Do Firms Prefer Likers or Doubters?

Research-in-Progress

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Abstract

The social media has emerged as an appealing new channel for firms to promote products/services. A fundamental but largely unanswered question is how would the firm use social media to promote products. We address the question by focusing on the movie industry and developing a dynamic game-theoretic model. We assume that: 1) firm intends to build its market reputation; 2) consumers always prefer to watch a high-quality movie. Our model suggests that, it can be optimal for a rational firm to underrate the movie. More specifically, we find that the movie distribution firm would have incentives to overrate the movie even if they observe that the movie quality is low. Furthermore, we show that as long as there is a properly designed uncertainty resolution mechanism, the adoption of social media could alleviate the "Lemon" problem in the movie market, which in turn, improves market efficiency.

Keywords: Social Media, Movie Quality, Information Asymmetry, Reputation

1 Introduction

Social media has become increasingly popular as an instrument for the promotion of products/services in many industries (Duan et al, 2008; Miller et al, 2013). Abundant evidence shows that promotions of products using social media are effective in driving product sales (Miller, 2009; Luo et al, 2013; Chen et al., 2015). For instance, Dell achieves three million revenue with Twitter-related sales (Miller, 2009). For experienced goods such as movies, adopting social media is popular among firms in promoting their products. Consumers may seek signals of quality in advance of watching and social media platforms provide the best way for the audience to gather information. Bird box, a movie produced by Netflix, has caught attention by massive social media fans because they feel like nobody in their life talks about this movie but everyone on the Internet discusses it (Jordan, 2018). The popularity of adopting social media raises consumers' concern about the quality of information delivered through the promotion. Whether the true quality of movie is reflected to market is also valued in addition to the movie quality per se. Therefore, the firm concerns the accuracy of promotion as well as creating awareness on social media.

Companies use many ways to influence social media promotions such as giving away free products (Zhu and Furr, 2016) and hiring experts or opinion leaders (Holbrook, 1999; Plucker et al. 2009) to write reviews. Those mechanisms will lead to a situation that both "Likers" and "Doubters" will appear on social media, which brings both positive reviews and negative reviews at the same time. Prior research presents mixed results about having negative reviews about your products. Berger (2010) shows that negative reviews showing on social media can boost the sales. While Basuroy et al (2003) point out that negative reviews hurt performance more than positive reviews help performance. The actual effect of having doubters remains unanswered. This phenomenon is intensified in social media promotion. In this paper, we aim to study the following research question: How would the firm use social media to promote products? Specifically, how the movie distribution firms would use social media to promote the movies? What is the rationale for firms to underrate the movie quality? Can information technology improve market efficiency?

To answer these questions, this paper develops a model to study the movie distribution firm's strategy of using social media to promote the movie. Our model suggests that under certain conditions, it is optimal for a rational firm to underrate the movie through social media. More specifically, we find that the movie distribution firm would have incentives to overrate the movie even if they observe that the movie quality is low. Furthermore, we show that as long as there is a properly designed uncertainty resolution mechanism, the adoption of social media could alleviate the "Lemon" problem in the movie market, which in turn, improve market efficiency.

Our model starts with two assumptions. First, the firm intends to build its market reputation. Second, consumers always prefer to watch a high-quality movie. The model incorporates two uncertainties: whether the firm observes the true quality of the movie, whether the firm is truthfully or strategically promoting. At the beginning, the distribution firm receives a movie to promote, and the true quality of the movie is not known. After the spot release, the firm briefly observes early feedback from the market, e.g., organic reviews from consumers. This is an imperfect signal that indicates the quality of the movie. After observing this signal, the firm chooses the action, that is, to overrate through "Likers" or underrate through "Doubters" or do both on social media to promote the movie. Consumers update their beliefs about the type of the firm and the quality of the movie after observing the firm's action and then decide whether to watch the movie. We impose a uncertainty resolution mechanism in revealing the true movie quality. If the firm is revealed to be truthful promoting, it will successfully build the market reputation.

Our first result states that for any type of distribution firm, there exist equilibria under which the firm would truthful promote the movie quality based on the observed signal at an early stage. This occurs when the probability of uncertainty resolution on the movie quality is higher than some cutoff value. The underlying logic is as follows. With greater probability the market will identify whether the firm is exaggerating the quality of the movie, there is a greater chance the firm will lose reputation in the long run. High uncertainty resolution probability will motivate the firm to be truthfully promoting in order to build a market reputation.

Conversely, if the probability of uncertainty resolution is low, the firm might have an incentive to exaggerate the quality of the movie to attract more consumers. A second factor that comes into play is

the consumers' requirement about the quality of the movie in order to decide to watch. If the requirement is generally high among consumers, then the firm will exaggerate movie quality via the social media. There are two reasons for this. If the firm overrates and convinces consumers that the movie quality is high, then it would earn the current market return from distributing a high-quality movie. In addition, given the probability of uncertainty resolution is low, it is likely that the market will not identify the firm's action. Therefore, the firm will overrate the movie when it observes low movie quality due to the tradeoff between attracting more consumers and loss of reputation.

However, if the consumers' requirement is low, we have a counter-intuitive result that the firm does not always have the incentive to exaggerate the movie quality given the probability of uncertainty resolution is small. In this case, consumers may still watch the movie even if firm truthfully promote a low movie quality. There is little benefit for the firm to exaggerate the movie quality. Therefore the firm will still choose to promote the movie truthfully.

2 Model

Let us consider a movie market with one distribution firm, a continuum of consumer. The quality of a movie is described by a binary state variable, $s \in \{H, L\}$, which is random and distributes according to Prob$\{s = H\} = \pi > 1/2$, and with probability of $1 - \pi$, it is low-quality. The movie distribution firm can be one of the two types: $\theta \in \{\theta_1, \theta_2\}$. With probability $r \in (0, 1)$, the firm is "high-quality/honest" which is denoted by θ_1, and with probability $1 - r$, it is normal type/low-quality/strategic type. The movie distribution firm observes an informative but imperfect signal, e.g., watch the preview version of a movie:

$$\text{Prob}\{\omega = \hat{H}|H\} = \text{Prob}\{\omega = \hat{L}|L\} = q \in (\pi, 1).$$

Assuming $q > \pi$ will ensure Prob$\{x = H|\omega = \hat{H}\} >$ Prob$\{x = L|\omega = \hat{H}\}$. Here, to avoid the confusion on the notations, we use $\hat{H}$ to indicate that the observed signal is H, and use $\hat{L}$ to indicate that the observed signal is L. We explain q as a measure of distribution firm's expertise. In other words, a distribution firm with more industry experience would be more likely to observe the true state, i.e., the true quality of the movie.

After observing the signal, the firm strategically choose the social media advertisement $x \in \{H, L\}$. Here, x represents the actions which can be used to infer the quality of a movie. For instance, hiring "Doubter" (L) or "Liker" (H). Therefore, if $x = H$, it indicates that the movie is high-quality; if $x = L$, it indicates that the movie is low-quality. From now on, we denote the firm's strategy by $\sigma(x = \omega|\theta_2) =$ Prob$(x|\omega, \theta_2)$. This reads as: after observing signal ω,the firm would choose $x = \omega$ with probability $\sigma_\omega(x|\theta_2)$. To reduce the issues caused by multiple equilibria and tedious technical details, we assume that a high-quality firm always reports observed signal honestly, i.e., $\sigma(x = \omega|\theta_1) = 1$. Thus, only the low-quality firm can strategically advertise the observed signal by freely choosing either H or L. For simplicity, we denote the low-quality firm's strategy conditional on its signal by $\sigma(x|\omega) =$ Prob$(x|\omega, \theta_2)$, and restrict our attention to the case under which $\sigma(H|\hat{H}) \geq \sigma(H|\hat{L})$. Cases where this assumption does not hold are equivalent to a relabeling of the reporting. The firm that choose both "Doubter" and "Liker" correspond to the cases of $\sigma(H|\hat{H}) \in (0, 1)$ and $\sigma(L|\hat{L}) \in (0, 1)$.

What is essential for our modeling is the information conveyed in the promotion but not the form of the promotion it takes. In this sense, our model could include many other advertisement strategy, provided that these different strategies would convey different impressions about the true quality of the movie.

After watching the movie, we assume that with probability $\rho \in (0, 1)$, the uncertainty of the quality can be resolved before next purchase. The rationale for introducing this uncertainty resolution mechanism is to capture the consumer's personal expertise on the movie quality or the complication of the movie topic. When $\rho \to 1$, it corresponds to a movie which is easy to be identified as good or bad. Then $\rho \to 0$, corresponds to the opposite case.

2.1 *Preference*

For consumers, their preferences are defined as below. If $\mathbb{E}[(x - \mathbb{E}(x|\pi))^2|\mu(a)] \geq 0$, consumer will choose to watch: $d = 1$, i.e.,

$$\mu(a)[B - \pi B]^2 + (1 - \mu(a))[0 - \pi B]^2 \geq 0$$

with $B > 0$, which is equivalent to $\mu(a)(1 - \pi)^2 + (1 - \mu(a))\pi^2 \geq 0$, i.e.,

$$\mu(\pi^2 - 2\pi + 1) + (1 - \mu)\pi^2 \geq 0 \quad \Leftrightarrow \quad \mu(\pi^2 - 2\pi + 1 - \pi^2) \geq -\pi^2$$

i.e.,

$$d = 1 \quad \Leftrightarrow \quad \mu \begin{cases} \geq \dfrac{-\pi^2}{1 - 2\pi} & \text{if } \pi < 1/2 \\ \leq \dfrac{-\pi^2}{1 - 2\pi} & \text{if } \pi > 1/2 \end{cases}.$$

Therefore, given $\pi > 1/2$, then $d = 1$ if $\mu > \mu^* \equiv \dfrac{\pi}{2\pi - 1}$. Given $\pi \leq 1/2$, then $d = 1$ for any μ.

For the distribution firm, the payoff is

$$U_F = \mathbf{1}_{\text{purchase}} \mathbf{1}_s U$$

where $U > 0$ is firm's revenue if it truthfully reports the observed signal, i.e., do not use the opposite message, and

$$\mathbf{1}_{\text{purchase}} = \begin{cases} 1 \text{ Consumer purchses} \\ 0 \text{ No pruchase} \end{cases} \quad \text{and } \mathbf{1}_s = \begin{cases} 1 \text{ If } x = s \\ 0 \text{ If } x \neq s \end{cases}$$

The firm's outside options are normalized to zero. Here, we assume that truthful reporting the observed signal always gives the firm the same positive expected payoff no matter which state is realized. This assumption also catch the point under which the market would always reward an honest firm.

2.2 *Timing*

Overall, the timeline of the game is as follows:

1. nature determines the type of the firm and the quality of the movie;
2. firm observes the signal s according to the type and chooses x;
3. with probability $\rho \in (0, 1)$ the consumer would observe the true state s (identify the quality of the movie), and update beliefs on the type of the firm and choose whether to watch movies provided by the firm in the future;
4. the payoffs are realized.

For further analysis, we now introduce some notations. First, we define the states after which the consumer would make purchase decision as $\mathbf{A} = \{H, L, \emptyset\}$. Then we use A_i to denote the ith element in set $\mathbf{A}$ which indicates the state of uncertainty resolution. Second, we denote $\mu(\theta_1|x, A_i)$ as the consumer's posterior on the firm's type being a high-quality type after observing x. For ease of reference, we summarize the main notations used in our model in Table 1.

Notation	Description
s	Random variable describing the state of the world, i.e., quality of movie
ω	The signal observed by a firm
H	The value of the movie quality when it is realized to be high
$\hat{H}$	Observed signal is H
L	The value of the movie quality when it is realized to be low
$\hat{L}$	Observed signal is L
π	The probability that the quality of a movie is realized to be high H
θ	The type of a distribution firm
θ_1	A high-quality firm
θ_2	A low-quality firm
q	The probability of firm getting a signal truthfully indicating the movie quality
r	The probability that a firm is a high-quality
x	The action chosen by the firm
$\sigma(x\|\omega)$	The normal type firm's strategy conditional on its observed signal
ρ	The probability that the uncertainty of the quality of movie can be resolved. Here ρ is never going to reach 1.
U_F	The utility of firm
$\emptyset$	It indicates that the state of the uncertainty is not resolved
A	It indicates the state of uncertainty resolution
$\mu(\theta_1\|x, A_i)$	Consumer's posterior on the firm being a high-quality type after observing a report x
$d(x, A_i)$	Consumer's strategy after observing, x, and given that the state of uncertainty resolution is A_i

Table 1: Notations

3 Main Results

We now present our main results. In the following results, given different parameter space,

1. for any type distribution firm, there exists an equilibrium under which it would choose to truthfully report the observed signal, i.e., no mix;
2. firm of low quality would always buy $x = H$ if $\omega = H$, and buy both H and L, if $\omega = L$; and high-quality firm would always truthfully report the observed signal.

Formally, we have:

Proposition. *Given $\mu(\theta_1|L, \emptyset) < \mu^* < \mu(\theta_1|H, \emptyset)$:*

1. *if $\rho > \rho^*$, there is an equilibrium under which*
   (a) *$\sigma(H|\hat{H}) = 1$ and $\sigma(H|\hat{L}) = 0$;*
2. *if $\rho < \rho^*$, there is an equilibrium under which*
   (a) *when $\mu(\theta_1|L, \emptyset) < \mu^* < r$*
      i. *$\sigma(H|\hat{H}) = 1$ and $\sigma(H|\hat{L}) \in (0, 1]$;*
   (b) *when $r < \mu^* < \mu(\theta_1|H_1, \emptyset)$*
      i. *$\sigma(H|\hat{H}) = 1$ and $\sigma(H|\hat{L}) \in (0, 1]$;*

where μ^* is the cut-off value of consumer's purchase decision, $\rho^* = \dfrac{2\psi(H|\hat{L}) - 1 + q}{2q(1 - \psi(H|\hat{L}))}$ with $\psi(H|s)$ as firm's posterior beliefs that the true state of the world is H given the observed signal is $s \in \{\hat{H}, \hat{L}\}$.

$\rho > \rho^*$	$\rho < \rho^*$		
Honest promote	$\mu^* < \mu(\theta_1 \mid L, \emptyset)$	$\mu(\theta_1 \mid L, \emptyset) < \mu^* < \mu(\theta_1 \mid H, \emptyset)$	$\mu^* > \mu(\theta_1 \mid H, \emptyset)$
	Honest promote	Low quality firm would choose both "Doubter" and "Liker" when observing L	Honest promote

Table 2: Summary of results

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