

Too Much Preview, Too Little Sales?

The Paradox of E-Book Previews

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Abstract— Online previews and reviews are important sources of product information for consumer purchase decisions. This study investigates how exposure to online previews and reviews affects individual purchase decisions and how these sources of information interact with each other. It also examines how the manner by which previews reduce information asymmetry and thereby minimizes uncertainty in the individuals' utility function. The results show that online previews positively influence individual purchase decisions. There is a U-shaped quadratic relationship between the amount of preview shown and subsequent purchase intentions. The exposure to both previews and reviews poses a greater effect on purchase decisions than does exposure to previews or reviews alone, indicating that previews and reviews are complementary sources of information. The results are also indicative of previews and reviews being substitutes, as the effect of previews decreases as the number of reviews and average review points increases. We conducted a subsample analysis to further investigate how the order of exposure to previews and reviews affects their impact on purchase decisions. The results show that exposure to previews after exposure to reviews has a greater positive influence on individuals' purchase decisions. Also, we show how exposure to previews affects post-purchase consumer satisfaction by measuring the review points given by consumers after the purchase. The results show that individuals who were exposed to previews before purchase are more satisfied with the product than those who purchased the products without exposure to previews.

Keywords— Preview; online consumer reviews; e-book; digital products; decision making; econometrics

I. INTRODUCTION

As digital products (e.g., movie, e-book, music etc.) are experience-goods, consumers cannot accurately predict their utility prior to purchase. Online consumers thus face greater uncertainty regarding product quality especially when little information is provided about the consumption experience. The Internet enables consumers to easily find product information through various technological features such as supplier-provided previews or post-purchase reviews of other consumers. Third party reviews also offer product information, but are usually based on lab testing or expert evaluations. Sometimes, retailers offer free trials of software

or mobile applications to attract consumers. This “freemium” strategy aims to convert free users to paid users, through direct product experience. Such strategies are based on the belief that revealing product information through previews or consumer reviews may promote consumers' purchase decisions by reducing information asymmetry.

Even though there is a large body of research related to online consumer reviews, empirical research on the economic impact of previews on sales of digital products is surprisingly scarce. Due to distinctive attributes of online previews and consumer reviews, however, the impact of these two may act differently on individuals' purchase decision. As the marginal cost of producing digital goods is small compared to physical products, firms face relatively low risk of investment in online previews. However, previews may diminish sales by allowing those who do not need the full product to freely sample the content. Thus, providing an adequate amount of content in the preview to prevent free sampling and maximize the expected utility of consuming the full product, it is important to control the amount of content provided through online previews.

This paper focuses on the impact of previews on consumers' purchase decisions. We also examine how much content should be provided in previews to prevent mere free sampling and increase consumers' purchase likelihood. Given that digital products are single-purchase goods, consumers are unlikely to buy these products when they achieve their goals. Therefore, it is important to control how much content to reveal through previews in order to maximize consumers' purchase intention by reducing information asymmetry but preventing free-riders at the same time. Second, we examine the interaction of previews and reviews, investigating whether they are *substitutes* or *complementary* sources of information. As digital content providers may make conscious decisions regarding the provision of preview and review information, it is important to understand how the two interact to affect individual purchase decision under varying circumstances. We conducted subsample analyses to further investigate the ordering effect of exposure to previews and consumer reviews on individuals' purchase decisions. The results show that the exposure to previews after consumer

reviews generates greater positive influence on individuals' purchase decisions. We further investigate how online previews affect consumer satisfaction after product consumption. We investigate how online previews effectively assist consumers to find the products that best match their preferences through analysis of the review points given to products purchased. We collected panel data which contains records of their exposure to online previews and reviews, as well as their subsequent purchases. This enables us to directly measure the impact of previews and reviews on individual purchase decisions and control for consumer heterogeneity. This unique dataset enables us to study the impact of both preview and review information on purchase decisions.

This study attempt to answer the following questions:

(1) What is the differential impact of preview and review information on individuals' purchase decisions? (2) How much preview information should be provided to consumers in order to increase purchase likelihood? (3) How do preview and review interact to impact individual's purchase decisions? (4) How does the impact of preview differ according to exposure order? (5) How does the exposure to preview affect consumer satisfaction after product consumption?

II. LITERATURE REVIEW

A. Previews and free trials

Product trial and sampling is an important research topic relevant to studies on online previews. Online previews, wherein free sample chapters of e-books are provided, are a form of product trial and sampling designed to encourage consumers to purchase the products. Goaring [1] looks into how incomplete product information from product trials affects consumer demand and expectation regarding product quality. According to the author, the effect of consumer learning from product trials rests on the substance of information collected by consumers and on consumer expectations. In a similar study, Smith [2] delves into the manner by which consumers respond to advertisements and free trials. Exposure to both marketing schemes can induce favorable perceptions of brand performance and lead to purchase decisions. More recently, Bawa and Shoemaker [3] investigate three effects of free samples on product sales; (1) an acceleration effect wherein consumers engage in repeat purchase of a sampled brand earlier than they otherwise would have; (2) a cannibalization effect, in which the number of paid purchases of a brand decreases; and (3) an expansion effect, which triggers purchase by consumers who would not consider buying a brand without a free sample. The findings indicate that free samples exert positive long-term effects on product sales, but that such effects vary extensively.

Given the high uncertainty of digital product quality, offering free product trials is a strategy that is also widely practiced in the online retail industry. One of the increasingly prominent subjects in product trial and sampling research are software "freemiums", in which firms offer light editions or time-locked trial versions of products without charge. Liu et al. [4] show that the high sales ranks and review ratings of free mobile applications increase sales for the paid versions of these apps. Wagner et al. [5] explore whether limiting the number of features available for freemiums is the best

approach to converting users into paying customers. The authors find that maximizing premium fit enhances the probability of user conversion.

Prior literatures suggests that the optimal scheme for offering free trials is to develop programs that guarantee conversion to paid versions of the products. With consideration for consumers' software usage costs, including search and learning costs, Cheng and Tang [6] inquire into the optimal strategy for monetizing limited-version free trial software. The results indicate that network effects moderate the benefit gained from such software and that companies are better off providing free trials rather than segmenting the market with two different product versions. Chen and Liu (2012) examined the optimal timing of free trial software to ascertain how premium versions can be launched and marketed in a way that maximizes sales revenue. While the study found a positive relationship between probability of purchase and demonstration time, purchase probability decreased beyond certain duration of demonstration time provided.

B. Online Consumer Reviews

Many previous studies in the fields of IS and marketing have attempted to unravel the association between online consumer reviews and product sales. Godes and Mayzlin (2004)[7], for example, reveal that the volume of online WOM and television show ratings are positively related. Chevalier and Mayzlin [8] employ the difference-in-differences approach to establish how the online book ratings in two virtual bookstores (Amazon.com and BN.com) affect consumer purchase behavior. Furthermore, Forman et al. (2008) [9] point out that review identity disclosure substantially increases product sales.

Some studies indicate that online consumer reviews are not always positively related to product sales. Duan et al. (2008) [10] find that online consumer reviews pose no significant influence on movie sales. Chen and Xie (2008) [11] illustrate that online consumer reviews considerably affect book sales when online consumer reviews are sufficiently informative. Zhu and Zhang (2010) [12] explore how product and consumer characteristics moderate the effects of online consumer reviews on product sales. The findings show that online reviews are more influential for less popular games and for players with more extensive internet experience.

III. THEORETICAL BACKGROUND

An e-book is a single-purchase product whose quality or characteristics cannot be observed until consumption. In contrast to printed books, which consumers can skim through, e-books cannot be read or sampled before consumers pay for them. Such constrained access increases the information asymmetry regarding the uncertain quality of e-books [13].

This information asymmetry elicits uncertainty and increases the perceived risk of the consequences of purchase. Online previews and online consumer reviews are important sources of information regarding e-books. Enabling access to sample content allows consumers to directly experience a book and decide whether this book suits their tastes. The

reviews posted by other customers who have read an e-book may also aid product evaluation. Online consumer reviews contain subjective information and opinions from which consumers can indirectly experience e-book content. The direct experience acquired from previews and the indirect experience offered by online consumer reviews reduce information asymmetry, thereby minimizing the perceived risk regarding e-book purchase.

A. Information Asymmetry and Risk Perception

Information asymmetry occurs when one of the parties in a transaction has more information than the other [14]. This imbalance also happens when information is unevenly distributed across the parties, thus motivating a transaction participant to use information to take advantage of another [15]. Information asymmetry may arise for experience goods whose quality cannot be evaluated before purchase [13]. The lack of product information prevents consumers from precisely determining the severity of the consequences that may accompany a purchase. According to [13], various marketing signals, such as advertisements or price convey information on product quality and mitigate information symmetry. Information asymmetry is therefore resolved by the increased access to product information.

The Internet has further expanded the channels from which consumers can find information; these avenues include search engines, recommendation systems, and online previews or reviews. Such channels help reduce information asymmetry and risk perception regarding the quality of e-books. Park et al. [16] point to a negative relationship between perceived risk and consumer purchase intention. Given that consumers tend to maximize utility and avoid mistakes, the uncertainty emerging from the consequences of purchase diminishes purchase intention [17]. Theories of information asymmetry and risk perception maintain that online previews and consumer reviews will facilitate purchase decisions by providing increased product information.

B. Information Herding

People tend to emulate others' behavior and conform to the decisions of others. Such *herd behavior* is driven by the predilection for blind assent, wherein people simply go along with others, even when their private information tells them otherwise [18]. Herd behavior stems from the inherent human nature to imitate others. In relation to purchase behavior, people may be led to believe that others have more comprehensive information about a product and therefore want to purchase the product that others bought [19].

The Internet enables convenient access to and sharing of information. Online transactions are characterized by high uncertainty of product quality. This uncertainty prompts consumers to frequently rely on the choices and opinions of other decision makers [18]. Consumers publish product reviews that recount their experiences with products, and others monitor review sites for comments regarding product

quality to use these as bases for deciding on whether to purchase a product [20].

IV. HYPOTHESES

A. Effects of Previews and Reviews on Purchase Decision

1) Effects of Previews on Purchase Decision

The high product uncertainty of experience goods drives consumers to search for information that will aid their evaluation of product quality [16]. Unproductive information seeking occasions a number of problems. The lack of product information and the attendant inability to ascertain product quality bring about information asymmetry. In addition, incomplete information may give rise to inaccurate expectation about a product. These problems are potentially mitigated by online previews given that they grant consumers an introductory experience of e-books and enable the evaluation of correspondence between consumer tastes and books of interest. Using the direct experience rendered by online previews, consumers can reduce information asymmetry and definitively establish product quality. Improvement in these two aspects, in turn, increases purchase intention. With respect to the association between product information and product expectations, Goering [1] states that consumers tend to form expectations about the entire distribution of product quality on the basis of available information. Adequate exposure to online previews may therefore stimulate positive projections about product quality and promote consumer purchase intention. In line with this assumption, we posit that:

Hypothesis 1a: Exposure to previews positively affects purchase intention.

Similar to online previews, online consumer reviews are equally valuable information resources. An important matter for consideration, however, is that the different evaluative modes offered by previews and reviews may act on consumer purchase intention in distinctive ways. Several studies illustrate that direct experience fosters stronger attitudes and more compellingly prompts consumers to ascribe high credibility to products than does indirect experience [21] [22] [23] [24]. Online previews provide consumers hands-on encounters with products after which they evaluate product quality on the basis of their own reading of the previews. Conversely, although online reviews also enable consumers to evaluate product quality, these essentially constitute a secondary (indirect) experience derived from the first-hand experience of others. Direct product experience more effectively builds credibility and stimulates acceptance than does indirect exposure [24]. Hands-on experiences, such as product trials or preview readings, allow consumers to fully interact with products. Such experiences thus provide more concrete information that permits the meticulous evaluation of products.

With regard to the specific context of e-book purchase, these products are consumed primarily for their hedonic value (e.g., pleasure or entertainment). For these commodities, the emotional responses to direct experience are more significant criteria than cognition in the evaluation of product quality. This view is corroborated by Mehrabian and Wixen [25], who report that consumers' emotional responses to video game

trials are strongly correlated with the evaluation of the games. Additional evidence is provided by Kempf [26], who find that hedonic products strongly trigger emotional responses during product trials. Direct experience (i.e., previews) generates more emotional responses than does indirect experience (i.e., reviews), thus exerting more exceptional effect on purchase decisions for e-books. We therefore propose that exposure to previews more profoundly reduces perceived risk than does reading consumer reviews. Such reduction, in turn, leads to higher purchase intention.

Hypothesis 1b: Exposure to online previews poses a greater effect on purchase intention than does exposure to online reviews.

2) Effects of Preview Breadth

Online preview services afford consumers direct product experience for free. Internet-based retailers capitalize on the high uncertainty of product quality by employing free-trials as strategies for attracting consumers. Skype, for example, provides free access to basic features, such as voice over IP, but requires payment for premium functionalities, such as SMS or phone calls. This practice of offering free-trials is called *freemium* and is aimed at converting free users to paying users. The more extensive the initial experience of a product, the higher the confidence in and certainty about product quality. Unlimited free service, however, inspires satisfaction with a product, thereby reducing purchase intention [5]. Given that digital products are single-purchase goods, consumers are unlikely to buy these products when they achieve their buying goals with the help of online previews. The availability of online previews to everyone interested in e-books diminishes demand. A core point at issue, then, is to examine the tradeoff between reduced uncertainty and demand cannibalization. Cheng and Liu [27] indicate that purchase probability initially rises with increasing demonstration time for free software trials, but that such probability decreases with subsequent extension of demonstration time. In line with this discussion, we hypothesize that although substantial content in online previews reinforces purchase intention by reducing product uncertainty, excessive information lessens such intent.

Hypothesis 2: Preview size generates a quadratic effect; that is, the breadth of preview information and purchase intention exhibit an inverted U-shaped relationship.

3) Interaction Effects of Previews and Reviews

Although previews and reviews have different mechanisms of action on consumer purchase decisions, exposure to both may also create synergistic effects on such choices. As previously discussed, dual exposure provides more product information than does reading previews or reviews only. Chen et al. [28] illustrate that increased information sources build high product credibility and motivate trust in a product. Other studies also reveal a positive interaction between direct and indirect experience, wherein access to both engenders a positive synergistic effect on product strength and confidence about product quality. The uncertainty of product quality is hence expected to diminish when consumers access both previews and reviews. Therefore,

we posit hypothesis that the effects of exposure to previews and reviews on individuals' purchase intention are complementary.

Hypothesis 3a: Exposure to both online previews and reviews exerts a stronger effect on purchase intention than does exposure to previews or reviews only.

We employ two review-specific measurements (number of reviews and average review points) in this study in order to measure the moderating effect of different consumer review effects on preview effect. The effects of previews may vary depending on environmental and contextual factors, whose interaction eventually determine purchase decisions [29]. The number of reviews reflects the volume of discussion of corresponding products. The greater the number of reviews, there is higher chance that consumers are more exposed to product information. Also, larger number of reviews seems trustworthy because of the greater amount of information about the products [12]. In a similar vein, theories on herding behavior [18] suggest that an individual's choices may be highly influenced by the decisions made by others instead of by private information. Therefore, the previews may not be as effective as in influencing the purchases of products with small number of reviews, since quality information is available in consumer reviews. This measurement scheme may decrease consumer reliance on online previews.

The average review points reflect the evaluation of the product quality by other consumers. The higher average review points gives impression of high quality providing higher confidence and credibility about the product. This attitude may decrease consumers' reliance on online preview. Herding behavior [18] suggests that individuals' choice may be highly influenced by choices made by others instead of their private information. These observations lead us to believe that effects of previews and reviews *substitute* to each other, where preview effects decrease as the online consumer reviews (i.e., number of reviews and average review points) increase.

Hypothesis 3b: Exposure to previews increase higher purchase intention with decreasing online consumer reviews (i.e., number of reviews and average review points).

The sequence of exposure to previews and reviews may affect purchase intention significantly. Smith [23] explored how consumers combine information from direct experience (i.e., trial) and indirect experience (i.e., advertisement) by using information integration theory. Information integration theory first proposed by Norman H. Anderson [30] describes how people combine information from different number of sources to make overall judgment. One of the key aspects in information integration theory is the effect of the sequence of information. According to Anderson, the difference in impact of information due to sequence of informational stimuli can be explained by primacy effects, change in meaning, and attention decrements. The primacy effects imply that the early information is more likely to be remembered compared to the information presented later. The change in meaning indicates that the impression of early

information distorts the interpretation of later information. Lastly, attention decrement states that people tend to give more attention to prior information than later.

Consistent to hypothesis H1b, direct experience through preview generates higher credibility and higher levels of message acceptance than indirect product experience [2]. Also, direct product experience enhances product consumers' motivation, opportunity, and ability to process product-related information at the point of purchase [31]. Therefore, hands-on experience through previews allows consumers for accurate product evaluation and provides more certainty of product quality.

When consumers are exposed to previews prior to reviews, they obtain product information through direct experience first, and then read product reviews. The greater belief confidence about product quality generated through hands-on experience is more likely to be remembered and more attention will be given compared to information obtained from reviews (primacy effects). Also, the concrete product information from previews may influence information from reviews. Therefore, we hypothesize that:

Hypothesis 3c: Exposure to preview prior to review results in higher purchase intention.

B. Effects of Previews on Product Satisfaction

Review points reflect consumers' evaluation of product quality and product satisfaction. A high review point signifies high quality, thus reflecting consumers' high satisfaction through product experience. A foregoing discussion tells us that previews diminish information symmetry by providing hands-on experience of actual products. Using the direct experience from previews, consumers predict product quality and objectively evaluate the fits between the product and their personal preferences. Therefore, previews role as product evaluating assistant to help consumers to correctly identify the product that matches with their tastes, leading to higher product satisfaction. We formulate the hypothesis regarding exposure to previews and product satisfaction as follows:

Hypothesis 4: The satisfaction of product experience increases after exposure to previews.

V. EMPIRICAL ANALYSIS AND RESULTS

A. Data Description

We analyze unique panel data from June 24, 2015 to August 23, 2015 from one of the leading e-book retailer companies in Korea. Consumers should click through "preview" and "review" tab in book-detailed web page in order to read previews and reviews of the corresponding books. Our data consists of individuals' preview and review click stream data, individuals' transaction data, and log traffic data. The individuals' preview and review click stream data allows us to observe whether individuals are actually exposed to previews and reviews of specific books. We also collected the number of reviews and average review points on each e-book and book characteristics such as preview size, price, whether paper book version exists, and publish dates. The

number of reviews represents volume of discussion and popularity of the e-book, while average review points reflect product quality.

Table 1, and 2 shows description and summary statistics of variables of interest, respectively. Preview_yn and review_yn are dummy variables indicating whether individual i was exposed to preview and review of a specific book j respectively. Preview_size represents the file size of preview, representing the amount of preview of e-book j. The previews of the each e-book are reported to be approximately 5% of the total file size of e-book. Since each e-book has different file size, the number of preview pages provided will be different. Fixed_price represents fixed price of e-book j and pbook_yn is a dummy variable indicating whether paper book version of book j exists. Publish dates is the number of days passed since the e-book j was published.

We excluded series books from our analysis, since the effect of preview would be significantly different from non-series books. The purchase decision on series books may heavily depend on the previous episode of the books, thus the effect of preview of non-series book and series book may differ significantly. We also eliminated free books from our dataset, since free books are usually offered for advertising purposes. For example, novice authors publish free books for promoting their books as well as themselves. Since most of the free books do not offer previews, excluding free books from dataset simultaneously drops out the books without previews.

Our final dataset contained total 458,562 individual levels of observation. There was 4.6% of conversion rate when individuals were not exposed to both preview and review. There was 15.5% and 7.9% of conversion rate when individuals were exposed to previews and reviews, respectively. When users were exposed to both preview and review, the conversion rate was the highest, which was 31.1%. The summary of corresponding data description is given in Table 3.

TABLE I. VARIABLE DESCRIPTION

Variable	Description
preview _{yn}	A binary variable of exposure to online preview (Yes: 1, No:0)
review _{yn}	A binary variable of exposure to online consumer review (Yes: 1, No:0)
preview _{size}	Preview file size
review _{count}	Number of online consumer reviews
avg _{point}	Average consumer review points (Max:5, Min:0)
fixed _{price}	Fixed price
pbook _{yn}	A binary variable of whether paper version exists (Yes:1, No:0)
publish _{date}	Date passed since the book published

Note: preview_yn and review_yn are dummy variables.

TABLE II. SUMMARY OF STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>preview_{yn}</i>	458562	0.187	0.390	0	1
<i>review_{yn}</i>	458562	0.500	0.500	0	1
<i>preview_{size}</i>	458560	1.8326	4.345	0.046	204.760
<i>review_{count}</i>	458562	30.746	54.377	0	407
<i>avg_{point}</i>	363984	4.516162	0.642	1	5
<i>fixed_{price}</i>	458562	4575.625	4583.776	100	279000
<i>pbook_{yn}</i>	458562	0.218	0.413	0	1
<i>publish_{date}</i>	458557	-432.069	456.517	-3137	-2

TABLE III. CONVERSION RATE

	Purchase			Conversion Rate
	No	Yes	Total	
No preview&review	181,331	8,787	190,118	4.6%
Preview only	33,058	6,084	39,142	15.56%
Review only	168,000	14,456	182,456	7.9%
Both preview&review	32,278	14,568	46,846	31.1%

B. Empirical Model

1) Effect of Previews and Reviews on Purchase Decision

The purpose of this paper is to empirically test the effect of exposure to previews and reviews on individuals' purchase decision, and how these source of information interact with each other. We use fixed effect logistic regression and seemingly unrelated bivariate probit model in order to take account for book fixed characteristics and potential selection bias.

a) Fixed Effect Logistic Regression

To estimate the impact of preview, we first consider the following empirical model:

$$\Pr(\text{purchase}_{yn} = 1|X) = \frac{\exp(u_{ijt})}{1+\exp(u_{ijt})}$$

$$u_{ij} > 0 : \text{purchase}_{yn_{ijt}} = 1$$

$$u_{ij} \leq 0 : \text{purchase}_{yn_{ijt}} = 0$$

Where,

$$u_{ijt} = \beta_0 + \beta_1 X_1 + \beta_2(\text{preview}_{yn})_{ijt} + \beta_3(\text{review}_{yn})_{ijt} + \beta_4(\text{preview}_{yn})_{ijt} * (\text{review}_{yn})_{ijt} + \beta_5(\text{preview}_{size})_j + \beta_6(\text{preview}_{size})_j^2 + \beta_7(\text{review}_{count})_{jt} + \beta_8(\text{preview}_{yn})_{ijt} * (\text{review}_{count})_{jt} + \beta_9(\text{review}_{yn})_{ijt} * (\text{review}_{count})_{jt} + \beta_{10}(\text{avg}_{point})_{jt} + \beta_{11}(\text{preview}_{yn})_{ijt} * (\text{avg}_{point})_{jt} + \beta_{12}(\text{review}_{yn})_{ijt} * (\text{avg}_{point})_{jt} + \varepsilon_{ijt}$$

We use fixed effect logistic regression to estimate above equation. The dependent variable is *purchase_{yn_{ijt}}* which is equal to 1 when individual i purchased e-book j and 0 when individual i did not purchased e-book j at transaction point t. *X₁* represents the fixed book characteristics: fixed price, existence of paper book and publish date. *(preview_{yn})_{ijt}* and *(review_{yn})_{ijt}* indicate whether individual i is exposed to online previews or reviews of book j at transaction point t,

respectively. We add quadratic term of *(preview_{size})_j* to observe inverted U-shaped relationship between the amount of preview provided and individuals' purchase decision.

Another issue undertaken in this study is the interaction effects of online previews and reviews. We employ two measures of online consumer reviews: number of reviews and average review points of book j. The number of reviews is an indicator of volume of discussion of corresponding book. The more number of consumer reviews, the more that individuals are exposed to the corresponding book information. The average review points reflect the quality of the book j assessed by consumers after experiencing the products. In order to observe interaction between preview effects and review effects, we interact *(preview_{yn})_{ijt}* with *(avg_{point})_{jt}* and *(review_{count})_{jt}*.

The interaction effect of exposure to previews and reviews may differ according to exposure sequences of the two. We conducted subsample analysis to investigate whether the sequence of exposure to previews and reviews act differently to individuals' purchase intention. We employed *(preview_{first})_{ijt}* dummy variable which equals 1 when individual i was exposed to previews prior to reviews (otherwise equals 0). We conducted fixed effect logistic regression to estimate following models:

$$\Pr(\text{purchase}_{yn} = 1|X) = \frac{\exp(u_{ijt})}{1+\exp(u_{ijt})}$$

$$u_{ij} > 0 : y_{ijt} = 1$$

$$u_{ij} \leq 0 : y_{ijt} = 0$$

Where,

$$u_{ijt} = \beta_0 + \beta_1 X_1 + \beta_3(\text{preview}_{first})_{ijt} + \beta_4(\text{preview}_{size})_j + \beta_5(\text{preview}_{size}_{sq})_j + \beta_6(\text{review}_{count})_{jt} + \beta_7(\text{avg}_{point})_{jt} + \varepsilon_{ijt}$$

b) Seemingly Unrelated Bivariate Probit Model

One may argue that the exposure to previews may be correlated with some unobserved factors which may influence individuals' purchase decision. For example, consumers' exposure to previews may reflect their strong interest in making purchases of corresponding books. (Moe 2003) This may create self-selection issues in our analyses and would lead to inconsistent estimates of our results. In order to address such potential selection bias, we use instrumental variables for *(preview_{yn})_{ijt}*.

The choice of reading previews before making purchase decision may vary across consumers. Some consumers may heavily depend on information obtained from previews, while others may attain product information through other sources. Therefore, consumers who are exposed to previews in prior observation are more likely to be exposed to previews in subsequent observation. Following this argument, we use lagged values of individuals' exposure to previews as instrument for *(preview_{yn})_{ijt}*. The exposure to previews in previous observation is positively correlated to exposure to previews in subsequent observation, but it does not influence unobserved factors which may influence individuals' purchase

decision of books in subsequent observations. Also, the previews which are frequently viewed by consumers are more likely to be viewed by given consumer i . In other words, consumers are more likely to read previews which are frequently read by others. Therefore, we use instrumental variable as the total number of times the preview of each book is exposed by other consumers. The total number of times preview exposed to consumers is likely to be correlated with

$(preview_{yn})_{ijt}$, but uncorrelated with individual i 's purchase decision of given book j at inter-purchase time t .

In order to control for the potential selection bias where individuals' exposure to previews may be correlated to unobserved factor, we used seemingly unrelated bivariate probit model. The model estimates decisions that are interrelated as opposed to independent and it is useful to estimate binary response model with binary endogenous variables. (Wooldridge, 2010)

TABLE IV. MODEL ESTIMATION RESULTS
(EFFECT OF PREVIEWS AND REVIEWS ON PURCHASE DECISION)

VARIABLES	Fixed Effect Logistic			Two-Stage Instrumental Bivariate Probit	
	Preview Effects	Preview Effects (Interaction)	Ordering Effects	Purchase_yn	Preview_yn
$preview_{first}$			-0.0884** (0.0386)		
$preview_{yn}$	2.437*** (0.0174)	2.434*** (0.0329)		0.806*** (0.0190)	
$review_{yn}$	0.823*** (0.0181)	0.601*** (0.0240)		0.207*** (0.00889)	
$review_{count}$	0.00377*** (9.99e-05)	0.00214*** (0.000207)	0.00283*** (0.000201)	0.000701*** (9.14e-05)	0.000432*** (4.55e-05)
avg_{point}	0.415*** (0.0136)	0.159*** (0.0224)	0.444*** (0.0291)	0.0530*** (0.00901)	0.0712*** (0.00438)
$preview_{size}$	-0.0239*** (0.00498)	-0.0246*** (0.00500)	-0.0368*** (0.0110)	-0.00674*** (0.00207)	
$preview_{size}^2$	0.000272*** (5.94e-05)	0.000284*** (5.97e-05)	0.000413 (0.000271)	9.05e-05*** (2.21e-05)	
$preview_{yn} * review_{yn}$		0.122*** (0.0345)		0.162*** (0.0140)	
$preview_{yn} * review_{count}$		-0.00181*** (0.000204)		-0.000916*** (0.000105)	
$review_{yn} * review_{count}$		0.00297*** (0.000226)		0.00130*** (0.000104)	
$preview_{yn} * avg_{point}$		-0.156*** (0.0269)		-0.0341*** (0.0124)	
$review_{yn} * avg_{point}$		0.582*** (0.0268)		0.275*** (0.0119)	
$publish_{date}$	0.000242*** (1.77e-05)	0.000222*** (1.78e-05)	0.00020*** (3.37e-05)	0.000125*** (8.21e-06)	0.000104*** (7.38e-06)
$pbook_{yn}$	-0.0438** (0.0177)	-0.0459*** (0.0177)	-0.00582 (0.0335)	-0.0173** (0.00830)	-0.00528 (0.00722)
$fixed_{price}$	-6.91e-05*** (3.90e-06)	-7.06e-05*** (3.91e-06)	-8.25e-05*** (8.33e-06)	-1.56e-05*** (1.36e-06)	-7.35e-06*** (9.47e-07)
$iv_{lag_preview}_{yn}$					1.155*** (0.00578)
$iv_{sum_preview}_{yn}$					0.00119*** (1.62e-05)
Constant				-1.593*** (0.0102)	-1.299*** (0.00675)
rho				-0.0216** (0.0103)	

Note: The first column in table shows fixed effect logistic regression only with main terms. The second column contains estimates results of same fixed effect logistic regression with interaction terms. The third column shows the results of ordering effects between exposure to previews and reviews. Robust standard errors are in parentheses

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

Consumers who are more interested in purchasing a specific book may have higher probability of being exposed to previews. Therefore, consumers' choice of whether to read previews or not may be spuriously related with their purchase decision. We specify two joint binary outcome models (preview-read decision and purchase decision) where these two outcomes may be correlated.

$$purchase_yn_{ijt} = 1[(\mu_Y(preview_yn_{ijt}, X_{ijt}) > v_{ijt})] \tag{3}$$

$$preview_yn_{ijt} = 1[(\mu_R(Z_{ijt}) > \epsilon_{ijt})] \tag{4}$$

C. Results

1) Effect of Previews and Reviews on Purchase Decision

We ran fixed effect logistic regression and seemingly unrelated bivariate probit regression to empirically test the effect of online previews on individual's purchase decision. The results of the coefficients are presented in Table 4. The first and second columns contained estimated results for fixed effect logistic regression. The first column only contains main effect of exposure of previews and review, preview size effect, number of reviews and other book fixed characteristics. The results show that the effect of preview on individuals' purchase decision is positive and significant, supporting *hypothesis 1a*. Also, the effect of exposure of previews exhibits stronger positive effect compare to exposure of reviews, thus supporting *hypothesis 1b*. Interestingly, the breadth of preview information and purchase intention shows U-shaped relationship, rejecting *hypothesis 2*. The results indicate that individuals' purchase intention first decreases with the amount of online preview, but increases as more amount of online preview is provided. This is counter-intuitive result, since it is common sense that providing too much content through preview may create demand cannibalization. The possible interpretation for this result is that the effect of preview is stronger for the book whose size is either very small or very large.

One of our interests in this research is to find out whether preview and review are complementary or substitute to each other by examining direction of interaction effects of preview and review. The second column shows that when individuals were exposed to both preview and review creates positive synergy effect on purchase intention (supporting *hypothesis 3a*). Thus, exposure to preview and reviews are *complementary* to each other. Also, the estimate for the interaction between exposure to preview and online consumer reviews (i.e., number of reviews and average review points) is significantly negative, implying that the impact of preview and online consumer reviews are *substitutes*. Therefore, the effect of exposure to online preview is lessened with increase of online consumer reviews (i.e., number of reviews and average review points), supporting *hypothesis H3b*. In order to measure sequence effect of exposure to preview and review, we examined subsample of 44,077 observations which individuals were exposed to both preview and review.

The sequential effects of exposure to previews and reviews (third column) show negative and significant coefficient suggesting that purchase probability is higher when individuals are exposed to preview after the review. (*hypothesis 3c* is not supported) The results imply that the

direct experience (exposure to previews) after the indirect experience (exposure to reviews) generates stronger, positive product evaluation, thereby promoting individuals' purchase intention.

The last column of Table 4 shows results of the joint estimation of seemingly unrelated bivariate probit regression. The results are consistent with the estimations obtained from fixed effect logistic regression. It shows that the effect of exposure to previews on individuals' purchase decision is significantly positive (supporting *hypothesis 1a*), indicating that the preview effectively decreases uncertainty of product quality and thereby promotes individuals' purchase decision. After accounting for potential selection bias of exposure to previews, the effect of previews is still stronger than the effect of reviews, implying that the preview is more effective for enhancing sales of the products compare to online consumer reviews. (supporting *hypothesis 1b*) Also, the effect of preview size and interaction effects between previews and reviews hold with results from fixed effect logistic regression. (rejecting both *hypothesis 2a* and *2b*, supporting *hypothesis 3a* and *3b*)

2) Effect of Previews on Product Satisfaction

Table 5 shows results of ordinal logistic regression regarding the effect of previews on the product evaluation of consumers. The results show that the effects of both exposure to previews and reviews are significantly positive on product evaluation. According to the results, the consumers who were exposed to previews are more likely to give higher star points of the products, supporting *hypothesis 4*. The results imply that the direct experience from previews provide more accurate product evaluation than indirect experience from online reviews. Therefore, it is more likely to fail to objectively assess the products when opinions of others regarding product quality is reflected on purchase decision. The summary of results is presented in Table 6.

TABLE V. MODEL ESTIMATION RESULTS (EFFECT OF PREVIEWS ON PRODUCT SATISFACTION)

VARIABLES	point
<i>preview_yn</i>	0.183*** (0.0564)
<i>review_yn</i>	-0.267*** (0.0854)
<i>preview_size</i>	0.0213 (0.0299)
<i>preview_size^2</i>	-0.000961 (0.000585)
<i>review_count</i>	-0.000361 (0.000428)
<i>avg_point</i>	1.264*** (0.0662)
<i>fixed_price</i>	4.70e-06 (1.93e-05)
Constant cut1	-3.872*** (0.135)
Constant cut2	-3.199*** (0.124)
Constant cut3	-1.976*** (0.114)
Constant cut4	-1.141*** (0.112)

TABLE VI. SUMMARY OF RESULTS

Hypotheses		Results
Effects of Preview	H1a	Supported
	H1b	Supported
Preview Size Effects	H2	Not Supported
Interaction Effects between Preview and Review	H3a	Supported
	H3b	Supported
	H3c	Not Supported
Product Satisfaction	H4	Supported

D) Robustness Check with IV-GMM Estimation

One may argue that the exposure to previews may be correlated with some unobserved factors that may influence individuals' purchase decision. For example, consumers' exposure to previews may reflect their strong interest in making purchases of corresponding books [31]. This may create self-selection issues in our analyses and would lead to inconsistent estimates of our results. We instrument $(preview_yn)_{ijt}$ by using lagged values of each individual's exposure to previews in robustness check estimations. The intuition behind the use of this instrument variable is that consumers who are exposed to previews in prior observations tend to be exposed to previews in subsequent observations, but the exposure to previews in prior observations does not influence individuals' purchase decision on books in subsequent observations.

We obtained IV-GMM estimation in order to control potential selection bias of our results. The results show that although there is no selection into exposure to previews, the effect of previews has a significant positive association with individuals' purchase decision. $((preivew_yn)_{ijt} = 1.004^{***})$ The estimations accounting for potential selection bias are consistent with our earlier results, reinforcing our findings that exposure to preview enhances individuals' purchase decision.

VI. IMPLICATIONS

A. Theoretical Implications

This study provides how product information attained through previews and online consumer reviews generate economic values in the context of experience goods where product uncertainty is high. Internet companies provide product information through online consumer reviews and previews in order to reduce product uncertainty and enhance consumers' shopping experience. Many of the prior research investigated the effect of online consumer reviews or recommendation systems as important tools affecting individuals' online purchase decisions. However, the effect of online preview has seldom been examined. Our research attempts to fill this gap in previous literature, by examining how individuals' exposure to online preview and review affects their purchase decision and how these sources of information interact with each other.

Also, most of the prior research on online consumer reviews examined aggregate effect of online reviews on sales

of products, thus hard to measure the true effect of online previews on sale. However, online consumer reviews affect product sales only when consumers' reliance on online consumer reviews is enough to be high when they make purchase decisions. According to Zhu and Zhang [24], the degree of reliance on online consumer reviews depends on product- and consumer- specific characteristics, and found that these characteristics significantly moderate the relationship between online consumer reviews and purchase decision. Our research measures the effect of online previews and reviews on individuals' purchase decision by using unique click stream data with the information of whether individuals were actually exposed to online previews and reviews of each book. The strength of this research is that we are able to assess whether individuals are exposed to previews and reviews of specific books. Our research provides deeper understanding of impact of online previews and reviews on purchase decisions.

This study further investigates the interaction effects between previews and reviews. Previews provide hand-on product experience, allowing consumers to make personal purchase decision. Online consumer reviews, on the other hand, are generated by other consumers, reflecting opinions of others. This study provides insights of how personal decision obtained from direct experience from exposure to preview and opinions of others from online consumer reviews interact each other to affect purchase decision.

B. Practical Implications

In a practical perspective, our results show that individuals' purchase intention and the amount of previews provided showed U-shaped relationship, implying that the effect of previews is stronger when the e-book is either very short or very long. Retailers and publishers thus should strategically decide how much content to provide as preview to promote consumers' purchase decision. Also, our results showed that exposure to both online previews and reviews have stronger impact on purchase intention compare to exposure to online previews or reviews only. Our results suggest that firms should provide suitable online previews and review services to increase consumers' exposure to online previews and reviews. Lastly, consumers who were exposed to previews are more likely to write post-purchase reviews and show higher satisfaction of the products. Therefore, firms should encourage consumers to use preview function while making purchase decisions.

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