and the number of kilometres driven per goods vehicle. In response to this non-financial incentive, 59% of respondents opted for a slow delivery, compared to 9% in the control group. Our analysis shows that this difference is significant although the relationship between the non-financial incentive and the choice for a sustainable delivery option is only moderately strong ( $p = 0.000$ ;  $\Phi = 0.528$ ). We conclude that the presence of a positively formulated “did you know?” message about delivery sustainability, can encourage consumers to choose for a slower and more sustainable delivery.

### *(2) Order of delivery options*

To investigate the impact of the order of delivery options, we placed the delivery options in the reverse order with the more sustainable delivery option positioned first. In response to this non-financial incentive, 24% of respondents opted for a slow delivery, compared to 9% in the control group. Our analysis shows that this difference is significant but the relationship between the non-financial incentive and the choice for a sustainable delivery option is weak ( $p = 0.017$ ;  $\Phi = 0.188$ ). However, still more respondents choose for the standard, fast delivery option compared to the slow, more sustainable delivery option. Therefore, we conclude that changing the order of delivery options is not powerful to steer consumers towards choosing a slower and more sustainable delivery.

### *(3) Social media sharing option*

To investigate the impact of a social media sharing option, we added a message and a Facebook share button next to the more sustainable delivery option: “I choose for sustainable delivery by waiting longer. You too? #Sharingiscaring!”. In response to this non-financial incentive, 51% of respondents opted for a slow delivery, compared to 9% in the control group. Our analysis shows that this difference

is significant although the relationship between the non-financial incentive and the choice for a sustainable delivery option is only moderately strong ( $p = 0.000$ ;  $\Phi = 0.464$ ). We conclude that the presence of a social media sharing option related to delivery sustainability, can encourage consumers to choose for a slower and more sustainable delivery.

#### *(4) Descriptive social norm*

To investigate the impact of a descriptive social norm, we added the message and Facebook share button applied in the third experiment next to the more sustainable delivery option, while informing that the message had been shared more than one-thousand times already. In response to this non-financial incentive, 68% of respondents opted for a slow delivery, compared to 9% in the control group. Our analysis shows that this difference is significant and the relationship between the non-financial incentive and the choice for a sustainable delivery option is fairly strong ( $p = 0.000$ ;  $\Phi = 0.638$ ).

### **Discussion and conclusion**

In an attempt to involve consumers in environmental sustainability efforts for e-commerce deliveries, this study assesses and compares the impact of four non-financial incentives on choosing a more sustainable delivery option. We specifically focus on slow delivery instead of fast delivery to reduce the environmental impact, although we believe that the findings can be generalised to other aspects of the e-commerce delivery service that consumers have been found willing to accept, such as time and location (Buldeo Rai et al., 2019b; Ignat and Chankov, 2020; Nguyen et al., 2019) and to other aspects that affect the delivery service experience only to a small extent, such as vehicle type.

The non-financial incentives explored are based on psychological drivers of sustainable consumer behaviour (Trudel, 2018) and applied in accordance to the research context, by (1) providing information, (2) changing the order of delivery options, (3) adding a social media sharing option and (4) pushing a descriptive social norm. While these incentives imply only low-cost modifications for retailers and low-impact consequences for consumers, their potential environmental gains are significant and grow only further along with ever rising parcel volumes. Longer delivery terms (Jaller and Pahwa, 2020; Lin et al., 2017; Munoz-Villamiza et al., 2021; Siikavirta et al., 2003), but also the absence of narrow delivery timeframes (Boyer et al., 2009; Manerba et al., 2018) and alternative delivery locations (Buldeo Rai et al., 2019a) allow logistics service providers to load and route vehicles more efficiently, increase drop density and deliver more sustainably.

Yet the environmental gains of these delivery options materialise only when consumers select them in the check-out page. As such, information on how to drive consumers towards them is a vital piece of the puzzle, although one that remains largely unexplored in both research and practice. This study provides an explorative contribution to this end and accordingly responds to the call by Trudel (2018): “It is crucial that policymakers and sustainability-driven organisations understand how and why people make choices, consume, conserve, and dispose of products that affect the environment”. Yet even if retailers and logistics service providers do not principally identify as “sustainability-driven”, efficient and sustainable deliveries also save costs.

By means of an online administered experiment among Dutch-speaking online consumers in Belgium, we found that positively formulated information messages on the environmental impact of different delivery options, based on the “future focus” concept, has the capacity to persuade more than half of consumers to sustainable decision-making in the web-shop check-out page. This extends the study of Ignat and Chankov (2020), in which they established the positive impact of adding grams of CO<sub>2</sub> emissions to delivery options in a stated-preference survey. We also established the positive impact of adding a Facebook button to share consumers’ sustainable decision-making (based on the concept of

“the self”, impacting half of respondents) and providing an indication that many consumers had already done the same (based on the concepts of “social influence” and “social norm”, impacting almost three-quarters of respondents). In this way, our findings are in line with Mirosnicenko (2018), who explored the potential of social media sharing on choosing a more sustainable delivery option in her master thesis. The application of social norms in this context has not yet been explored in literature, which we hope to inspire for future works.

Contrary, while reversing the order of delivery options persuaded more respondents to opt for slow delivery compared to respondents without incentive, still more respondents opted for fast delivery. This non-financial incentive based on “nudging” was the only one that did not include any kind of indication or information on the environmental implications of different delivery options. Our approach thus deviates from the study by Agatz et al. (2020) who nudged consumers by means of green labels, possibly providing a more impactful incentive to explore than merely reversing the order of delivery options. What this study suggests is that providing incentives based on symbolic or explanatory information on the one hand (experiment 1) or combining different incentives on the other hand (experiment 4) are the most promising ways forward for research and practice.

In line with previous research (B2C Europe, 2018; Buldeo Rai et al., 2019b; Ignat and Chankov, 2020; Nguyen et al., 2019), our findings suggest a knowledge gap on sustainable e-commerce delivery among consumers. Yet we question the notion that neutrality or disinterest lies beneath. Perhaps it’s just the tools that provide knowledge and enable action that lack? This is in line with Lehmann and Sheffi (2020), who state more generally that the information gap is a key hurdle to sustainable consumption. Based on our exploratory findings, we conclude that information-provision “at the source” can turn neutrality into action. What’s more, putting non-financial incentives into practice can enhance sustainable consumer behaviour overall over time: when shopping at other online retailers, when socially influencing others and when setting a social norm.

As opposed to financial incentives that imply additional charges, either for consumers (e.g., fast delivery at a surcharge) or for retailers (e.g., slow delivery at a discount), our suggestions come at negligible costs. Low-impact and frequently enacted behaviours, such as choosing e-commerce delivery options, constitute the majority of sustainable consumer behaviour research (Trudel, 2018), potentially because they are most promising to bring about actual environmental change. Given the exploratory nature and limitations of this study, we identified three opportunities for future research:

(1) Verification of the findings among consumer groups with differences in terms of age, gender, urbanisation degree, online consumption behaviour and attitudes towards sustainability, to respond to the potential bias resulting from our sample composition. Application of our study among socio-demographics that are more resistant towards sustainability appeals is particularly of interest.

(2) Verification of the findings among different product types in terms of sensitiveness, value and size. Comparison of the non-financial incentives for food versus non-food products and search versus experience goods, given the importance of these categories in e-commerce, transport and environment research, is potentially of interest.

(3). Both neutral and positive formulations of information on the environmental impact of different delivery options seem to work (this study; Ignat and Chankov, 2020; Agatz et al., 2020), social norms can be either descriptive (this study) or injunctive, etc. Hence, more fine-grained exploration of non-financial incentives are suggested to deepen this body of knowledge further. Moreover, other types of non-financial incentives exist within the classification of Trudel (2018), on cognitive barriers, the self, social influence and social norms, that call for future investigation. In doing so, the aim is to strengthen the generalisability of our findings as well as the applicability of non-financial incentives in encouraging

sustainable decision-making in web-shops' check-out pages. Still, this study remains an artificial setting in which respondents are aware of their participation. An influence on respondents' decision-making in the experiment is possible, e.g., because of social desirability or expectation. Therefore, a follow-up field study in collaboration with a retailer that is willing to apply the changes in its check-out page is necessary.