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Marketing with Shallow and Prudent Influencers

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Abstract

Marketers often utilize social media influencers to reach audiences with more authentic and credible messaging. While some influencers are prudent and carefully test products before promoting them, many others are shallow and merely post the marketer messaging as is.

We analyze the impact of shallow and prudent influencers on marketer profits, customer satisfaction, and influencer payoffs. Counter to intuition, we find that shallow influencers increase market transparency, consumer satisfaction and marketer profits, while prudent influencers entice the marketers to reduce information efficiency in the market, and increase the share of unsatisfied consumers. In a market where both shallow and prudent influencers exist, prudent influencers may increase their payoff even further by extracting additional information rent. The results provide insight into the value that shallow influencers bring to the market and guidance for marketers considering the use of influencer marketing.

Keywords: Influencer Marketing, Product Reviews, Information Design, Bayesian Persuasion.

JEL Classification: D82, D83, M31.

1 Introduction

Influencer marketing allows firms to sponsor social media posts by users with large followings (“influencers”) and has been growing rapidly as a form of digital marketing (Avery and Israeli 2020, Linqia 2020). The basis for its popularity are company claims that this method is more

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effective than traditional ads because consumers trust influencers they follow (Jin et al. 2019, Influencer Marketing Hub 2020). Theoretically, influencers can help generate demand in several ways: (i) reduce uncertainty about products they promote (Milgrom 1981, Chen and Xie 2008); (ii) draw attention of consumers to products; and (iii) help firms generate “promotional chat” to manipulate the perception of product quality (Mayzlin 2006, Pei and Mayzlin 2019).

In many cases we observe influencers invest different levels of effort. Prudent influencers test and try products in an attempt to “curate” the good ones. Shallow influencers, in contrast, merely communicate to users whatever information the sponsor provided. Indeed, many successful influencers appear to be shallow, admitting that they do not even like the brands they promote (Carmichael Lynch 2018).

Since shallow influencers do not seem to “do anything” in this market, their popularity is surprising. It is unclear why consumers would like to follow their advice and consequently why firms would want to pay them. Our first research objective is to explain this phenomenon. Intuitively we would expect consumers to prefer the input from prudent influencers since they provide more information which is carefully collected, but our results show that this isn’t the case.

Our second objective is to analyze the information and sponsorship environments when the market has both types of influencers – will marketers prefer to contract with shallow, prudent, or both types of influencers? Which type of collaboration generates more efficient information transmission in the market?

We are also interested in understanding which type of influencer might be more successful in terms of their payoffs. Many social media users have been trying lately to become well-known influencers by strategically creating content. Our third objective is to provide normative recommendations for these potential influencers who need to decide whether to review products thoroughly or just promote products in a shallow manner.

In our game theoretical model, a marketer sells a product with uncertain match utility to consumers. The marketer can contract with multiple influencers, some shallow and some prudent. The prudent influencers receive a signal about the match utility of the product. They then decide whether to promote it to their followers. Shallow influencers are not as thorough. They tell their followers about the product regardless of its match if the marketer pays them enough. When consumers see an influencer recommend the product, they also receive a signal about the product’s

match, and decide whether to buy it or not. If the realized match of the purchased product turns out to be negative, the consumer can impose a negative penalty on the recommending influencer. In contrast to prior literature on information intermediaries and influencer marketing (Lizzeri 1999, Miklós-Thal and Schumacher 2013, Pei and Mayzlin 2019), our model has two unique features. First, information in the market is symmetric and no player has private information. Second, players cannot manipulate the realization of signals, i.e., claim that a product is good when the experience from it was bad. This setup allows us to also explore the information design decision of the firm and understand when influencers make it possible to utilize Bayesian persuasion that persuades consumers to buy products that do not match their tastes (Rayo and Segal 2010, Kamenica and Gentzkow 2011, Bergemann and Morris 2019). In our analysis we focus on three cases: (i) a market with only shallow influencers, (ii) a market with only prudent influencers, and (iii) a market with a mix of both types.

Our results show that shallow influencers allow the firm to persuade consumers to buy the product when the backlash from a negative experience is not too high. Prudent influencers will only recommend products with good signals and write positive reviews. They will also allow the firms to design their signals to persuade consumers, but for a more limited range of reputation costs. This is surprising since prudent influencers have an opportunity to limit their reputational costs by observing a signal about the product before they choose to promote it.

A second finding is that the firm’s profit is higher when it contracts with shallow influencers compared to prudent influencers, while in conjunction the consumer satisfaction in a market with shallow influencers is also higher. This result is also counter-intuitive as it appears that shallow influencers cause both firms and consumers to be happier with such intermediation in the market. Finally, we also find that prudent influencers may benefit from the existence of shallow influencers in the market since they can extract informational rent by observing an extra signal, but this value is positive only when enough shallow influencers are active.

Beyond our contribution to the research on information intermediaries, promotional reviews and information design, we contribute to the emergent research on influencer marketing (Pei and Mayzlin 2019, Fainmesser and Galeotti 2019). Unlike much of the research, we do not assume that influencers can manipulate how their reviews are perceived by consumers, which is consistent with regulator and social media platform guidelines (Federal Trade Commission 2019). Nevertheless,

our results provide an explanation for why reviews will only be positive in equilibrium, why shallow influencers might be popular, and what value they bring to the market.

Following the detailed model description, we present the results of the equilibrium analysis. All proofs appear in the Appendix. We then conclude with a discussion of insights and implications of our analysis.

2 Model

The market has three types of players: a marketer, mass one of influencers, and mass one of consumers. The marketer produces a new experience good they would like to launch. Because the product is new all the players are unsure about the fit of the product to consumers. When a consumer buys the product they receive utility $u = v - p$ where $v = 0$ if the product is bad and does not match their tastes and $v = v_H > 0$ if the product is good and does match their tastes. We assume, without loss of generality, that the price of the product is normalized to $p = 1$ and that $2 > v_H > 1$, with a commonly known, a-priori probability of $1/2$ that the product yields value v_H . These assumptions imply that the a-priori expected utility from purchasing the product is $1/2v_H - 1 < 0$, and consumers will not purchase the product without additional information. We assume that the marketer can only convince consumers to change their mind by asking influencers to recommend the product to their consumer followers.

2.1 The Marketer's Decision

A marketer's contract with an influencer consists of a lump sum ϕ for recommending the product, and additional information. The additional information comes in the form of a signal about the utility of the product. The marketer can design an information environment where an influencer will receive a good signal G with probability p_G if the product matches the consumer tastes, and a good signal G with probability p_B if the product does not match. Otherwise the signal observed is a bad signal B . The signals can be thought of as a result of trying the product, and the values of p_G and p_B determine how revealing the experience is to the influencer about the true match of the product to consumers. The marketer can change the values of p_G and p_B by providing a more representative sample to the influencer, or by providing them with more information.

Denote by $D(\phi, p_G, p_B)$ the product's demand when the marketer offers compensation ϕ and

information design p_G and p_B . Then the marketer chooses ϕ , p_G and p_B to maximize:

$$\pi_M = \mathbb{E}[D(\phi, p_G, p_B) - \phi(p_G, p_B)] \quad (1)$$

where the expectation is taken over the realizations of the signals given the information design. Note that the payment ϕ depends on the information design and the signal realization because the realized payment of the marketer will depend on the signals observed by influencers and consumers, in a process which we detail below. We note that the marketer cannot condition payment on the valence of the recommendation by the influencer, although this will turn out to be the equilibrium outcome.

2.2 The Decision of the Influencers

The market has two types of influencers: prudent and shallow. The share of prudent influencers is $\alpha \in [0, 1]$. The goal of the influencers is to recommend the product to their consumer followers and collect the fee ϕ without angering too many of the followers who might have a negative experience if the realized match of the product is bad.

Upon receiving the contract details (ϕ, p_G, p_B) from the marketer, prudent influencers review the product by observing a signal $r_I \in \{G, B\}$, and based on the signal's realization, they decide whether to recommend the product to their followers. If they recommend the product, they communicate (p_G, p_B, r_I) to the consumer.

Shallow influencers, in contrast, do not bother to review the product and do not observe a signal about the product's match. If the payment ϕ is high enough, they always recommend the product to their followers and communicate (p_G, p_B, r_I) to them, with $r_I = \emptyset$.

When consumers observe the recommendation of the influencer, they make a purchase decision based on their updated belief about the product's match, in a process that we describe in the following section. If they made a purchase decision and the product turned out to not match their tastes, they stop following the influencer, which lowers the future income of the influencer. We assume that each consumer who stops following an influencer imposes a penalty θ on the payoff of the influencer, which generates a reputational concern for the influencer.

The influencer therefore decides whether to recommend the product in order to maximize:

$$\pi_I = \phi - \theta Pr(\text{product doesn't match} | p_G, p_B, r_I) \quad (2)$$

where their prediction about the match probability of the product depends on the signal they observed and their prediction about the consumer's response to the recommendation, which we detail below. If the influencer does not recommend the product, they receive a payoff of zero. As a tie-breaking rule, we assume that an influencer who is indifferent between recommending and not recommending the product will elect to recommend it.¹

2.3 Consumers' Decisions

Every consumer follows one influencer. Consumers will not purchase a product if they do not receive additional information, which arrives in the form of a recommendation (p_G, p_B, r_I) from each influencer. When a consumer receives a recommendation from an influencer, they read this recommendation and receive their own independent signal drawn according to (p_B, p_G) about the product's quality, which we denote by $r_C \in \{G, B\}$.

The consumer then purchases the product if its expected utility is higher than its price, i.e., if the following individual rationality (IR) constraint holds:

$$\mathbb{E}[v - p | r_C, r_I, p_G, p_B] = \Pr(v = v_H | r_C, r_I, p_G, p_B) v_H - 1 \geq 0 \quad (3)$$

Consumers observe the realized utility after purchasing the product. If the product turns out to not match their taste, they stop following the influencer and impose a penalty θ on the influencer's payoff.

3 Equilibrium Analysis and Results

We seek to characterize the equilibrium behavior of the consumers, influencers and the marketer, with a particular focus on:

- The payment ϕ paid by the marketer to influencers and the marketer's information design (p_B, p_G) .
- Whether shallow or prudent influencers are active in the market, and which type is more active.

¹A weaker rule where some influencers recommend the product with positive probability when indifferent will yield the same results qualitatively.

- Which type of influencer has higher income in equilibrium.
- The level of disappointment (consumers with negative experiences) in the market.

Our solution concept is subgame perfect equilibrium. We initially look at cases with only shallow ($\alpha = 0$) or only prudent ($\alpha = 1$) influencers. This analysis applies when the marketer can offer a different contract to each type of influencer, and also when the payment is per follower, which is a common approach in influencer marketing. We then analyze the case of $\alpha \in (0, 1)$. This scenario applies when marketers do not know the type of influencer upfront or can't afford to offer differential contracts. Payments which are contingent on popularity yield similar results and are analyzed in the Online Appendix.

3.1 Only Shallow Influencers in the Market ($\alpha = 0$)

When a consumer sees a recommendation from a shallow influencer, they initially believe the product will match their tastes with probability $1/2$. The posterior probability of the product matching after observing the signal r_C is:

$$Pr(v = v_H | r_C) = \frac{Pr(r_C | v = v_H)Pr(v = v_H)}{Pr(r_C)} = \begin{cases} \frac{p_G}{p_G + p_B} & r_C = G \\ \frac{1 - p_G}{1 - p_G + 1 - p_B} & r_C = B \end{cases} \quad (4)$$

Hence, the consumer will purchase the product after observing $r_C = G$ if $\frac{p_G}{p_G + p_B}v_H \geq 1$ and after observing $r_C = B$ if $\frac{1 - p_G}{1 - p_G + 1 - p_B}v_H \geq 1$. The following result shows that a consumer cannot rationally purchase the product after seeing both signals, and hence we will assume they will purchase the product only after seeing a good signal $r_C = G$ when they follow a shallow influencer.²

Lemma 1. *When following a shallow influencer, a necessary condition for the consumer to purchase after observing $r_C = G$ is $p_G > p_B$. A necessary condition for the consumer to purchase after observing $r_C = B$ is $p_B > p_G$.*

Because the consumers purchase the product only after observing $r_C = G$, the shallow influencer's expected payoff becomes:

$$\pi_I = \phi - \theta Pr(r_C = G, v = 0 | p_G, p_B) \quad (5)$$

²Assuming consumers buy after seeing a bad signal will yield the symmetric result where we re-label good to B and bad to G .

The second part of the expression is the penalty from a consumer receiving a non-match after observing a good signal $r_C = G$. The probability of this event equals

$$Pr(r_C = G, v = 0 | p_G, p_B) = Pr(r_C = G | v = 0, p_B) Pr(v = 0) = 1/2 p_B$$

To make sure that the shallow influencer recommends the product to the consumer, the marketer will therefore set $\phi = \frac{1}{2} \theta p_B$, yielding the expected marketer's payoff

$$\pi_M = p Pr(r_C = G) - \frac{1}{2} \theta p_B = \frac{1}{2} p_G + \frac{1}{2} (1 - \theta) p_B \quad (6)$$

where we used the fact that $Pr(r_C = G) = \frac{1}{2} (p_G + p_B)$ and $p = 1$.

We observe that the marketer's expected profit always increases with p_G while it increases with p_B if and only if $\theta < p = 1$, which allows us to reach the following result:

Proposition 1. *When the market has only shallow influencers:*

- *The marketer will set $p_G^* = 1$.*
- *When $\theta > 1$, the marketer will set $p_B^* = 0$ and $\phi^* = 0$. There will not be disappointed consumers in the market.*
- *When $\theta < 1$, the marketer will set $p_B^* = v_H - 1 > 0$ and $\phi^* = \frac{1}{2} \theta (v_H - 1) > 0$. The share of disappointed consumers in the market will be $\frac{1}{2} (v_H - 1) > 0$.*

Proposition 1 shows that when the shallow influencers have high reputational concerns ($\theta > 1$), the marketer will design the information environment to fully reveal the match of the product by setting $(p_G, p_B) = (1, 0)$. This will result in consumers fully discovering the match of the product before they purchase, yielding no disappointed consumers in equilibrium. The equilibrium profit of the marketer will be $\pi_M^* = \frac{1}{2}$.

When the influencers' reputational concerns are lower ($\theta < 1$), the marketer will design the information environment to persuade the consumers to buy the product even when it is not a match by setting $p_B > 0$. The level of persuasion increases with v_H . However, given the increased risk of disappointed consumers, the marketer will need to compensate the influencer for this potential risk. The resulting equilibrium profit of the marketer will then be

$$\pi_M^* = \frac{1}{2} (1 + (1 - \theta)(v_H - 1)) > \frac{1}{2}$$

which is higher than the case of high reputational concerns. The conclusion is that shallow influencers can allow marketers to increase sales, while the higher their reputational concerns are, the lower the marketer's profit and the level of persuasion in the market.

3.2 Only prudent influencers in the market ($\alpha = 1$)

When a consumer observes a recommendation from a prudent influencer, they will incorporate the signal of the influencer, r_I , into their posterior belief that the product is a match using Bayes' rule:

$$Pr(v = v_H | r_I, r_C) = \begin{cases} \frac{p_G^2}{p_G^2 + p_B^2} & (r_I, r_C) = (G, G) \\ \frac{p_G(1-p_G)}{p_G(1-p_G) + p_B(1-p_B)} & (r_I, r_C) = (B, G) \text{ or } (r_I, r_C) = (G, B) \\ \frac{(1-p_G)^2}{(1-p_G)^2 + (1-p_B)^2} & (r_I, r_C) = (B, B) \end{cases}$$

Similarly to before, the consumer will purchase the product if $Pr(v = v_H | r_I, r_C)v_H \geq 1$. An analysis of the decision of the consumer shows that a consumer will never buy after seeing both (G, G) and (B, B) , and is summarized below:

Lemma 2. *When the consumer observes the signals (r_I, r_C) :*

- *A necessary condition for them to purchase the product after observing (G, G) is $p_G > p_B$.*
- *A necessary condition for them to purchase the product after observing (B, B) is $p_G < p_B$.*
- *If they purchase when observing (G, G) , a necessary condition for them to purchase after observing (B, G) or (G, B) is that $1/2 \geq p_G \geq p_B$ or $1 - p_B \geq p_G > 1/2$.*

Similarly to the case of the shallow influencers, we focus on the equilibria in which $p_G \geq p_B$ and assume that the consumer purchases the product after they see $(r_I, r_C) = (G, G)$.

Moving to the analysis of the prudent influencer's decision, their decision to review depends on the realization of the signal r_I . First, after observing a signal $r_I = G$, their expected payoff depends on whether the consumer purchases when observing a bad signal $r_C = B$. If the consumer *does not* purchase when they see $(r_I, r_C) = (G, B)$, the influencer's payoff is:

$$\pi_I = \phi - \theta Pr(r_C = G, v = 0 | r_I = G) = \phi - \theta \frac{p_B^2}{p_B + p_G}$$

where we used the fact that

$$Pr(r_C = G, v = 0 | r_I = G) = Pr(r_C = G | v = 0, r_I = G) Pr(v = 0, r_I = G) = \frac{p_B^2}{p_B + p_G}$$

Otherwise, if the consumer *does* buy after seeing the signals $(r_I, r_C) = (G, B)$, then the consumer buys with any signal, and the influencer's payoff is:

$$\pi_I = \phi - \theta Pr(v = 0 | r_I = G) = \phi - \theta \frac{p_B}{p_B + p_G}$$

We note that the payoff of the influencer is lower when the consumer buys after seeing a sequence (G, B) and (G, G) compared to only after (G, G) , given the same compensation ϕ . This is because the payoff does not increase if the influencer generates higher demand for the marketer, but does decrease if more consumers are disappointed after buying. The marketer will therefore need to compensate the influencer more if they would like to receive higher demand, because higher demand increases the cost of the influencer.

The second case where the influencer observes a signal $r_I = B$ yields the payoff $\pi_I = \phi$ if the consumer does not buy the product when they observe the sequence (B, G) and the payoff

$$\pi_I = \phi - \theta Pr(r_C = G | v = 0, r_I = B) = \phi - \theta \frac{p_B(1 - p_B)}{1 - p_B + 1 - p_G}$$

when they do buy the product after such a sequence, where we used the fact that

$$Pr(r_C = G, v = 0 | r_I = B) = Pr(r_C = G | v = 0, r_I = B) Pr(v = 0, r_I = B) = \frac{p_B(1 - p_B)}{1 - p_B + 1 - p_G}.$$

Consumers will never buy after seeing (B, B) because of the assumption that $p_G \geq p_B$.

The influencer will take the behavior of the consumer into account when they make the reviewing decision. The cases we analyzed above create separate conditions for reviewing based on the values of ϕ , p_G and p_B and the influencer's signal r_I which are summarized in the following Lemma:

Lemma 3. *The influencer will publish a review about the product after observing the signal r_I and given the contract (p_G, p_B, ϕ) when:*

- $Pr(v = v_H | G, G) v_H < 1$.
- $Pr(v = v_H | G, B) v_H < 1 \leq Pr(v = v_H | G, G) v_H$, $r_I = G$ and $\phi \geq \theta \frac{p_B^2}{p_B + p_G}$, or $r_I = B$ and $\phi \geq 0$.
- $Pr(v = v_H | B, G) v_H \geq 1$, $r_I = G$ and $\phi \geq \theta \frac{p_B}{p_B + p_G}$, or $r_I = B$ and $\phi \geq \theta \frac{p_B(1 - p_B)}{1 - p_B + 1 - p_G}$.

Lemma 3 shows that there are three different thresholds of the payment ϕ that will entice the influencer to write a review. We denote these levels by $\phi_G^L = \theta \frac{p_B^2}{p_G + p_B}$, $\phi_G^H = \theta \frac{p_B}{p_B + p_G}$, and $\phi_B =$

$\theta \frac{p_B(1-p_B)}{1-p_B+1-p_G}$. As the payoff functions of the influencer show, for the same level of ϕ , the influencer's payoff is higher if they recommend the product after a bad signal $r_I = B$ than recommending after a good signal $r_I = G$. This is because promoting after $r_I = G$ increases demand which also increases the downside from negative responses of disappointed consumers. This means that if an influencer is willing to promote the product after $r_I = G$, they will also do so after $r_I = B$. This observation allows us to simplify the analysis of the full equilibrium to characterize the marketer's decisions and equilibrium outcomes:

Proposition 2. *When the market has only prudent influencers:*

- *The marketer will set $p_G^* = 1$.*
- *When $\theta > \frac{1+\sqrt{v_H-1}}{2}$, the marketer will set $p_B^* = 0$ and $\phi^* = 0$. There will not be disappointed consumers in the market.*
- *When $\theta < \frac{1+\sqrt{v_H-1}}{2}$, the marketer will set $p_B^* = \sqrt{v_H-1}$ and $\phi^* = \frac{v_H-1}{1+\sqrt{v_H-1}}\theta$. The share of disappointed consumers in the market will be $\frac{v_H-1}{1+\sqrt{v_H-1}} > 0$.*

Compared to the case with shallow influencers in Proposition 1, the marketer's strategy is distinctly different. First, the marketer will elect to not persuade consumers and fully reveal the product's match by setting $p_G^* = 1$ and $p_B^* = 0$ for lower values of θ than in the case of shallow influencers. This is because prudent influencers, who "threaten" to not promote the product when they have a higher risk of adverse response from consumers, induce more transparency in a market with medium reputational costs. In contrast, in a market with low reputational costs θ , the marketer will elect a higher persuasion level compared to the case of shallow influence ($p_B = \sqrt{v_H-1}$ with prudent vs. $p_B = v_H-1$ with shallow), and this is because they need to compensate for the lowered demand emanating from prudent influencers by enticing more consumers to buy the product when it is not a match. Thus, we observe a reversal in the level of persuasion for three distinct levels of θ : (i) when θ is low, prudent influencers induce more persuasion; (ii) when θ is intermediate, shallow influencers induce more persuasion; and (iii) when θ is high, both types of influencers induce full revelation. Figure 1 illustrates this effect on the level of persuasion p_B for different values of θ .

Second, the fact that the marketer chooses to persuade consumers more when they contract with a prudent influencer for low values of θ means that for these values, more consumers in the market will have a negative experience from the product. This means that assuming that more

Figure 1: Level of persuasion of prudent and shallow influencers as a function of θ .

prudent reviews are better for consumers is not always true (and often is not) when the marketer endogenously chooses compensation and information design.

Third, this effect increases the expected reputational costs of the prudent influencer, which means that the marketer needs to increase their compensation beyond what they pay shallow influencers under the same conditions. The increase results in lower marketer profits with prudent influencers compared to with shallow ones when $\theta < \frac{1 + \sqrt{v_H - 1}}{2}$.

In summary, by becoming gatekeepers for their followers, prudent influencers might reduce consumer satisfaction and firm profits compared to when using shallow influencers. This counterintuitive result arises because in equilibrium the firm will elect to try to compensate for the increased cost of prudent influencers by trying to persuade more consumers to buy the product when it does not match, resulting in decreased efficiency in the market.

3.3 Both Types of Influencers in The Market ($0 < \alpha < 1$)

We now analyze the case where both types of influencers are in the market. Since the marketer cannot condition the payment on the valence of the review and whether it is shallow or prudent, the marketer will choose one compensation contract (ϕ, p_G, p_B) that can induce one type of influencer to participate in the market, or both. Consumers, however, observe the reviews by the influencers and know if they are prudent or shallow. Since every consumer follows a single influencer, the

consumer's individual rationality constraints will remain the same as analyzed before, depending on the type of influencer being followed.

The type of influencer the consumer follows and the consumer's behavior when they observe a specific set of signals define three consumer segments the marketer can target. However, targeting one segment sometimes automatically entails targeting another segment as well. Specifically, if the information environment is such that the followers of prudent influencers purchase after observing $(r_I, r_C) = (G, B)$ or (B, G) , then consumers who follow a shallow influencer will also buy the product after observing $r_C = G$. Further, if those who follow a shallow influencer purchase after observing $r_C = G$, then those who follow a prudent influencer will purchase after observing $(r_I, r_C) = (G, G)$.

With regard to the payment ϕ , we observed that with only prudent influencers, the marketer needed to choose among three levels of payment to induce reviews. When shallow influencers are also in the market, they have their own threshold for accepting the contract $\phi_S = p_B\theta/2$. Direct comparison shows that $\phi_G^L \leq \phi_S \leq \min\{\phi_B, \phi_G^H\}$ for any $0 \leq p_B \leq p_G \leq 1$, and both inequalities attain equality only when $p_G = p_B$.

By setting (ϕ, p_G, p_B) , the marketer chooses from one of the following targeting strategies:

1. (group 1) Attract only consumers who follow a prudent influencer and buy only after observing the signal sequence (G, G) .
2. (group 1+2) Attract group 1 consumers and those who follow a shallow influencer and will buy if group 1 buys.
3. (group 1+2+3) Attract group 1 and 2 consumers and those who follow a prudent influencer and will buy if the sequence of signals is $(r_I, r_C) = (B, G)$ or (G, B) .

Targeting a larger group of consumers might generate more demand, but requires higher costs, creating a trade-off for the marketer. The share of prudent influencers in the market α will affect this choice as well, as when α is large, it is more profitable to target those who follow prudent influencers only.

The equilibrium analysis yields the following result:

Proposition 3. *When the market has a fraction α of prudent influencers and $1 - \alpha$ shallow influencers with $0 < \alpha < 1$:*

- The marketer always sets $p_G^* = 1$.
- When $1 - (2 - v_H)\alpha \geq \frac{1+\sqrt{v_H-1}}{2}$ or $\theta \geq \frac{1+\sqrt{v_H-1}}{2} > 1 - (2 - v_H)\alpha$, the marketer always sets $p_B^* = 0$ and $\phi^* = 0$.
- When $\frac{1+\sqrt{v_H-1}}{2} > \theta \geq 1 - (2 - v_H)\alpha$, there is a threshold α_1 such that marketer sets $p_B^* = \sqrt{v_H - 1}$ and $\phi^* = \frac{v_H-1}{1+\sqrt{v_H-1}}\theta$ if $\alpha > \alpha_1$, and $p_B^* = 0$ and $\phi^* = 0$ otherwise.³
- When $\frac{1+\sqrt{v_H-1}}{2} > 1 - (2 - v_H)\alpha \geq \theta > 0$, there is a threshold α_2 such that the marketer sets $p_B^* = \sqrt{v_H - 1}$ and $\phi^* = \frac{v_H-1}{1+\sqrt{v_H-1}}\theta$ when $\alpha > \alpha_2$, and $p_B^* = v_H - 1$ and $\phi^* = \frac{(v_H-1)}{2}\theta$ otherwise.
- Consumers will never purchase after the sequence $(r_I, r_C) = (B, G)$ or (G, B) .

Proposition 3 shows that the share of prudent influencers in the market α and the reputational cost θ interact to affect the marketer's and influencer decisions. Figure 2 illustrates the interaction between α and θ and how that affects the participation of the shallow and prudent influencers in the market. We observe that when θ is high, the marketer decides to provide full revelation information in the market, in which case both types of influencers will write reviews and the payment to them will be zero. The active consumers in the market will be segments 1 and 2. As θ starts to decrease, we observe that when α is small, the marketer would like shallow influencers to also participate in writing reviews and activate consumers in segments 1 and 2, while when α is large, the marketer would like only prudent influencers to write reviews and attract segment 1 consumers. The reason is that when α is small, there are many shallow influencers in the market and the marketer would like to receive the income they can generate. Although the payment ϕ they require to recommend the product is lower than that required by prudent influencers, they are also unwilling to tolerate a marketer with high persuasion levels $p_B^* > 0$, because those increase the expected reputational cost. Prudent influencers, in contrast, observe a signal before writing a review, and thus have lower risk when the marketer chooses to persuade, while shallow influencers are not afforded this benefit. The analysis shows that this ignorance is what allows shallow influencers to protect consumers from persuasion in the market, resulting in less disappointed consumers.

When we analyze the equilibrium profits of the influencers and the marketer, we find the following:

³The expressions for α_1 , and α_2 are provided in the proof of Proposition 3.

Figure 2: Participation of shallow and prudent influencers in the campaign. Light Grey: both participate, with persuasion ($p_B = v_H - 1$). Blue (Dark Grey): both participate, no persuasion ($p_B = 0$). White: Only prudent participates, with persuasion ($p_B = \sqrt{v_H - 1}$). $\hat{\theta}$ solves $\alpha_1 = \tilde{\alpha}$ with $\tilde{\alpha} = \frac{1-\theta}{2-v_H}$. α_1 and α_2 are defined in the proof for Proposition 3.

Corollary 4. *In the subgame perfect equilibrium when $\alpha \in [0, 1]$:*

- *When shallow influencers are active, their payoff is zero.*
- *The payoff of prudent influencers is zero for high values of θ . It increases with α for intermediate values of θ . It has an inverse U shape for low values of θ , being zero for low and high values of α , and positive for intermediate values of α .*
- *The profit of the marketer is at least 1/2. It is highest at $\alpha = 0$ or $\alpha = 1$, while it may decrease for intermediate values of α .*

Because shallow influencers do not observe an extra signal, unlike prudent influencers, they cannot extract informational rent by agreeing to recommend the product. In contrast, the additional information that prudent influencers hold can help them extract informational rent. Although this result might seem intuitive, it is not quite so. The prudent influencers makes a positive payoff only

when shallow influencers are active, and only if the marketer decides to persuade by setting $p_B^* > 0$.

It is also interesting to note that the marketer's profit is not necessarily maximized when the payoffs of the influencers are the lowest. That is, this is not a zero sum game. The marketer would prefer only shallow or only prudent influencers to be active, allowing an optimal information design. For intermediate values of α and low values of θ the marketer profits are often minimal, since they are better off fully revealing the state of the product, as illustrated in Figure 3.

Figure 3: The profit of the marketer has a U shape with respect to α . Higher values of θ lead to lower profit. The maximal profit is achieved when $\alpha = 0$ or $\alpha = 1$. $\hat{\theta}$, $\tilde{\alpha}$, α_1 and α_2 are defined as in Figure 2.

4 Conclusion and Future Work

As the popularity of influencer campaigns grows, we observe a proliferation of non-expert “micro-influencers” who promote products without carefully reviewing them for quality. We provide an explanation for this phenomenon by analyzing the impact of such shallow influencers compared to prudent influencers, who are careful and deliberate in the products they recommend.

Intuitively, one might think that consumers will be better off by following recommendations from prudent influencers, and consider recommendations from shallow influencers as manipulative and non-credible. This would have caused marketers to prefer to contract with prudent influencers, and would limit the success of shallow influencers.

The analysis shows that this is not the case. When shallow influencers are active in the market, the satisfaction of consumers increases as well as the marketer’s profit. This is a result of two forces operating concurrently. First, prudent influencers observe a signal about the product’s quality and can decide whether to promote it or not. This allows them to extract informational rent when shallow influencers are active in the market, which lowers the marketer’s profit. Second, because prudent influencers demand a higher payoff in order to write a review, the marketer needs to compensate for the loss of profit by increasing demand. To do that, the marketer will persuade more consumers to buy the product even if it will be detrimental to them. The marketer does so by shifting the information design of their signals to be less transparent about the true product’s utility, which increases the chances of consumers buying a product when it is of low utility. This lowers the information efficiency in the market.

Our model abstracts away from two important features—heterogeneous review costs and heterogeneous numbers of followers. Heterogeneous costs are analyzed in Section OA.1 of the Online Appendix. When the review costs of prudent influencers are high enough, only shallow influencers are active. When review costs are low, we find the same qualitative results as in the main analysis. Hence, we do not anticipate differences in cost structure to explain the popularity of shallow influencers. When the popularity of influencers (number of followers) is heterogeneous, our results follow through when payment is per follower of a post. When payment cannot be conditioned on the number of followers the marketer would like both influencers to always participate in the campaign. The payment offered increases in the popularity of the influencer with the binding participation constraint. This might explain why popularity, and not necessarily expertise or depth of content are driving the payment to influencers, and why some shallow influencers are paid dramatically more than prudent ones. Details appear in Section OA.2 of the Online Appendix.

Beyond the normative implications from this project for influencers and firms, this research also has policy implications for social media platforms. Social media platforms currently derive most of their income from advertising, while content created by influencers is often sponsored directly by advertisers and potentially cannibalizes the income of the platform from advertising. Recently, a few platforms have implemented mechanisms that try to charge brands for running influencer campaigns on the platform.⁴ Our research can help these platforms answers important questions

⁴For example, Instagram Paid Partnerships: <https://business.instagram.com/a/brandedcontentexpansion>, Accessed September 23, 2020.

while designing these mechanisms, such as how much to charge and how much exposure to give to content from influencers. To make this decision, it is important to know who are the profitable influencers in the market and which one the consumers prefer to follow.

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A Proofs

Proof of Lemma 1. A necessary condition for the consumer to buy is to believe that $Pr(v = v_H | r_C) > 1/2$. If they buy following a good signal, that means they believe that $Pr(v = v_H | r_C) = \frac{p_G}{p_G + p_B} > 1/2 \iff p_G > p_B$. Alternatively, if they buy following a bad signal B , they believe that $Pr(v = v_H | r_C) = \frac{1 - p_G}{1 - p_G + 1 - p_B} > 1/2 \iff p_G < p_B$. $\square$

Proof of Proposition 1. The expected payoff of the marketer in (6) always increases in p_G , but increases in p_B if and only if $\theta < 1$. The IR condition of the consumer is $\frac{p_G}{p_G + p_B} v_H \geq 1$, and can be written as $p_B \leq p_G(v_H - 1)$. Hence, the marketer will set $p_G^* = 1$, while when $\theta > 1$, they will set $p_B^* = 0$, which maintains the consumer's IR constraint. When $\theta < 1$, they will set $p_B^* = v_H - 1$ that binds the consumer's IR constraint.

When $\theta = 1$, p_B does not affect the marketer's profit, yet to maximize revenue they are better off setting $p_B = 0$. $\square$

Proof of Lemma 2. A necessary condition for the consumer to buy is that $Pr(v = v_H | (r_I, r_C)) > 1/2$.

For the first item, when buying after (G, G) , the posterior $\frac{p_G^2}{p_G^2 + p_B^2} > \frac{1}{2} \iff p_G > p_B$. For the second item, when buying after (B, B) the posterior $\frac{(1 - p_G)^2}{(1 - p_G)^2 + (1 - p_B)^2} > 1/2 \iff 1 - p_G > 1 - p_B \iff p_B > p_G$.

For the third item, when buying after (B, G) or (G, B) , the posterior $\frac{p_G^2}{p_G^2 + p_B^2} > \frac{1}{2} \iff p_G(1 - p_G) > p_B(1 - p_B)$ which happens when $p_G > p_B$ and $p_G < 1 - p_B$ if $p_G > 1/2$, or when $p_G < p_B$ and $p_G > 1 - p_B$ when $p_G < 1/2$. Restricting to also buying after (G, G) proves the third item. $\square$

Proof of Lemma 3. When $Pr(v = v_H|G, G)v_H < 1$ the consumer never buys, yielding no risk of penalty from consumers, resulting in the prudent influencer reviewing as long as $\phi \geq 0$.

When $Pr(v = v_H|G, B)v_H < 1 \leq Pr(v = v_H|G, G)v_H$, the consumer purchases only after observing (G, G) . The expected profit of the prudent influencer after observing $r_I = G$ is $\phi - \theta \frac{p_B^2}{p_B + p_G}$, resulting in a recommendation if $\phi \geq \theta \frac{p_B^2}{p_B + p_G}$, while it is penalty free after observing $r_I = B$ since consumers will not purchase, resulting in recommending when $\phi \geq 0$.

When $Pr(v = v_H|B, G)v_H \geq 1$, the consumer will purchase if either the prudent influencer or they receive a signal G . After $r_I = G$, the prudent influencer's expected profit from recommending is $\phi - \theta \frac{p_B}{p_B + p_G}$. After $r_I = B$, it is $\phi - \theta \frac{p_B(1 - p_B)}{1 - p_B + 1 - p_G}$. Comparing these to zero yields the two payment thresholds described in the Lemma. $\square$

Proof of Proposition 2. The marketer will never choose an information design with $Pr(v = v_H|G, G)v_H < 1$ as no consumer will buy, making case 1 in Lemma 3 impossible.

Suppose the marketer chooses (p_G, p_B) such that $Pr(v = v_H|G, B)v_H < 1 \leq Pr(v = v_H|G, G)v_H$ (case 2 in Lemma 3). If they offer ϕ that only compensates reviewing after seeing $r_I = B$, there will be no consumer demand. Hence $\phi = \phi_G^L$ and the influencer will review after any signal. The consumer only buys after observing (G, G) in this case, yielding the marketer an expected demand of $Pr((r_I, r_C) = (G, G)) = (p_G^2 + p_B^2)/2$. The marketer therefore solves:

$$\begin{aligned} \max_{p_G, p_B} p Pr((r_I, r_C) = (G, G)) - \phi_G^L &= \frac{1}{2}(p_G^2 + p_B^2) - \theta \frac{p_B^2}{p_G + p_B} \\ \text{s.t. } Pr(v = v_H|G, B)v_H &< 1 \leq Pr(v = v_H|G, G)v_H \end{aligned} \quad (7)$$

The consumer's IR constraint can be written as $p_B(1 - p_B) > p_G(1 - p_G)(v_H - 1)$ and $p_B^2 \leq p_G^2(v_H - 1)$.

Because the expected profit increases in p_G , the marketer will set $p_G = 1$. With $p_G = 1$, the marketer's decision is constrained to picking p_B within $[0, \sqrt{v_H - 1}]$. The marketer's profit with $p_G = 1$ then increases in p_B or first decreases and then increases when $p_B \in [0, \sqrt{v_H - 1}]$, depending on the value of θ . The maximum is achieved at one of the two corners $(p_G, p_B) = (1, 0)$

or $(1, \sqrt{v_H - 1})$. In these corners, the marketer's profit is highest with $(p_G, p_B) = (1, \sqrt{v_H - 1})$ if $\theta < (1 + \sqrt{v_H - 1})/2$, and with $(p_G, p_B) = (1, 0)$ otherwise. The payment to the prudent influencer will be $\phi^*(1, \sqrt{v_H - 1}) = \frac{\theta(v_H - 1)}{1 + \sqrt{v_H - 1}}$, and $\phi^*(1, 0) = 0$. The marketer's possible expected profits are $\pi_M(1, \sqrt{v_H - 1}, \frac{\theta(v_H - 1)}{1 + \sqrt{v_H - 1}}) = v_H/2 - \frac{\theta(v_H - 1)}{1 + \sqrt{v_H - 1}}$ and $\pi_M(1, 0, 0) = 1/2$. When $\theta < (1 + \sqrt{v_H - 1})/2$, the marketer's expected profit decreases with θ .

Next, suppose that the marketer chooses (p_G, p_B) such that $Pr(v = v_H | G, B)v_H \geq 1$. The marketer can choose either a low offer ϕ_B or a high offer ϕ_G^H .

When the marketer offers ϕ_G^H , the prudent influencer always recommends, and the expected demand is $D(\phi_G^H, p_G, p_B) = Pr(r_I = G \text{ or } r_C = G) = p_G + p_B - (p_G^2 + p_B^2)/2$. The marketer solves

$$\begin{aligned} \max_{p_G, p_B} \pi_M &= p Pr(r_I = G \text{ or } r_C = G) - \phi_G^H = p_G + p_B - \frac{1}{2}(p_G^2 + p_B^2) - \theta \frac{p_B}{p_G + p_B} \quad (8) \\ \text{s.t. } &Pr(v = v_H | G, B)v_H > 1 \text{ and } 0 \leq p_B \leq p_G \leq 1 \end{aligned}$$

The marketer's profit is increasing with p_G , and the consumer's IR constraint limits $p_G \leq 1$, hence it is binding with $p_B(1 - p_B) = (v_H - 1)p_G(1 - p_G)$ for $p_G \geq 1/2$, resulting in $p_B = (1 - \sqrt{1 - 4(v_H - 1)p_G(1 - p_G)})/2$. The marketer's profit maximization is constrained to be only over $p_G \in [1/2, 1]$. The solution to the first order condition $\partial \pi_M / \partial p_G = 0$ yields:

$$\theta = \frac{(2p_G + 1 - \sqrt{\delta})^2[(v_H + 1 - 2v_H p_G)\sqrt{\delta} + (2p_G - 1)(v_H - 1)]}{4[2p_G(2p_G - 1)(v_H - 1) - \sqrt{\delta} + \delta]} \quad (9)$$

where $\delta = 1 - 4(v_H - 1)p_G(1 - p_G)$. When $1 < v_H < 2$ the solution to (9) is positive if and only if $p_G > 1/2$, it is decreasing in p_G and $\lim_{p_G \rightarrow 1^-} \theta = 0$, $\lim_{p_G \rightarrow 1/2^+} \theta = +\infty$. This implies Equation (9) has a unique solution for p_G which we denote $p_G^*(v_H, \theta)$. In addition, the marketer's profit π_M is increasing with p_G when $1/2 < p_G \leq p_G^*(v_H, \theta)$ and decreasing with p_G when $p_G^*(v_H, \theta) \leq p_G \leq 1$. Therefore, $p_G^*(v_H, \theta)$ is the unique solution of the first order condition. Because the consumers' IR constraint is binding, $p_B^*(v_H, \theta) = (1 - \sqrt{1 - 4(v_H - 1)p_G^*(v_H, \theta)(1 - p_G^*(v_H, \theta))})/2$, and $\phi^* = \theta \frac{p_B^*(v_H, \theta)}{p_B^*(v_H, \theta) + p_G^*(v_H, \theta)}$.

When the marketer offers ϕ_B , the prudent influencer only reviews following a bad signal, and the expected demand is $D(\phi_B, p_G, p_B) = Pr((r_I, r_C) = (B, G)) = [p_G(1 - p_G) + p_B(1 - p_B)]/2$. The

marketer chooses (p_G, p_B) to solve:

$$\begin{aligned}
\max_{p_G, p_B} \pi_M &= pPr((r_I, r_C) = (B, G)) - \phi_B Pr(r_I = B) \\
&= \frac{1}{2}[p_G(1 - p_G) + p_B(1 - p_B)] - \frac{p_B(1 - p_B)\theta}{1 - p_B + 1 - p_G} \frac{1}{2}(1 - p_B + 1 - p_G) \\
&= \frac{1}{2}[p_G(1 - p_G) + p_B(1 - p_B)(1 - \theta)] \\
\text{s.t. } &Pr(v = v_H|G, B)v_H > 1, \text{ and } 0 \leq p_B \leq p_G \leq 1
\end{aligned} \tag{10}$$

When $\theta > 1$, $p_B^* = 0$, $p_G^* = 1/2$, and $\phi^* = 0$. In this case, the marketer's maximal profit is $\pi_M = 1/8$. When $\theta \leq 1$, the consumers' IR constraint is binding with $p_G^* = 1/2$, $p_B^* = (1 - \sqrt{2 - v_H})/2$, and $\phi^* = \frac{v_H - 1}{2(2 + \sqrt{2 - v_H})}\theta$. The marketer's maximal profit is $\pi_M = (v_H - v_H\theta + \theta)/8$.

When the marketer decides on $Pr(v = v_H|G, B)v_H \geq 1$ with ϕ_B , the expected profit never exceeds $1/8v_H$. This is lower than the profit of $1/2$ when $Pr(v = v_H|G, B)v_H < 1 \leq Pr(v = v_H|G, G)v_H$ and $(p_G, p_B) = (1, 0)$. Opting for ϕ_G^H with $Pr(v = v_H|G, B)v_H \geq 1$ yields lower profit than setting $(p_G, p_B) = (1, \sqrt{v_H - 1})$ and offering ϕ_G^L . Hence, the marketer will never choose (p_G, p_B) such that $Pr(v = v_H|G, B)v_H \geq 1$. $\square$

Proof of Proposition 3. We will show that targeting groups 1, 2 and 3 is not profitable, and that the marketer will choose among targeting group 1 or groups 1 and 2 depending on the values of α and θ .

When targeting group 1 only, only the prudent influencers are active and this case is equivalent to setting $\phi = \phi_G^L$ in Proposition 2, yielding the optimal contract:

$$(p_G^*, p_B^*, \phi^* = \phi_G^L) = \begin{cases} (1, \sqrt{v_H - 1}, \frac{v_H - 1}{1 + \sqrt{v_H - 1}}\theta) & \theta < \frac{1 + \sqrt{v_H - 1}}{2} \\ (1, 0, 0) & \theta \geq \frac{1 + \sqrt{v_H - 1}}{2} \end{cases} \tag{11}$$

with payoffs:

$$\pi_M = \begin{cases} \alpha \left(\frac{v_H}{2} - \frac{\theta(v_H - 1)}{1 + \sqrt{v_H - 1}} \right) & \theta < \frac{1 + \sqrt{v_H - 1}}{2} \\ 1/2\alpha & \theta \geq \frac{1 + \sqrt{v_H - 1}}{2} \end{cases} \tag{12}$$

When targeting group 1 and 2 consumers, both prudent and shallow influencers are active when $r_I = G$. This means paying at least $\phi_S > \phi_G^L$, yielding the expected profit $\pi_M = \alpha Pr((r_I, r_C) = (G, G)) + (1 - \alpha)Pr(r_C = G) - \phi_S$.

The active consumer IR constraint in this case is $p_G/(p_G + p_B)v_H \geq 1$. The equilibrium optimal strategy and payoff are:

$$(p_G^*, p_B^*, \phi^* = \phi_S) = \begin{cases} (1, v_H - 1, \theta \frac{v_H - 1}{2}) & \theta < 1 - (2 - v_H)\alpha \\ (1, 0, 0) & \theta \geq 1 - (2 - v_H)\alpha \end{cases} \quad (13)$$

$$\pi_M = \begin{cases} \frac{1 + \alpha(v_H - 1)^2 + (1 - \alpha - \theta)(v_H - 1)}{2} & \theta < 1 - (2 - v_H)\alpha \\ 1/2 & \theta \geq 1 - (2 - v_H)\alpha \end{cases} \quad (14)$$

To determine whether the marketer selects targeting group 1 or groups 1 and 2, we analyze by cases. When $\frac{1 + \sqrt{v_H - 1}}{2} > 1 - (2 - v_H)\alpha$, which holds iff $\alpha > \alpha_0 = \frac{1 - \sqrt{v_H - 1}}{2(2 - v_H)}$, we separate the analysis into three ranges of θ :

(i) When $\theta \geq \frac{1 + \sqrt{v_H - 1}}{2}$, the optimal information design is $(p_G^*, p_B^*) = (1, 0)$. The two possible payment levels coincide, and the maximum profit is $1/2$.

(ii) When $1 - (2 - v_H)\alpha \leq \theta < \frac{1 + \sqrt{v_H - 1}}{2}$, the marketer compares the profits when $(p_B, \phi) = (0, 0)$ and when $(p_B, \phi) = (\sqrt{v_H - 1}, (v_H - 1)\theta/(1 + \sqrt{v_H - 1}))$ with $p_G = 1$ in both cases. The former yields a profit $1/2$, and the latter yields $\alpha(\frac{v_H}{2} - \frac{(v_H - 1)\theta}{1 + \sqrt{v_H - 1}})$.

$\alpha(\frac{v_H}{2} - \frac{(v_H - 1)\theta}{1 + \sqrt{v_H - 1}}) > 1/2$ iff $\alpha > \alpha_1 = \frac{1 + \sqrt{v_H - 1}}{v_H(1 + \sqrt{v_H - 1}) - 2(v_H - 1)\theta}$ yielding the optimal strategy $p_G^* = 1, p_B^* = \sqrt{v_H - 1}, \phi^* = \phi_G^L = (v_H - 1)\theta/(1 + \sqrt{v_H - 1})$ if $\alpha > \alpha_1$, and $p_G^* = 1, p_B^* = 0, \phi^* = 0$ if $\alpha_0 < \alpha < \alpha_1$.⁵

(iii) When $\theta < 1 - (2 - v_H)\alpha$, the marketer decides between $(p_B, \phi) = (\sqrt{v_H - 1}, (v_H - 1)\theta/(1 + \sqrt{v_H - 1}))$ and $(p_B, \phi) = (v_H - 1, (v_H - 1)\theta/2)$ with $p_G = 1$ in both cases. The former option yields a higher profit if and only if $\alpha > \alpha_2 = \frac{[1 + (1 - \theta)(v_H - 1)](1 + \sqrt{v_H - 1})}{[v_H + (v_H - 1)(2 - v_H)](1 + \sqrt{v_H - 1}) - (v_H - 1)\theta}$.⁶

The marketer's optimal strategy is $p_G^* = 1, p_B^* = \sqrt{v_H - 1}, \phi^* = (v_H - 1)\theta/(1 + \sqrt{v_H - 1})$ if $\alpha > \alpha_2$, and $p_G^* = 1, p_B^* = v_H - 1, \phi^* = (v_H - 1)\theta/2$ if $\alpha_0 < \alpha < \alpha_2$. The profit of the manufacturer is at least $1/2$.

A similar analysis for the case of $\alpha \leq \alpha_0$ shows that the marketer should always set $\phi^* = \phi_S$ to contract with both types of influencers.

Finally, suppose the marketer sets (p_G, p_B) targeting group 1, 2 and 3. To do that they need to choose among payments ϕ_B and ϕ_G^H .

⁵ α_0 is always lower than α_1 for any θ and v_H . When $\theta < (1 + \sqrt{v_H - 1})/2$ then $\alpha_1 < 1$ always holds.

⁶When $\theta < 1 - (2 - v_H)\alpha$, $\alpha_0 < \alpha_2$ always holds.

If $\phi = \phi_B$, then in addition to shallow influencers, prudent influencers will review only after a bad signal. The marketer's expected profit is

$$\pi_M = (1 - \alpha)Pr(r_I = G) + \alpha Pr((r_I, r_C) = (B, G)) - \phi_B(1 - \alpha + \alpha Pr(r_I = B))$$

The profit is maximized when the IR constraint is binding with $p_B(1 - p_B) = (v_H - 1)p_G(1 - p_G)$. This constraint limits the maximum value of the profit to never exceed what could be achieved from setting $\phi^* = \phi_S$.

If $\phi = \phi_G^H$, then all the influencers review regardless of their signal. The marketer's profit is

$$\pi_M = (1 - \alpha)Pr(r_I = G) + \alpha Pr(r_I = G \text{ or } r_C = G) - \phi_G^H$$

The consumers' IR constraint is also binding when the marketer maximizes the expected profit. Similarly to the previous case, the profit will not exceed that from setting $\phi^* = \phi_S$. □

Proof of Corollary 4. Shallow influencers are active when the contract (p_G^*, p_B^*, ϕ^*) is $(1, v_H - 1, \theta \frac{v_H - 1}{2})$ or $(1, 0, 0)$. Their payoff is $\phi^* - 1/2 p_B^* \theta = \theta \frac{v_H - 1}{2} - 1/2 (v_H - 1) \theta = 0$ for the former and 0 for the latter.

Prudent influencers are active when the contract is $(1, v_H - 1, \theta \frac{v_H - 1}{2})$, $(1, \sqrt{v_H - 1}, \frac{v_H - 1}{1 + \sqrt{v_H - 1}} \theta)$, or $(1, 0, 0)$. They only write a review when they see a good signal, hence their payoff is $(1/2 p_G^* + 1/2 p_B^*) \phi^* - 1/2 (p_B^*)^2 \theta$. The first contract yields a payoff of $\frac{\theta}{4} (v_H - 1) (2 - v_H) > 0$, while the latter two yield zero payoff.

For the marketer's profit, the result is a straightforward comparison of the Marketer's payoffs from the proof of Proposition 3. □

Online Appendix

OA.1 Heterogeneous Review Costs

We consider a generalized model in which prudent influencers incur a cost $c \geq 0$ from reviewing whereas shallow influencers do not. We note that consumer decisions will not be impacted if the influencer they follow has a cost to review. Hence the results in Lemma 2 hold. We analyze two cases - a market with only prudent influencer ($\alpha = 1$) and market with a mix of shallow and prudent influencer. This allows us to look at the cases where the marketer can differentiate the contracts among shallow and prudent influencers, as well as the cases where they cannot offer a different contract to each type. The results are very similar to the main analysis, although in the case of $0 < \alpha < 1$, when the cost of the prudent influencer is high enough, the marketer would employ only shallow influencers. This is intuitive, as the cost of the prudent influencer increases the payment required by the prudent influencer to participate in the market, which lowers the marketer's profit.

OA.1.1 Only Prudent Influencers in the Market ($\alpha = 1$)

Because the consumer decisions will not change given a set of signals (r_I, r_C) the prudent influencer payoff is only lowered by the cost c of observing the signal r_I , but their decision remain the same:

Lemma 4. *The influencer will publish a review about the product after observing the signal r_I and given the contract (p_G, p_B, ϕ) when:*

- $Pr(v = v_H | G, G)v_H < 1$.
- $Pr(v = v_H | G, B)v_H < 1 \leq Pr(v = v_H | G, G)v_H$, $r_I = G$ and $\phi \geq \theta \frac{p_B^2}{p_B + p_G} + c$, or $r_I = B$ and $\phi \geq c$.
- $Pr(v = v_H | B, G)v_H \geq 1$, $r_I = G$ and $\phi \geq \theta \frac{p_B}{p_B + p_G} + c$, or $r_I = B$ and $\phi \geq \theta \frac{p_B(1-p_B)}{1-p_B+1-p_G} + c$.

Similarly to the case without reviewing costs, the marketer will not choose an information design such that $Pr(v = v_H | G, G)v_H < 1$ (case 1 in Lemma 4), and will offer one of three levels of compensation ϕ_G^L, ϕ_G^H , or ϕ_B respectively, which are increased by c :

$$\max_{p_G, p_B} \pi_M = pPr((r_I, r_C) = (G, G)) - \phi_G^L = \frac{1}{2}(p_G^2 + p_B^2) - \theta \frac{p_B^2}{p_G + p_B} - c \quad (15)$$

$$\text{s.t. } Pr(v = v_H | G, B)v_H < 1 \leq Pr(v = v_H | G, G)v_H$$

$$\max_{p_G, p_B} \pi_M = pPr(r_I = G \text{ or } r_C = G) - \phi_G^H = p_G + p_B - \frac{1}{2}(p_G^2 + p_B^2) - \theta \frac{p_B}{p_G + p_B} - c \quad (16)$$

$$\text{s.t. } Pr(v = v_H | G, B) v_H > 1 \text{ and } 0 \leq p_B \leq p_G \leq 1$$

$$\max_{p_G, p_B} \pi_M = pPr((r_I, r_C) = (B, G)) - \phi_B Pr(r_I = B) \quad (17)$$

$$\begin{aligned} &= \frac{1}{2}[p_G(1 - p_G) + p_B(1 - p_B)] - \left(\frac{p_B(1 - p_B)\theta}{1 - p_B + 1 - p_G} + c \right) \frac{1}{2}(1 - p_B + 1 - p_G) \\ &= \frac{1}{2}[p_G(1 - p_G) + p_B(1 - p_B)(1 - \theta) - (2 - p_G - p_B)c] \end{aligned} \quad (18)$$

$$\text{s.t. } Pr(v = v_H | G, B) v_H > 1, \text{ and } 0 \leq p_B \leq p_G \leq 1$$

When the marketer offers ϕ_G^L or ϕ_G^H , the optimal information design coincides with the special case where prudent influencers have zero cost, because prudent influencers always review regardless of their signal. Hence, the marketer's expected profit will only decrease by c when these two levels of compensation are offered, and similarly to before, the marketer will always prefer ϕ_G^L to ϕ_G^H .

If, in contrast, the marketer offers ϕ_B , the prudent influencers only recommend if their own signal is $r_I = B$, and the reviewing cost will change the marketer's optimal strategy. When $\theta > 1$, the marketer's optimal decision is $p_B^* = 0$, $p_G^* = (1 + c)/2$, and $\phi_B^* = c$. When $\theta < 1$, first order analysis shows that the consumer's participation constraint will be binding. The optimal information design (p_G^*, p_B^*) satisfies $p_G^* \in (1/2, (1 + c)/2)$ and $p_B^* = (1 - \sqrt{1 - 4(v_H - 1)p_G^*(1 - p_G^*)})/2$. Using (18), marketer's profit will be

$$\pi_M(p_G^*, p_B^*, \phi_B^*) = \begin{cases} \frac{1}{8}(c^2 - 6c + 1) & \theta > 1 \\ \frac{1}{2}p_G^*(1 - p_G^*)[1 + (1 - \theta)(v_H - 1)] - \frac{c}{2}(2 - p_G^* - p_B^*) & \theta < 1 \end{cases} \quad (19)$$

This profit will be positive only when $c < 3 - 2\sqrt{2}$ if $\theta > 1$ and when $c < 1/2$ if $\theta < 1$.⁷ It will not be a viable strategy to offer ϕ_B if $c > 1/2$.

Under either case ($\theta > 1$ or $\theta < 1$), we show that ϕ_B is never optimal by showing that the marketer's profit from the contract (p_G^*, p_B^*, ϕ_B^*) is always lower than from using $\phi = \phi_G^L$. Recall

⁷The case of $c > 3 + 2\sqrt{2}$ when $\theta > 1$ can be eliminated since prudent influencers will not review at such a high reviewing cost. When $c < 3 - 2\sqrt{2}$ the marketer's profit monotonically decreases with the prudent influencers' reviewing cost. The upper bound on c when $\theta < 1$ is not sharp, but is sufficient for the analysis. For the marketer's profit to be positive, c needs to be even smaller.

that when $\phi = \phi_G^L$:

$$\pi_M = \begin{cases} \frac{v_H}{2} - \frac{\theta(v_H-1)}{1+\sqrt{v_H-1}} - c & \theta < \frac{1+\sqrt{v_H-1}}{2} \\ \frac{1}{2} - c & \theta \geq \frac{1+\sqrt{v_H-1}}{2} \end{cases} \quad (20)$$

From the previous analysis we can limit the analysis to $c < 1/2$. When $\theta > 1$ and $c < 3 - 2\sqrt{2}$, the marketer's profit of $(c^2 - 6c + 1)/8$ from paying ϕ_B is lower than the profit $1/2 - c$ when paying ϕ_G^L . When $\theta < 1$, we need to analyze the following inequality:

$$\frac{1}{2} - c \geq \frac{1}{2} p_G^* (1 - p_G^*) [1 + (1 - \theta)(v_H - 1)] + \frac{c}{2} (p_G^* + p_B^*) - c. \quad (21)$$

for any $c < 1/2$ since the left hand side of (21) is the lower bound of the marketer's profit when offering ϕ_G^L . To show (21) holds, we will analyze a stronger condition. On the right hand side of (21), the optimal p_G^* is between $1/2$ and $(1 + c)/2$. Considering the two summands separately, the first summand $\frac{1}{2} p_G^* (1 - p_G^*) [1 + (1 - \theta)(v_H - 1)]$ is bounded from above by its maximum which is attained at $p_G^* = 1/2$. The second summand $\frac{c}{2} (p_G^* + p_B^*) - c$ is bounded from above if we replace $p_G^* = (1 + c)/2$ and maintain the consumer's participation constraint. The right hand side of (21) is then bounded from above by $(v_H + \theta - v_H \theta)/8 + c[c - \sqrt{1 - (v_H - 1)(1 - c^2)} - 2]/4$.

Hence, showing that

$$\frac{1}{2} - c \geq \frac{1}{8} (v_H + \theta - v_H \theta) + \frac{c}{4} [c - \sqrt{1 - (v_H - 1)(1 - c^2)} - 2] \quad (22)$$

holds for any $c < 1/2$ will complete the proof. Since $v_H > 1$, we can further relax the right hand side of (22) and replace the first term by $v_H/8$. After simplification, the inequality becomes:

$$\frac{v_H}{2} + c[c - \sqrt{1 - (v_H - 1)(1 - c^2)} + 2] \leq 2 \quad (23)$$

and it can be verified directly that it holds for $c < 1/2$.

The results of the analysis are summarized as follows:

Proposition 5. *When the market has only prudent influencers with reviewing cost:*

- The manufacturer will set $p_G^* = 1$.
- When $\theta > \frac{1+\sqrt{v_H-1}}{2}$, the manufacturer will set $p_B^* = 0$ and $\phi^* = 0$. There will not be disappointed consumers in the market.
- When $\theta < \frac{1+\sqrt{v_H-1}}{2}$, the manufacturer will set $p_B^* = \sqrt{v_H-1}$ and $\phi^* = \frac{v_H-1}{1+\sqrt{v_H-1}}\theta$. The share of disappointed consumers in the market will be $\frac{v_H-1}{1+\sqrt{v_H-1}} > 0$.

OA.1.2 Both Types of Influencers in the Market ($0 < \alpha < 1$)

When c is low the marketer's optimal decision would be the same as before. This scenario occurs as long as $\phi_G^L < \phi_S$. Solving $\phi_G^L = \phi_S$, we find that when $c \leq c_0 = \frac{\theta(p_B p_G - p_B^2)}{2(p_G + p_B)}$ the marketer will employ the same marketing strategy as in the case of $c = 0$.

When $c > c_0$, it suffices to compare the profit when setting $\phi_S = \theta p_B/2$ with setting $\phi_G^L = \theta \frac{p_B^2}{p_G + p_B} + c$. When setting $\phi = \phi_S$, only shallow influencers recommend, and the marketer's profit is:

$$\pi_M = (1 - \alpha)(Pr(r_I = G) - \phi_S) = \frac{1}{2}(1 - \alpha)[p_G + (1 - \theta)p_B]$$

resulting in the optimal information design $(p_G^*, p_B^*) = (1, v_H - 1)$ if $\theta < 1$ and $(p_G^*, p_B^*) = (1, 0)$ if $\theta > 1$.

If the marketer sets $\phi = \phi_G^L$, both types of influencers will always review. The marketer's expected profit is:

$$\begin{aligned} \pi_M &= \alpha Pr((r_I, r_C) = (G, G)) + (1 - \alpha)Pr(r_I = G) - \phi_G^L \\ &= \frac{\alpha}{2}(p_G^2 + p_B^2) + \frac{1 - \alpha}{2}(p_G + p_B) - \theta \frac{p_B^2}{p_G + p_B} - c \end{aligned}$$

The profit is increasing with p_G , so it is optimal to set $p_G^* = 1$. The consumers' participation constraint is $p_B \leq (v_H - 1)p_G$.

Maximizing the expected profit yields the following:

Lemma 5. *Suppose the marketer sets $\phi = \phi_G^L = \theta \frac{p_B^2}{p_G + p_B} + c$, $p_G^* = 1$ and $p_B \in [0, v_H - 1]$.*

- *There is a $\theta_0(\alpha)$ such that the marketer's profit π_M is increasing with p_B as long as $\theta < \theta_0(\alpha)$. In this case, the marketer would set $p_B^* = v_H - 1$.*

- *Suppose $\theta > \theta_0(\alpha)$.*

- *There is a value α_3 such that if $\alpha < \alpha_3$, the marketer's profit is maximized when $p_B = v_H - 1$.*

- *There is a value $\alpha_4 > \alpha_3$ such that for any $\alpha_3 < \alpha < \alpha_4$, the marketer's profit is maximized at some $p_B^{(1)} \in (0, v_H - 1)$.*

Proof. When $\phi = \phi_G^L$ and $p_G = 1$, the marketer's maximum profit increases with p_B if and only if $\theta < \frac{(1-\alpha)/2 + \alpha p_B}{\frac{p_B}{1+p_B} \left(2 - \frac{p_B}{1+p_B}\right)}$ for any $0 < \alpha < 1$, and $p_B \in [0, v_H - 1]$. The right hand side of the inequality

has a global minimum, denoted by $\theta_0(\alpha)$ and defined as:

$$\theta_0(\alpha) = \min_{0 \leq p_B \leq v_H - 1} \frac{(1 - \alpha)/2 + \alpha p_B}{\frac{p_B}{1 + p_B} \left(2 - \frac{p_B}{1 + p_B} \right)}. \quad (24)$$

Setting $\phi = \phi_G^L$ and $p_G = 1$, we can rewrite $\partial \pi_M / \partial p_B > 0$ as:

$$\alpha p_B^3 + \left(\frac{1 + 3\alpha}{2} - \theta \right) p_B^2 + (1 - 2\theta) p_B + \frac{1 - \alpha}{2} > 0. \quad (25)$$

Denote the left hand side of (25) by $Q(p_B)$. $Q'(p_B) = 0$ has exactly two solutions $p_B = -1$ and $p_B = \frac{2\theta - 1}{3\alpha}$. Using these two solutions we summarize the properties of $Q(p_B)$ and the marketer's optimal choice of p_B :

- (i) If either $\frac{2\theta - 1}{3\alpha} < 0$ or $\frac{2\theta - 1}{3\alpha} > 0$ and $Q(\frac{2\theta - 1}{3\alpha}) > 0$, then $Q(p_B) > 0$, i.e., (25) holds for any $p_B \in [0, v_H - 1]$. It implies that π_M is increasing with p_B .
- (ii) If $\frac{2\theta - 1}{3\alpha} > 0$ and $Q(\frac{2\theta - 1}{3\alpha}) < 0$, then there exists a unique $0 < p_B^{(1)} < \frac{2\theta - 1}{3\alpha}$ such that $Q(p_B^{(1)}) = 0$.
 - (a) If $p_B^{(1)} \geq v_H - 1$, then $Q(p_B) > 0$ for any $p_B \in [0, v_H - 1]$ and π_M is increasing with p_B .
 - (b) If $p_B^{(1)} < v_H - 1$, then π_M has a local maximum at $p_B^{(1)}$.

Under either (i) or (iia), the optimal strategy for the marketer is to set $p_B = v_H - 1$. Under (iib), the optimal decision for p_B depends on where π_M attains its absolute maximum, either at the interior point $p_B^{(1)}$ or the end point $v_H - 1$. We would need to compare π_M at these two values of p_B .

Equivalently, the marketer should always set $p_B^* = v_H - 1$ unless the following conditions hold: $\frac{2\theta - 1}{3\alpha} > 0$, $Q(\frac{2\theta - 1}{3\alpha}) < 0$, $p_B^{(1)} < v_H - 1$ and $\pi_M(p_B^{(1)}) \geq \pi_M(v_H - 1)$, where $p_B^{(1)}$ satisfies $0 < p_B^{(1)} < \frac{2\theta - 1}{3\alpha}$ and $Q(p_B^{(1)}) = 0$. $\square$

The lemma implies that it is never optimal to set $p_B = 0$, unlike the cases analyzed in the main text. As θ increases, the value of $p_B^{(1)}$ approaches 0, but it is always strictly positive.

Now we compare marketer's profits from $\phi = \phi_B$ and from $\phi = \phi_G^L$. The prudent influencers' reviewing cost c determines the marketer's optimal strategy. As c exceeds a cutoff value c_1 , it is more profitable for the marketer to involve only shallow influencers. Otherwise, involving both types of influencers yields a higher profit.

OA.2 Heterogeneous Popularity

As explained in the text, the analysis with $\alpha = 1$ and $\alpha = 0$ can be seen as a payment per post per follower, in which case all the result follow through as they are, with the payment multiplied by the number of followers of an influencer.

However, if the marketer cannot condition the payment on popularity, we can augment the analysis by assuming that there are only two influencers (one prudent and one shallow), each followed by a fraction of mass one of consumers. Let α be the fraction of consumers following the prudent influencer and $1 - \alpha$ the fraction following the shallow one. The consumer's penalty from a bad match imposed on an influencer is thus $\theta\alpha$ for the prudent, and $\theta(1 - \alpha)$ for the shallow. This case is also equivalent to a scenario where each influencer has their own penalty cost θ .

The marketer chooses the compensation from $\phi_G^L, \phi_G^H, \phi_B$, and ϕ_S , where $\phi_G^L = \theta\alpha \frac{p_B^2}{p_B + p_G}$, $\phi_G^H = \theta\alpha \frac{p_B}{p_B + p_G}$, $\phi_B = \theta\alpha \frac{p_B(1-p_B)}{1-p_B+1-p_G}$ and $\phi_S = \theta(1 - \alpha) \frac{p_B}{2}$. Following the same analysis as before, the final decision is between ϕ_G^L and ϕ_S , and which influencer will be active in the market depends on whether ϕ_G^L or ϕ_S is higher. Note that $\phi_G^L < \phi_S$ if and only if $\alpha < \underline{\alpha} = \frac{p_B + p_G}{3p_B + p_G}$.

First, suppose that $\alpha < \underline{\alpha}$. If the marketer chooses the low offer ϕ_G^L , then the decision and profit are precisely the same as before, given by (11) and (12). If the marketer chooses the high offer ϕ_S , then the equilibrium decision is

$$(p_G^*, p_B^*, \phi^* = \phi_S) = \begin{cases} (1, v_H - 1, \theta \frac{(1-\alpha)(v_H-1)}{2}) & \theta < \frac{\alpha(v_H-1)}{1-\alpha} + 1 \\ (1, 0, 0) & \theta > \frac{\alpha(v_H-1)}{1-\alpha} + 1 \end{cases} \quad (26)$$

and profit is

$$\pi_M = \begin{cases} \frac{\alpha}{2}(v_H - 1)^2 + \frac{1-\alpha}{2}(1 - \theta)(v_H - 1) + \frac{1}{2} & \theta < \frac{\alpha(v_H-1)}{1-\alpha} + 1 \\ \frac{1}{2} & \theta > \frac{\alpha(v_H-1)}{1-\alpha} + 1 \end{cases} \quad (27)$$

Comparing the maximal profits from these two choices for three ranges of θ : (1) $\theta < (1 + \sqrt{v_H - 1})/2$, (2) $(1 + \sqrt{v_H - 1})/2 < \theta < \frac{\alpha(v_H-1)}{1-\alpha} + 1$, and (3) $\theta > \frac{\alpha(v_H-1)}{1-\alpha} + 1$, it follows that marketer's optimal decision is always to involve both influencers in the campaign. In this analysis, the only non-trivial case is when $\theta < (1 + \sqrt{v_H - 1})/2$. Specifically, if $\theta < (1 + \sqrt{v_H - 1})/2$, $\phi^* = \phi_G^L$ will yield a higher profit than ϕ_S if and only if $\alpha > \bar{\alpha}$, where

$$\bar{\alpha} = \frac{1 + (1 - \theta)(v_H - 1)}{v_H - \frac{\theta(v_H-1)}{1+\sqrt{v_H-1}} - (v_H - 1)^2 + (1 - \theta)(v_H - 1)}. \quad (28)$$

We notice that $\bar{\alpha}$ is increasing with θ when $0 \leq \theta < (1 + \sqrt{v_H - 1})/2$, hence its minimum value is attained when $\theta = 0$, for which $\bar{\alpha} = \bar{\alpha}(0)$. However, in equilibrium, $\underline{\alpha}^* = \frac{p_B^* + p_G^*}{3p_B^* + p_G^*}$ for $(p_G^*, p_B^*) = (1, v_H - 1)$ or $(1, \sqrt{v_H - 1})$. It follows that $\bar{\alpha}(0) > \underline{\alpha}^*$ always holds for any $1 < v_H < 2$. Hence it must be that $\underline{\alpha}^*$ is always lower than $\bar{\alpha}$ for any $0 \leq \theta < (1 + \sqrt{v_H - 1})/2$. It is thus impossible to fulfill $\alpha < \underline{\alpha}^*$ and $\alpha > \bar{\alpha}$ simultaneously.

Second, suppose that $\alpha > \underline{\alpha}$. If the marketer offers ϕ_S , only shallow influencers will review, and the profit is

$$\pi_M = (1 - \alpha)(Pr(r_I = G) - \phi_S) = \frac{1}{2}(1 - \alpha)[p_G + (1 - \theta)p_B].$$

The optimal information design is $(p_G^*, p_B^*) = (1, v_H - 1)$ if $\theta < 1$ and $(p_G^*, p_B^*) = (1, 0)$ if $\theta > 1$. If the marketer offers $\phi = \phi_G^L$, both influencers will accept it, and the marketer's expected profit is

$$\pi_M = \frac{\alpha}{2}(p_B^2 + p_G^2) + \frac{1 - \alpha}{2}(p_B + p_G) - \theta\alpha \frac{p_B^2}{p_B + p_G}$$

under the consumer's individual rationality constraint $p_B \leq (v_H - 1)p_G$. In equilibrium, it must be the case that $p_G = 1$. The analysis is almost identical to that given by Lemma 5 in OA.1. Setting $p_G = 1$, the first derivative $\partial\pi_M/\partial p_B > 0$ reduces to (c.f. (25)):

$$\alpha p_B^3 + (1 + \alpha - 2\alpha\theta)p_B^2 + (2 - \alpha - 4\alpha\theta)p_B + 1 - \alpha > 0. \quad (29)$$

We denote its left hand side by $\hat{Q}(p_B)$. The first derivative $\hat{Q}'(p_B) = 0$ has two solutions $p_B = -1$ and $p_B = \frac{-2 + \alpha + 4\alpha\theta}{3\alpha}$.

- (i) If either $\frac{-2 + \alpha + 4\alpha\theta}{3\alpha} < 0$ or $\frac{-2 + \alpha + 4\alpha\theta}{3\alpha} > 0$ and $\hat{Q}(\frac{-2 + \alpha + 4\alpha\theta}{3\alpha}) > 0$, then π_M is increasing with p_B .
- (ii) If $\frac{-2 + \alpha + 4\alpha\theta}{3\alpha} > 0$ and $\hat{Q}(\frac{-2 + \alpha + 4\alpha\theta}{3\alpha}) < 0$, then there exists a unique $0 < p_B^{(2)} < \frac{-2 + \alpha + 4\alpha\theta}{3\alpha}$ such that $\hat{Q}(p_B^{(2)}) = 0$.
 - (a) If $p_B^{(2)} \geq v_H - 1$, then π_M is increasing with p_B .
 - (b) If $p_B^{(2)} < v_H - 1$, then π_M attains maximum at either $p_B^{(2)}$ or $v_H - 1$.

We can readily verify that $(p_G, p_B, \phi) = (1, v_H - 1, \phi_G^L)$ yields a higher profit than either $(p_G, p_B, \phi) = (1, 0, \phi_S^* = 0)$ or $(1, v_H - 1, \phi_S^* = \theta(1 - \alpha)(v_H - 1)/2)$ for any $\alpha > \underline{\alpha}$, $1 < v_H < 2$ and any reasonable

range of θ .⁸ Regardless of where the marketer achieves the maximum profit from offering $\phi = \phi_G^L$, either at $p_B^{(2)}$ or $v_H - 1$, it is always better than offering ϕ_S .

To summarize, in a market with influencers having heterogeneous popularity, it is in the marketer's best interest to always increase the payment to the level that activates both influencers.

⁸For example, $0 < \theta < 2$. This bound is sharp. Offering ϕ_G^L with $p_B = v_H - 1$ will yield a higher profit than ϕ_S for any $\underline{\alpha} < \alpha < 1$ if and only if $\theta < \frac{v_H(v_H^2 - 2v_H + 2)}{2(v_H - 1)^2}$, where the right hand side attains minimum value of 2 at $v_H = 2$.