Media Platforms' Content Provision Strategies and Sources of Profits

Yu-Chieh Kuo[1]

[1]Department of Information Management, National Taiwan University

June 2, 2022

Background

▷ The media platforms grow and be one part of our life nowadays.

▷ We can observe that platforms adopt different strategies for monitization, for example, subscription, ad-only, dual-adoption.

▷ Moreover, UGC (User-Generated-Content) and PGC (Professionally-Generated-Content) platforms face different trade-off when determining their strategy.

▷ At the same time, users and advertisers have their desire for content and consumer.

     ▷ Users want to procure contents in their favor.

     ▷ Advertisers want to display their ads to their targets.

▷ Platforms nowadays iteract with multi agents: users, advertisers, content suppliers.

Questions

▷ How do platforms adopt their strategies under different scenarios with the interaction between content suppliers, consumers, and advertisers?

▷ What is an optimal strategy for a media platform under different scenario?

▷ How does consumers' desire for content and advertisers' desire for consumers affect a platform's content provision strategy?

▷ Specifically, we want to examine the optimal strategy under different content market structures.

  ▷ We will consider perfect competition, monopoly, and moderate competition in content market structures.

Literature Review

▷ Researchers highlight and analyze various issue for two-sided platforms in buyer-seller markets, such as platform competition in Armstrong (2006), pricing in Weyl (2010), and network asymmetry in Ambrus and Argenziano (2009).

▷ This research follows the related literature on two-sided media markets, and consider the empirical evidence of ads dislike from consumers in Wilbur (2008), the desire of reaching consumer from advertisers in Argentesi and Filistrucchi (2007) , and the condition to offer consumers an opinion of paying for no ads in Shin et al. (2019).

▷ However, these works focus on the consumer and advertiser side but abstract away from the content side of the market. We extend to three-sided platforms and include the consumers' desire for content, then examine how platforms should allocate its limited bandwidth for content and ads.

Outline

1. Model Setting

2. Perfectly Competitive Market

3. Monopoly Market

4. Moderately Competitive Market

5. Conclusion

Consumer

Utility from procuring content

▷ We start from a duopoly media markets where media pkatforms procure content from suppliers, allocate a space for content and host the promotional messages of advertisers.

▷ The consumer's utility when joining platform i to enjoy the content is $v \cdot \left(a_i - \frac{1}{2}a_i^2\right)$.

    ▷ v represents how consumer desires the content.

    ▷ $a_i \in [0, 1]$ is the proportion of platform i's space allocated for content; $1 - a_i$ is the space for ads on the other hand.

▷ This formulation captures the reality that the utility of the incremental content is likely to be lower as the proportion of content increases.

▷ Moreover, the marginal utility of content declines and may reach to a balance of the potential revenue from consuemrs and ads.

Consumer
Utility from joining platform

▷ Consumer are heterogeneous in their preference for a platform, and we capture such the heterogeneity by Hotelling line.
  ▷ Assume that consumers are uniformly distributed on $[0, 1]$.
  ▷ A consumer located at a distance x from platform i experiences a disutility by tx, where t captures the consumers' sensitivity to platform characteristics.

▷ The consumers pay a price p_{iC} when joining platform i, and obtain the overall utility

$$U_{iC}(x) = v \cdot \left(a_i - \frac{1}{2} a_i^2 \right) - tx - p_{iC}.$$

Advertisers

▷ Advertisers want to join a platform to promote their products and services to consumers.

▷ Advertisers' valuation of a consumer is r_A, and if they can reach n_{iC} consumers through platform i, they obtain the utility $u_{iA} = r_A \cdot n_{iC}$.

▷ Assume that a platform can capture the entire surplus from advertisers due to a scarce ad promotion space, the platform will set a promotion price at $p_{iA} = u_{iA} = r_A \cdot n_{iC}$ (Shin (2015)) and earn an ad revenue by $(1 - a_i)p_{iA}$.

Content Suppliers

$\triangleright$ Platform purchase the content from the suppliers to serve their consumers.

$\triangleright$ Let c be the marginal cost of producing content and the supplier charges p_S for a unit of content, their profit is $\Pi_S = (p_S - c) \cdot \sum_i a_i$.

Media Platforms
Profits and strategy space

▷ Consequently, platform *i* earns the profit
$\Pi_{iP} = n_{iC} \cdot p_{iC} + (1 - a_i) \cdot p_{iA} - a_i \cdot p_S$, and it faces an optimization
problem by deciding the proportion allocated for content a_i, and the
price charging to consumers p_{iC}.

▷ A platform can adopt one of the following strategies.

Free-content: The platform chooses to earn all its profits from
advertisers by setting $0 < a_i < 1$ and $p_{iC} = 0$.

No-ad: The platform chooses to earn all its profits from consumers
by setting $a_i = 1$ and $p_{iC} > 0$.

Dual: The platform earns profits from both consumers and
advertisers and set $0 < a_i < 1$ and $p_{iC} > 0$.

Decision Sequence

▷ In the first stage, the content supplier sets a content price p_S.

▷ In the second stage, platforms choose their strategies after observing p_S and set a_i and p_{iC}.

▷ In the third stage, consumers determine which platform to join after observing a_i and p_{iC}.

Consumer's Utility

▷ An infinite number of homogeneous content suppliers engage in the market and compete with each other.

▷ The equilibrium content supplier price is $p_S = c$ due to the perfect competition.

▷ Assume that platform 1 is located at $x = 0$ and platform 2 at $x = 1$, the consumers utility joining two platforms is

$$U_{1C}(x) = v \cdot \left(a_1 - \frac{1}{2}a_1^2 \right) - tx - p_{1C} \equiv V(a_1) - tx - p_{1C}$$
$$U_{2C}(x) = v \cdot \left(a_2 - \frac{1}{2}a_2^2 \right) - t(1-x) - p_{2C} \equiv V(a_2) - t(1-x) - p_{2C},$$

and the indifferent consumer is located at

$$x_0 = \frac{1}{2} + \frac{V(a_1) - V(a_2)}{2t} - \frac{p_{1C} - p_{2C}}{2t}.$$

Platform's strategy

▷ The mass of consumers joining platform 1 and 2 is $n_{1C} = x_0$ and $n_{2C} = 1 - x_0$, and platform i charges the ad promotion fee $p_{iA} = r_A \cdot n_{iC}$ to advertisers.

Lemma 1: In this context, if the marginal cost of producing content is too high ($c \geq \tau$), both platforms adopt *Free-content* strategies or *Dual* strategies otherwise, where $\tau = \frac{1}{2}\left(-r_A + \frac{tv}{r_A}\right)$.

Intuition: Since the content price $p_S = c$, platforms are not willing to buy too much content and display it if p_S is too high and will adopt a *Free-content* strategy to attract more users, and profit from advertisers. *No-ad* will not be a case since we don't consider the user's disutility of watching ads here. We will extend this disutility later.

Equilibrium and Profit

▷ If $c \geq \tau$, both platforms adopt *Free-content* strategy then set
$a_i^* = a^{Free} \equiv 1 - \frac{t(2c+r_A)}{\sqrt{tvr_A(2c+r_A)}}$ and $p_{iC}^* = p_{iC}^{Free} \equiv 0$, and obtain a profit
at $\Pi_{iP}^{Free} = \frac{t(2c+r_A)^2}{2\sqrt{tvr_A(2c+r_A)}} - c$.

▷ If $c < \tau$, both platforms adopt *Dual* strategy then set
$a_i^* = a^{Dual} \equiv \frac{-2c-r_A+v}{v}$ and $p_{iC}^* = p_C^{Dual} \equiv \frac{-2cr_A-r_A^2+tv}{v}$, and obtain a
profit at $\Pi_{iP}^{Dual} = \frac{4c^2-2(v-r_A)c+vt}{2v}$.

Platform's strategy under different desire

Proposition 1(a): A growing consumers' desire for content leads to the transition for platforms from using a *Free-content* strategy to *Dual* and earn less profits.

> ▷ Recall that in Lemma 1, if the marginal cost of producing content is higher than $\tau = \frac{1}{2}\left(-r_A + \frac{tv}{r_A}\right)$, both platforms adopt *Free-content* strategies.

> ▷ The value of τ increases as the consumers' desire v grows, which may change the relationship between c and τ.

> ▷ However, due to $\frac{\partial \Pi_{ip}^{Free}}{\partial v} < 0$ and $\frac{\partial \Pi_{ip}^{Dual}}{\partial v} < 0$, the profits decreases with the growing v. Intuitively, the platform charges a higher price due to a higher v, but also needs to offer more content to attract customers, which ascends the cost and leaves less space for ads.

Platform's strategy under different desire

Proposition 1(b): A growing advertisers' desire for consumers (r_A) leads to the transition for platforms from $\mathcal{Dual}$ strategy to *Free-content* and benefits platforms

  ▷ A growing r_A decreases τ and thus faciliates $c \geq \tau$.
  ▷ An increase in ads' desire for consumers motivates platforms to increase the ads space by reducing the content's, which enhances the ads profit but also decreases the procurement cost for content.

Proposition 2: When the price of content is sufficiently high, an increase in content price improves competing platforms' profit.

  ▷ Both platforms adopt a *Free-content* strategy if the price of content is sufficiently high. An increase of the price of content motivates platforms to reduce the proportion of content, which leads to a higher ads revenue and a lower procurement cost.

Ads exposion

▷ Advertisers are more willing to pay more for promotion if a platform hosts more proportion of content since customers are expected to spend more time on platform and exposed to ads for a longer time.

▷ The price of ads is modified as $p_{iA} = a_i^k \cdot r_A \cdot n_{iC}$, where $0 \leq k \leq 1$ captures the sensitivity of the ad price to the propostion of content.

▷ The author claim that this modification consistently shows the platform has to face a balance for revenues between consumers and advertisers, and there exists a small $k \in (0, 1]$ to make the result consistent with Proposition 2.

My comment: A larger proportion of content excludes the exposion of ads. Moreover, the author doesn't provide a proof for the claim. I think this modification should be improved.

Content Supplier's Decision

▷ The content supplier has no market power in the previous setting. Now we examine the case that the content supplier can set the content price p_S and then discuss the interaction between the content supplier and the platform.

▷ The content supplier determines the content price p_S to maximize its profit by anticipating the platform's strategy, that is,

$$\max \ \Pi_S = (p_S - c) \sum a_i(p_S).$$

Platform's Strategy and Profit

▷ Platforms' strategies are consistent with Proposition 1 and 2. We want to observe the interactions between platforms and content suppliers for the different desire from consumers and advertisers.

Proposition 3(a): The stronger consumers' desire for content benefits the content supplier regardless of platforms' strategies.

▷ Such desire motivates platforms to purchase more content in all strategies and promotes the content supplier's revenue.

Proposition 3(b): The stronger advertisers' desire for consumer hurts the content supplier's revenue under a $Dual$ strategy but benefits it under a $Free\text{-}content$ strategy.

▷ Such desire motivates platforms to increase the space of ads and consequently demands less content. However, both I and the author cannot give the latter an intuition, and I have no choice but to treat it as a mathematical result.

Content Price

▷ Given different content cost, platforms select different strategies.

▷ Content cost alters to p_S in this context, but the strategy selecting criteria for platforms is consistent in the previous one, that is, depending on the cost of content.

▷ If $p_S < \tau$, platforms choose $\mathcal{Dual}$ strategy and the demand for content in this case is $a^{\mathcal{Dual}}(p_S) = \frac{-2p_S - r_A + v}{v}$; platforms choose $\mathcal{Free\text{-}content}$ and have the demand $a^{\mathcal{Free}}(p_S) = 1 - \frac{t(2p_S + r_A)}{\sqrt{tvr_A(2p_S + r_A)}}$.

Proposition 4: A monopoly content supplier may not extract all surplus from the platforms.

▷ Since platforms are able to profit from ads, they can balance the profit from both channels carefully, which is different with the traditional market.

1. Model Setting

2. Perfectly Competitive Market

3. Monopoly Market

4. Moderately Competitive Market

5. Conclusion

Moderate Competition on Content Price

$\triangleright$ In addition to the previous two polar cases, we observe only a few content suppliers and moderate competition in the content market in some markets.

$\triangleright$ Consider a duopoly content market. Let p_{jS} be the price of content from supplier j, and h_i be the proportion of content platform i buys from supplier 1 and $1 - h_i$ from supplier 2.

$\triangleright$ Given the content procurement decision, the profits of platform i is

$$\Pi_{iP} = n_{iC}p_{iC} + (1 - a_i)p_{iA} - a_i \cdot h_i \cdot p_{1S} - a_i \cdot (1 - h_i) \cdot p_{2S}.$$

$\triangleright$ The corresponding profits of the two content suppliers are

$$\Pi_{1S} = p_{1S} \cdot \sum_i (a_i \cdot h_i) \quad \text{and} \quad \Pi_{2S} = p_{2S} \cdot \sum_i (a_i \cdot (1 - h_i)).$$

Competition among Content Suppliers

▷ We assume two content suppliers are horizontally different to the platforms. Their difference factors, such as integration of systems, may influence platforms' decision but not affect the utility for consumers.

  ▷ This allows us to focus on how mere competition between content suppliers affects content price.

▷ We use the marginal substitution rate (MRS) of the suppliers as a metric, and MRS gives the change in the demand when the content price increases by 1%, where $MRS_i(p_{1S}, p_{2S}) \equiv \left| \frac{\partial h/h}{\partial p_{iS}/p_{iS}} \right|$, and $h \equiv h_1 = h_2$.

Moderate Competition in Content Price

▷ A high MRS suggests that the content suppliers are more substitutable and the market is more competitive and vice versa.

▷ In a traditional one-sided market, if the seller increases the price, the buyer switches to the opposite firm.

▷ However, in a multi-sided media market, if one seller (content supplier) increases the price, the buyer (platforms) has two options: decrease the proportion of content, or switch to the competing supplier

    ▷ This reduces the competition for the content suppliers in price. Content suppliers don't extremely bear the price competition compared with that in a monopoly market, and the equilibrium price in a duopoly market is higher than a monopoly one.

Ads Disutility for Consumers

▷ In the original model, we don't consider the nuisance of ads for consumers. Here we extend the model by including a direct disutility of ads.

▷ Let $d_C \geq 0$ be the consumers' dislike for a unit space of ads, then the utility of a consumer at distance x from platform i is

$$U_{iC}(x) = v\left(a_i - \frac{1}{2}a_i^2\right) - d_C \cdot (1 - a_i) - tx - p_{iC}.$$

▷ The original model can be regarded as a special case for $d_C = 0$.

Platform's Strategy When Ads Disutility Matters

Proposition 5: Even if consumers derive disutility from seeing ads, platforms never adopt a *No-ad* strategy in a monopoly content supplier makert. However, in a competitive market, *No-ad* is possible to adopted.

- ▷ Recall that a platform chooses *No-ad* strategy only when the content price is sufficiently low.
- ▷ However, *No-ad* strategy leads platforms to buying the maximum amount of content, which encourage the monopoly suppliers to raise the price.
- ▷ Consequently, platforms cater to advertisers and thus adopt *Free-content* or *Dual* strategy rather than *No-ad*.
- ▷ In the competitive market, the content price is possibly low, at meanwhile the disutility from ads restricts the benefits of ads.

Practical Examples

▷ Media platforms such as Netflix and Spotify, who procure content from competing content suppliers, usually offer the content to consumers without ads.

▷ In contrast, TV stations broadcasting the Olympics of FIFA World Cup, which providecd by suppliers with some marketing power, typically host ads and also charge viewers.

1. Model Setting

2. Perfectly Competitive Market

3. Monopoly Market

4. Moderately Competitive Market

5. Conclusion

Managerial Significance

▷ It is difficult for a manager to conjecture how the different sides of a media market might interact in a given situation, however, this paper provides useful

▷ Further research may put the quality of content, platform in-house content supplier, and any possible extension into consideration.

Ambrus, Attila and Rossella Argenziano (2009) "Asymmetric networks in two-sided markets," *American Economic Journal: Microeconomics*, 1 (1), 17–52.

Argentesi, Elena and Lapo Filistrucchi (2007) "Estimating market power in a two-sided market: The case of newspapers," *Journal of Applied Econometrics*, 22 (7), 1247–1266.

Armstrong, Mark (2006) "Competition in two-sided markets," *The RAND journal of economics*, 37 (3), 668–691.

Shin, W, W Amaldoss, and J Du (2019) "Media Platforms' Content Provision Strategy and Source of Profits," in *ISMS Marketing Science Conference 2019/2019 INFORMS Marketing Science Conference*, INFORMS Society for Marketing Science (ISMS).

Shin, Woochoel (2015) "Keyword search advertising and limited budgets," *Marketing Science*, 34 (6), 882–896.

Weyl, E Glen (2010) "A price theory of multi-sided platforms,"
American Economic Review, 100 (4), 1642–72.

Wilbur, Kenneth C (2008) "A two-sided, empirical model of television
advertising and viewing markets," *Marketing science*, 27 (3),
356–378.