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Offline Returns for Online Retailers via Partnership

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Abstract. Online shoppers often prefer to return items to stores (i.e., "offline return") rather than mail them back. We study a new business practice, return partnership, wherein online retailers partner with store retailers to offer offline returns. We seek to identify when return partnerships benefit both the store and online retailers. Customers choose between the online and store channels for their purchase and decide whether, and through which channel, to return an online purchase if needed. We find that store and online retailers who offer differentiated products have incentives to partner, as in the case of the return partnership between Everlane and Cost Plus World Market (formed via Happy Returns—a service provider that connects online retailers with store retailers). In this case, the online retailer's benefit from the cost savings achieved by consolidating shipments of returned items from stores outweighs the loss associated with a high return rate. We show that, contrary to initial intuition, return partnerships may also feature retailers who offer similar products, as in the case of Amazon-Kohl's. In this case, online customers' migration to offline returns ensures a store retailer's incentive to partner. However, it limits the incentive of an online retailer when the added convenience of an offline return induces more returns of online purchases. Thus, we caution that with limited differentiation in product offerings, store visits should not be too convenient for a partnership to form.

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1. Introduction

Consumer retail sales by companies in the United States totaled $4.5 trillion in 2021, of which $871 billion (or 19%) is attributed to online sales; online sales, in particular, have been booming, hitting a record high of $1 trillion in 2022 (Young 2022, Conley 2023). However, the biggest challenge of shopping online remains the inability to physically inspect and assess the fit of an item before purchase, and, as a result, 30%–40% of all online clothing and footwear purchases are returned (Reagan 2019), forcing retailers to take note of customers' return preferences.

Omnichannel retailers can allow customers to return their online purchases in two ways—namely, via mail or to their stores. Although the latter option requires customers to travel to the specific retailer's stores, many customers prefer it: Risley (2018) finds that 46.7% of shoppers prefer to return products to stores, whereas just 26.7% prefer shipping them back, for retailers who have a physical presence. Online returns are often inconvenient because a customer needs to package the item and print a return label, if needed, and may even have to pay expenses associated with a mail-in return. Returning to a store involves a store visit, the convenience of which depends on the number of locations and whether they are located in high-traffic city centers or rural areas. And returning to a store gives consumers a chance to shop for other items (Narvar 2017). As pure-play *online retailers* do not have physical stores, they are constrained to offering the mail option. This inability to offer customers the choice of returning to a physical location is a disadvantage for online retailers.[1]

Consequently, a new business practice has emerged, in which online retailers partner with firms that own a physical store network (hereafter referred to as "store retailers") so that customers may use these offline stores to drop off returns of their online purchases (hereafter referred to as "offline returns"). Amazon partnered with Kohl's to offer the offline returns service at all Kohl's stores in the United States.[2] Similarly, items purchased from several online retailers, including Everlane, Revolve, and Rothy's, can be returned at the stores of Cost Plus World Market and Paper Source; this service is facilitated by Happy Returns, a third-party service provider (Happy Returns 2021). Through Narvar, all Walgreens stores and select Nordstrom stores serve as return points for several online retailers, such as Dagne Dover and Schutz (Narvar 2020, Nordstrom 2023).[3] In the rest of this paper, we will call the partnerships for offline returns between online retailers (e.g., Amazon) and store retailers (e.g., Kohl's) "return partnerships."

In the case of the Amazon-Kohl's partnership, Kohl's accepts the returns, packages the items, and sends them back to one of Amazon's return centers (Thomas 2019). Similarly, employees of Cost Plus World Market process Everlane, Revolve, and Rothy's consumers' returns. The service is offered at no additional cost to customers (Thomas 2019). The partnerships typically do not involve direct monetary payment to the store retailers (e.g., from Happy Returns to its store retailers). The benefit to store retailers arises from purchases made during customers' visits to stores: Kohl's claims that this partnership has improved foot traffic and sales in its stores (Thomas 2019). Online retailers, on the other hand, save on freight costs in their reverse logistics because the retailer can collect and ship multiple returned items from a physical store, and such consolidated shipments are cheaper than small parcels of individual mail-in returns (Lembke 2017). Happy Returns charges some fees to online retailers by offering return logistics and claims that it saves an average of 20% in online retailers' shipping costs (Chua 2020).

In this paper, we study the incentives of online retailers and store retailers toward this unique partnership. Their incentives are intertwined in the following way: The convenience of visiting a store determines how likely customers are to endorse store shopping. Offering a return partnership affects the number of online purchases and their subsequent return channel. On the one hand, a store retailer whose store network offers convenient store visits may fear that a partnership could make offline returns of online purchased items also convenient, thus increasing the appeal of shopping online relative to shopping in stores. On the other hand, the convenience of returning via stores may nudge more customers to return their online purchases, thereby boosting store sales; Kohl's uses this logic in its appeal to consumers to "find immediate replacements for what you're returning" (Kohl's 2020).

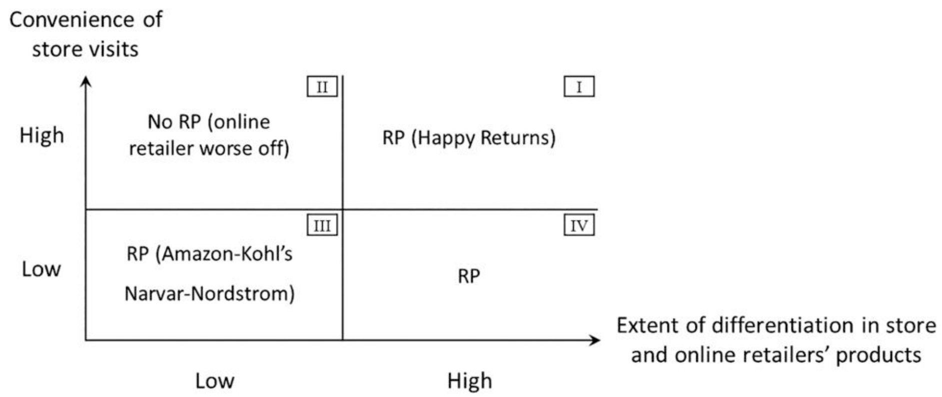
Our observations lead to several questions about the return partnership. First, whereas online retailers in Happy Returns' partnerships sell products that are largely differentiated from those of the store retailers, Amazon and Kohl's sell similar products. This poses the question—how does the type of product sold by online retailers and store retailers influence whether a return partnership occurs? Second, why do some return partnerships offer easy offline returns (e.g., through a wide network of store retailers in major urban city centers, as in the return partnerships of Happy Returns), whereas others (e.g., through fewer Kohl's stores located primarily in suburban areas) do not?

To answer these questions, we construct a model with an online retailer and a store retailer. Customers face uncertainty around their valuation for the products sold by the two retailers and choose between shopping in a store and shopping online. A customer who buys online initially makes subsequent decisions for keeping or returning her online purchase and possibly visiting a store to buy the store product. On the other hand, a customer who visits the store initially makes decisions between buying the store product and not buying the store product while subsequently shopping online. Under a return partnership, the customers have an additional option of returning their online purchases to stores. We also allow for varying levels of differentiation in the online and store retailers' products. If the products are highly differentiated, customers incur high disutility when not finding the exact product they want; thus, those who like one retailer's product are not willing to buy the other retailer's product. Because the customer's preference is revealed only after inspecting a product, several consumers who buy online later realize the high disutility, resulting in a high return rate for online purchases. We compare the expected profit of the retailers before and after a return partnership is formed and identify when both retailers are better off under the partnership. To better understand our results from a practical perspective, we illustrate our results using the data collected through Happy Returns and one of its major store retailer partners, together with publicly available data.

Our main insights are as follows; Figure 1 provides a summary.

- We find that partnerships between online retailers and store retailers that are conveniently located to customers involve differentiated products. Because the return rate is high for online purchases, the online retailer benefits from offsetting some of the loss on returns with the reverse-logistics cost savings. At the same time, a store retailer benefits from the increased foot traffic from returning customers. Through this result, we can explain why Happy Returns hosts a network of store retailers whose product offerings are sufficiently different from those of online retailers (quadrant (I) in Figure 1).
- We provide an explanation for return partnerships where the online retailers and store retailers offer similar products. In this case, consumers are willing to substitute one retailer's product with the other. As a result, online customers who return are likely to replace the online purchase with a store product. A store visit then becomes even more attractive to online consumers after a return partnership is in place, leading to more consumers opting to return and ensuring the store retailer

Figure 1. When Does a Return Partnership Occur?



Notes. We overlaid examples of return partnerships that map to the specific regions. "RP" denotes that a return partnership is win-win to store and online retailers.

partners. And the online retailer partners as long as the offline return service does not become too convenient, so as to limit the increase in returns (while still benefiting from a partnership due to the reduced handling costs of offline returns). This may explain partnerships such as Amazon-Kohl's (quadrant (III) in Figure 1).[4]

• We also find that return partnerships are unlikely to form when the products are similar and store visits are convenient, as in quadrant (II) in Figure 1. As before, online customers who return items tend to replace their online purchase with a store product, and a partnership with a conveniently located store retailer induces more returns. This deters an online retailer from joining a partnership. The return partnership of Narvar through "select Nordstrom stores" may be partially attributed to the limited differentiation with Narvar's online retailers. Combining the above insights, we find that a return partnership can also be beneficial when the products are differentiated and store visits are inconvenient, as in quadrant (IV) in Figure 1.

• By modeling consumers' purchase and return decisions and their impact on retailers' sales, our work provides insight into the types of online retailers that should form partnerships. Online retailers who offer convenient ways to shop and return online (e.g., Revolve, with its free two-day shipping and a full-refund online return policy) are best positioned to enter a partnership. On the other hand, online retailers who either impose stringent return policies or do not foresee a sizeable improvement in their reverse logistics costs are better off not forming a partnership, due to the aforementioned increase in the return rate.

The rest of the paper is organized as follows. In Section 2, we review the relevant literature. We formalize our model in the absence of a return partnership in Section 3. We then analyze the return partnership setting in Section 4. We study several extensions in Section 5 and conclude in Section 6.

2. Literature Review

There has been considerable interest in how firms may influence customers' purchasing and return decisions in a *single-channel* setting. Moorthy and Srinivasan (1995) show that offering a money-back guarantee (i.e., a full refund return policy) may signal product quality. Su (2009) studies the return policy of a monopolistic, single-channel firm when its customers' return or keep decision depends on the leniency of the policy and finds that the optimal return policy will offer a partial refund. Shulman et al. (2009) investigate the return policy decision of a seller who sells two products and consumers who may keep their initial purchase, return it for a refund, or return it for a refund and buy the other product (i.e., exchange). They find that the seller may offer a lower refund to reduce a consumer's desire to exchange an initial purchase. In a duopoly, Shulman et al. (2011) find that restocking fees for returns may be higher than those in a monopoly. Altug and Aydinliyim (2016) study the return policy decision when customers are strategic and discount-seeking. Shang et al. (2017) allow some customers to be opportunistic—that is, purchase with the intention of a return—and identify the impact on a retailer's profit. Samorani et al. (2019) track returning customers' subsequent actions and find that although higher-priced items are more likely to be returned, returning customers are more likely to buy another product. Altug et al. (2021) compare the effectiveness of two tactics to address opportunistic returns—namely, presenting customers with a menu of refunds and prices and identifying suspected renters using analytics.

The prevalence of *omnichannel* retailing in practice has led to a growing body of literature among theoretical and empirical researchers investigating different strategies. On the theoretical side, Ofek et al. (2011) study how assistance levels at the stores of a retailer change when they introduce an online channel. Gao and Su (2017a) study the effect of buy online, pick up in store (BOPS) and find that although BOPS may not be profitable for all products, it may enable a retailer to reach new customers. Gao and Su (2017b) find that physical showrooms may decrease a firm's profit due to lower store inventory level, whereas virtual showrooms increase returns due to excessive customer migration to the online channel. Nageswaran et al. (2020) study the return policy of an omnichannel firm and find that those with a significant offline store network may benefit from cross-selling when customers return online purchases to offline stores. Gao et al. (2022) study how an omnichannel retailer should decide the number and size of its physical stores, given that customers use the stores to shop and return online purchases.

On the empirical side, Gallino and Moreno (2014) study BOPS fulfillment strategy, and they find that offering BOPS increases store sales driven by cross-selling to customers visiting stores. Kumar et al. (2019) study the effect of opening a new offline store and find that online sales increase because customers engage more with the retailer. Ertekin and Agrawal (2021) find that a reduction in the time window within which customers may return items reduces offline store sales and returns volume. Bell et al. (2018) show that physical showrooms help customers self-select into the showroom channel to resolve their valuation uncertainty, resulting in lower return volume. Moreover, Bell et al. (2020) find that customers who visit physical showrooms spend more and are less likely to return items. Different from these papers, we study a new omnichannel returns strategy, where *multiple* firms take on the role of the two channels.

Our contribution to the literature is the consideration of a unique partnership, through which the store retailer benefits from returning customers' purchases and the online retailer benefits from providing its customers a convenient cross-channel return option. A related paper is that by Hwang et al. (2022), who quantify how much a return partnership generates additional sales to a store retailer partner. Whereas theirs is an empirical study focusing on the store retailer's sales, our work takes a holistic view, analytically studying the incentives of both store and online retailers based on expected benefits and costs from a return partnership and sheds light on why the different return partnerships seen in practice form.

3. Base Model and Analysis in the Absence of a Return Partnership

We consider an online retailer who sells a product through its online channel and a store retailer who sells a product through an offline store. These two products are located at the two ends of a Hotelling line of unit length; the online retailer's product is at the zero position, and the store retailer's product is at the one position. Customers are indexed by a preference parameter, which is their location $x \in [0,1]$ on the Hotelling line. A customer considers which product matches her needs, if any, and she is interested in purchasing at most one of the products. Table 1 summarizes our notation.

As in prior work on omnichannel retail operations (Ofek et al. 2011, Gao and Su 2017b, Gao et al. 2022), there is uncertainty in the utility obtained from either retailer's product; in particular, the uncertainty in the preference parameter is resolved by either inspecting the store retailer's product in person before purchase or after receiving the online retailer's product if she purchases online. Customers make decisions in two stages. In the first "ex ante" stage, a customer chooses between visiting a store and buying online. In the second "ex post" stage, the uncertainty about the preference parameter is revealed, and the customer makes keep, return, or subsequent purchase decisions. A customer derives utility $u(>0)$ from a product that fits her needs exactly and disutility $\delta(>0)$ per unit of distance from either product. Thus, the utility from consuming the online retailer's product for a customer at location x is $u-\delta x$, and that from consuming the store retailer's product is $u-\delta(1-x)$. The common utility u from obtaining an exactly matching product, which may be interpreted as a base utility from the product less price charged, precludes providing one of the retailers with an unfair advantage.[5] The parameter δ can be interpreted as the perceived differentiation in the products sold by the two retailers, as in Shulman et al. (2011) and Ofek et al. (2011): A larger δ implies a larger absolute difference in utility between the two products, so that a customer with a strong preference for the online retailer's product is not willing to buy the store retailer's product. In other words, the two products are catering to the ideal taste of a smaller segment of the potential customer base. The Amazon-Kohl's partnership may be interpreted as low-δ due to the similarity in products, whereas the partnership between Everlane, which sells fashionable bags, and Paper Source, which sells casual bags, is one with high-δ. We will hereafter refer to δ as the extent of product differentiation, as noted in Shulman et al. (2011).[6]

Buying online imposes a hassle cost $h_o(\geq 0)$, which includes the effort involved in search and checkout, paying shipping fees (if any), and waiting to receive the product. Visiting a store imposes a hassle cost $h_s(>0)$, which is related to the distance from the store. To avoid trivial results, we assume that the utility from an exact fit product exceeds the online shopping hassle and the store visit hassle; that is, $\max\{h_o, h_s\} < u$.

We describe customers' considerations when making these decisions next; Figure 2 illustrates the decisions and associated payoffs.

Table 1. Table of Notation

Symbol	Definition
Notation related to customer decisions	
x	Customer's preference parameter on the Hotelling line
u	Customer's utility from a product that fits needs exactly
δ	Extent of product differentiation
h_s	Customer's hassle cost for store visits
h_o	Customer's hassle cost for online shopping
h_r	Customer's hassle cost for online returns
Notation related to online retailer	
m_o	Online retailer's per-unit profit margin from a sale that is not returned
c_r	Online retailer's per-unit loss on a returned item (online or offline)
c_o	Online retailer's per-unit return handling cost for an item returned online
c_s	Online retailer's per-unit return handling cost for an item returned to store
$d_o^{(\cdot)}$	Online retailer's expected sales that are not returned
$d_{o,r}^{(\cdot)}$	Online retailer's expected online returns
$d_{s,r}^{(\cdot)}$	Online retailer's expected offline returns
$\pi_o^{(\cdot)}$	Online retailer's expected profit
Notation related to store retailer	
m_s	Store retailer's per-unit profit margin from product sales
m_a	Store retailer's per-unit profit margin from additional in-store purchases
$d^{(\cdot)}$	Expected number of customers who visit a store
$d_s^{(\cdot)}$	Store retailer's expected sales
$\pi_s^{(\cdot)}$	Store retailer's expected profit

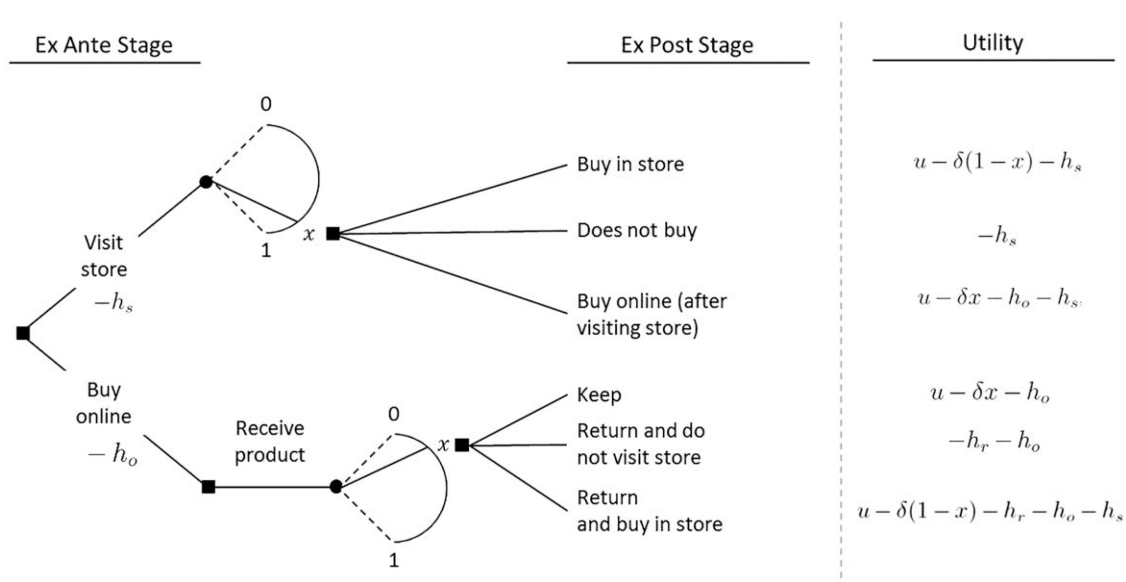
Notes. Symbols marked with a $(\cdot)$ denote derived quantities, where superscripts b and p are used to indicate the base model and the return partnership model, respectively. Subscripts s and o represent store and online channels, respectively, and subscript r represents returns.

- **Visit store:** A customer who visits the store in the ex ante stage resolves the uncertainty in product preference. She then makes a decision to buy the store retailer's product, do nothing, or buy the online retailer's product in the ex post stage. In particular, she obtains utility $u-\delta(1-x)$ from consuming the store product, utility $u-\delta x$ from consuming the online product, and utility zero from doing nothing. Thus, the expected utility from visiting a store in the ex ante stage is given by

$$u_s = \mathbb{E}\max\left\{\underbrace{u-\delta(1-x)}_{\text{buy in store}},\ \underbrace{0}_{\text{does not buy}},\ \underbrace{u-\delta x-h_o}_{\substack{\text{buy online}\\ \text{(after visiting store)}}}\right\}-h_s. \tag{1}$$

In (1), the first term corresponds to a customer buying the store product during her store visit, and the third term captures the phenomenon of showrooming,

Figure 2. Customer Decisions and Payoffs in the Base Model



wherein a customer first visits the store and then buys the product online (Mehra et al. 2018).

• **Buy online:** A customer who buys online in the ex ante stage decides to either keep or return the online purchase via mail, and, if returning, she also decides to either visit a store or not, in the ex post stage. The customer obtains utility $u - \delta x$ from consuming the online product. In line with practice, we assume that returning the purchase imposes a hassle cost $h_r(>0)$ for returning via mail (hereafter referred to as "online return"). A returning customer may visit a store at hassle cost h_s and purchase the store retailer's product to obtain utility $u - \delta(1-x)$. Thus, the expected utility from buying online in the ex ante stage is given by

$$u_o^b = \mathbb{E}\max\{\underbrace{u-\delta x}_{\text{keep}}, \underbrace{-h_r}_{\text{return and do not visit store}}, \underbrace{-h_r - h_s + u - \delta(1-x)}_{\text{return and buy in store}}\} - h_o, \quad (2)$$

where superscript "b" is used to indicate the base model in this section. In (2), the first term corresponds to a customer keeping her online purchase, the second term corresponds to an online return, and the third term corresponds to a customer buying the store product after returning the online product.

Customers choose between visiting a store and buying online by comparing their expected utilities given in (1) and (2). Visiting a store allows a customer to resolve her uncertainty before purchasing a product and avoid dealing with returns.[7] In contrast, customers who buy online are able to avoid traveling to a store, although they may have to incur return costs later.

In order to focus on realistic parameter regions, we make the following assumptions.

Assumption 1. (*i*) $\delta > u + h_r$; (*ii*) $\delta < (h_r + u)^2/(2(h_r + h_o))$.

Assumption 1(i) ensures that not all customers who buy the online product will keep it. If, instead, $\delta < u + h_r$, an online consumer always enjoys higher utility $(u - \delta x)$ from keeping the product than from returning it $(-h_r)$, implying that there exist online retailers who experience no returns. Because the return rate for online sales is 30%–40% in clothing and footwear product categories (Reagan 2019), Assumption 1(i) steers our insights to be in line with practice. Assumption 1(ii) ensures that u_o^b is positive, so that consumers are willing to consider both channels.[8] This is a common assumption in related work (e.g., Gao and Su 2017b, Mehra et al. 2018, Gao et al. 2022).

Let d^b denote the expected number of customers who visit a store. For the store retailer, let d_s^b denote the expected sales. For the online retailer, let d_o^b denote the expected sales that are not returned and $d_{o,r}^b$ denote the expected sales that are returned later.

The expected profit of the store retailer and that of the online retailer are denoted as π_s^b and π_o^b, respectively. A store-visit customer may also buy additional items that are outside of the focal products. These purchases, referred to as "incremental sales" in Gallino and Moreno (2014), represent, for example, a customer purchasing beauty or home decor at Kohl's, in addition to her intended footwear purchase. Let $m_s(>0)$ denote the store retailer's profit margin from product sales and $m_a(>0)$ denote the expected profit margin considering the probability (and value) of cross-selling those additional items. Then, the expected profit earned by the store retailer, π_s^b, is given by

$$\pi_s^b = \underbrace{d_s^b}_{\text{store purchases}} m_s + \underbrace{d^b}_{\text{store visits}} m_a. \quad (3)$$

The online retailer enjoys a profit margin $m_o(>0)$ per item sold (and not returned) and incurs a loss $c_r(>0)$ on a returned item. A loss is incurred on returned items because they often have to be salvaged through secondary channels, and even when they can be resold, it may be at a markdown: Phillips (2018) claims that roughly half of returns go back on the shelf (at over 30% markdown), and the other half go through secondary channels. Thus, c_r is the cost of production less the expected salvage value from the returned item. In addition, there is a cost for online returns, $c_o(>0)$, which includes any cost for shipping and handling returns. Then, the expected profit earned by the online retailer, π_o^b, is given by

$$\pi_o^b = \underbrace{d_o^b}_{\text{sales not returned}} m_o - \underbrace{d_{o,r}^b}_{\text{returns}} (c_r + c_o). \quad (4)$$

In (4), the first term corresponds to initial sales that are not returned, and the second term corresponds to initial sales that are returned online. Our analysis focuses on realistic settings, in which the profit margin on a sale is at least as large as the net loss on returns; that is, $m_o \geq c_r + c_o$.[9]

We discuss some of our assumptions and model features and explain how we have relaxed them. First, we assume that the uncertainty in the preference parameter can be resolved by inspecting either product. Shulman et al. (2011) and Ofek et al. (2011) make a similar assumption in their models involving multiple products; specifically, a consumer can rationally deduce the valuations of other products after sampling one product. This assumption keeps our model analytically tractable and leads to crisp insights; nevertheless, we analyze the case where the consumer who samples one product cannot fully resolve the uncertainty in the second product in Section 5.1.

Second, customers are ex ante homogeneous, which implies that only one of the branches of decisions in the ex ante stage in Figure 2 will be active (the specific branch depends on the value of h_s). That said, because of the heterogeneity in customers' utility, in the ex post stage, multiple branches will be active—that is, customers eventually segment into multiple channels. This manifests in that if customers opt to buy online in the ex ante stage, d^b and d_s^b in (3) comprise these customers' store visits and purchases, respectively, in the ex post stage, as there are no store visits or purchases in the ex ante stage. In Section 5.2, we allow h_s to vary uniformly across consumers, which allows us to study settings where different customers choose different channels in the ex ante stage as well. (Relatedly, we explore the impact of the number of stores operated by a store retailer in Section 5.3, where, in addition to ex ante heterogeneity in h_s, we model an explicit tie between h_s and the distance to the nearest store, as in Gao et al. 2022.) As noted by Cattani et al. (2006), heterogeneity in both the hassle cost and the utility becomes very challenging analytically, so we retain homogeneous h_s in the main paper, in line with prior work, such as Gao and Su (2017b) and the main model of Gao and Su (2017a). Our model can also be augmented to add customers who are loyal to a specific channel—that is, a fraction of consumers have a prohibitively high store visit hassle cost, and another fraction of consumers have negligible store visit hassle cost, similar to Mehra et al. (2018) and Ofek et al. (2011). This would introduce ex ante heterogeneous behavior—that is, customers buy online and visit stores in the ex ante stage—without changing our results.

Third, we assume that customers purchase at most one of the products, as in prior work (Shulman et al. 2009, Ofek et al. 2011, Shulman et al. 2011); however, we extend our analyses in Section 5.4 to allow online consumers to visit the store in the ex post stage without returning the online purchase, as well as allow store customers to buy both products.

3.1. Analysis

The following proposition summarizes customers' decisions. All proofs appear in Online Appendix B.

Proposition 1. *In the absence of a return partnership*:

i. *Customer decisions in the ex post stage are as follows*:

a. *A customer who visits the store buys the store product if* $x > \max\{(\delta - h_o)/(2\delta), 1 - (u/\delta)\}$; *buys the online product if* $x < \min\{(\delta - h_o)/(2\delta), (u - h_o)/(\delta)\}$; *and does not buy any product otherwise.*

b. *A customer who buys online keeps the online product if either* $\{x < 1/2 + (h_r + h_s)/(2\delta)$ *and* $h_s \le h_e^b\}$ *or* $\{x < (u + h_r)/\delta$ *and* $h_s > h_e^b\}$; *returns it online and does not buy the store product if* $x \in [(u + h_r)/\delta, 1 - (u - h_s)/\delta]$ *and* $h_s > h_e^b$; *and returns it online and buys the store product otherwise.*

Here,

$$h_e^b \equiv 2u - \delta + h_r. \tag{5}$$

ii. *Customer decisions in the ex ante stage are as follows: There exists threshold* h_s^b *such that customers visit the store in the ex ante stage if and only if (iff)* $h_s \le h_s^b$.

Proposition 1(i)(a) summarizes the ex post stage decisions of customers who visit the store in the ex ante stage. These customers buy the product that is a better match with their preference—that is, those who prefer the store product (i.e., $x > \max\{(\delta - h_o)/(2\delta), (1 - (u/\delta))\}$) will buy it in the store, and those who prefer the online product (i.e., $x < \min\{(\delta - h_o)/(2\delta), (u - h_o)/(\delta)\}$) will buy it online. Figure 3 illustrates the customer decisions, wherein the above customers correspond to the "Buy in store" and "Buy online" regions, respectively. If the products are highly differentiated (high δ, as in Figure 3(b)), customers with intermediate preference may choose not to buy any product. The higher the δ, the steeper the decline in consumption utility with the distance from either retailer. As a result, these intermediate customers do not prefer either product and are better off not making any purchase.

Proposition 1(i)(b) summarizes the ex post stage decisions of customers who buy online in the ex ante stage. These customers make keep versus return decisions in the ex post stage. When the store visit hassle cost is low (i.e., $h_s \le h_e^b$), customers keep if $x < (1/2) + (h_r + h_s)/(2\delta)$ from Proposition 1(i)(b). This implies that they are more likely to return as the hassle cost h_s decreases: The convenience of visiting a store induces customers with a store product preference to return their online purchase. This is illustrated in the "Keep" region for $h_s \le h_e^b$ in Figure 3(a). At high $h_s > h_e^b$, customers keep if $x < (u + h_r)/\delta$; see "Keep" region for $h_s > h_e^b$ in Figure 3(a). Moreover, out of the returning customers, those whose preference level is intermediate (i.e., $x \in [(u + h_r)/(\delta), 1 - (u - h_s)/(\delta)]$ in Proposition 1(i)(b)) do not find it worthwhile to buy the store product; this is illustrated by the "Return and do not visit store" region in Figure 3.[10] If the products are highly differentiated with high δ, h_e^b given in (5) is low; in Figure 3(b), $h_e^b < h_s^b$, and customers keep if $x < (u + h_r)/\delta$.

Given customers' uncertainty in the preference parameter, x, the chance of keeping the item is given by $(1/2) + (h_r + h_s)/(2\delta)$ for $h_s \le h_e^b$ and $(u + h_r)/\delta$ otherwise. Based on the relative probabilities of keeping and returning items, customers make their initial channel choice. Proposition 1(ii) reveals that the above ex post stage decisions induce those customers who have a low store visit hassle cost (i.e., $h_s \le h_s^b$) to visit the store retailer. Comparing Figure 3, (a) and (b), we also notice that the threshold h_s^b is larger at higher product differentiation δ, suggesting that if the products sold by the retailers are less similar, customers' patronage shifts from online toward stores. This interesting phenomenon is driven by the impact of product differentiation on the chance of returns. From Proposition 1(i)(b), the preference x of the customer who is indifferent between keeping and returning (i.e., $(u + h_r)/\delta$ for $h_s > h_e^b$ and $(1/2) + (h_r + h_s)/(2\delta)$ otherwise) decreases with δ. This implies that as δ increases, there is a higher chance of returning a product (so the "Keep" region in Figure 3(b) is smaller than that in Figure 3(a)); this, in turn, decreases the utility from shopping online in the ex ante stage.

The customer decisions in Proposition 1 translate into sales for the store retailer, and sales and returns for

Figure 3. (Color online) Customers' Decisions Based on the Store Visit Hassle, h_s, and Preference, x, in the Base Model

Notes. The following parameter values are used: $u = 4, h_r = 0.75$, and $h_o = 0.5$. (a) $\delta = 6$. (b) $\delta = 9$.

the online retailer, which are summarized in the following proposition.

Proposition 2. *In the absence of a return partnership*:

i. *The number of store visits, d^b, and store sales, d_s^b, are given by*

$$d^b = \begin{cases} 1, & \text{if } h_s \le h_s^b \\ r_s, & \text{otherwise}, \end{cases} \tag{6}$$

$$d_s^b = \begin{cases} 1 - \max\left\{\dfrac{\delta - h_o}{2\delta}, 1 - \dfrac{u}{\delta}\right\}, & \text{if } h_s \le h_s^b \\ r_s, & \text{otherwise}, \end{cases} \tag{7}$$

where the number of store purchases, r_s, made by customers who buy online in the ex ante stage is given by

$$r_s = \begin{cases} 0, & \text{if } h_s \le h_s^b \\ \dfrac{1}{2} - \dfrac{h_r + h_s}{2\delta}, & \text{if } h_s^b < h_s \le h_e^b \\ \dfrac{u - h_s}{\delta}, & \text{if } \max\{h_s^b, h_e^b\} < h_s. \end{cases} \tag{8}$$

ii. *The online retailer's sales that are not returned, d_o^b, and the number of online returns, $d_{o,r}^b$, are given by*

$$d_o^b = \begin{cases} \min\left\{\dfrac{\delta - h_o}{2\delta}, \dfrac{u - h_o}{\delta}\right\}, & \text{if } h_s \le h_s^b \\ \dfrac{h_r + h_s + \delta}{2\delta}, & \text{if } h_s^b < h_s \le h_e^b \\ \dfrac{u + h_r}{\delta}, & \text{if } \max\{h_s^b, h_e^b\} < h_s, \end{cases} \tag{9}$$

$$d_{o,r}^b = \begin{cases} 0, & \text{if } h_s \le h_s^b \\ \dfrac{1}{2} - \dfrac{h_r + h_s}{2\delta}, & \text{if } h_s^b < h_s \le h_e^b \\ 1 - \dfrac{u + h_r}{\delta}, & \text{if } \max\{h_s^b, h_e^b\} < h_s. \end{cases} \tag{10}$$

iii. *The online retailer's expected profit, π_o^b, is increasing in h_s for $h_s^b < h_s \le h_e^b$ and constant otherwise.*

Proposition 2 characterizes how the store visit hassle h_s and product differentiation δ affect the store and online retailers. In particular, the expected number of customers who visit a store is d^b, which comprises all customers when the store visit hassle cost is low (i.e., $h_s \le h_s^b$) and those customers who resort to buying the store product after returning their online purchases otherwise (i.e., $h_s > h_s^b$). In the former case, only a fraction of these customers buy the store product, as illustrated by the "Buy in store" region in Figure 3 and captured in the store retailer's sales, d_s^b, in Proposition 2(i). In the latter case, all store visitors buy the store product (after returning their online purchases), and their size is given by r_s. Naturally, the store retailer's sales, d_a^b and d_s^b, and, therefore, expected profit π_s^b, are nonincreasing in the store visit hassle cost, h_s: The convenience of a store visit implies that customers are more inclined to visit a store in the ex post stage (as well as in the ex ante stage) once they realize their preference for the store product, and this translates to higher profit for the store retailer.

The online retailer's sales d_o^b is not returned, and $d_{o,r}^b$ is returned online (Proposition 2(ii)). To examine the impact of the store visit hassle cost, h_s, we consider two cases, depending on the product differentiation, δ: (I) $\delta < 2u + h_r$; and (II) $\delta \geq 2u + h_r$. In case (I), $h_e^b > 0$ from Proposition 1(i). Then, from (9), the online retailer's sales, $d_o^b = (h_r + h_s + \delta)/(2\delta)$ for $h_s \in (h_s^b, h_e^b)$, are increasing in the store visit hassle cost, h_s. (d_o^b is constant in h_s for $h_s \leq h_s^b$ and $h_s \geq h_e^b$.) This result is in line with the empirical finding of Brynjolfsson et al. (2009), who estimate the impact of the number of stores on sales of a competing women's clothing online retailer: They find that for products for which a customer may be able to easily find a substitute at a store retailer (i.e., small δ in our model), there is a decline in online sales as the number of stores increases (i.e., decreasing h_s in our model). In case (II), $h_e^b \leq 0$ from Proposition 1(i), so the condition $h_s^b < h_s \leq h_e^b$ in (9) cannot occur. Thus, the online retailer's sales d_o^b are constant in h_s. As large δ represents the case of niche products that are difficult to find substitutes for in a store, this is also in line with another finding of Brynjolfsson et al. (2009) that the number of stores has a statistically insignificant impact on the sales of a competing online retailer for such products.

If customers buy online in the ex ante stage—that is, $h_s > h_s^b$—the online retailer's expected profit depends on the proportions of customers who keep their purchase and return it. At low h_s, an increase in h_s turns customers against visiting the store to buy the store product, and they keep their online purchase instead (see "Keep" region in Figure 3(a) for $h_s^b < h_s < h_e^b$). This manifests in the increasing nature of π_o^b for intermediate h_s in Proposition 2(iii). At high $h_s > h_e^b$, store visits are so inconvenient that only those customers who have a strong preference for the store product choose to visit the store; those with an intermediate preference make an online return without a store visit. That is, at high $h_s > h_e^b$, the chance of keeping the item is constant with respect to h_s (given by $\frac{u+h_r}{\delta}$; see the discussion after Proposition 1); so are the return rate and the expected profit π_o^b (Proposition 2(iii)).

4. Model and Analysis of a Return Partnership

Figure 4 illustrates the customer decisions and payoffs under a return partnership. The option of visiting a store in the ex ante stage is unchanged, and customers derive expected utility u_s in (1) from doing so. When the customer buys online in the ex ante stage, she now has the additional option of visiting a store to drop off her return in the ex post stage. The store return drop-offs are typically free for the consumer (Thomas 2019); however, the consumer has to visit the store, incurring a hassle cost of h_s. Moreover, at the time of this store visit, she may buy the store retailer's product: Kohl's nudge, that consumers may "find immediate replacements for what you're returning [i.e., Amazon purchases]," suggests that this phenomenon occurs in practice (Kohl's 2020). A customer who returns to a store and does not buy the store product simply incurs the hassle cost h_s, and a customer who returns to a store and buys the store product obtains utility $u - \delta(1-x) - h_s$ in the ex post stage. Thus, customers' expected utility from buying online in the ex ante stage under a return partnership is given by

$$u_o^p = -h_o + \mathbb{E}\max\Big\{u - \delta x,\ -h_r, u - \delta(1-x) - h_r - h_s,\ \underbrace{-h_s}_{\text{return to store}},\ \underbrace{u - \delta(1-x) - h_s}_{\text{return to store and buy store product}}\Big\}. \quad (11)$$

(Superscript "p" is used to indicate the return partnership model in this section.) When comparing u_o^p in (11) with u_o^b in (2), it is easy to see that u_o^p is no smaller than u_o^b. This is expected, as customers have an additional option of offline return under the return partnership. Because customers who visit the store can simply drop off the return rather than incur the hassle h_r of an online return, the option of returning to the store and purchasing the store product dominates the option of returning online and purchasing the store product, so $u - \delta(1 - x) - h_r - h_s$ can be dropped from (11).

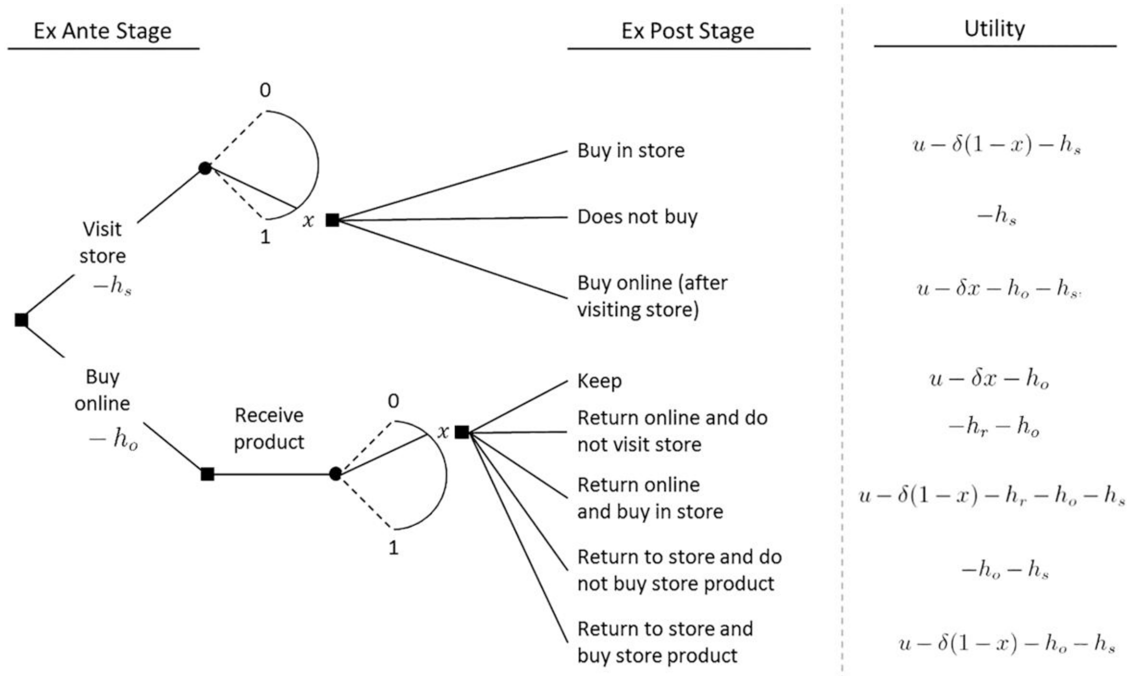
This additional option of offline returns affects customers' decisions on whether to visit a store or buy online in the ex ante stage, based on u_s in (1) and u_o^p in (11). Note from (11) that there may be customers whose expected utilities from buying online have improved under the return partnership, and they may switch from store shopping to online shopping. These customers benefit from the return partnership by buying online and incurring the store visit hassle cost, h_s, only when there is a need for returning items (i.e., postponing this cost to the ex post stage), instead of visiting a store and incurring h_s up front in the ex ante stage when there is no return partnership.

We next examine how a return partnership affects the expected profits of the store and online retailers. Let d^p denote the expected number of customers who visit the store, and let d_s^p denote the expected sales of the store retailer's product. Then, the expected profit earned by the store retailer, π_s^p, is given by

$$\pi_s^p = \underbrace{d_s^p}_{\text{store purchases}} m_s + \underbrace{d^p}_{\text{store visits}} m_a. \quad (12)$$

The online retailer may experience both online and offline returns. Let d_o^p, $d_{o,r}^p$, and $d_{s,r}^p$ denote expected online sales that are not returned, returned online, and returned to a store, respectively. There is a cost for

Figure 4. Customers' Decisions and Payoffs Under a Return Partnership



offline returns, $c_s(>0)$, which includes any cost for shipping and handling returns through the store channel. Through bulk shipping and efficient processing, the offline returns service saves online retailers an average of 20% compared with the per-item cost they incur for online returns (Happy Returns 2021), so we assume $c_s < c_o$. Then, the expected profit earned by the online retailer, π_o^p, is given by

$$\pi_o^p = \underbrace{d_o^p}_{\text{sales not returned}} m_o - \underbrace{d_{o,r}^p}_{\text{online returns}} (c_r + c_o) - \underbrace{d_{s,r}^p}_{\text{offline returns}} (c_r + c_s). \tag{13}$$

4.1. Analysis

In this section, we first present customers' decisions and retailers' expected sales and profits. We then derive conditions under which both retailers earn higher expected profits under a return partnership.

The following proposition summarizes customers' decisions under a return partnership. Note that store customers' decisions in the ex post stage are identical to those in Proposition 1(i)(a).

Proposition 3. *Under a return partnership*:

i. *Online customer decisions in the ex post stage are as follows*:

a. *Keep the online product if* $\{h_s \le \min\{h_r, \delta-2u\}, x \le (u+h_s)/\delta\}$; $\{\delta-2u < h_s < h_e^p, x < (\delta+h_s)/(2\delta)\}$; *or* $\{h_s \ge h_e^p, x < (u+h_r)/\delta\}$;

b. *Return online and does not visit the store if* $h_s \ge h_e^p$ *and* $(u+h_r)/\delta \le x \le 1-(u-h_s+h_r)/\delta$;

c. *Return to the store and does not buy the store product if* $h_s \le \min\{h_r, \delta-2u\}$ *and* $(u+h_s)/\delta \le x \le 1-(u/\delta)$; *and*

d. *Return to the store and buy the store product otherwise.*

Here,

$$h_e^p \equiv \max\{2(u+h_r)-\delta, h_r\}. \tag{14}$$

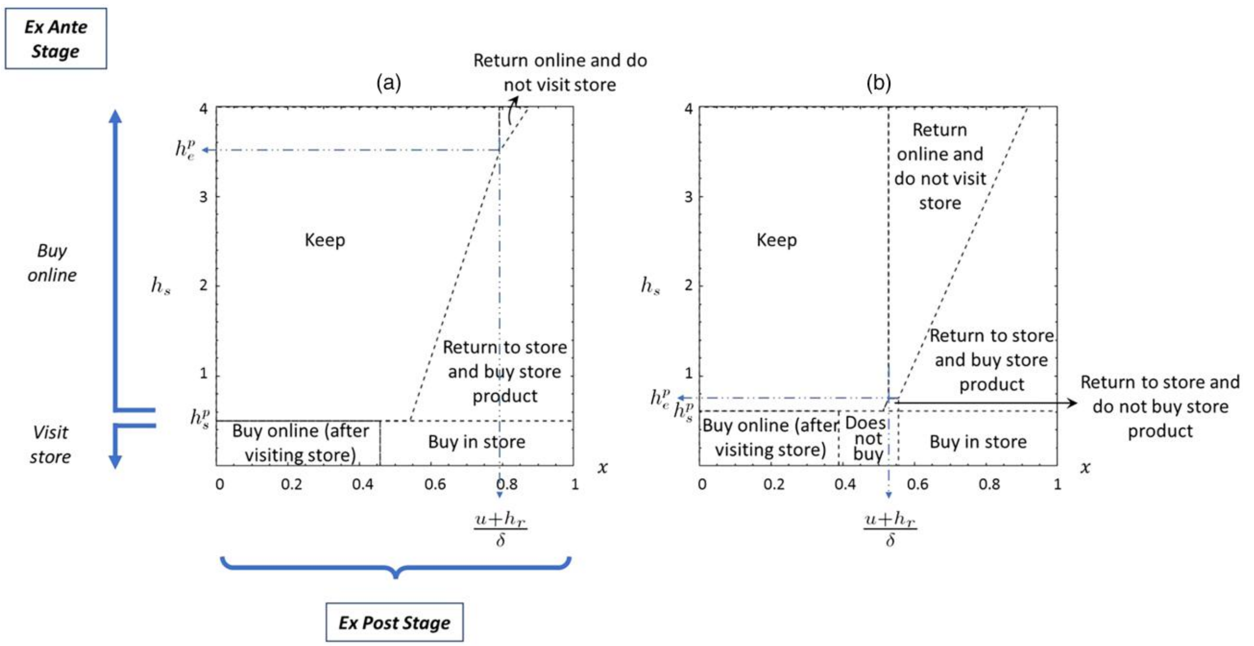
ii. *The fraction of online customers who return the online product is larger under a return partnership than that under the base model when* $h_s^b < h_s < h_e^p$.

iii. *Customer decisions in the ex ante stage are as follows*: *There exists threshold* h_s^p *such that customers visit the store in the ex ante stage iff* $h_s \le h_s^p$. *Moreover,* $h_s^p \le h_s^b$.

Figure 5 illustrates customer decisions. Proposition 3(i)(a) summarizes when online customers keep their purchase. As in the base model, at high hassle (i.e., the third case in Proposition 3(i)(a)), online customers keep the product if $x < (u+h_r)/\delta$. At low hassle (i.e., the first two cases in Proposition 3(i)(a)), the proportion of these customers is increasing in h_s (because customers keep the online product when $x \le (u+h_s)/\delta$ and $x < (\delta+h_s)/(2\delta)$, respectively). This is illustrated by the "Keep" region for $h_s \in (h_s^p, h_e^p)$ in Figure 5.

Customers who return adopt one of three alternatives, which are summarized in Proposition 3(i)(b)–(d). Proposition 3(i)(b) outlines when online customers

Figure 5. (Color online) Customers' Decisions Based on the Store Visit Hassle, h_s, and Preference, x, Under a Return Partnership



Notes. The same parameter values are used as in Figure 3. (a) $\delta = 6$. (b) $\delta = 9$.

return online and do not visit the store. As in the base model (Proposition 1(i)(b)), this case happens when the store visit hassle cost is high and customers do not have a strong preference for either product (intermediate x in Proposition 3(i)(b); see the "Return online and do not visit store" region in Figure 5). Proposition 3(i)(c) outlines when online customers return to the store and do not buy the store product. This occurs if the store visit hassle cost is low and the retailers offer differentiated products, so there exists $h_s \le \min\{h_r, \delta - 2u\}$; in Figure 5(b), the value of $\min\{h_r, \delta - 2u\} = h_e^p = h_r$, so this customer segment corresponds to a small region, in which $h_s \in (h_s^p, h_e^p)$. Moreover, customers should not have a strong preference for either product (intermediate x in Proposition 3(i)(c)), as shown in Figure 5(b). Proposition 3(i)(d) outlines the offline return with store product purchase option, which, as the region "Return to store and buy store product" in Figure 5 illustrates, occurs when customers have a strong preference for the store product. Proposition 3(i)(c) and (d) demonstrate that the partnership causes a *return channel shift* of some customers who used to return online, but now return in stores. Note that this behavior occurs when all customers buy online in the ex ante stage in the base model (so $h_s > h_s^b \ge h_s^p$; Proposition 1(ii) and Proposition 3(iii)). Specifically, some of these online customers who used to return online in the base model now opt for an offline return once a return partnership is in place.

The number of returns is larger under a return partnership for intermediate $h_s \in (h_s^p, h_e^p)$ than under the base model (Proposition 3(ii)). Different from the base model, customers can make a return and buy the store product in a single trip under a return partnership, which makes more of those customers who prefer the store product choose this option over keeping their online purchase.

Proposition 3(iii) reveals that in the ex ante stage, customers visit the store retailer whenever the store visit hassle cost is low—that is, $h_s \le h_s^p$ (see Figure 5). However, these customers do not travel as far as they do in the base model because $h_s^p \le h_s^b$, as shown in Proposition 3(iii). In particular, when the store visit hassle cost is moderate—that is, $h_s \in (h_s^p, h_s^b]$—all customers switch from visiting the store in the base model to buying online under the return partnership model. We refer to this as the *initial channel shift* effect. The reason is that buying online allows customers to postpone their store visit to the ex post stage when they know whether they prefer the online product, which makes buying online more appealing than buying at a store. It follows that, depending on the value of h_s, either the initial channel shift or the return channel shift may happen (but not both).

The following proposition summarizes the expected sales for the store retailer and expected sales and returns for the online retailer under a return partnership.

Proposition 4. *Under a return partnership*:

i. *The number of store visits, d^p, and store sales, d_s^p, are given by*

$$d^p = \begin{cases} 1, & \text{if } h_s \le h_s^p \\ r_n + r_m, & \text{otherwise.} \end{cases} \tag{15}$$

$$d_s^p = \begin{cases} 1 - \max\left\{\dfrac{\delta - h_o}{2\delta}, 1 - \dfrac{u}{\delta}\right\}, & \text{if } h_s \le h_s^p \\ r_m, & \text{otherwise.} \end{cases} \tag{16}$$

Here, the number of offline returning customers who do not make any store purchases, r_n, is

$$r_n = \begin{cases} 1 - \dfrac{2u + h_s}{\delta}, & \text{if } h_s^p < h_s \le \min\{h_r, \delta - 2u\} \\ 0, & \text{otherwise,} \end{cases} \tag{17}$$

and the number of offline returning customers who also make store purchases, r_m, is

$$r_m = \begin{cases} 0, & \text{if } h_s \le h_s^p \\ \dfrac{u}{\delta}, & \text{if } h_s^p < h_s \le \min\{h_r, \delta - 2u\} \\ 1 - \dfrac{\delta + h_s}{2\delta}, & \text{if } \delta - 2u < h_r, \max\{h_s^p, \delta - 2u\} \\ & < h_s \le 2(u + h_r) - \delta \\ \dfrac{h_r - h_s + u}{\delta}, & \text{otherwise.} \end{cases} \tag{18}$$

ii. *The online retailer's sales that are not returned, d_o^p, number of online returns, $d_{o,r}^p$, and number of store returns, $d_{s,r}^p$, are given by*

$$d_o^p = \begin{cases} \min\left\{\dfrac{\delta - h_o}{2\delta}, \dfrac{u - h_o}{\delta}\right\}, & \text{if } h_s \le h_s^p \\ 1 - d_{o,r}^p - d_{s,r}^p, & \text{otherwise.} \end{cases}$$

$$d_{o,r}^p = \begin{cases} 1 - \dfrac{2(u + h_r) - h_s}{\delta} & \text{if } \max\{h_s^p, h_r, 2(u + h_r) - \delta\} < h_s \\ 0, & \text{otherwise.} \end{cases} \tag{19}$$

$$d_{s,r}^p = r_n + r_m. \tag{20}$$

Moreover, the total return volume, $d_{o,r}^p + d_{s,r}^p$, is decreasing in h_s for $h_s \in (h_s^p, h_e^p)$ and constant in h_s otherwise.

iii. *The online retailer's expected profit, π_o^p, is constant in h_s for $h_s \le h_s^p$; increasing in h_s for $h_s^p < h_s < \max\{h_s^p, h_e^p\}$; and decreasing otherwise.*

Proposition 4 characterizes how a return partnership affects the store and online retailers due to the option of offline returns in the ex post stage. Proposition 4(i) summarizes the expected number of customers who visit stores, d^p, and the store retailer's sales, d_s^p. When the store visit hassle cost is low ($h_s \le h_s^p$), the return partnership does not affect customer decisions, and the store retailer's sales and the number of store visits are the same as in the base model. When the store visit hassle is high ($h_s > h_s^p$), store visits are made by those online customers who need to drop off returns of online purchases. In particular, the store is visited by online customers who end up in two cases—namely, those who wish to buy the store product and those who want to merely drop off their return to the store. In particular, r_n in (17) represents the expected number of online customers who return to the store and do not buy the store product (see the corresponding region in Figure 5(b)). Similarly, r_m in (18) represents the expected number of online customers who return to the store and buy the store product (see the corresponding region in Figure 5, (a) and (b)). Thus, in this case of high h_s, the volume of store sales is r_m.

Proposition 4(ii) summarizes the expected number of online sales, d_o^p, and online returns, $d_{o,r}^p$, similarly to Proposition 2(ii). Different from Proposition 2(ii), Proposition 4(ii) introduces an additional term, $d_{s,r}^p$, items that are returned to stores in (20), which is equal to the total number of customers who purchase online and return to stores, $r_n + r_m$. The impact of increasing store visit hassle cost on sales and returns reveals two interesting effects: On the one hand, it can increase the volume of online returns relative to offline returns (because $d_{o,r}^p$ is nondecreasing in h_s and $d_{s,r}^p$ is nonincreasing in h_s). This hurts the online retailer's expected profit, as an offline return has a lower return handling cost than an online return (because $c_s < c_o$). On the other hand, it can decrease the total return volume (Proposition 4(ii)).

Depending on the magnitude of the two effects, the online retailer may enjoy a higher profit when the store retailer is more conveniently located (so that the hassle cost, h_s, becomes lower). When the store visit hassle cost is intermediate—that is, $h_s \in (h_s^p, h_e^p)$—it is small enough for customers to choose to return to stores in the ex post stage (once they realize they need to make a return), but large enough to deter store visits in the ex ante stage. An increase in h_s in this range causes more of these customers to keep the product, thus leading to a smaller return volume (see "Keep" region in Figure 5(a) for $h_s^p < h_s < h_e^p$). Moreover, the second effect described above occurs (i.e., decrease in the total return volume), whereas the first effect (i.e., increase in the online return volume) does not, and π_o^p is increasing in h_s for intermediate h_s in Proposition 4(iii). At high $h_s > h_e^p$, similar to Proposition 2(iii), store visits are so inconvenient that online customers return the product with a fixed probability, $1 - (u + h_r)/\delta$. This implies that the return volume is unaffected by h_s (Proposition 4(ii)). However, because an increasing proportion of these returns are made online, π_o^p decreases in h_s in this region (Proposition 4(iii)).

4.2. Impact of a Return Partnership

We are now ready to evaluate how the retailers' expected profit is impacted by forming a partnership, and thereby examine when the retailers are incentivized to join a return partnership. A return partnership forms when both retailers' expected profit increases under the partnership; that is, $\pi_s^p > \pi_s^b$ and $\pi_o^p > \pi_o^b$.

Proposition 5

i. *The store retailer's expected profit increases under a return partnership—that is,* $\pi_s^p > \pi_s^b$*—iff* $h_s > h_s^b$*, where* h_s^b *is defined in Proposition 1(ii).*

ii. *The online retailer's expected profit increases under a return partnership—that is,* $\pi_o^p > \pi_o^b$*—in the following cases:*

a. *Suppose* $h_s^p < h_s \le h_s^b$*. Then, there exist* $\tilde{h}(\ge h_s^p)$ *and* $\hat{h}(\in[\tilde{h}, h_s^b])$ *such that* $\pi_o^p > \pi_o^b$ *iff* $\tilde{h} < h_s < \hat{h}$.

b. *Suppose* $h_s > h_s^b$*. Then, there exist* $\overline{\delta}, \underline{h}(\in[h_s^b, \max\{h_e^p, h_s^b\}]), \overline{h}(\in[\underline{h}, h_e^b])$ *and* $h^\dagger(\in[\max\{h_s^b, h_e^b\}, \max\{h_s^b, h_e^p\}])$ *such that* $\pi_o^p > \pi_o^b$ *iff* $[\delta \ge \overline{\delta}$ *and* $h_s > \underline{h}]$ *or* $[\delta < \overline{\delta}$ *and* $\{h_s > h^\dagger$ *or* $\underline{h} < h_s < \overline{h}\}]$.

iii. *A return partnership forms iff* $[\delta \ge \overline{\delta}$ *and* $h_s > \underline{h}]$ *or* $[\delta < \overline{\delta}$ *and* $\{h_s > h^\dagger$ *or* $\underline{h} < h_s < \overline{h}\}]$.

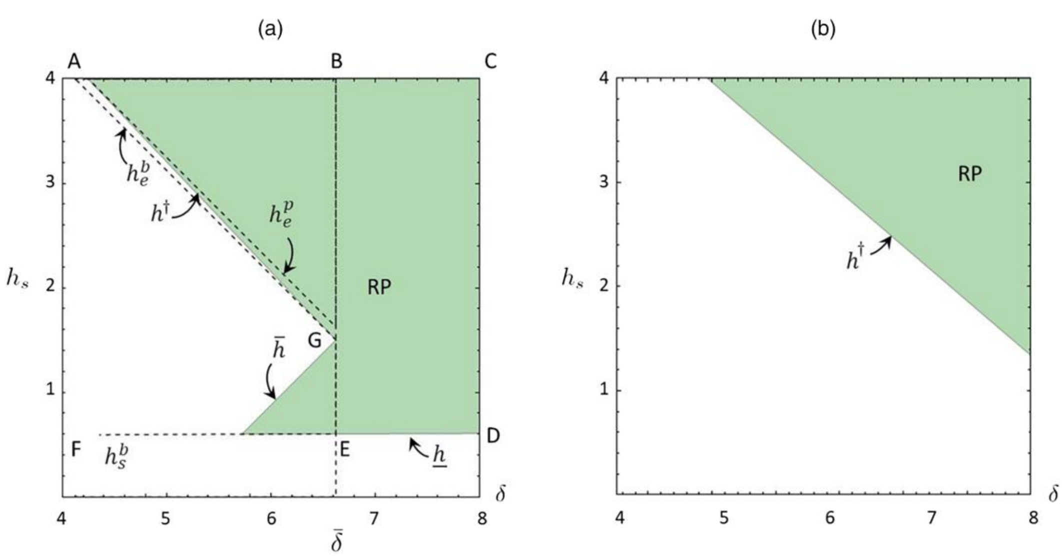
Proposition 5(i) reveals that the store retailer's expected profit increases under a return partnership when $h_s > h_s^b$. In this case, the partnership impacts the store retailer's profit positively through new customer foot traffic. On the other hand, when $h_s^p < h_s \le h_s^b$, the initial channel shift impacts the store retailer's profit negatively because these customers may now visit stores only if they need to drop off a return; in the base model, they are certain to visit stores. Because these customers have already experienced the hassle cost of online shopping, they are less willing to buy the store product than those customers who visit the store in the ex ante stage. In other words, for the store retailer, the initial channel shift (i.e., all customers forgoing visiting the store) dominates the foot traffic from returning customers in this intermediate h_s region. (When $h_s \le h_s^p$, a return partnership induces no changes in customer decisions.)

Proposition 5(ii)(a) reveals that the online retailer benefits from a return partnership if the hassle cost is intermediate. Because $h_s^p < h_s \le h_s^b$ in this case, a return partnership induces an initial channel shift, which benefits the online retailer through higher online sales in the ex ante stage. But, because of the possibility of returns, the online retailer's expected profit under a return partnership first increases for $h_s \in (h_s^p, \max\{h_s^p, h_e^p\})$ and then decreases for $h_s > \max\{h_s^p, h_e^p\}$ (Proposition 4(iii)). The online retailer's expected profit under the base model is constant in h_s because $h_s < h_s^b$. Therefore, the profit under a partnership may exceed that under the base model at intermediate $h_s \in (\tilde{h}, \hat{h})$. However, a return partnership does not occur in this case because the store retailer does not benefit from a return partnership when $h_s \le h_s^b$ (see Proposition 5(i)).

Next, we examine the conditions given in Proposition 5(ii)(b), under which the online retailer benefits when $h_s > h_s^b$. Because Proposition 5(i) states that the store retailer benefits from a return partnership for such h_s, the conditions given in Proposition 5(ii)(b) allow for a return partnership to occur. These conditions are formally stated in Proposition 5(iii) and illustrated in Figure 6.

Recall from the discussion of Proposition 1 that as δ increases, a customer is less likely to keep the product under the base model. In other words, at high δ, the

Figure 6. (Color online) Scenarios When Both Retailers Benefit from a Return Partnership (RP)



Notes. The same parameter values are used as in Figure 3. Additionally, $m_o = m_s = 62.62, m_a = 31.31, c_r = 22.49, c_o = 5$, and $c_s = 2.8$. These values are motivated by a typical return partnership setting; see Online Appendix A for details. (a) Low return hassle cost, $h_r = 0.125$. (b) High return hassle cost, $h_r = 0.75$.

return volume in the base model is large. We can observe that this is also true under a return partnership by comparing the areas of return in Figure 3(b) with those in Figure 5(b). Moreover, it does not vary much with h_s above h_s^b (see Figures 3(b) and 5(b)). A return partnership then helps shift a portion of this large volume of returns to the more cost-effective store channel; therefore, the online retailer benefits from the partnership. This corresponds to $\delta \geq \overline{\delta}$ in Proposition 5 and is illustrated by the area within points BCDE in Figure 6(a).

When the products are similar (i.e., $\delta < \overline{\delta}$), the return channel shift benefits the online retailer, but an increase in return volume due to a partnership erodes the online retailer's profit. Intuitively, the online retailer's expected profit from a partnership is higher than that in the base model when the volume of returns before a partnership is sufficiently large—which ensures that the magnitude of the cost savings from the return channel shift is large—and the increase in return volume due to a partnership is not too large—which ensures that the online retailer does not suffer too much additional loss due to returns. Proposition 5(ii)(b) states that the return partnership benefits the online retailer for $h_s > h^\dagger$ or $\underline{h} < h_s < \overline{h}$. By their definitions in Proposition 5(ii)(b), $\overline{h} \leq h_e^b \leq h^\dagger$, so we focus on $h_s \geq h_e^b$ and $h_s < h_e^b$ sequentially.

Consider $h_s \geq h_e^b$ and $\delta < \overline{\delta}$, which correspond to the area within points ABG in Figure 6(a). In this case, the number of returns is fixed under the base model (see discussion following Proposition 2). Under a partnership, the number of returns is equal to that under the base model when $h_s > h_e^p$ and decreasing in h_s otherwise (see Figure 5(a) or Corollary 1 in Online Appendix C). Therefore, as h_s increases in the range $h_e^b \leq h_s \leq h_e^p$, the rise in the return volume caused by a partnership becomes smaller. (There is no rise in the return volume for $h_s > h_e^p$.) The online retailer benefits from a partnership when this rise in the return volume is not too large, which occurs at sufficiently large $h_s > h^\dagger (\in [h_e^b, h_e^p])$. Intuitively, in this case, the online retailer enjoys a low return rate prior to the partnership (due to low δ) and does not tolerate a large increase in the return volume due to a partnership. As a result, the online retailer's incentive hinges on ensuring that store visits are not too convenient.

Consider $h_s < h_e^b$ and $\delta < \overline{\delta}$, which correspond to the area within points AGEF in Figure 6(a). The return volume under the base model decreases in h_s according to Proposition 1(i)(b). This implies that the return volume will be high when $h_s < \overline{h}$. Thus, as in the high δ case above, the online retailer benefits from a return partnership via the return channel shift of the large return volume to the more cost-effective store channel. However, at very low $h_s < \underline{h}$, the offline return service becomes too convenient, leading to too many new returns (see Corollary 1 in Online Appendix C). Thus, a partnership is viable for intermediate $\underline{h} < h_s < \overline{h}$ in general.[11] Intuitively, the online retailer's return rate prior to the partnership depends on the store visit hassle cost: When it is convenient to visit stores, more customers return prior to a partnership. Then, the online retailer's incentive hinges on ensuring that there are significant cost savings from a large return channel shift.

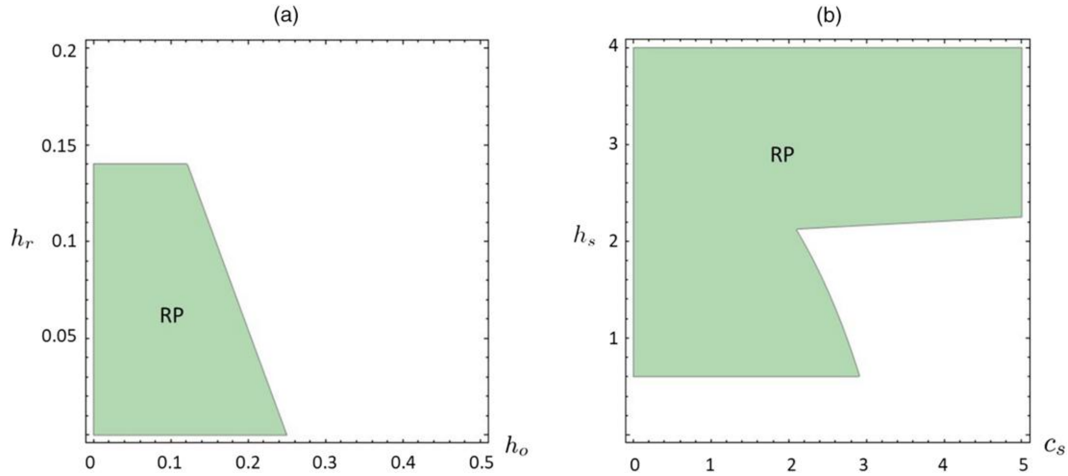
Figure 6(b) recreates Figure 6(a) for the case of high return hassle cost and reveals that the return partnership occurs for $h_s > h^\dagger$ only. To see why the case of $\underline{h} < h_s < \overline{h}$ does not exist in this case, note that a higher value of h_r implies that more online consumers keep the online product (Proposition 1). Then, the return volume in the base model is not large enough to justify shifting consumers to the store return channel, and the convenience of a store return is too attractive relative to an online return, leading to a sharp increase in return volume.

4.3. Managerial Implications

Our results reiterate that the store retailer's inclination toward the partnership exists, even in the absence of a direct monetary compensation, suggesting that attempts to forge return partnerships with store retailers must emphasize the sales boost from returning customers. Figure 6 also suggests that online retailers looking to partner with a large network of physical stores (i.e., low h_s) could consider store retailer partners who sell differentiated products (i.e., high δ). Happy Returns chooses store partners that sell sufficiently differentiated products—for example, Cost Plus World Market. Narvar's strategy is somewhat different from that of Happy Returns. Narvar has partnered with online retailers Dagne Dover and Schutz, as well as Nordstrom as its store partner. Nordstrom sells products that are similar to those sold by online retail partners; that is, Narvar's return partnership with Nordstrom has a small δ. We find that a return partnership may occur in this case, as long as the store retailer operates few stores with high h_s (Figure 6). Indeed, the return service at Nordstrom is only offered in "select Nordstrom stores" (Narvar 2020, Nordstrom 2023). Likewise, Amazon and Kohl's sell similar products, and, in line with our results, the number of Kohl's stores in major cities is relatively low (see endnote 4).

Figure 7 shows the role of key model parameters and presents some additional insights on when a return partnership is viable. We can observe that the value of a partnership is contingent on the ease of shopping and returning online. Specifically, online retailers who make it easy to shop online (low h_o) and return online (low h_r) are more likely to benefit from such a partnership (Figure 7(a)). This may be why online retailers, such as Revolve, who offer free two-day shipping and a full-refund return policy for online returns (i.e., low h_r)

Figure 7. (Color online) Impact of Model Parameters on Viability of Return Partnership (RP)



Notes. The same parameter values are used as in Figure 6. Additionally, $\delta = 6$, and $h_s = 0.25$ in panel (a) and $h_r = 0.125$ in panel (b). (a) Variation with ease of shopping online. (b) Variation with extent of cost benefits.

opt for a return partnership. It also cautions that those retailers that implement a stringent return policy (e.g., high restocking fee) need to carefully consider the implications of offering offline returns, due to the risk of increased returns therein. We also observe that the extent of cost savings that the retailer foresees from forming a partnership matters to its viability. On the one hand, forming a return partnership with a store retailer who is not conveniently located (i.e., high h_s) is less risky because the partnership is unlikely to increase return volumes and simply moves some of the online returns to the more cost-effective store channel. In this case, a partnership is viable regardless of the extent of cost savings, c_s (Figure 7(b)). On the other hand, when online retailers partner with store retailers that are located conveniently to the online retailer's customer base (low h_s), the partnership is justified if there is a sizeable reduction in the per-unit return handling cost from shifting some of the returns to the store channel. This is in line with the fact that online retailers of Happy Returns enjoy significant cost savings—20% savings on return handling costs compared with online returns on average (Happy Returns 2021)—and provide convenient store access for consumers.

5. Extensions

5.1. Correlated Consumer Valuations

Our model assumed that customers realize their preference completely in the ex ante stage; that is, they know their consumption valuation for both products upon sampling a single channel (either inspecting the store product during a store visit or receiving the online product). Similar assumptions are made in related work (e.g., Shulman et al. 2010, 2011) for analytical tractability and ease of exposition. In this section we relax this assumption. Specifically, the valuation uncertainty is revealed completely only for the channel that they choose in the ex ante stage, and, for the other channel, the valuation uncertainty is partially resolved.

The model is as follows. Let V denote the ex ante uncertain (uniformly distributed) valuation for the products.[12] Suppose a consumer realizes a valuation v for the first product that she samples (which could be the store or the online product). The customer then updates her valuation for the second product—which she has not yet sampled—as the weighted average of v and V. Let the weight placed on V be $\rho\,(\in(0,1))$; the weight placed on v is $(1-\rho)$. A similar multiplicative structure is used in Ertekin and Agrawal (2021) to model correlation between the utility of a purchase and the time since the purchase. This implies that there is uncertainty around the valuation of the second product, whose magnitude is determined by ρ. This allows us to flexibly capture the relationship between product differentiation and correlation in the two products' valuations. To see why, consider the case where the two products are very different. Then, a larger weight must be placed on the uncertain component of valuation, V, than on the known realization of product valuation, v. In other words, the first channel does not reveal a lot of useful information when the two retailers carry very different products. When the products are similar, the weight placed on the known realization v is larger than that placed on the unknown component V, so the first channel substantially discloses how the consumer feels about the second product.

We present the detailed analysis of this model in Online Appendix C.1. We can show that the correlation between the two product valuations can be anywhere from zero to one: the valuations have low correlation and are hardly related when the products are different, but exhibit a strong correlation when the products are similar. In line with the main model, our results suggest that an online retailer looking to offer convenient offline returns (i.e., low h_s) may consider a store retailer whose product valuation is not correlated with that of the online retailer's product, and a return partnership may occur at higher values of h_s when the two product valuations are correlated.

5.2. Heterogeneity in Store Visit Hassle Cost

We now incorporate the possibility that the store visit hassle cost may differ across customers—for example, due to varying distance from their residence to the store retailer. Specifically, the store visit hassle cost parameter h_s now varies for different customers, and we assume $h_s \sim U[0, H]$, as in Gao and Su (2017a).

Online Appendix C.2 presents the detailed analyses for this model. The ex ante heterogeneity in store visit hassle cost introduces different customer segments—some buy online and others visit the store—in the ex ante stage, enriching our main model further. It is noteworthy that the two-channel shift effects discussed in the main model may occur simultaneously in the present extension. Even so, the key aspects necessary for a return partnership to form persist in this extended model. An online retailer's willingness to partner is sustained when they experience a large volume of returns before a partnership, which can translate to a large return channel shift to offline returns. At the same time, the initial channel shift of consumers opting for online purchases in lieu of store visits under a return partnership must be limited, which is true at high H. Recall that H captures the maximum store visit hassle cost, so that a smaller value of H implies that most customers live close to the store retailer and actively consider visiting the store. We find that when retailers sell differentiated products (i.e., high δ), a partnership is viable for a wider range of store retailers, as long as the store retailer does not have too low a value of H. However, when the online and store retailer offer similar products (i.e., low δ), a partnership forms only if the store retailer has a high enough H value such that not too many customers return to stores under the partnership.

5.3. Store Retailer with Multiple Offline Stores

We now incorporate the possibility that the store retailer operates multiple offline stores. Specifically, the store retailer operates $n(\in Z^+)$ offline stores spread uniformly along a circle of unit circumference (Salop 1979). Customers are spread uniformly around this circular city. This type of location model is used in prior work—for example, Balasubramanian (1998), Shulman et al. (2009), and Gao et al. (2022). Visiting a store imposes a hassle cost $h_s = t \cdot y$, where $y(\geq 0)$ represents the distance between the customer's location and the nearest store, and $t(> 0)$ represents a per unit cost.

Online Appendix C.3 presents the detailed analyses for this model. We find that our main insights hold true. Store retailers with a moderate network of physical stores (i.e., medium n) should consider online retailer partners who sell differentiated products (i.e., high δ). On the other hand, when the store retailer sells products that are similar to those sold by the online retailer (i.e., low δ), a return partnership may occur as long as there are not too many stores (i.e., n is low).

5.4. Incorporating Consumers Keeping Both Products

So far, we assumed that the consumer is interested in consuming at most one of the products, as commonly assumed in prior work (Shulman et al. 2009, Ofek et al. 2011, Shulman et al. 2011). We now relax this assumption and allow online consumers to visit the store in the ex post stage without returning the online purchase. Similarly, consumers who visit the store in the ex ante stage may decide to buy the online product in addition to the store product in the ex post stage. Under this option, customers keep both the products to receive the expected utility of $u - \delta x + u - \delta(1-x) - h_o - h_s$. We conduct a detailed analysis incorporating this option in Online Appendix C.4, which demonstrates the robustness of our results. Specifically, we show that a return partnership may occur either when the products are differentiated or when the store visit hassle cost is high, as in our main model.

6. Conclusion

Retailers are increasingly adopting omnichannel strategies in order to cater to customers' channel preferences. We study the emerging business practice in which an online retailer enters into a return partnership with a store retailer. Under such a partnership, an online retailer can offer its customers the preferred offline return option for online purchases via offline stores of a store retailer. We allow customers to decide which retailer to purchase items from and, if needed, return items to. To the best of our knowledge, we are the first to study this unique partnership by taking into account the incentives of both firms to participate.

Our findings show how return partnerships can be a win-win for online and store retailers: online retailers benefit from shifting returns to a cost-effective channel, and store retailers benefit from higher foot traffic in their stores due to returning customers. We show that return partnerships may occur organically, even in the absence of any monetary compensation for the service. In particular, return partnerships may feature store partners who operate few stores, but offer products similar to those of online retailers, or possess a large store network, but offer differentiated products.

Through our results, we can explain several return partnerships that we see in practice. Service provider Happy Returns has chosen store retailers that offer differentiated products to partner with online retailers. We attribute this strategy to the larger network of stores that partner with Happy Returns. In addition to ensuring that online retailers are incentivized to partner regardless of the number of locations, this allows a service provider—especially those in the growth stage (e.g., Happy Returns)—to focus on expanding the offline store network without being concerned about online retailers' willingness to partner. By modeling the ease of shopping and returning online, our findings shed light on the types of online retailers that benefit from a return partnership. Our findings imply that online retailers, such as Revolve, who offer convenient online shopping and lenient returns, are best poised to benefit from partnerships.

However, our study also highlights the importance of choosing the right partners. For example, we caution that an online retailer and a store retailer with comparable products have incentives to partner only if the number of stores is not too large. This is because an online retailer does not find the offline return service profitable when the convenience offered by offline returns drives returns up. Return partnerships of Amazon-Kohl's and Narvar-Nordstrom can be characterized as low product differentiation with few stores, in line with our results, as many Kohl's stores are located in suburban areas of major cities, and only select Nordstrom stores offer the service. Moreover, we urge online retailers who impose a strict return policy (e.g., high restocking fees) to carefully examine the return-rate-increasing effects of entering into a partnership.

Although we do not study multiple store retailers in this paper, our model may provide some insight into when a return partnership may involve multiple store retailers. Each store retailer's incentive to join the partnership, which is tied to its existing sales and returning online customers who visit its stores, is similar to that in our model. The online retailer's incentive is similar to that in our model if all store retailers offer a similar level of differentiation. Then, a return partnership with multiple retailers occurs, as suggested by our model, considering the hassle h_s to be determined by the total number of stores in the partnership. However, if the store retailers sell products of varying differentiation, a return partnership can be more likely than suggested by our model if, for the online retailer, a reduction in the profit due to the partnership with one store retailer can be offset by an increase in profit due to the partnership with another store retailer.

We hope that this paper presents a foundation for other investigations on this topic. One research direction is to explore the effect of increasing the number of return locations on the return handling cost. Although more locations reduce the distance between stores, which can save pickup-related costs, they also introduce diseconomies of scale, as collecting returned items from more locations in different parts of a city may increase this cost. It would also be interesting to investigate the sustainability impact of return partnerships: Bulk shipping of returned items from store retailers may reduce waste and greenhouse gas emissions, compared with returns by mail; however, offering a convenient return option may lead to more reckless purchases by customers, increasing both waste and emissions. Pricing and refund policy decisions would be valuable additions as well: An online retailer may increase the price or charge a fee for returns by mail once it offers a return partnership. Our results revealed situations where only one of the retailers benefits from a partnership, and subsequent research could explore contracts that make both firms better off under a partnership. One may also empirically investigate the network effects of partnering via a platform like Happy Returns and how the partnership impacts an online retailer's sales and returns.

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Endnotes

[1] We refer to retailers who only operate an online channel and predominantly online retailers who may have few offline stores as "online retailers"; for example, Everlane has five stores in the United States, all located in California and New York, so they are effectively a pure-play online retailer in all other states (https://www.everlane.com/stores).

[2] Except Anchorage, Alaska, according to Kohl's (2020).

[3] Delivery service providers FedEx and UPS also offer offline returns for some online retailers and partner with store retailers: FedEx's partnerships include Walgreens and Fred Meyer, and UPS's partnerships include CVS and Michaels (Bhattarai 2019, FedEx 2023). Their setting is similar in that they partner with online and store retailers; however, they differ in that they offer fulfillment services and operate their own physical stores.

[4] The 1,170 Kohl's stores (Kohl's 2023) are far fewer than Happy Returns' return network of over 5,000 locations, and Kohl's stores are located in suburban areas. For example, whereas there are no Kohl's stores in Seattle—the closest one is located over 10 miles

away from the center of the city—Happy Returns hosts 16 return locations in Seattle.

[5] Although a difference in the price charged by the retailers may lead to a difference in this utility, it would not change our results qualitatively.

[6] Partnerships with convenience stores (e.g., between Narvar's online retailers and Walgreens) have a clear appeal for the store retailer and, as such, are less interesting to investigate (we present additional analyses for this special return partnership case in Online Appendix C.6). Our model deals with retailers who sell in similar product categories and, thus, face nuanced tradeoffs.

[7] Although store purchases may be returned for idiosyncratic reasons, in practice, the majority of valuation uncertainty is resolved by inspecting a product in store. Thus, we assume that store purchases are not returned.

[8] From (2), for large h_s, $u_o^b = -h_o + \mathbb{E}\max\{u - \delta x, -h_r\} = -h_o + \int_0^{\min\{1,\frac{u+h_r}{\delta}\}} (u - \delta x)dx - \int_{\min\{1,\frac{u+h_r}{\delta}\}}^1 h_r dx = -h_o + \frac{(h_r+u)^2}{2\delta} - h_r$ because $u + h_r < \delta$.

[9] Our parameter calibration using publicly available data and Happy Returns' data reveals that this condition is satisfied by typical online retailers. Nevertheless, we present the results under the other case in Online Appendix C.8.

[10] Note that when $h_s > h_e^b$, we also have $\frac{u+h_r}{\delta} < 1 - \frac{u-h_s}{\delta}$, so that this region exists.

[11] For the parameters in Figure 6(a), we show that $\underline{h} = h_s^b$ in the proof of Proposition 5. That is, the online retailer's incentive persists for $h_s^b < h_s < \overline{h}$.

[12] In line with the main model, we assume a common utility distribution for the products to preclude providing one of the retailers with an unfair advantage; any differences in the distribution would not affect our results qualitatively.

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