

## Article

# Exploring the Interactive Relationship between Retailers' Free Shipping Decisions and Manufacturers' Product Sales in Digital Retailing

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**Abstract:** In the realm of multichannel digital retailing, free shipping has gained popularity as a promotion strategy. However, few studies have investigated how retailers make decisions regarding free shipping. Furthermore, concerns have arisen regarding the sustainability of free shipping promotions for manufacturers. This research employs a simultaneous equation model with fixed effects to explore the determinants of market structure concerning the proportion of retailers offering free shipping and its impact on manufacturers' product sales. As per our current knowledge, this research is pioneering in establishing a causal relationship between the percentage of free-shipping retailers and manufacturers' product sales. Specifically, an increase in the percentage of retailers employing free shipping leads to higher product sales, while lower product sales drive increased retailers to adopt free shipping. Our findings indicate that competition among products has a significant positive effect on the percentage of retailers offering free shipping in the interactive relationship. Furthermore, increased competition among retailers results in more retailers adopting free shipping strategies. These results affirm the efficacy of free shipping as a promotional approach to increase manufacturers' product sales, particularly in highly competitive markets.



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**Keywords:** retail free shipping; promotion; product sales; competition; simultaneous equation model; digital retailing

## 1. Introduction

A key feature that differentiates online retailers from traditional offline retailers is that online retailers rely on shipping to deliver goods to consumers [1]. Consequently, determining the pricing strategy for delivery services stands as a pivotal choice for e-commerce retailers. Among retailers' shipping policies, the popularity of free shipping is increasing. Free shipping is a promotional tactic employed by retailers, wherein they cover the shipping costs of the products, aiming to attract consumers [2,3]. This implies that customers are exempt from any additional charges associated with the delivery of purchased products. According to a survey by National Retail Federation, 49 percent of shoppers said free shipping would prompt them to make a purchase decision when they are hesitant about it [4]. Nevertheless, the issue of the long-term sustainability of free shipping has sparked considerable attention in recent times. Sustainability encompasses the adept resolution of human issues in a way that consistently generates advantages for the well-being of society [5]. It involves attaining a balanced and harmonious integration of society, economy, and the environment, all aimed at safeguarding the welfare of both humankind and the planet [6]. In this context, our focus is on economic sustainability. From a corporate perspective, companies prioritize economic sustainability due to its direct implications for profitability, long-term growth, and business viability [7]. The absence of

profitability hinders the company from maintaining its operations, consequently impeding its contribution to social and environmental sustainability. On the one hand, economic sustainability partly ensures companies' capability to remunerate employees, offer benefits, and safeguard workers' rights. Additionally, enterprises are more capable of embracing social responsibility, endorsing community projects, and engaging in environmental initiatives. On the other hand, despite the rise in transportation resulting from the free shipping strategy leading to carbon emissions, enterprises may pursue more efficient transportation and distribution approaches to uphold profitability, simultaneously promoting environmental sustainability.

The biggest concern behind economic sustainability is the heavy burden of shipping costs for both retailers and manufacturers. As per the information provided by the Council of Supply Chain Management Professionals (CSCMP), U.S. businesses invested a sum of 2.3 trillion U.S. dollars in the year 2022 [8]. Moreover, the high volume of returns accompanied by free shipping further increases the cost [9]. An academic also showed that free shipping is unprofitable because of the high return rate [10]. Free shipping is a complex and vital decision that requires online retailers to strike a balance between recuperating delivery expenses and enticing consumers [11], especially for small and medium-sized retail enterprises without cost advantage [12]. However, certain retailers, particularly those of significant scale, may transfer the responsibility of shipping expenses onto manufacturers. Manufacturers subsidize the retailers through the provision of freight allowances. Therefore, manufacturers need to be aware of the ideal market arrangement concerning the ratio of retailers employing free shipping, which can assist them in making marketing support investments that maximize their profit. After all, subsidizing retailers for their shipping costs is not a sustainable strategy in the long term.

Moreover, within the dynamic and competitive online market, characterized by the presence of numerous competing retailers, each carrying an array of substitute products within the same category, the decisions about retailers offering free shipping become significantly more intricate. Firstly, retailers' free shipping decisions interact with the manufacturer's product sales. Except that retailers' free shipping decisions may affect the manufacturer's product sales, the return of a retailer's free shipping decision depends on the dynamic product sales. Intuitively, when product sales are low, more retailers may be incentivized to use a free shipping strategy to stimulate demand in time. Secondly, competition may further moderate the return of a retailer's free shipping decision and, thus, the number of retailers who use a free shipping strategy. As there are always multiple substitutable products in the channel, retailers need to leverage the competition the focal product faces and their total category profit when making free shipping decisions. Furthermore, the competitive landscape within the retail sector could drive the adoption of free shipping as a promotional tool. However, an increase in the number of retailers implementing free shipping promotions may intensify price rivalry, ultimately impacting retailers' bottom-line profits.

Our study seeks to address the void in scholarly research by investigating and empirically analyzing retailers' decisions regarding offering free shipping within the competitive online marketplace, where there are always multiple retailers selling identical products while carrying numerous substitutable products. Notably, we examine the dynamic interplay between retailers' choices concerning free shipping and the subsequent impact on the sales performance of the manufacturer's products. Our research is centered on the subsequent research questions: (1) What factors determine the market structure concerning the percentage of retailers offering free shipping? Especially how competition affects the market structure. (2) How does the structure of the market, concerning the percentage of retailers providing free shipping, impact the sales of products? To address these questions, we developed a conceptual framework to characterize retailers' free shipping decisions, consumers' purchase decisions, and their relationships. Empirically, we employ a model based on simultaneous equations to investigate the research questions. The dataset is sourced from Amazon.com, a platform where numerous retailers commonly offer indis-

tinguishable items, and third-party retailers autonomously establish product price and shipping policies.

This research presents intriguing results. Specifically, we uncover a reciprocal causal relationship between the proportion of retailers utilizing free shipping strategy and product sales: Retailers increase free shipping promotions during periods of lower sales, while a greater proportion of such retailers substantially amplifies product sales, thereby aiding manufacturer product expansion. Empirical evidence underscores the positive correlation between competition among products and the proportion of free shipping retailers, alongside its adverse impact on product sales. Our findings advocate free shipping as an efficient sales promotion tactic, especially in fiercely competitive markets, where heightened retailer competition propels the adoption of free shipping strategies. Remarkably, retailers boasting higher reputation levels make a positive contribution to manufacturer product sales.

The existing literature has focused on the free shipping decision of individual retailers [1,13–15], and only a limited number of studies have delved into the factors influencing the proportion of free shipping retailers [16]. Moreover, while extensive research has investigated the impact of price promotions on consumers' intentions to make purchases [17–23], a distinct research gap exists concerning the impact of retailers' promotions for free shipping on the sales of manufacturers' products. Additionally, there is a lack of research exploring the reciprocal relationship between retailers' free shipping decisions and product sales. This study aims to address these gaps by analyzing determinants of product sales and retailers' choices regarding free shipping. It considers the interconnectedness between product sales and the market structure concerning the percentage of free-shipping retailers, contributing to both the literature on retailers' decisions and the broader supply chain considerations.

The remaining content of this paper is structured as follows: Section 2 will examine previous literature. Section 3 will establish the conceptual framework and hypotheses. Section 4 will detail the data and methodology. Sections 7 and 8 will present findings and conduct thorough robustness checks. Section 9 discusses the main results. Lastly, Section 10 concludes.

## 2. Literature Review

While the specific research questions of our study remain unexplored, there exist currents of established literature that pertain to our research domain.

### 2.1. Promotion Strategy and Consumers' Purchase Decisions

Previous studies have explored the effects of promotional activities by manufacturers and presented findings indicating that promotional activities have the potential to amplify the consumption of the featured product among existing customers [24–27] and motivate brand substitution [18,21,22,28–30]. Utilizing scanner data within the ketchup and peanut butter segments, Murthi and Rao [21] investigated the influence of promotional activities on consumers' selection of brands and revealed that promotions prompt certain consumers to concentrate solely on the brands being promoted. This impact is notably stronger among consumers who are sensitive to price changes than those who are less conscious of pricing. Promotions may also increase the consumption of new users by reducing consumers' search costs when making purchase decisions. Fader and Mcalister [18] suggested that consumers use simplifying heuristics to screen alternatives before choosing one to purchase, and promotions consumers narrow the alternative brands by excluding brands that lack promotional offerings. Similarly, Siddarth et al. [22] discovered that promotional activities have the potential to broaden a consumer's range of options by incorporating a brand being promoted that would not otherwise be included in their initial consideration set.

While some scholars argue that price promotion harms consumers' perceived quality [31–33]. Suri et al. [32] and Ashworth et al. [33] discovered that significant price decreases can adversely impact consumers' intent to purchase due to the association of lower prices with diminished product quality. From a different perspective, Campbell

and Diamond [31] posited that notable price reductions could elicit skepticism about the company's promotional motives, potentially causing harm to brand image and profitability instead of enhancing purchase intent.

Moreover, existing studies found that retail price promotion positively affects store sales [34–37]. In particular, an increasing number of retailers use free shipping to promote sales [10,17,19,20,23]. Yip and Law [23] used a questionnaire and a convenience sampling method to examine website attributes on user preferences and found that offering free delivery services can attract more online users. Lewis [19] investigated how shipping fees impact customer acquisition, retention, and average spending behavior. The results indicated that providing free shipping exerts a favorable influence on both customer acquisition and retention rates. Lewis et al. [20] explored how shipping charges impact the frequency of orders placed by customers. Their findings revealed that free shipping strategies prove highly efficient in boosting sales. Chatterjee [17] scrutinized the impact of supplementary fees on the perceived value of online promotional offers and the inclination to make purchases, employing experimental tests rooted in mental accounting and price segmentation. The findings revealed that the highest purchase intent was associated with free shipping.

## 2.2. Retailers' Promotion Strategy in the Distribution Channel

The above two trends of research focus on manufacturers' promotions or retailers' promotions. However, usually, manufacturers' products are sold by multiple retailer channels, and price promotions are conducted by retailers directly. Thus, it is necessary to examine the impact of retailers' promotions on brand performance from the channel relationship's perspective.

Kumar and Leone [34] investigated how brand and store substitutes are affected by price promotions implemented within retail stores within an urban area, utilizing store-level scanner data. Their research revealed that the most substantial degree of brand substitution resulted from price promotions. Moreover, price promotions led to store substitution in specific cases. Their findings underscored that the promotional efforts of retailers offer advantages for both retailers and manufacturers. This is attributed to the occurrence of brand substitution, enticing customers from other establishments to make the switch to capitalize on these promotional opportunities. Gilbert and Jackaria [38] compared the effect of four different promotional deals (coupons, markdowns, samples, and "buy-one-get-one-free") within the retail landscape of the United Kingdom's supermarket sector and found that price discount was valid for motivating brand switching. Furthermore, Doern and Fey [39] confirmed that sellers' free delivery service enhances customers' trust and loyalty to products in electronic commerce in Russia. Analyzing shipping policies across multi-retailer and exclusive retailer supply chains using theoretical models, Shao [40] revealed that implementing a free shipping policy in online retailing could lead to reduced customer prices and increased supply quantities for the supplier. This sheds light on the rationale behind suppliers promoting horizontal competition among retailers within an e-commerce context.

## 2.3. Determinants of Retailer Price Promotion Strategy and Free Shipping Promotion

Researchers have studied the effect of a price promotion strategy and determinants of retailer price promotion strategy in depth. Voss and Seiders [41] investigated the impact of sector-level attributes, including the perishability and diversity of product assortments, along with firm-level traits, such as retailer distinctiveness, store count, and average store dimensions, on the dynamics of price promotion choices. Their research was conducted using a dataset comprising 38 firms spanning 11 distinct retail sectors. They found that assortment heterogeneity, scale, and scope also have significant effects, but retailer differentiation has no significant effect. Moreover, although they mentioned competitive and demand characteristics, they did not test these factors. Shankar and Bolton [42] delved into the dynamics of retailers' pricing strategy, exploring how variables influence elements,

such as price consistency, the intensity of price promotions, coordination of price promotions, and the relative pricing of brands. To achieve this, they analyzed a scanner database encompassing 1364 combinations of brands and stores. The study revealed that factors tied to competitors play a pivotal role as determinants of a retailer's pricing strategy. Furthermore, Boatwright et al. [43] examined how retail competition impacts the determination of promotional strategy. This study was facilitated through a distinctive dataset from retail grocery chains. However, they found that retail competition is not important in explaining promotional responses.

The above studies have investigated some determinants of a retail price promotion strategy, but they all ignore brand demand characteristics. Nevertheless, both the realm of marketing theory and practical applications have indicated that a brand's demand level serves as a vital factor in shaping retailers' pricing strategies [44]. Some researchers have confirmed that retailers can learn from the demand data, update their belief on the expected demand for the product and adjust their pricing strategy simultaneously [45–48]. Specifically, Tsao and Sheen [49] built a theoretical model to ascertain the most suitable retail prices, promotional strategies, and replenishment volumes to optimize net profit. They showed that in cases where demand diminishes over time, it is advisable for the optimal retail price to decrease, accompanied by an escalation in the optimal promotional effort. This strategic adjustment aims to bolster demand stimulation.

As free shipping becomes a more common promotion strategy, some papers have studied the determinants of retailers' free shipping promotion decisions [1,13–16]. Gümüş et al. [16] formulated a game-theoretic framework aimed at investigating how a retailer's decision between implementing a free shipping fee versus a flat shipping fee is influenced by the attributes of both the firm and the product at hand. This strategic decision-making process significantly contributes to establishing an equilibrium market structure, particularly concerning the percentage of retailers offering free shipping. The authors then empirically tested the results of their theoretical model using digital cameras and printer data. They found a positive correlation between the percentage of consumers skeptical about shipping charges and the portion of retailers that employ free shipping, while the cost of products has a negative effect. To the best of our knowledge, this study represents the pioneering exploration of retailer shipping policy from the perspective of market structure. Through the game-theoretical model and empirical analysis, Yao and Zhang [1] investigated the pricing equilibrium by delving into the decisions made by Internet retailers concerning the base product pricing, as well as the establishment of shipping schedules. Moreover, the study also examined the intricate dynamics of customer behavior, encompassing their purchasing preferences and shipping choices. The authors mainly focused on the impact of shipping time and found that the shipping fee is negatively associated with on-time delivery probability.

In summary, existing research has investigated the determinants of free shipping decisions [1,13–16]. Specifically, Gümüş et al. [16] examined factors related to the percentage of free shipping retailers in the online marketplace. However, their primary emphasis was on cost-related aspects. Additionally, they did not analyze how the ratio of free-shipping retailers ultimately impacts product sales. Numerous studies have investigated the effect of price promotions on consumers' purchase decisions [17–23]. However, there is a dearth of research concerning the influence of retailers' free shipping promotions on manufacturers' product sales. Furthermore, to our current understanding, no research has delved into the examination of the reciprocal association between retailers' decisions regarding free shipping and product sales. The present study seeks to analyze the determinants of product sales and retailers' choices concerning free shipping while taking into consideration the endogenous interplay between product sales and the market structure concerning retailers' free shipping decisions. This study is anticipated to bridge the existing literature gap about retailers' decisions regarding free shipping, encompassing the determinants of these decisions and the interconnectedness between retailers' free shipping choices and brand demand.



### 3. Conceptual Framework and Hypotheses

#### 3.1. Conceptual Framework

We first develop a conceptual framework to describe the factors affecting the choices made by retailers regarding free shipping within the product distribution channel and consumers' purchase decisions. Within this framework, a reciprocal interaction exists between the ratio of retailers embracing a free shipping strategy and consumers' product demand, wherein each serves as both a causal factor and an outcome. This interdependency gives rise to a challenge of endogeneity. Retailers make their free shipping policy based on product demand, and in turn, retailers' free shipping decisions will affect product demand simultaneously by influencing consumers' purchase decisions.

Within a competitive market environment, a variety of distinct retailers engage in the sale of the focal product. At the same time, some retailers also sell substitutes for the focal product. Each retailer autonomously makes the determination of whether to implement free shipping to maximize its profit, thus, shaping the market structure concerning the percentage of retailers offering free shipping and flat fee shipping. Thus, we propose competition, including the competition the focal product faces (which we name product competition) and competition among retailers (which we name retailer competition) influence the possibility of retailers' free shipping decisions and, thus, the percentage of free shipping retailers. We examine a pair of factors associated with retailer competition, encompassing the number of retailers present within the market and the extent of disparities among these retailers. Besides observing and learning from real-time product sales data, a retailer in the product channel updates its belief about expected product demand and adjusts its free shipping decision.

Secondly, we center around how consumer purchase decisions are influenced by the percentage of retailers that provide free shipping. Free shipping is supposed to affect the behavior of potential and existing consumers in different ways [19]. We suppose that free shipping may affect existing consumers by attracting repeat buying, and it can also attract new consumers and switchers by easing their perception of risk and decreasing search costs, contributing to market expansion. Besides, product competition is also supposed to influence focal product sales as substitutes compete for the market share [50,51]. Furthermore, the sales performance of a manufacturer's product is also contingent on the reputation level of the retailers engaged in its distribution.

#### 3.2. Hypotheses

Based on the above conceptual framework, we develop nine hypotheses, as shown in Figure 1.

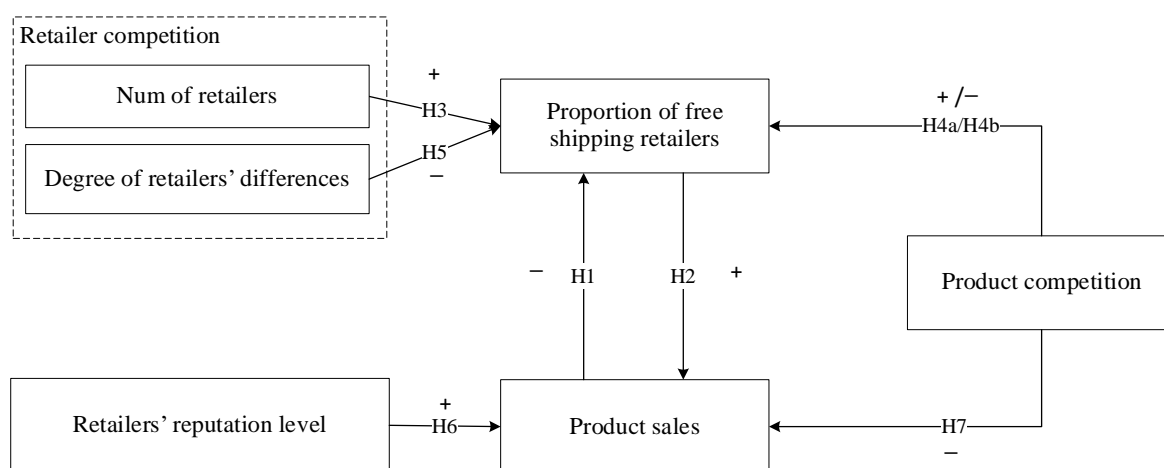


Figure 1. Conceptual framework.

Due to the uncertain and increasingly competitive online retail environment, the practice of dynamic and real-time decision-making is gaining paramount significance. Moreover, Internet retailing facilitates the process for online retailers to gather and harness consumer data at a comparably affordable expense [52]. Using the available real-time sales data of the product, retailers can learn about consumers' arrival rates and update their belief on the expected demand for the product and adjust their pricing strategy simultaneously [47,53]. Usually, adjustments to retail prices and promotional strategies are made in accordance with shifts in market demand, whether upwards or downwards [49]. Specifically, instances of reduced demand frequently serve as a stimulus for corrective measures, and implementing price promotions presents a swift solution to enhance sales performance [47].

Compared to promotions of similar economic value, free shipping leads to a heightened intent to make a purchase [17]. Moreover, shipping fees garner a more pronounced response from consumers compared to the base prices of the products [20]. Thus, when product sales decrease, more retailers in the channel are likely to leverage free shipping fees as a promotional tactic to enhance sales.

**Hypothesis 1 (H1):** *In situations where product sales experience a decline, an increased number of retailers within the channel exhibit a preference for implementing a free shipping approach.*

Given that current customers possess a greater familiarity with overall costs [19], they may be sensitive to the shipping fee. Thus, a retailer's free shipping strategy can attract some consumers to switch from retailers without using a free shipping strategy. Under such conditions, increased adoption of the free shipping strategy among retailers may only induce store-switching behaviors of existing consumers.

However, increased retailers offering free shipping within the market can attract potential consumers. A free shipping strategy helps potential consumers reduce search costs and narrow product consideration set, as there is no need to assess the entirety of product prices if consumers are aware that a reputable brand is currently being promoted [21]. Besides, customers who display brand loyalty may be incentivized to transition to a choice if the price of their less favored brand experiences a substantial reduction [29]. Furthermore, prospects who lack experience with the focal product may perceive a high risk in product quality. Free shipping can function as a risk premium, providing compensation to consumers for the possibility of future returns and thus encouraging consumers' purchase intention [10]. Hence, we assert that increased utilization of free shipping promotions by a greater number of retailers enhances the likelihood of new consumers remembering the promoted product and incorporating it into their range of considerations.

Therefore, although an expanded implementation of the free shipping strategy by numerous retailers within the product distribution channel may induce store switching among existing consumers, it will contribute to market expansion. Then, we have the following hypothesis:

**Hypothesis 2 (H2):** *With amplified adoption of the free shipping strategy among retailers, there will be a surge in sales for the focal product.*

Competition among retailers is the fundamental driver of short-term promotion [54]. The number of retailers is positively related to competitive intensity [55,56]. On the one hand, more retailers in the market provide consumers with more alternative retailers from which to choose. Thus, consumers may focus more on price comparison [57] and be more responsive to a temporary price promotion [43]. Then, a retailer is more likely to use free shipping to promote the product. On the other hand, in a competitive environment, a retailer will react fiercely to competitors' promotion strategies [58]. Therefore, in instances where retailers employ free shipping as a promotional tactic, their competitors may follow their actions. As a result, the possibility arises that an increased number of retailers could adopt a free shipping approach.

**Hypothesis 3 (H3):** *When there are more retailers in the channel, the percentage of retailers who would like to use a free shipping strategy will increase.*

Generally, margins at retail depend on the elasticity of consumer demand [59]. When there are more substitutes, consumers may put more weight on price differences among competing products [57]. Then, retailers dealing with the focal product are inclined to have a higher likelihood of utilizing a promotion strategy, such as free shipping promotion, to gain market share. However, retailers may sell these substitutes in their stores at the same time. With more other substitutes, there is a higher possibility that the profit of promoting the focal product is smaller than the profit loss of existing products. Therefore, to maximize the total category profit, the retailer is less likely to implement free shipping as a means of promoting the focal product. Thus, we have competing hypotheses.

**Hypothesis 4a (H4a):** *The higher the product competition in the market, the more retailers will choose a free shipping strategy.*

**Hypothesis 4b (H4b):** *The higher the product competition in the market, the fewer retailers will choose a free shipping strategy.*

In cases where retailers share similarities, it becomes challenging for each retailer to establish distinctiveness through a higher reputation or better service quality. Consequently, consumers might prioritize the pricing offered by retailers when deliberating on their purchase choices. As a result, retailers' similarity facilitates price competition among retailers. However, if some retailers can differentiate themselves from other retailers, the higher reputation or better service quality could give the retailers competitive advantages to attract consumers. Then, the importance of price promotion reduces, and price elasticity decreases [41]. Therefore, a high degree of difference among retailers dampens price competition, and fewer retailers in the product channel would focus on free shipping promotions. On the contrary, when retailers are similar, more retailers in the product channel would like to use free shipping as a promotion to compete with other retailers. We thus have the following hypothesis:

**Hypothesis 5 (H5):** *If the degree of difference among retailers is lower, more retailers would like to use a free shipping strategy.*

Firstly, reputation commonly serves as the primary indicator of trust [60,61], which is the primary driver of consumers' loyalty in the online environment [62]. Furthermore, loyal consumers are generally likely to repurchase from online retailers [63,64]. Thus, a high retailer reputation contributes to consumer retention. Secondly, although consumers may perceive uncertainty and risk shopping online, especially towards retailers they are not familiar with [65], a higher reputation enhances consumers' trust and mitigates risk perceptions [66]. Moreover, consumers will use the high retailer reputation as a signal of high product quality because the reputable retailer will have an incentive to truthfully represent the quality of the product it sells to protect its reputation [67]. As a result, a better perception of product quality increases consumers' purchase intention. Thus, we have the following hypothesis:

**Hypothesis 6 (H6):** *Higher retailers' reputation level leads to higher product sales.*

Frequently, consumers view products within the same category as near alternatives [68], and especially in established markets, products offered by competitors cannot be significantly differentiated [67]. Thus, an additional product into the market leads only to business stealing [50]. Given the market size, the competitive intensity may arise because of substitution when more products are in the market [51]. That is, some consumers may switch from the focal product to other products. Then, we hypothesize:



**Hypothesis 7 (H7):** *Given the increased competition among products within the market, there is a heightened likelihood of witnessing a decline in the sales performance of the focal product.*

## 4. Methodology

### 4.1. Data

Our data collection encompassed attributes associated with the product (including sales rank, rating of product reviews, and volume of product reviews), traits of retailers (such as pricing, shipping policies, and retailer ratings), and the configuration of the market structure (such as the number of retailers and the count of alternative products available in the market) daily in the “Wipe and Refill” category on Amazon from 26 February 2018, to 9 September 2018. We decided to collect data from the “Wipe and Refill” category because the “Wipe and Refill” category consists of products that are regularly consumed and replenished. These products are often purchased repeatedly over time. By focusing on this category, the research could assess how free shipping promotions influence consumer behavior related to consumer loyalty and retention. Furthermore, the repetitive nature of purchases in the “Wipe and Refill” category could lead to richer sales data. In addition, the “Wipe and Refill” market is competitive. Usually, several retailers sell a product from a single manufacturer. To gather data, we employ an enumeration sampling technique, encompassing the comprehensive collection of all products within the “Wipe and Refill” category. Given the moderate total count of products in the “Wipe and Refill” category, the tracking of all items is feasible.

To streamline data collection, we devised web crawlers programmed to automatically fetch the specified HTML pages and extract related information on a daily basis. To ensure the precision and reliability of these web crawlers, we executed the subsequent validation procedures: (1) Before the actual data collection, we subjected the system to a one-month testing period. (2) Concurrently deploying the web crawlers on two servers, we scrutinized the collected data for consistency to establish data integrity. These servers also functioned as mutual backups, minimizing the risk of program failure. (3) Our web crawlers have error-handling mechanisms. In instances where access to a web page is denied, or data extraction fails, the spiders log the encountered issues for subsequent review. (4) We consistently monitor the performance of the web crawlers and update their algorithms to adapt to changes in website structures or data formats. (5) A daily routine involves a manual assessment of the web crawlers’ reliability. This encompasses validation of scraped data, identification of discrepancies, and correction of errors.

During the data period, 2791 products were observed. We focus on third-party retailers in the online marketplace. The reasons behind are: (1) Amazon uses the same shipping policy for products, that is, threshold-free shipping. (2) In this category, third-party retailers independently set retail product prices and shipping fees. (3) Third-party retailers are usually small and medium retailers who do not have a cost advantage and care more about making shipping fee decisions. In the realm of Amazon, third-party retailers employ two distinct types of free shipping policies. The first type entails unconditional free shipping, wherein retailers provide free shipping regardless of the final purchase value for the end consumer. The second type is threshold-free shipping, facilitated through Amazon’s fulfillment services, and it requires that the total purchase value to exceed \$25 [16]. Within this study, our focal point is unconditional free shipping. It is noteworthy that when the term “free shipping” is referenced throughout our analysis, it pertains specifically to the context of unconditional free shipping. In summary, the available sales data and retailers’ shipping policy data make Amazon.com an ideal setting for us to study the relationship between product sales and retailers’ free shipping decisions.

### 4.2. Variable Measurement

Listed below are the measurements for the primary variables.

The proportion of free shipping retailers (*free\_proportion*). Retailers offering the product retain the autonomy to individually choose between implementing a free shipping strategy or a flat fee shipping approach. This variable is measured by calculating the ratio

of retailers employing a free shipping strategy to the overall count of retailers operating within the product market.

Product sales ( $\ln(\text{sales})$ ). Earlier studies indicate that the connection between the natural logarithm of sales and the natural logarithm of rank follows an approximate linear pattern:  $\ln(\text{sales}) = 9.825 - 0.78 * \ln(\text{rank})$  [69]. Consequently, we utilize this method to transform sales ranks into corresponding sales figures.

Product competition (*product\_competition*). The variable is quantified by calculating the mean count of alternative products retailed within the category by the retailers operating within the product channel.

The number of retailers (*num\_retailers*). The quantification of the variable is conducted based on the count of retailers providing the product.

Retailers' reputation level (*retailers\_reputation*). Retailers' ratings are viewed as an online retailer's reputation [70]. The variable's measurement is executed through the weighted mean rating attributed to retailers engaged in product sales. Retailer size is indicated by the aggregate ratings received by the retailer because the retailer with higher total ratings tends to be bigger.

Degree of retailer's difference (*degree\_retailers\_difference*). We calculate the degree of difference between retailers in the product channel as the variance of retailers' ratings. The lower variance of retailers' ratings means that retailers are more similar to each other.

Control variables. Generally, Amazon's merchandise typically garners substantial sales figures, and thus independent retailers' decisions may be affected by Amazon. Hence, we introduce the *Amazon\_dummy* variable to regulate the presence of Amazon as a vendor for the product. When Amazon retails the product, the value of *Amazon\_dummy* is set to 1; otherwise, it is designated as 0. We also control the product price level *price\_level* and capture it by the minimum of retailers' total prices in the product channel. We use the product price level as a proxy of product cost because they are highly correlated [16]. Price levels for retailers are significantly influenced by costs, which remain a key determining factor. Furthermore, the greater the expense associated with the product and/or shipping, the more likely retailers are to impose shipping charges to offset a portion of those expenses [16]. Moreover, pricing significantly influences consumers' purchase decisions, and typically, a price increase corresponds to a decrease in product sales. Besides, we contain product review valence *product\_review\_valence* and product review volume *product\_review\_volume* that most previous literature has proved to be related to product sales [69,71–74]. We measure the product review valence by the average numeric ratings and the volume of product reviews by the total count of reviews [69,74]. Moreover, we incorporate a binary variable *review\_volume\_dummy* to control products lacking reviews. When a product lacks reviews, *review\_volume\_dummy* is set to 0; conversely, when reviews are present, it is designated as 1.

Table 1 provides a summary of the key factors encompassed in the model, presenting their descriptive statistics.

**Table 1.** Descriptive statistics of key model variables.

	M	SD	Min	Max
<i>free_proportion</i>	0.56387	0.41061	0	1
<i>ln(sales)</i>	7.05289	1.09145	0	8.183627
<i>num_retailers</i>	3.59588	4.10415	1	33.5357
<i>product_competition</i>	27.5471	36.7330	0	196
<i>retailers_reputation</i>	4.72888	0.31207	1	5
<i>degree_retailers_difference</i>	0.12421	0.15138	0	1.7354
<i>Amazon_dummy</i>	0.07734	0.26714	0	1
<i>price_level</i>	33.37862	32.07036	0.01	350
<i>product_review_valence</i>	4.092082	0.634003	1	5
<i>product_review_volume</i>	26.6548	177.7016	0	3864
<i>review_volume_dummy</i>	0.4134345	0.4924681	0	1

## 5. Empirical Model

The conceptual framework presented in the previous sections suggests the bidirectional link between product sales and the percentage of free shipping retailers. That is, the increases in product sales are attributed to the increases in the ratio of retailers employing free shipping. On the other hand, retailers make their shipping fee decisions according to product sales simultaneously. To account for this mutual interaction, we estimate a system of two simultaneous equations.

*The proportion of free shipping retailers.* Retailers make strategic decisions regarding deciding between implementing free shipping or applying shipping charges, which consequently shapes the market structure concerning the percentage of retailers providing free shipping. Here, we model the percentage of retailers adopting the practice of free shipping for the sale of product  $i$  during month  $t$   $free\_proportion_{it}$ , as a function of the product sales, the number of retailers, the degree of retailers' difference, and the competition faced by the product, as follows:

$$\begin{aligned} free\_proportion_{it} &= \delta_0 + \delta_1 \ln sales_{it} + \delta_2 num\_retailers_{it} + \delta_3 product\_competition_{it} \\ &+ \delta_4 degree\_retailers\_difference_{it} + \delta_5 price\_level_{it} \\ &+ \delta_6 Amazon\_dummy_{it} + \varepsilon_{1it} \end{aligned} \quad (1)$$

We control whether Amazon sells in the product channel  $Amazon\_dummy_{it}$  and the product price level  $price\_level_{it}$ . The error term,  $\varepsilon_{1it}$ , encompasses additional variables influencing the ratio of retailers adopting free shipping practices.

*Product sales.* We model the key dependent variable of interest, the product sales  $\ln sales_{it}$  of product  $i$ 's at month  $t$ , as a function of the ratio of retailers who use free shipping to deliver the product, the retailers' reputation level, and product competition, as follows:

$$\begin{aligned} \ln sales_{it} &= \beta_0 + \beta_1 free\_proportion_{it} + \beta_2 retailers\_reputation_{it} \\ &+ \beta_3 product\_competition_{it} + \beta_4 product\_review\_valence_{it} \\ &+ \beta_5 product\_review\_volume_{it} + \beta_6 price\_level_{it} \\ &+ \beta_7 Amazon\_dummy_{it} + \beta_8 review\_volume\_dummy_{it} + \varepsilon_{2it} \end{aligned} \quad (2)$$

We contain product characteristics, including product review valence, product review volume, whether Amazon sells the product, and the product price level as control variables. Moreover, we control whether the product has no reviews  $review\_volume\_dummy_{it}$ . The error term,  $\varepsilon_{2it}$ , encompasses additional variables influencing product sales.

## 6. Estimation

In the simultaneous equations model, the endogenous dependent variables are the percentage of free-shipping retailers  $free\_proportion_{it}$  and product sales  $\ln sales_{it}$ . The two equations have exclusion restrictions for identification. The first equation has two variables excluded from the second equation: the number of retailers  $num\_retailers_{it}$  and the degree of retailers' difference  $degree\_retailers\_difference_{it}$ . These two variables directly influence the proportion of free shipping retailers without any direct impact on product sales. Similarly, the second equation is identified by variables excluded from the first equation: the product review valence  $product\_review\_valence_{it}$ , the volume of product reviews  $product\_review\_volume_{it}$ , and  $review\_volume\_dummy_{it}$ . In order to account for individual differences and mitigate the influence of unobserved variables that often obfuscate causal effects, we utilize the panel data fixed-effect mode. Additionally, we analyze the simultaneous equation model through the utilization of two-stage least square techniques, which are well-suited for panel-data frameworks characterized by endogenous covariates. The steps of the estimation approach are as follows: In step 1, the endogenous variables are fitted using all the exogenous variables. The fixed-effects regression technique is employed to estimate both endogenous dependent variables. Moving to step 2, we substitute the initial pair

of endogenous variables with the forecasted values of endogenous variables derived from the preceding step. Subsequently, we proceed to reevaluate the fixed-effects regression.

Additionally, we conducted an examination of the Variance Inflation Factor (VIF) for each model and identified no instances where VIF values exceeded the threshold of 10. This observation underscores the absence of multicollinearity concerns within the model. As there is more than one variable excluded from one equation, we test the overidentifying restrictions using the Sargan–Hansen test. The overidentification test shows that exclusion restrictions are valid for both equations since the statistics are not significant at any conventional significance. The findings have been documented in Table 2.

**Table 2.** Overidentification test results.

	Retailers' Free Shipping Decision Equation	The Product Sales Equation
$\chi^2(df)^a$	5.902	1.860
$p \geq \chi^2$	0.1165	0.1727

Additionally, we perform a Hausman test to contrast the efficacy of the fixed effects and random effects. The analysis reveals a preference for the fixed effects model over the random effects model. Detailed outcomes of both the fixed effects model and the random effects model are available in Table 3.

**Table 3.** Main estimation results.

		(1) Fixed Effect		(2) Random Effect	
		Coef.	Std. Err.	Coef.	Std. Err.
<i>free_proportion<sub>it</sub></i>					
<i>lnsales<sub>it</sub></i>	H1	−0.254 **	0.0816253	−0.00882	0.0166568
<i>num_retailers<sub>it</sub></i>	H3	0.00920 ***	0.0015344	0.0102 ***	0.0011036
<i>product_competition<sub>it</sub></i>	H4a/H4b	0.000324 ***	0.0000969	0.000519 ***	0.0000795
<i>degree_retailers_difference<sub>it</sub></i>	H5	−0.00282	0.0186558	0.0277	0.0167905
<i>price_level<sub>it</sub></i>		−0.00123 ***	0.0002747	0.0000338	0.0001517
<i>Amazon_dummy<sub>it</sub></i>		−0.0679 **	0.0222137	−0.123 ***	0.0120257
<i>intercept</i>		1.619 ***	0.3373676	0.561 ***	0.0707634
<i>lnsales<sub>it</sub></i>					
<i>free_proportion<sub>it</sub></i>	H2	1.792 ***	0.4517562	2.068 ***	0.2235754
<i>retailers_reputation<sub>it</sub></i>	H6	0.146 ***	0.0293882	0.203 ***	0.0268116
<i>product_competition<sub>it</sub></i>	H7	−0.000922 **	0.0002841	−0.00150 ***	0.0002506
<i>product_review_valence<sub>it</sub></i>		−0.0405	0.0226831	−0.00686	0.0183446
<i>product_review_volume<sub>it</sub></i>		0.001000 *	0.0004987	0.00103 ***	0.0001134
<i>price_level<sub>it</sub></i>		−0.00106	0.0006267	−0.00272 ***	0.0003728
<i>Amazon_dummy<sub>it</sub></i>		0.427 ***	0.0592951	0.550 ***	0.037985
<i>review_volume_dummy<sub>it</sub></i>		0.179 ***	0.0411882	0.563 ***	0.0272261
<i>intercept</i>		2.711 ***	0.3268241	1.991 ***	0.1960923

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

## 7. Results

Our results show that most hypotheses are supported except Hypothesis H5. Our analysis reveals a significant negative relationship between product sales and the market structure, specifically concerning the percentage of retailers offering free shipping, supporting Hypothesis H1. The findings reveal that a 1% increase in product sales leads to a reduction of 0.254% in the proportion of retailers opting for a free shipping strategy. Furthermore, the percentage of retailers offering free shipping has a significant and positive impact on product sales, consistent with H2. The results show that if the proportion of retailers who use free shipping increases by 1%, the product sales will increase by 1.792%.

We found that product competition significantly influences both the percentage of free shipping retailers and product sales. The coefficient of *product\_competition<sub>it</sub>* the first equation shows the positive and significant direct effect of product competition on the ratio of free-shipping retailers in the market, supporting H4a. The direct effect is  $\hat{\delta}_3 / (1 - \hat{\beta}_1 \hat{\delta}_1)$

(0.0002227). Here,  $1 - \hat{\beta}_1\hat{\delta}_1$  is a multiplier that accounts for the reciprocal relationship between the percentage of free shipping retailers and product sales. However, when considering the interaction between product sales and the percentage of free-shipping retailers, the overall effect of product competition on the proportion of free-shipping retailers  $(\hat{\delta}_1\hat{\beta}_3 + \hat{\delta}_3)/(1 - \hat{\beta}_1\hat{\delta}_1)$  is positive but larger than the direct effect, which is 0.0003836. This suggests that retailers are inclined to enhance product promotion through the offer of free shipping when there are more other substitutes. Moreover, the direct impact of *product\_competition<sub>it</sub>* on product sales  $\hat{\beta}_3/(1 - \hat{\beta}_1\hat{\delta}_1)$  (−0.0006336) is significantly negative, supporting H7. Although the indirect impact of product competition on product sales through the proportion of free shipping retailers  $\hat{\beta}_1\hat{\delta}_3/(1 - \hat{\beta}_1\hat{\delta}_1)$  (0.0003990) is positive, it is smaller than the negative direct impact. Therefore, the overall effect of product competition on product sales  $(\hat{\beta}_1\hat{\delta}_3 + \hat{\beta}_3)/(1 - \hat{\beta}_1\hat{\delta}_1)$  is still negative, which is −0.0002346.

Except for product sales, the number of retailers in the distribution channel demonstrates a notably positive influence on the proportion of retailers offering free shipping within the market, supporting H3. It suggests that when more counterparts are in the channel, each retailer's possibility to use free shipping promotion increases, and thus the percentage of free shipping retailers in the channel increases overall. Although the impact of the degree of retailers' difference on the percentage of free shipping retailers is negative, as the H5 supposed, it is insignificant. The coefficient of the control variable, product price level *price\_level<sub>it</sub>*, which is a proxy of the product cost in the first empirical equation, is significantly negative. It reveals that retailers may charge shipping fees to recoup some of those costs. The coefficient of the other control variables *Amazon\_dummy<sub>it</sub>* is negative and significant in the first equation, indicating that retailers are less likely to use free shipping promotions when there is Amazon in the market.

Furthermore, the level of reputation held by retailers exerts a notably positive influence on product sales. This implies that consumers demonstrate a willingness to buy products from retailers possessing a favorable reputation. It is consistent with H6. Similar to much of the preceding research, our findings indicate a noteworthy positive correlation between product review volume and online product sales. However, the impact of online review sentiment (valence) remains statistically insignificant. In the second equation, there is a notable and statistically significant negative correlation with the price level. This observation implies that products with higher prices tend to experience lower sales compared to their lower-priced counterparts. Nevertheless, *Amazon\_dummy<sub>it</sub>* has a significant positive on product sales. It is not surprising that consumers prefer a product sold by Amazon.

## 8. Robustness Check

In the main model, we employ the two-stage least squares method to gauge the simultaneous equations model, accounting for panel data fixed effects. We now try to estimate the simultaneous equations model using the three-stage least square method. As we use the panel data, we cannot use the three-stage least square directly. First, we transform all variables that commence with a specific prefix into a format suitable for fixed-effects estimation. Then, we use the three-stage least square method to estimate the converted variables. The results are presented in Table 4. Our examination employing these estimation techniques produces similar outcomes.

**Table 4.** Robustness check-Estimation results of three-stage least square.

	(1)	
	Three-Stage Least Square	
	Coef.	Std. Err.
<i>free_proportion<sub>it</sub></i>		
<i>lnsales<sub>it</sub></i>	−0.254 ***	0.0724819
<i>num_retailers<sub>it</sub></i>	0.00913 ***	0.0013619
<i>product_competition<sub>it</sub></i>	0.000322 ***	0.000086



Table 4. Cont.

	(1) Three-Stage Least Square	
<i>degree_retailers_difference<sub>it</sub></i>	0.00467	0.0158196
<i>price_level<sub>it</sub></i>	−0.00122 ***	0.0002438
<i>Amazon_dummy<sub>it</sub></i>	−0.0681 ***	0.0197251
<i>intercept</i>	1.671 ***	0.3151518
<i>lnsales<sub>it</sub></i>		
<i>free_proportion<sub>it</sub></i>	1.784 ***	0.4010945
<i>retailers_reputation<sub>it</sub></i>	0.147 ***	0.0255882
<i>product_competition<sub>it</sub></i>	−0.000921 ***	0.0002523
<i>product_review_valence<sub>it</sub></i>	−0.0277	0.0193313
<i>product_review_volume<sub>it</sub></i>	0.00118 **	0.0004251
<i>price_level<sub>it</sub></i>	−0.00107	0.0005564
<i>Amazon_dummy<sub>it</sub></i>	0.426 ***	0.0526336
<i>review_volume_dummy<sub>it</sub></i>	0.170 ***	0.0356174
<i>intercept</i>	2.659 ***	0.2886788

\*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

## 9. Discussion

Our main results explain the mechanism of how market structure concerning the percentage of free shipping retailers interacts with product sales. Firstly, the results suggest that retailers rely on product sales to make their free shipping decisions. According to the product sales data, retailers update their beliefs of expected product demand and adjust free shipping decisions. Although free shipping increases shipping costs, it can boost sales. Therefore, when the expected product demand is low, a growing number of retailers are inclined to adopt free shipping as a promotional strategy to expedite sales growth. As we discussed above, free shipping is more efficient than other equivalent promotion strategies. Although free shipping increases shipping costs, it can boost sales and reduce inventory costs. Overall, the return of a retailer's free shipping when the product demand is low is relatively high. On the contrary, given other factors, when the product demand is high, and consumers have a high willingness to pay, it is less necessary to use free shipping promotion because it can cause a loss of consumer surplus.

Secondly, the percentage of retailers offering free shipping exerts a notably positive influence on product sales, which means as the prevalence of free shipping among retailers within the product channel increases, consumers display a heightened willingness to pay for the product. Intuitively, the product market encompasses both current consumers and prospective consumers. We suggest that retailers' free shipping not only motivates repeat buying of existing consumers but also attracts consumers to switch from another product and new consumers in the market. These results confirm that free shipping is an effective promotion strategy for retailers, especially in an environment of fierce competition. However, different retailers should decide about free shipping promotions considering their cost and economies of scale. Although free shipping promotion can boost sales rapidly in the short term, it is not sustainable long term as retailers should bear high shipping costs. Therefore, we suggest small and medium-sized retailers without cost advantages, or economies of scale should take a long view of free shipping promotion. Moreover, previous studies suggest that direct price reduction promotion may negatively affect product quality perception [10,11], which has a detrimental impact on manufacturers. However, the promotion of free shipping is closely tied to the quality of shipping services offered by retailers and has no impact on consumers' perception of product quality. Therefore, although free shipping promotion is costly for manufacturers, it is an effective promotion that may not damage product image/brand image. We recommend that manufacturers allocate a larger portion of their marketing budget to incentivize retailers towards adopting free shipping promotions, as opposed to alternative price reduction strategies. This strategic shift is anticipated to yield more favorable outcomes.

One interesting finding of our research is the role of product competition. It decreases sales and encourages a higher number of retailers to adopt a free shipping strategy. On the one hand, when considering the interactive relationship between the percentage of free shipping retailers and product sales, the overall effect of product competition on the proportion of free shipping retailers is more substantial. Product competition increases consumers' price sensitivity, directly moderating the return of a retailer's free shipping strategy. Then, a growing inclination among retailers to embrace a free shipping strategy. Besides, intense product competition drives consumers to shift from one product to another, which hurts the focal product demand. As a result, the decreased expected demand caused by increased product competition will further encourage more retailers to use a free shipping strategy. On the other hand, when considering the positive impact of product competition on product sales through the percentage of free-shipping retailers, the overall effect of product competition on product sales decreases. With more highly substitutable products, retailers would like to seek opportunities to prevent the loss of consumers by using a free shipping strategy, which eases the negative effect of product competition on product sales.

Our findings also show that intensive competition among retailers in the channel motivates more retailers to use the free shipping strategy. We suggest that, on the one hand, retailer competition can increase the pay-off of a retailer's free shipping strategy. On the other hand, facing peer pressure, retailers in the market would like to follow competitors' promotion strategies.

Furthermore, our results suggest a higher retailer's reputation level can enhance consumers' trust and ease the perception of risk, which contributes to consumer acquisition and consumer retention. However, although selling through built retailers can contribute to manufacturers' sales, online retailers who have more power than manufacturers may hurt manufacturers' profits. For example, Amazon may require manufacturers to subsidize its cost [44]. We suggest that manufacturers should focus on their channel strategy.

## 10. Conclusions

Amidst the swift advancement of E-commerce, more and more small and medium-scale retail enterprises are moving online, and one of the biggest challenges they face is shipping fee decisions. Moreover, it is also vital for manufacturers to know whether retailers' free shipping is beneficial. The paper used a panel data simultaneous equation model to examine factors influencing the choices made by retailers regarding free shipping options, as well as their impact on product sales for manufacturers, considering the bidirectional relationship between the retailers' free shipping decisions and online product sales. We capture the causal relationship between the percentage of free shipping retailers and product sales. On the one hand, when product sales are lower, more retailers in the market would like to boost sales by using free shipping promotions. On the other hand, the proportion of retailers offering free shipping has a statistically significant positive effect on product sales, indicating that the increased adoption of a free shipping strategy by retailers contributes to the expansion of the manufacturer's product reach.

The empirical results further demonstrate that product competition has a positive impact on the proportion of retailers adopting free shipping within the market while concurrently exerting a negative influence on product sales. We found that competition among products has a more substantial positive effect on the percentage of free shipping retailers considering the interactive relationship. It is important to highlight that product competition has a direct negative impact and an indirect positive impact on product sales. Intensive competition among products decreases product sales, but retailers would like to seek opportunities to prevent the loss of consumers using a free shipping strategy, which mitigates the negative impact of competition among products on product sales.

Our results confirm that free shipping is an efficient promotion strategy to boost manufacturers' sales when there is intense competition in the market. We suggest that manufacturers should prompt retailers to utilize promotional strategies involving free ship-

ping instead of opting for direct price reduction promotion because direct price reduction promotion may negatively affect product quality perception or brand image [31,33] while the free shipping promotion is closely associated with the quality of shipping services provided by retailers. Moreover, competition among retailers drives more retailers to use free shipping strategies. We suggest that one reason is that increased competition makes consumers more price-sensitive, and thus retailers would like to use free shipping to attract consumers. The other reason is that retailers are more likely to follow competitors' promotion strategies when facing intensive competition. We also found that retailers with higher reputation levels will contribute to manufacturers' product sales.

### *10.1. Theoretical Implications*

First, this paper sheds new light on the factors motivating online retailers to adopt a free shipping strategy. While the significance of an online free shipping strategy is widely acknowledged, how retailers should make a free shipping strategy is not well studied. Our finding shows the importance of product sales, competition among retailers, and competition among products in driving retailers' free shipping decisions.

Second, we also extend past research on online consumers' purchasing behaviors. There is rich literature on online consumers' purchasing behaviors, but most of the research focuses on the effect of online reviews. However, our research analyzes how retailers' free shipping decisions, retailers' reputations, and competition among products affect the behaviors of different types of consumers, such as brand switching and repeat buying.

Third, we also highlight the relationship between retailers' promotion strategies and product sales from the perspective of the channel relationship. Although abundant studies have examined the effect of retailers' promotion strategies, studies on how retailers' promotion strategies affect a manufacturer's product sales are rare. Moreover, these researchers ignored the two-way relationship between retailers' promotion decisions and product sales.

### *10.2. Managerial Implications*

As free shipping is becoming more and more popular, it is crucial for retailers, especially small and medium retailers who do not have a cost advantage, to know how to make a rational shipping decision. Our findings of the drivers of free shipping decisions provide guidelines to make free shipping decisions. Furthermore, the results emphasize the importance of learning and dynamic pricing strategy in the competitive e-commerce environment. To keep their product profitable, retailers must monitor market changes and adjust marketing strategies in time.

For manufacturers, understanding insights from analyses of retailers' free shipping decisions gives them inspiration for their marketing support investment. In their efforts to enhance product sales, manufacturers have dedicated substantial resources to promotional activities. Our results show that free shipping is an efficient promotion strategy for both retailers and manufacturers as it is beneficial for consumers' retention and market expansion and is unlikely to harm the consumers' perceived product quality. Besides, it also gives manufacturers inspiration about cooperation strategy with retailers. Small manufacturers can think about selling through built retailers to free-ride their good reputation.

### *10.3. Limitations and Further Research*

To begin, our study centers on a distinct setting: the Wipe and Refill category found on Amazon.com. This unique context serves as the backdrop for addressing our research questions. If the data were accessible, a comparative analysis of retailers' choices concerning free shipping could be extended to encompass various product categories. While our dataset is drawn from the year 2018, it is crucial to acknowledge the transformative impact that COVID-19 has exerted on the E-commerce landscape. As data encompassing the COVID-19 era and subsequent periods become available, we may consider a re-evaluation of retailers' strategic choices regarding free shipping and its influence on manufacturers'

sales. This underscores the pivotal role of investigating post-pandemic data to deepen our understanding of E-commerce dynamics. Moreover, our study delves into evaluating the influence of retailers' free shipping policies on the sales performance of manufacturers' products. In instances where detailed sales data for individual retailers is accessible, a more comprehensive exploration could involve scrutinizing the impact of a specific retailer's free shipping approach on their sales, along with an assessment of how the free shipping decisions of other retailers might influence their sales outcomes. However, our study focuses on retailers operating exclusively within the Amazon Marketplace, which inherently bears limitations when it comes to representing the entirety of the market. Examining the broader influence of Amazon on retailers situated outside its ecosystem is an enticing avenue for future exploration.

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