Investigating Sales Spillover Effects of Online Product Sampling in E-commerce

(Research-in-progress)

Product sampling or trial has always been a popular and effective promotional tactic to boost product sales and introduce new products (Pinsker 2014; White 2013). The proliferation of the Internet and other digital media has enabled a new generation of product sampling, moving this offline promotional tactic to the online context (Yao et al. 2014). Large e-commerce websites, such as Taobao and JD[1], have introduced their own online product sampling portals as a complimentary service to their e-commerce counterparts. These online sampling portals feature hundreds of product sampling campaigns from a variety of retailers and are garnering increasing attention from thousands of customers every day[2]. Since giving away free samples involves costs, it is imperative for retailers and store-owners to understand the impact of online product sampling so as to justify their investment. This study, hence, intends to examine various sales spillover effects due to conducting online product sampling campaigns on E-commerce platforms. With a comprehensive literature review on product sampling and spillover effects, we identify four gaps in the literature that motivate our study.

Firstly, despite the rich literature on offline sampling of physical goods (e.g.,Bawa and Shoemaker 2004; Heiman et al. 2001; Heiman and Muller 1996; Marks and Kamins 1988) and online trials of digital or information goods (e.g., Chellappa and Shivendu 2005; Cheng and Liu 2012; Lee and Tan 2013; Niculescu and Wu 2014), there is scant research and empirical evidence documenting the economic impact of sampling of physical goods through online channels. Compared to traditional product sampling of physical products, online sampling of physical products could reach more customers in a low-cost manner and stimulate more customer purchases by increased exposure, acquisition of potential loyal customers and quality signaling (Yao et al. 2014). Sampling physical products through online channels might hence create a different scale of impact on sales. Till now, however, there is only one recent study exploring the impact of providing physical products' samples on sales of the focal product through the emerging online sampling platforms (Yao et al. 2014).

Secondly, previous studies have shed little light on the spillover effects of product sampling campaigns. Sales spillovers occur when promotions of one product influence the sales of other products that are not the target of the original promotions. Despite the rich research on various spillover effects due to advertising and retailer promotions (e.g., Balachander and Ghose 2003; Garthwaite 2014; Nijs et al. 2001; Sahni 2014), the possible spillover effects of product sampling on sales have not received sufficient attention, let alone the sales spillover effects in online product sampling platforms. Without accounting for potential spillovers, the actual effects of offering free samples have a significant risk of being estimated incorrectly.

Thirdly, there is currently no research examining the effects of online product sampling by incorporating the unique characteristics of online product sampling campaigns. Most of the online product sampling platforms follow a standard campaign procedure. Online retailing stores can choose to start an online product sampling campaign that lasts for a certain period of time, during which customers can apply for the free product samples. At the end of the campaign, a few applicants are selected by the platform to receive and evaluate the product samples. Unlike offline product sampling campaigns in which consumers know about the promotion and obtain the product samples or trials during the same period, online product sampling campaigns promote the product and offer the free samples in two separate periods.

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[1] See http://try.taobao.com/ for Taobao's and http://try.jd.com/ for JD's Trial Center.

[2] See an example of campaign at https://try.taobao.com/item.htm?id=22658467.

Thus, the time lag between the promotional period and actual sampling period might elicit different customer response patterns, resulting in different mechanisms in driving sales.

Fourthly, our study also intends to investigate the moderating effect of product types on the impact of online product sampling. Since consumers' perceptions and beliefs on products are activated by different cues from product attributes (Balachander and Ghose 2003), consumers' responses are likely to vary across product types. Understanding the effect of online product sampling campaigns on different types of products is essential for retailers and marketers to plan their promotion strategies more effectively and efficiently. In particular, we examine experience, search and credence products. Experience goods are those whose characteristics are hard to observe in advance and can only be ascertained upon consumption. Search goods are those whose features and characteristics can be easily evaluated before purchases (Nelson 1970). In contrast, credence products are those products whose attributes cannot be verified even after consumption (Darby and Karni 1973). Therefore, customers face more product uncertainties prior to purchases of experience and credence products than search products. Since conducting online product sampling campaigns is a good way to reduce product uncertainties and customers' perceived risks, the spillover effects are likely to differ across product types.

Based on the aforementioned research gaps, the objective of this paper is to examine various spillover effects of product sampling on sales as well as the moderating role of campaign timing and product type on the spillover effects in online marketplaces[3]. In essence, our research questions are: (1) *How and to what extent does sampling of a product affect the sales of other products in an online store (i.e., in-store spillover effects)?* (2) *How and to what extent does sampling of a product affect the sales of the same product in other stores on the same e-commerce platform (i.e., cross-store spillover effects)?* (3) *How do the in-store and cross-store sales spillover effects differ during and after the online sampling campaigns (i.e., in-sampling vs. post-sampling effects)?* (4) *How do the in-store and cross-store sales spillover effects vary across different product types (i.e., experience, credence and search)?*

In this study, we are especially interested in two types of spillover effects: in-store spillover effect (i.e., the effect of sampling a focal product in an online store on the sales of other products in the store) and cross-store spillover effect (i.e., the effect of sampling a focal product in an online store on the sales of the same product in another store). Online product sampling signals the trustworthiness of the store and helps build up store reputation that could help attract new customers and retain existing customers. Hence, we posit that sampling of a focal product increases the sales of other products in the same store (i.e., in-store spillovers). In addition, the same product sold in two stores could be regarded as close substitutes. Hence, customers who have had good experiences with the product or high perceptions on the product might not care about where the product is sold. Therefore, we posit that sampling of a focal product increases the sales of the same product in another store, resulting in cross-store spillovers. In addition, we investigate the moderating role of campaign timing on the spillover effects (i.e., in-sampling vs. post-sampling effects). During the sampling period, customers might delay their purchases and participate in the sampling campaigns instead. When the campaign ends, with only a small portion of customers winning the free samples, a large number of unsuccessful applicants may then switch to other alternatives in the same store or in another store. Hence, we posit a larger spillover effects after the sampling period than during the sampling period. We also examine the moderating role of product type. In particular, we examine experience, search and credence products.

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[3] This paper mainly focuses on e-commerce platforms with multiple independent stores (e.g., Taobao and eBay).

Experience goods and credence goods are hard to evaluate in advance. Search goods, however, can be easily evaluated before purchases (Nelson 1970). Therefore, customers face more product uncertainties prior to purchases of experience and credence products than search products. During the post-sampling period, customers can use the knowledge gained from the focal products' reports to infer the quality and reduce uncertainties about other close substitutes. Hence, we argue that the sampling of an experience/credence trial product in an online store has a larger post-sampling in-store/cross-store spillover effect, compared to the sampling of a search product.

To investigate our questions, we collected data from Taobao and Tmall, two leading China-based e-commerce platforms under the Alibaba Group. Taobao launched its online sampling platform Taobao Trial Center in 2011 which offers product samples from both Taobao and Tmall stores. All Taobao and Tmall stores can start a product sampling campaign without any registration fees. The campaign lasts for one week, during which customers can apply for the free product samples. The candidates selected by the platform are then eligible to obtain a free sample and are required to write a trial report documenting their experience with the product. The trial reports are also shown together with other standard customer reviews on each product page in Taobao and Tmall store. We wrote computer programs to crawl publicly available trial, product and store information daily from 2 April to 8 May, from 30 June to 25 July, from 4 August to 7 September and from 2 October to 6 November 2015. Our current preliminary analysis is based on data collected in these four periods on 156 trial products and another 156 comparison products in other stores that do not have online product sampling campaigns.

We operationalize all the variables at the product-day level. We then use simultaneous system equations to model the average daily sales of other products sold in the focal store ($lnSales\_other\_focal_{it}$) and the sales of the same product sold in another store without any sampling campaign ($lnSales\_trial\_comp_{it}$) simultaneously. $Sampled_{it}$ denotes whether the focal product's sampling has started on day t, while $InSampling_{it}$ and $PostSampling_{it}$ denote whether it is during sampling campaign and whether it is after sampling campaign respectively. $Experience_i$ ($Credence_i$) denotes the focal product type with 1 for experience (credence) product and 0 otherwise. The interaction terms are also included to investigate the moderating effects of product type on spillover effects. Moreover, we control for product attributes, shop attributes and the demand of the focal product. We also include weekend, month and product dummies. Let τ_i and κ_i denote the unobserved time-invariant heterogeneity effects, and μ_{it} and π_{it} denote the error terms. We hence specify two systems of equations,

$$
\begin{cases}
lnSales\_other\_focal_{it} = \tau_i + \beta_1 Experience_i + \beta_2 Credence_i + \beta_3 Sampled_{it} \\
\qquad + \beta_4 Sampled_{it} \times Experience_i + \beta_5 Sampled_{it} \times Credence_i + Controls + \mu_{it} \\
lnSales\_trial\_comp_{it} = \kappa_i + \theta_1 Experience_i + \theta_2 Credence_i + \theta_3 Sampled_{it} \\
\qquad + \theta_4 Sampled_{it} \times Experience_i + \theta_5 Sampled_{it} \times Credence_i + Controls + \pi_{it}
\end{cases}
\quad \text{(Eqn 1)}
$$

$$
\begin{cases}
lnSales\_other\_focal_{it} = \tau_i + \beta_1 Experience_i + \beta_2 Credence_i + \beta_6 InSampling_{it} + \beta_7 PostSampling_{it} \\
\qquad + \beta_8 InSampling_{it} \times Experience_i + \beta_9 InSampling_{it} \times Credence_i \\
\qquad + \beta_{10} PostSampling_{it} \times Experience_i + \beta_{11} PostSampling_{it} \times Credence_i + Controls + \mu_{it} \\
lnSales\_trial\_comp_{it} = \kappa_i + \theta_1 Experience_i + \theta_2 Credence_i + \theta_6 InSampling_{it} + \theta_7 PostSampling_{it} \\
\qquad + \theta_8 InSampling_{it} \times Experience_i + \theta_9 InSampling_{it} \times Credence_i \\
\qquad + \theta_{10} PostSampling_{it} \times Experience_i + \theta_{11} PostSampling_{it} \times Credence_i + Controls + \pi_{it}
\end{cases}
\quad \text{(Eqn 2)}
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Table 1 shows the preliminary results of our model. We find a significant positive in-store spillover effects but no cross-store spillover effects. We also find that the post-sampling period shows a stronger cross-store spillover effects than the in-sampling period. We also

find that the sampling of an experience product leads to larger in-store post-sampling spillover effects but larger cross-store in-sampling spillover effects. Nevertheless, we find no moderating effect of product type on cross-store spillovers.

In order to address the potential endogeneity issues resulting from omitted variable bias and selection bias, we propose to use difference-in-differences model and Heckman selection model subsequently. By investigating the spillover effects due to online product sampling, we expect our findings to provide important theoretical contributions to the product sampling literature and critical implications for online retailers' online promotional strategy.

Table 1. Preliminary Results

VARIABLES	Eqn 1		Eqn 2	
	lnSales_other_focal	lnSales_trial_comp	lnSales_other_focal	lnSales_trial_comp
lnSales_trial_focal	-0.209**	-0.062	-0.186*	-0.058
	(0.103)	(0.099)	(0.096)	(0.100)
Experience	0.241	4.556*	15.524***	-2.963***
	(0.230)	(2.426)	(3.649)	(0.776)
Credence	0.849***	-2.475***	-0.395	-2.427***
	(0.272)	(0.548)	(0.256)	(0.552)
Sampled	0.106**	0.086		
	(0.043)	(0.053)		
Sampled*Experience	0.243***	-0.119		
	(0.092)	(0.120)		
Sampled*Credence	-0.018	0.029		
	(0.074)	(0.099)		
InSampling			0.149***	0.073
			(0.046)	(0.059)
PostSampling			0.079*	0.095*
			(0.041)	(0.054)
InSampling*Experience			0.006	-0.106
			(0.085)	(0.119)
PostSampling*Experience			0.324***	-0.129
			(0.095)	(0.128)
InSampling*Credence			-0.165**	-0.066
			(0.081)	(0.110)
PostSampling*Credence			0.051	0.062
			(0.072)	(0.101)
Controls_trial_focal	Included	Included	Included	Included
Controls_other_focal	Included		Included	
Controls_trial_comp		Included		Included
Weekend and Month	Included	Included	Included	Included
Product Dummies	Included	Included	Included	Included
Observations	4,234	4,234	4,234	4,234
R-squared	0.636	0.629	0.658	0.631

*** p<0.01, ** p<0.05, * p<0.1

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